Internet Society Global Internet Report 2014

Open and Sustainable Access for All

Internet Society™

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Foreword

More than two decades ago, the Internet Society was formed to support the open development, evolution, and use of the Internet for the benefit of all mankind. Over the years, we have pursued that task with pride. We continue to be driven by the hope and promise of the benefits the Internet can bring to everyone.

In doing so, the Internet Society has fostered a diverse and truly global community. Internet Society Chapters and members represent the people of the world and the many and varied ways they use the Internet to enrich the lives of themselves and their peers. They use the Internet to create communities, to open new economic possibilities, to improve lives, and to participate in the world. We are inspired by their stories of innovation, creativity, and collaboration.

Thanks to the Internet's own success, we are now in an increasingly complex era where the stakes are much higher than before, and potential threats to the Internet's core principles loom larger. To protect your ability to use the Internet for your needs – to keep it open and sustainable – we must do more to measure impacts and present the strengths of the open Internet model in more compelling ways, to convince policy makers, influencers, and the general public of the importance of our mission.

To this end, I am pleased to launch this, the first in an annual series of *Global Internet Reports*. With this report, the Internet Society introduces a new level of integrated analysis, measurement, and reporting to Internet governance discussions at all levels.

The *Global Internet Reports* will become a showcase of topics that are at the heart of the Internet Society's work about the future of the Internet, weaving together the many threads of the diverse multistakeholder Internet community.

I commend our Chief Economist, Michael Kende, for his vision and hard work in creating this report, and I thank everyone else who committed their time and expertise to help.

The Internet Society is pleased to present our first report and trust that the *Global Internet Reports* will become an important contribution to the continued progress of Internet development.

Kathy Brown
President and CEO

Executive Summary

Introduction

The Internet Society (ISOC) is a global not-for-profit organization founded in 1992 to provide leadership in Internet related standards, development and policy, with the guiding vision that 'The Internet is for Everyone'. This report is the first in a series meant to celebrate the progress of the Internet, highlight trends, and illustrate the principles that will continue to sustain the growth of the Internet.

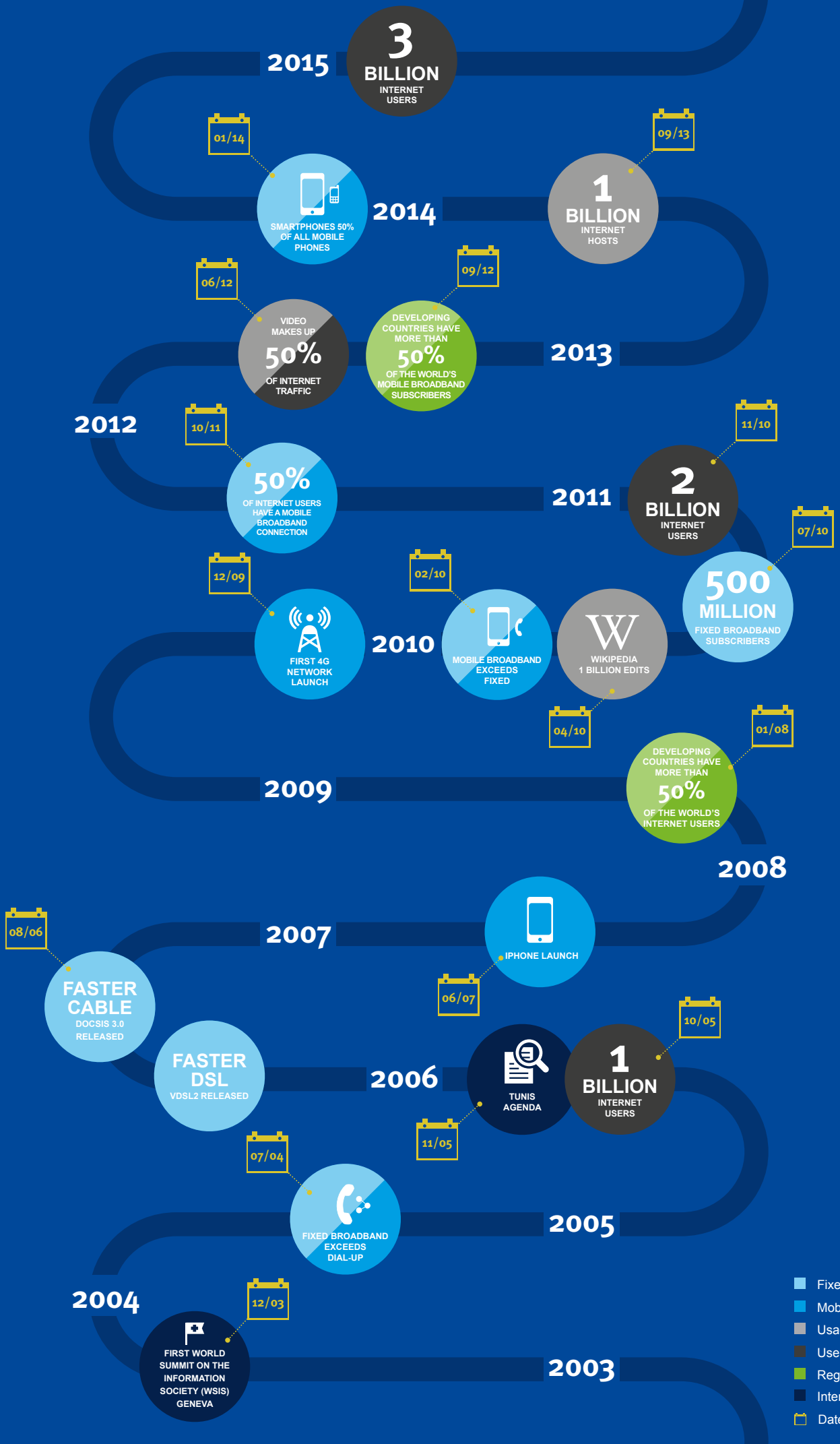
This report focuses on the open and sustainable Internet – what we mean by that, what benefits it brings, and how to overcome threats that prevent those of us already online from enjoying the full benefits, and what keeps non-users from going online in the first place. Given the rapid pace of change, it is important to solidify and spread the benefits of the open Internet, rather than taking them for granted.

This is your Internet: Trends and Growth

Against a backdrop of relentless growth, the Internet continues to change and evolve, as shown in the timeline below. It is remarkable that only in 2004 did fixed broadband connections exceed dial-up access, the number of users only exceeded one billion late in 2005, or that the first smartphone was only introduced in 2007. How many of us could have imagined back then that mobile broadband would so soon surpass fixed, developing country users surpass developed country users, video traffic surpass all other, and that we would be approaching three billion users in early 2015?

Throughout this process of constant change, the fundamental nature of the Internet has remained constant. The Internet is a uniquely universal platform that uses the same standards in every country, so that every user can interact with every other user in ways unimaginable 10 years ago, regardless of the multitude of changes taking place. This report shows why it is important to maintain, and strengthen, the open and sustainable Internet that has enabled not just the growth, but also the evolution of the Internet.

TIMELINE OF MILESTONES IN DEVELOPMENT OF THE INTERNET

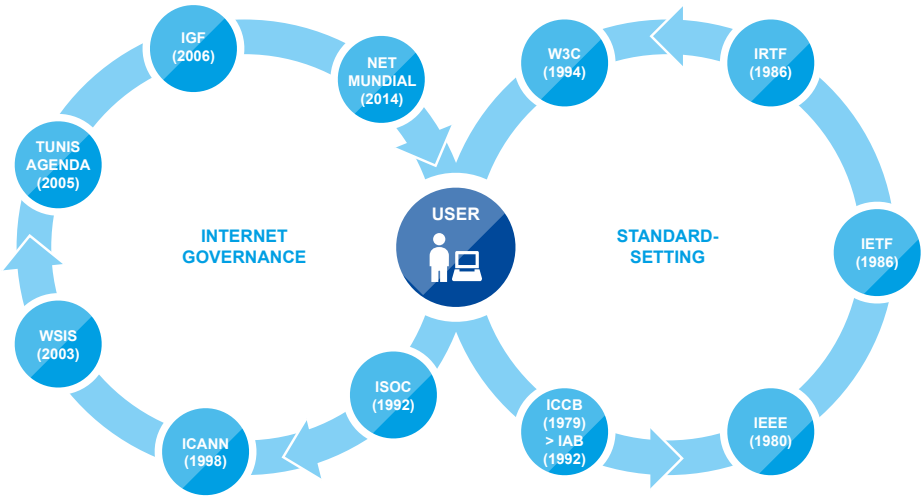


What is the Open and Sustainable Internet?

The Internet has changed the world. Open access to the Internet has revolutionized the way individuals communicate and collaborate, entrepreneurs and corporations conduct business, and governments and citizens interact. At the same time, the Internet established a revolutionary open model for its own development and governance, encompassing all stakeholders.

The development of the Internet relied critically on establishing an open process. Fundamentally, the Internet is a 'network of networks' whose protocols are designed to allow networks to interoperate. In the beginning, these networks represented different academic, government, and research communities whose members needed to cooperate to develop common standards and manage joint resources. Later, as the Internet was commercialized, vendors and operators joined the open protocol development process and helped unleash the unprecedented era of growth and innovation.

The cooperation between the communities of interest was itself made possible by tools that were enabled by this inter-network – email, file transfers, and then the World Wide Web. Thus came a vital feedback loop between the users of the network and the stewards, who were one and the same. This loop has ensured that the openness of the process developing the network is reflected in the open usage of the network, and vice versa.



The spirit of collaboration that lies at the foundation of the Internet has extended from standards to a multi-stakeholder governance model for shared Internet resources for naming and addressing. The multi-stakeholder approach now also covers policy in a variety of organizations and processes at the international and national level, creating an infinite loop of continuous improvement.

To illustrate, we show how the multi-stakeholder model is used to develop standards such as the Opus audio codec; how it has been applied to combat spam in developing countries; how Internet Exchange Points can be developed; and even how a multistakeholder approach has been adapted to provide wireless Internet access in rural India.

Benefits of an Open and Sustainable Internet

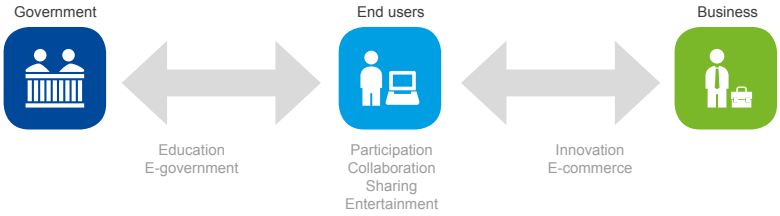
The open Internet has created a medium like no other, one that merges the most notable characteristics of traditional media such as broadcast and telecommunications, while also augmenting them in ways that have revolutionized aspects of civil society, business, and government.

The Internet allows these traditional forms of communications, but is more interactive than old-style broadcast, and more inclusive than a conventional telephone call. As a result, the nearly three billion Internet users are both creators of information as well as consumers. Websites, blogs, videos, tweets, can all be broadcast and accessed in the largest mass medium imaginable. Audio and video calls and conferences can be set up and received without regard to distance or cost.

However, these changes are not just limited to traditional media. Governments can use the Internet to deliver services and levy taxes and, in turn, can choose to enable citizens to elect, petition, and oversee their governments online. Entrepreneurs not only have new markets for their goods or services, but also a new means to raise money online to finance their dreams. Likewise, entertainers have a new global medium to share or sell their endeavours, while new artists can be discovered and grow online.

With open access to the Internet and an appropriate enabling environment, the resulting benefits of the Internet are limited only by the imagination and efforts of its users. Here we provide some examples that demonstrate the value of the open Internet for creating benefits among its global users.

EXAMPLES OF THE OPEN AND SUSTAINABLE INTERNET

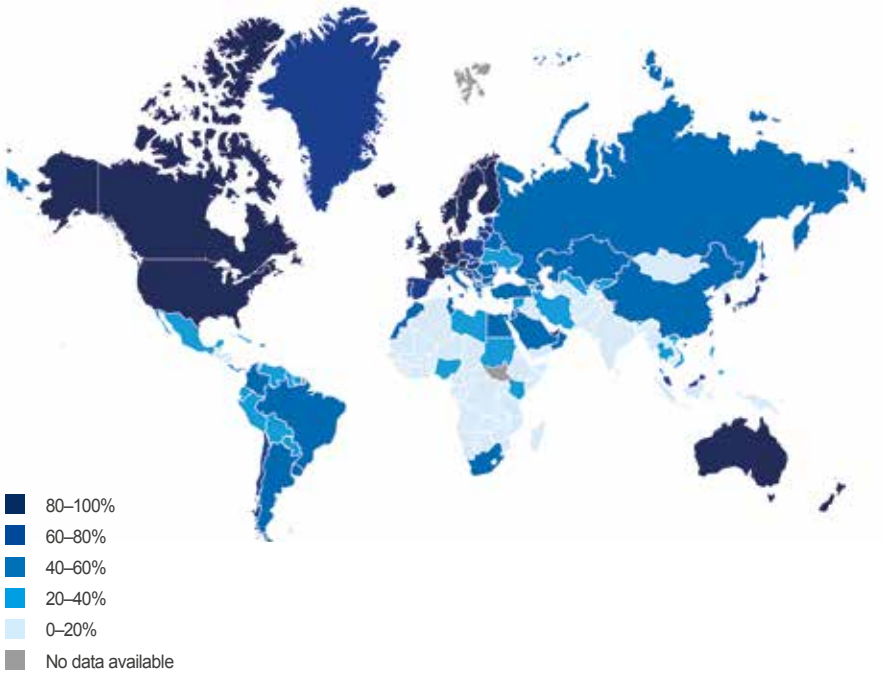


Challenges to the Open and Sustainable Internet

The benefits of the open Internet flow from the development and adoption of a set of underlying protocols that are in use worldwide. These protocols help to create the base of nearly three billion users, allowing them to communicate with one another to generate the benefits described in the previous section. However, while the Internet is often called the 'network of networks', all networks are not created alike.

GLOBAL INTERNET PENETRATION LEVELS IN 2012

[Source: ITU]



Creating a global network of networks based on a standard platform is a foundational success of the Internet. That is not to say, however, that there are not significant differences between countries in terms of Internet access and usage. The first, highlighted above, relates to the penetration of Internet users between countries; the more users within a country and in neighboring countries, the more benefits to any other user in being online.

Further, for those users already online, the overall user experience can differ significantly by country. Any such differences, however, do not originate from technical standards, but rather from government policy and economic reality. In particular, these differences can arise at two layers of the Internet:

- Infrastructure. Countries can differ by the affordability and bandwidth of access networks, and by the resilience of their international connections to other countries, based on economic factors and policy and regulatory choices.

- Content and applications. Some governments require network operators to filter content or block applications, using political or legal justifications. In other cases, content may not be available or locally relevant for economic reasons.

While the open Internet is an unparalleled positive force for advancement, it is not immune from economic and political influences that act to limit benefits. An affordable and reliable Internet is not yet a reality for the majority of people in the world. At the same time, where access is available it should not be taken for granted. The mere fact of being connected does not guarantee one will be able to innovate or freely share information and ideas; these abilities require an enabling Internet environment, one that is based on unrestricted openness.

Recommendations

Although the Internet is held together by a global set of standards, we have shown here that there are divisions in the user experience between countries. Further, in spite of the striking, once unimaginable, growth in Internet adoption and usage, the majority of the world population is still not online. Addressing the challenges in the previous section will not just improve the user experience of those currently online,

but will also contribute to the Internet Society's overarching vision, that the Internet is for Everyone.

Progress towards our vision is proceeding quickly around the world, as access continues to grow at a significant pace. However, much development work remains to be done to bring the economic and social benefits of the Internet to everyone. Further, those who are online are experiencing significant variations in their user experience.

For non-Internet users, sitting on the other side of the so-called digital divide, Internet access is clearly a critical component. With the advent of mobile broadband, which can be rolled out faster and at lower cost than fixed broadband, access is no longer as critical an issue for those in the new service regions. Nonetheless, affordability remains as a significant roadblock. However, there is evidence that among those who have access to the Internet and are able to afford it, there are still many who choose not to go online.

Have Internet already	• **Resilience:** Increase cross-border connectivity • **Security and privacy:** Use technology to promote trust and privacy • **Content availability:** Make sure content is widely and legally available
Could have Internet	• **Content access:** Provide access to locally relevant content • **Content creation:** Government lead in developing applications and creating demand for hosting infrastructure
Cannot have Internet	• **Access:** Remove barriers to deployment, and government invests where costs are high or incomes are low • **Affordability:** Remove taxes on equipment and services to lower costs, subsidize demand in targeted fashion

As a result, when considering how to bridge the digital divide, it is important to differentiate those who could afford to go online, but choose not to, from those who do not have access or could not afford it anyway. It is also important to consider the issues that impact those already online, such as improved security and privacy measures. Addressing those concerns will not just impact those already online, but improve the experience for those considering going online.

Conclusion

As we near three billion Internet users, it is appropriate to step back and marvel at the speed of adoption and changes that have taken place to date. It is clear that the open Internet model, which helped to fuel the growth and navigate all the bumps in the road, continues to be the best way to ensure that the Internet remains sustainable and continues to grow.

Working together – and honouring the Internet model – all stakeholders can meet the foreseen challenges outlined in this report – and others as they arise – to make the Internet yet more essential to end-users' lives as citizens, consumers, and innovators. At the same time, we can address the digital divide that separates regions and people, and make sure that once online, everyone has the same user experience. With open and universal online access, anything is possible.

Author's Notes and Acknowledgements

As the Internet Society's first Chief Economist, it has been an honour for me to write the first of our *Global Internet Reports*. Our vision is for this to be the first in an annual series of reports, providing an overview of key data and trends showing the growth and development of the Internet worldwide, each year focusing on a particular theme. This year, in light of the revelations of 2013 and subsequent challenges for standards development and Internet governance, we chose the topic of the Open and Sustainable Internet – why it is worthwhile to protect and promote.

The report is largely written from the end-user perspective – how we benefit from an open Internet and why its sustainability is so important to so many aspects of civil life, business, and government. This report is dedicated to our members and their chapters, in recognition of their dedication to the Internet Society and to the broader mission of promoting our principles for the Internet. We hope that this report helps in that mission.

Preparing and delivering this report was a team effort across the entire Internet Society. First, I would like to thank Karen Rose, who had a vision several years ago to 'bring data to the dogma' and brought me on to help fulfill that vision, and also provided insight and experience on every aspect of the report. I would also like to thank Lynn St. Amour, under whom this project started, and Kathy Brown for her enthusiasm and support since taking over.

I would also specifically like to thank a number of my colleagues who helped with the content of the report. Markus Kummer, Sally Wentworth, Konstantinos Komaitis, Nicolas Seidler, Karen Mulberry, Leslie Daigle, Mat Ford, Dan York, Lucy Lynch, Jane Coffin, Rajnesh Singh, Duangthip Chomprang, Dawit Bekele, Michuki Mwangi, Sebastian Bellagamba, and Raquel Gatto all provided input at various stages of the project. Additional thanks to Carl Gahnberg, who provided research and analysis throughout the project.

In addition, a large team helped to prepare the report for distribution and the online material, including Walda Roseman, Greg Wood, Wende Cover, Howard Baggott, Dan Graham, Fernando Zarur, Nona Phinn, Lia Kiessling, Kathy Sebuck, Graham Minton, and Joyce Dogniez. Please visit the online material, where we will provide interactive maps, updates, and new material throughout the year, at www.internetsociety.org/global-internet-report.

Beyond the Internet Society staff, I would like to thank the following members of the global Internet community for their help and expertise:

- Bert Wijnen, research engineer, and Emile Aben, system architect at RIPE NCC, for programming the Atlas probes to provide the round trip times to YouTube and Facebook, used in section 4.

- Jim Cowie, Chief Technology Officer, Renesys, who provided the resilience and disruption data used for the map in section 4.

- Robert Faris, Research Director of the Berkman Center for Internet and Society at Harvard University, for his peer review of the report.

- Mark Colville and Alex Reichl of Analysys Mason for research and analysis throughout the report, and Valérie Gualde for editing the report.

- Gerard Ross for providing a thorough and engaging final review of the document.

- Blossom Communications for developing the infographics, design, and layout of the report.

- TeliaSonera, who generously covered the cost of Blossom Communications.

And finally, in the spirit of the Internet model, I welcome your feedback, comments, and suggestions to help guide and shape future reports.

Michael Kende
Chief Economist

Introduction

A characteristic of the Internet, which has allowed it to grow so quickly and made it sustainable, is that it is open – both for users to access and innovate, and for all stakeholders to participate in its development and governance. These two aspects of openness did not arise separately, but rather are closely linked, two sides of the same coin.

The founders of the Internet effectively acted as its first multi-stakeholder group. They were pragmatic, pioneering developers, guided by strong, shared foundational principles. They set standards, arranged for interconnection, provided service to their groups, determined policies, and managed resources. As users of the Internet themselves, they governed with a goal to keep the Internet open and make it sustainable, creating an early feedback loop between the users of the Internet and their usage.

Later, as the Internet quickly grew and then commercialized, the roles of the founders were filled by organizations that arose and specialized, but held firm to the principle of user involvement. These institutions developed first to set standards and coordinate resources, then later emerged to address broader Internet governance matters. In this fashion, the feedback loop binding the users of the Internet to its ongoing oversight created an infinite loop of continuous improvement.

Many of the founders of the Internet were also founders of the Internet Society in 1992, further contributing to the feedback loop by promoting engagement and collaboration on key issues facing the evolution and growth of the global Internet. This *Global Internet Report* is the first in a series meant to celebrate the progress of the Internet, highlight trends, and illustrate the principles that will continue to sustain the growth of the Internet.

This report focuses on the open and sustainable Internet – what we mean by that, what benefits it brings, and how to overcome threats that prevent those of us already online from enjoying the full benefits, or that keep non-users

from going online in the first place. Given the rapid pace of change, it is important to solidify and spread the benefits of the open Internet, rather than taking them for granted.

There are still significant differences dividing the Internet experience around the world. Some users are never out of range of a high-speed connection, while others may have to walk to the nearest access point to get online. Some have multiple smartphones, each with a mobile broadband connection, while others must share a phone among the whole family. And some are 'digital natives', for whom nothing is a surprise, while others of us – those who remember a time before the Internet – still marvel at what can, and is, being done online.

This report is part of the ongoing attempt to create a future in which everyone, everywhere is automatically a digital native, such that the term itself will become a redundant anachronism, and memories of a time without Internet will be a thing of the past. Together, we must ensure the day never comes when digital natives reminisce about how the Internet used to be governed by, and for, the end-users, and how it used to provide access to everyone and everything online.

SECTION 01

This is your Internet: Trends and Growth

1.1 Introduction

Against a backdrop of relentless growth, the Internet continues to change and evolve, as highlighted in Figure 1.2. In just the past ten years, the number of Internet users shot past one billion and is nearing three billion; users migrated their fixed Internet access from dial-up to broadband; and their usage shifted from text-based to predominantly video traffic. Globally, the number of users in developing countries now exceeds those in developed countries; there are now more mobile broadband subscribers than fixed; and mobile access has shifted to smartphones.

Against this constant change, the fundamental nature of the Internet has remained constant. The Internet is a uniquely universal platform that uses the same standards in every country, so that every user can interact with every other user in ways unimaginable even 10 years ago. This report shows why it is important to maintain, and strengthen, the open and sustainable Internet that has enabled the growth and the changes, outlined in this section.

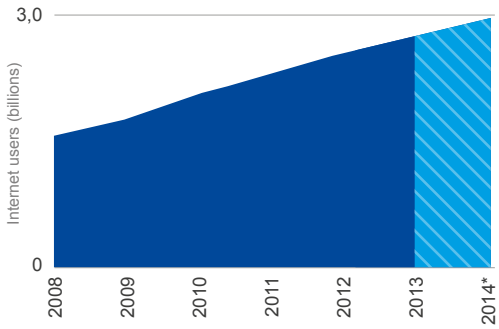
1.2 Overview

The Internet, both in terms of infrastructure and content, has grown rapidly since its inception, spurring enormous innovation, diverse network expansion, and increased user engagement in a virtuous circle of growth.

The number of Internet users has risen steadily as shown in Figure 1.1, reflecting the compelling draw and uptake of the growing and more diverse Internet services. We anticipate that the milestone of 3 billion users will be reached in early 2015, based on a recent International Telecommunication Union (ITU) forecast.[1]

Figure 1.1: Global Internet users

[Source: ITU,[2] 2014] (* signifies a forecast)



2,893,587,260

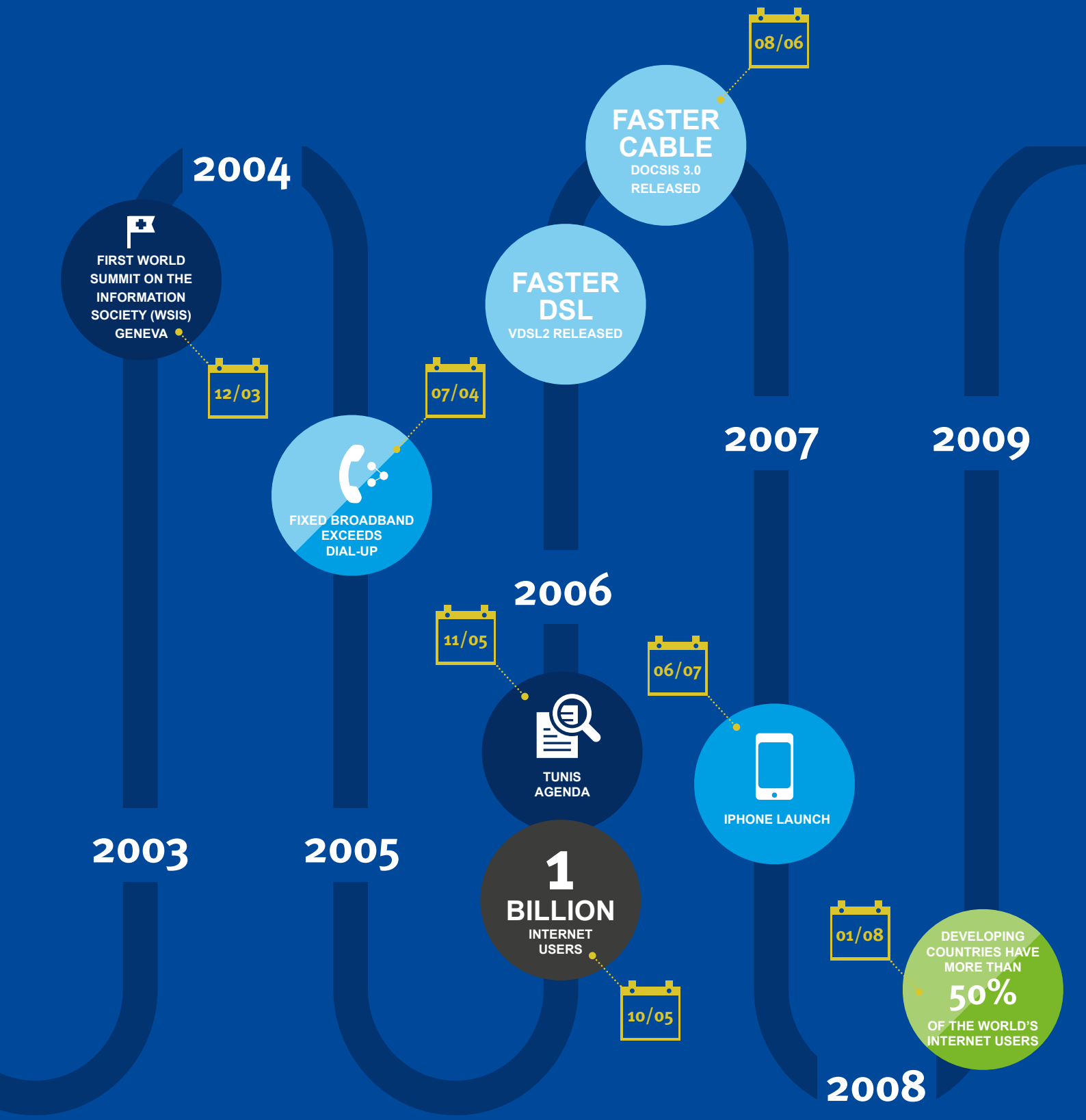
Internet Users Worldwide

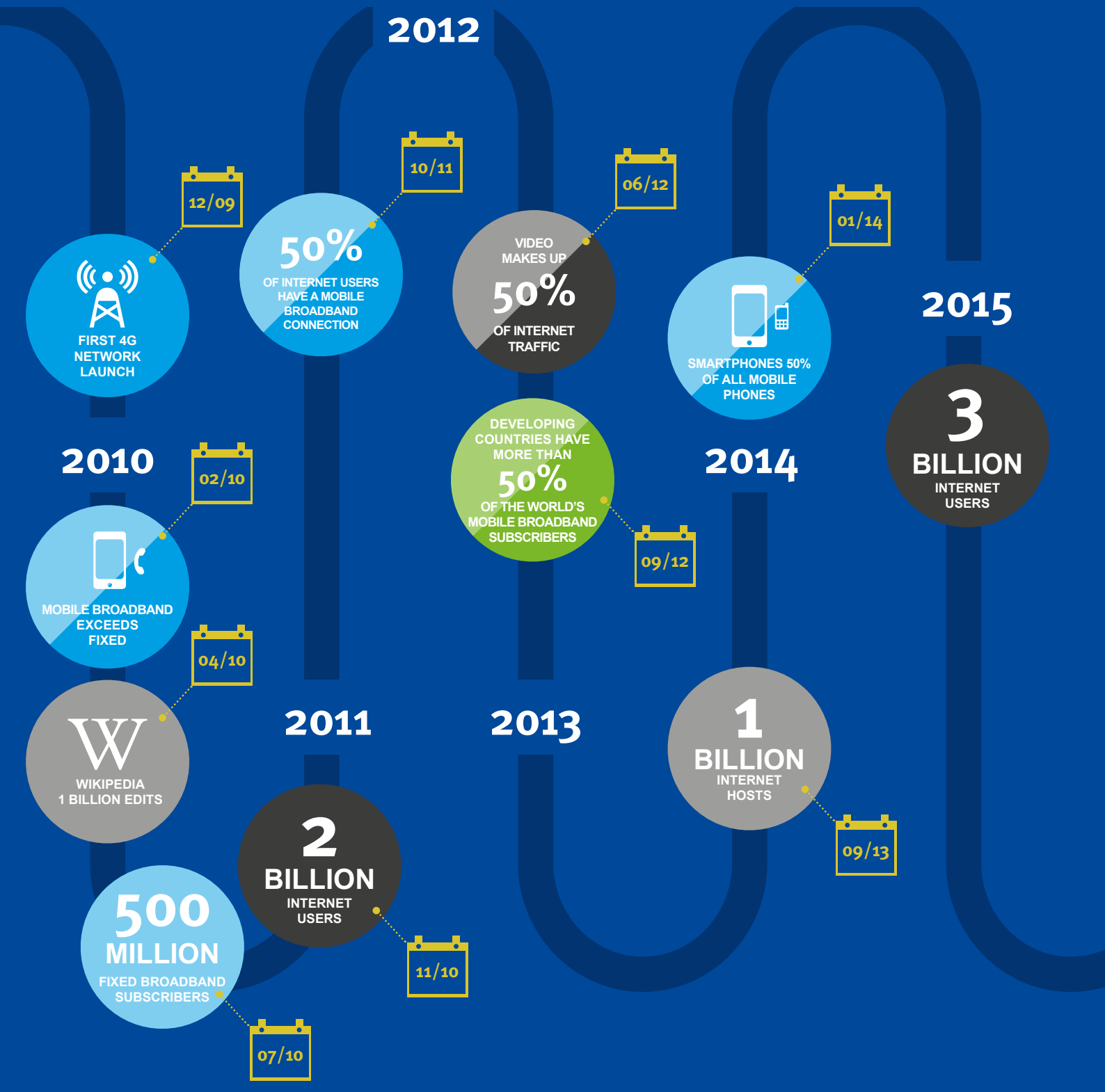
10 May 2014, 8:00 am CET

[Source: internetlivestats.com]

FIGURE 1.2: Timeline of milestones in development of the Internet

[Source: Internet Society, Analysys Mason, 2014]

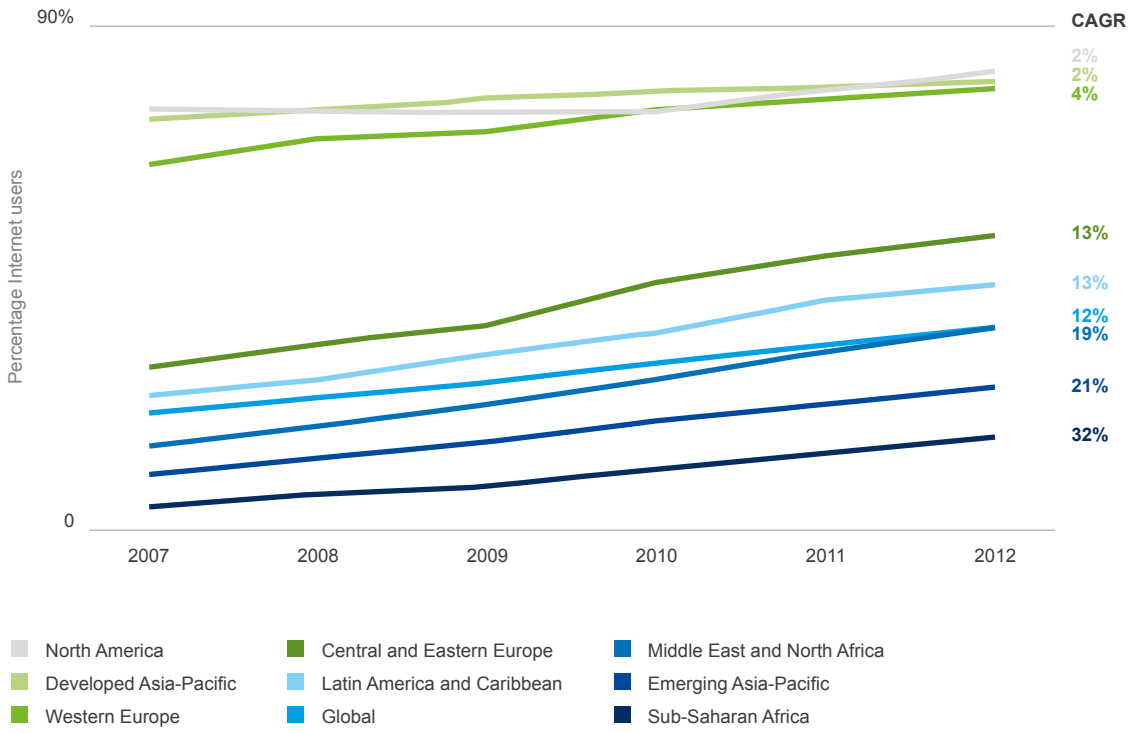



2012
12/09
FIRST 4G NETWORK LAUNCH
10/11
50%
OF INTERNET USERS HAVE A MOBILE BROADBAND CONNECTION
06/12
VIDEO MAKES UP
50%
OF INTERNET TRAFFIC
01/14
SMARTPHONES 50% OF ALL MOBILE PHONES
2015
3
BILLION
INTERNET USERS
2010
02/10
MOBILE BROADBAND EXCEEDS FIXED
04/10
WIKIPEDIA
1 BILLION EDITS
DEVELOPING COUNTRIES HAVE MORE THAN
50%
OF THE WORLD'S MOBILE BROADBAND SUBSCRIBERS
09/12
2014
2011
2013
1
BILLION
INTERNET HOSTS
09/13
2
BILLION
INTERNET USERS
11/10
500
MILLION
FIXED BROADBAND SUBSCRIBERS
07/10
Fixed broadband
Mobile broadband
Usage
Users
Regions
Internet Governance
Date (Month/Year)

As shown in Figure 1.3, the global proportion of people using the Internet has risen at a compound annual growth rate (CAGR) of 12% in the period 2008-2012, reaching a level of 37.9% of the global population in 2013. The increase in usage is particularly evident in those regions that had lower levels of Internet usage in 2008, with the comparable growth rates for the period in sub-Saharan Africa and emerging Asia-Pacific exceeding 20%, as can be seen in Figure 1.3.[3]

Figure 1.3: Proportion of population using the Internet

[Source: ITU, 2013]



Every computer, mobile phone, and any other device connected to the Internet needs an IP address to communicate with other devices. Thus, underpinning the increase in the number of Internet users is an increase in the number of Internet Protocol (IP) addresses issued by the five international Regional Internet Registries (RIRs).[4]

IPv6 is the next-generation IP standard intended to replace IPv4, the protocol most Internet services use today. As can be seen in Figure 1.4 and Figure 1.5 below, while more IPv4 space has been issued by the RIRs in total, the volumes

69.6%

Local Internet Registries (LIRs) in the RIPE NCC area with IPv6 allocations

May 2014

[Source: labs.ripe.net/statistics]

of addresses being allocated for IPv6 are growing much more rapidly. This slowing in the volume of IPv4 address space being issued is explained by the near depletion of the IPv4 address pool (in fact, some regions have effectively exhausted their IPv4 resources). At the same time, IPv6 implementation is just beginning to take off.[5]

Figure 1.4: Growth in IPv4 address space issued by each RIR in terms of /8s[6]

[Source: The Number Resource Organization, 2014]

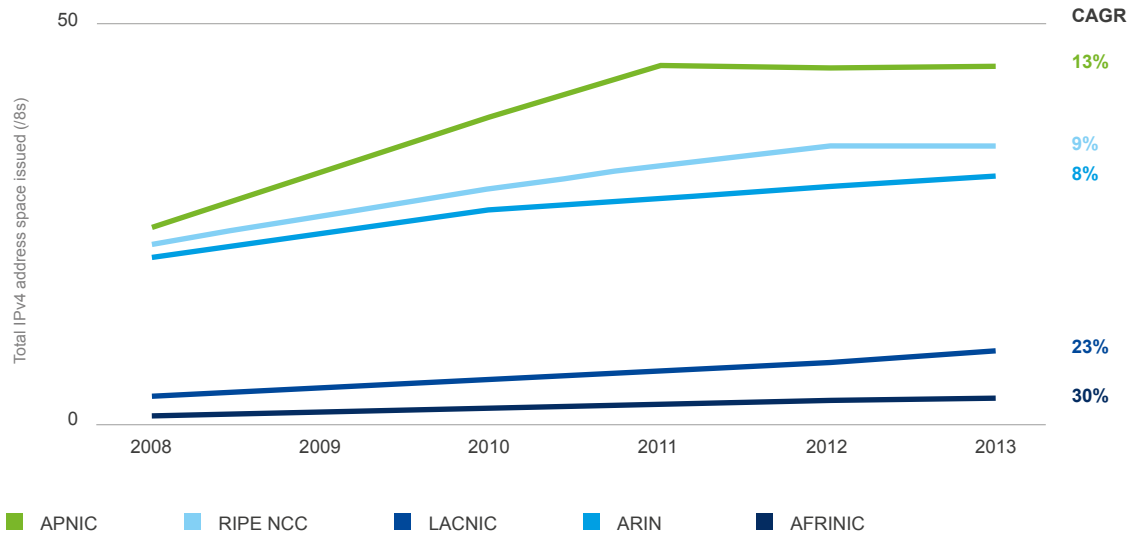
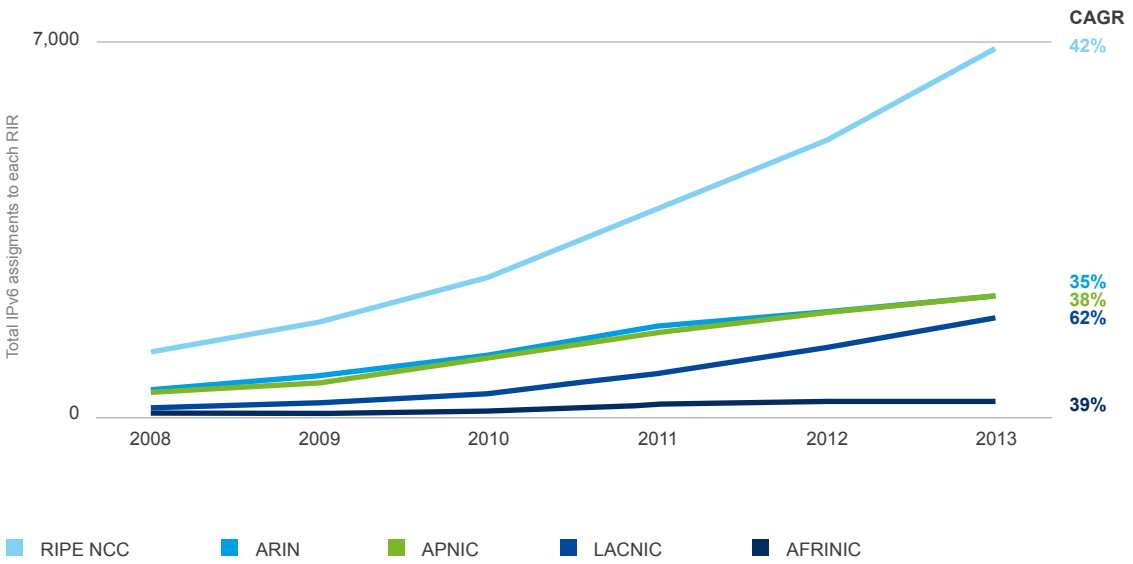


Figure 1.5: IPv6 allocations made by each RIR

[Source: The Number Resource Organization, 2014]



The growth and diversity of Internet infrastructure and its use can also be witnessed in the growth of key Internet identifiers, including autonomous system numbers (roughly measuring the number of distinct networks that interconnect to make up the Internet) and domain name registrations. As noted in Figure 1.6, nearly 70,000 autonomous systems were assigned and more than 135 million domain names registered in total by 2013. This diversity of networks and names serves the range of content and applications that have come to define the Internet experience of today, from education and government content to business, entertainment, and beyond.[7]

Similarly, Internet host numbers are growing, from just 1.3 million in January 1993 to 1.01 billion in January 2014.[8] Based on these numbers, we estimate that the threshold of 1 billion Internet hosts was passed in September 2013.[9] This growth in the number of computers connected directly to the Internet – at a yearly rate over 37% across 21 years – is a strong indicator of the huge rise in Internet connectivity and usage.

While Internet access continues to grow at significant rates, users are also rapidly shifting to broadband connections. Internet access can take many forms, from shared dial-up access in an Internet café to ultra-fast fibre-to-the-home broadband connections, and all forms are important to those users who rely on them for access. However, the clear trend is towards broadband access, both fixed and mobile, owing to the advantages of offering always-on access to ever-increasing amounts of bandwidth. Therefore, with an eye on the benefits to end-users, in this report we highlight advances in broadband Internet access.[10]

As shown in the next sections, both fixed and mobile broadband connections are expected to grow, with mobile connections already outnumbering fixed broadband connections. Of particular interest is the strong and accelerating growth in mobile broadband connections in the emerging regions that have low Internet penetration today.

While Internet adoption is growing worldwide, so is Internet traffic per connection, due to the increasing move to higher-bandwidth broadband access connections, the corresponding adoption of relatively data-heavy Internet applications (such as audio and video streaming) and increased adoption of devices, such as smartphones, that are optimized to access these applications. These themes are explored further in the next sections.

1,010,251,829

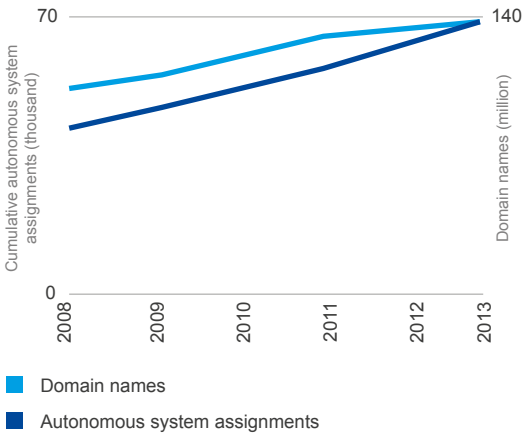
Hosts advertised in the Domain Name System

January 2014

[Source: Internet Systems Consortium, 2014]

Figure 1.6: Growth in domain names and autonomous system assignments

[Source: Regional Internet Registry, webhosting.info, 2014]

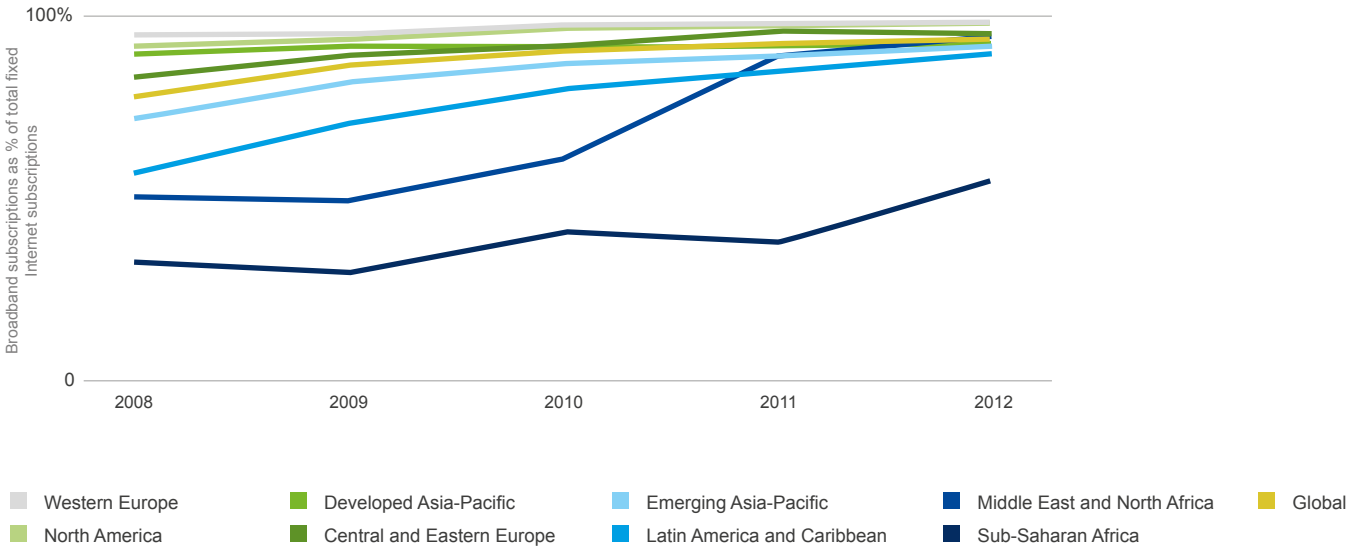


1.3 Fixed broadband Internet access

Fixed Internet subscriptions are increasingly dominated by broadband access. Broadband subscriptions reached 93% of total global fixed Internet subscriptions in 2012, as can be seen in Figure 1.7. All regions, aside from sub-Saharan Africa, had at least 90% of their fixed Internet access services at broadband speeds[11] by 2012. The 54% fixed broadband proportion in sub-Saharan Africa is not, however, a reflection of the total proportion of Internet access provided at broadband speeds in the region. This is because fixed access makes up only 4% of total Internet subscriptions in the region, while in North America, for example, 44% of total Internet subscriptions are fixed.

Figure 1.7: Proportion of fixed Internet subscriptions that are broadband

[Source: Analysys Mason, 2014]



The number of users with fixed broadband connections[12] has risen rapidly, as shown in Figure 1.8A. Connections are forecast to continue to rise, with particularly significant growth expected in the emerging Asia-Pacific region. However, the overall rate of global growth in fixed broadband connections will likely slow, from 10% annual growth for the period 2010-2013 to 5% for the forecast period 2013-2018, as developed fixed broadband markets approach saturation and mobile broadband continues to increase in importance.

While there is growth in fixed connections globally, in some regions the connections are starting from a very low base and are forecast to remain low relative to more developed regions. For example, despite the 20% annual growth forecast for sub-Saharan Africa, connections in that region will represent less than 10% of the connections forecast for North America, despite a 2.4 times larger population in sub-Saharan Africa. However, as shown in the next section, it is expected that mobile broadband connections will dominate, with 703 million 3G and 4G connections forecast for sub-Saharan Africa in 2018 (as compared to 11.9 million fixed connections).

Alongside the increase in the number of fixed broadband connections, total fixed broadband Internet traffic is expected to continue growing rapidly, with global traffic forecast to more than quadruple between 2013 and 2018, as shown in Figure 1.8B.

While both connections and Internet traffic will continue to rise, the increase in traffic is expected to be the more rapid, with a growth rate of 35% for the period 2013 to 2018 relative to 5% growth for connections over the same period. This is due to the global average traffic per connection being forecast to continue to grow significantly to reach an average 9.5GB per month per connection by 2018, as shown in Figure 1.8C below.

This increase in traffic per connection results from the rise in average bandwidth associated with the move to higher-bandwidth broadband connections, in combination with the rise in data-heavy Internet applications using rich media such as video. As can be seen in Figure 1.9, streaming one minute of video generates over 200 times more traffic than sending a single email. The proportion of fixed Internet traffic originating from video applications[13] has been forecast, by Cisco, to rise from 48% to 67% of total traffic between 2012 and 2017. Simultaneously, the proportion of traffic from web, email, and data applications is expected to fall from 23% to 18%, and the proportion from file sharing from 29% to 14%.[14]

This increase in video traffic is not at the expense of other Internet content and applications, however, as they are all forecast to experience a growth in total traffic. Within North America, traffic from the largest online video application, Netflix, makes up just over 28% of peak fixed traffic in North America, representing an average of 12.5 GB per month per fixed broadband subscriber, with YouTube representing another 16.8% of peak fixed traffic.[15]

673,295,648

Fixed Broadband Subscribers Worldwide

December 2013

[Source: ITU, 2014]

Figure 1.8: Fixed broadband

A. Global fixed broadband connections

B. Global fixed broadband Internet traffic

C. Monthly fixed broadband Internet traffic per connection

[Source: Analysys Mason, 2013]

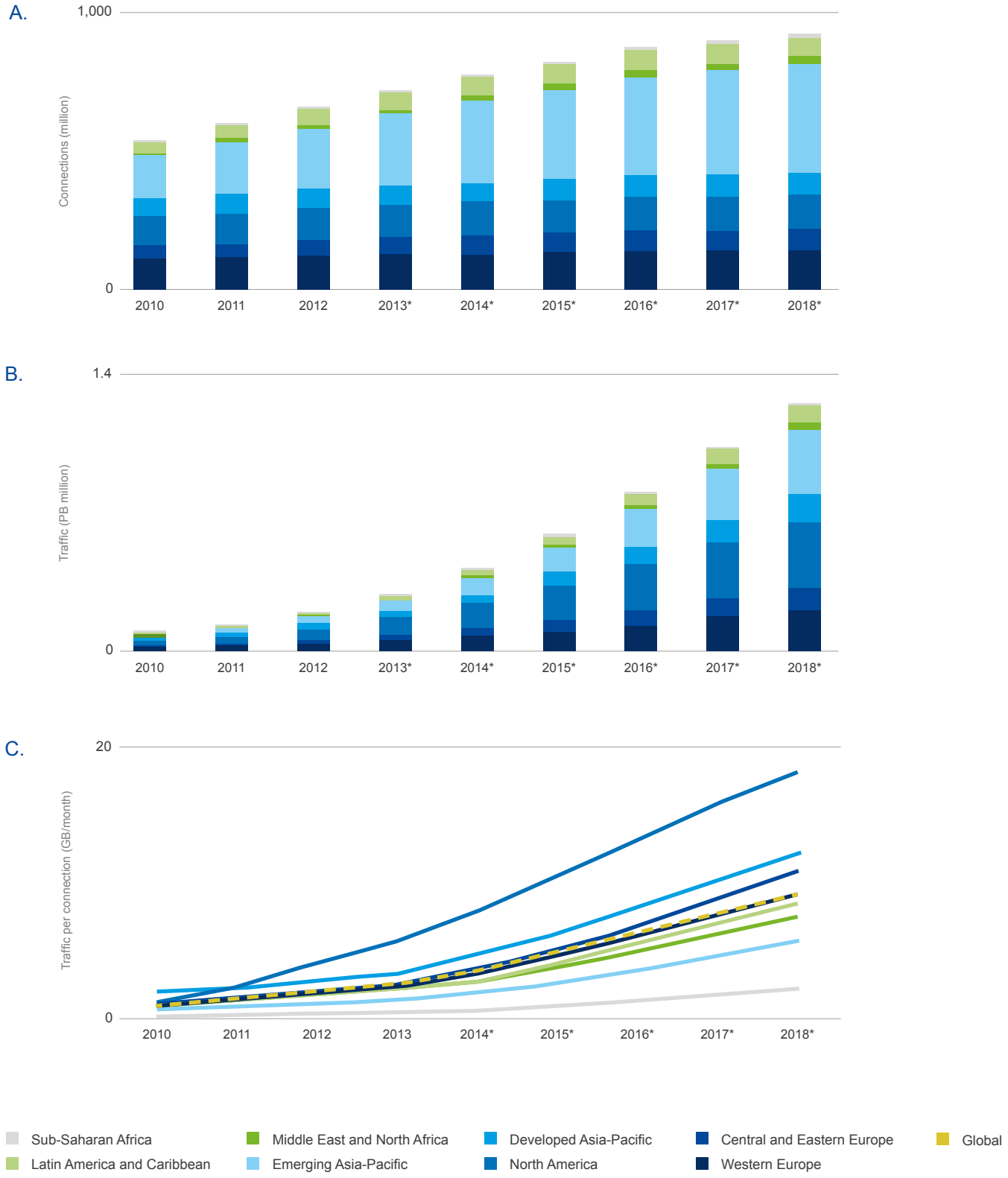
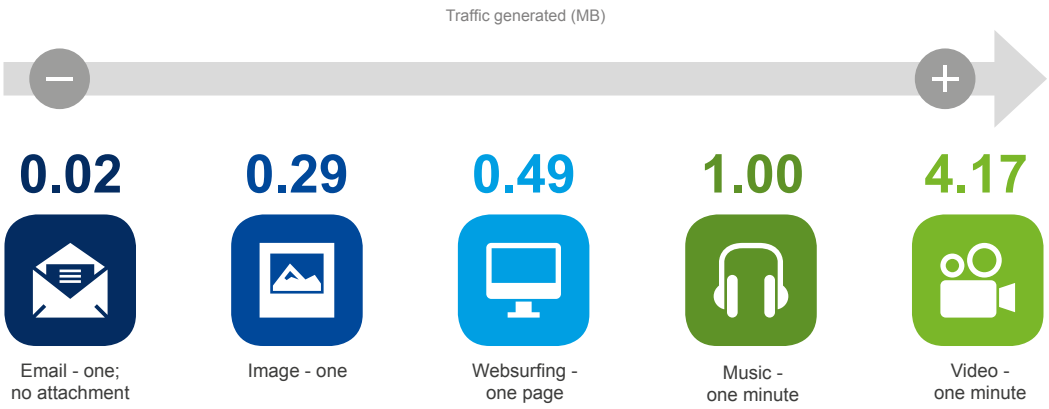


Figure 1.9: Traffic generated by different applications

[Source: Sprint, http://shop.sprint.com/content/datacalculator/index2.html, 2013]



One of the key issues for the future of the fixed broadband market will be how operators keep up with the demands for additional capacity arising from growing traffic and subscriber numbers. We would expect to see more investment in core network infrastructure, based on either new or existing technologies. Additionally, usage-based pricing, which restricts demand, may become more prevalent. The latter has already begun to be used, with 219 of the 691 broadband offers surveyed by the Organisation for Economic Co-operation and Development (OECD) in September 2012, including explicit data caps.[16]

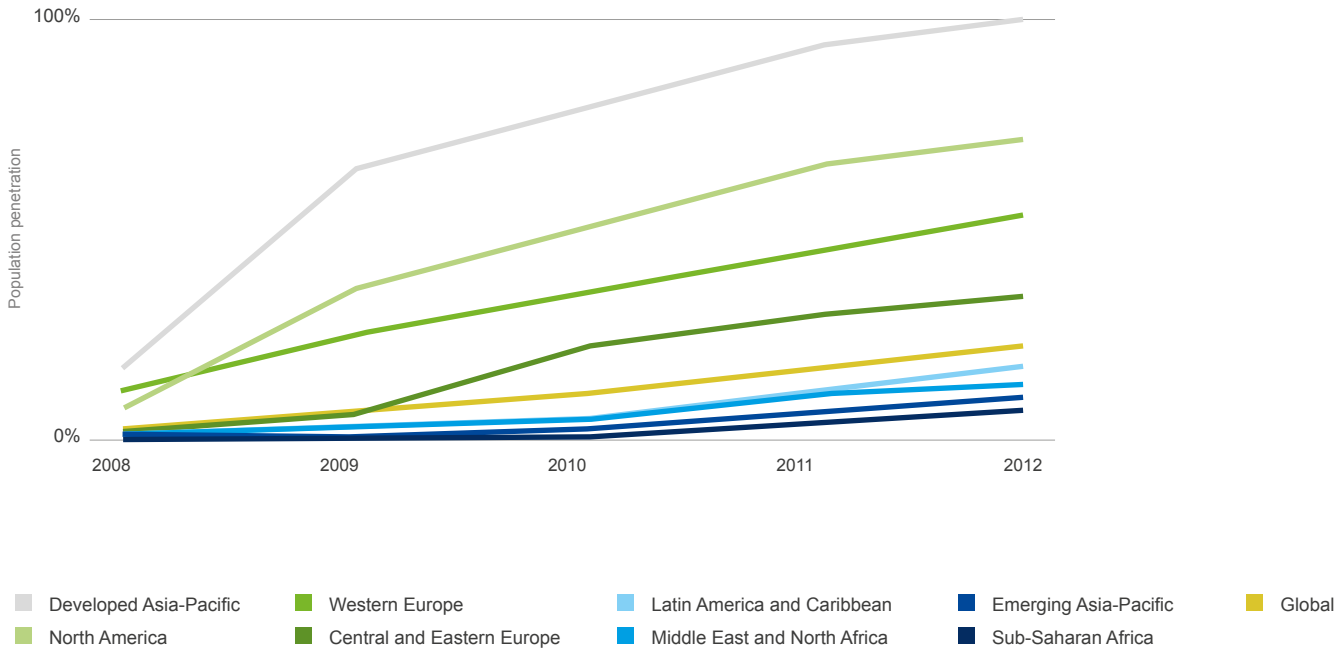
1.4 Mobile broadband Internet access

In the past several years, mobile broadband growth rates have exceeded even the significant rate of growth of fixed broadband access, particularly in developing regions. As shown in Figure 1.10, mobile broadband access has grown rapidly in the period 2008-2012. Of particular note is the developed Asia-Pacific region where the population penetration of mobile broadband exceeded 100% by year-end 2012, based on users with multiple subscriptions. Global penetration of mobile broadband subscriptions has grown at a yearly rate of 87% over the period shown, reaching 22% penetration in 2012.

In the next sections, we show that not only are there forecasts for significant growth in mobile broadband penetration, but the mobile broadband technology will be upgraded in many countries to meet users' demand for greater bandwidth speed.

Figure 1.10: Mobile broadband population penetration

[Source: ITU, 2013]



1,930,257,214

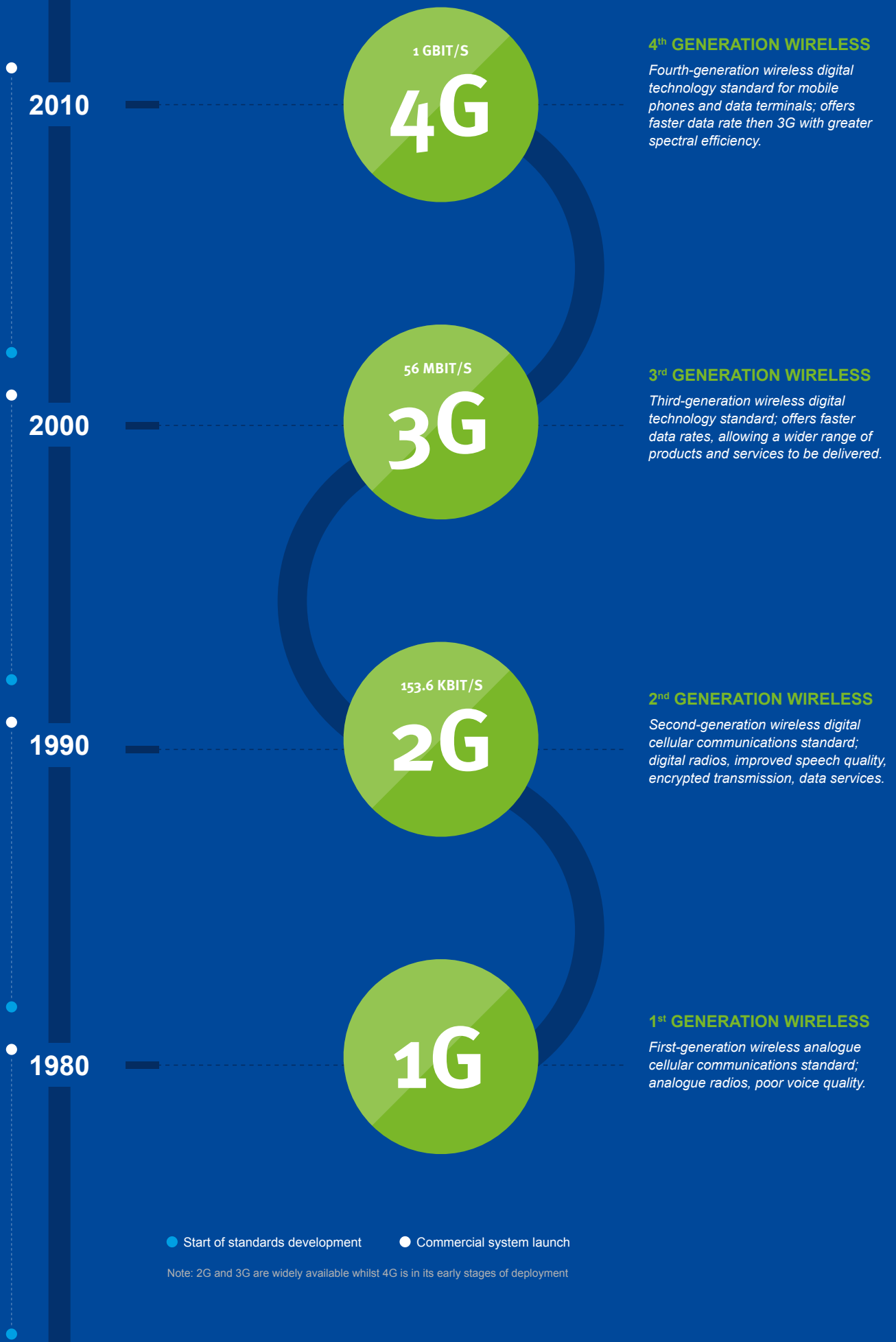
Mobile Broadband Subscribers Worldwide

December 2013

[Source: ITU, 2014]

FIGURE 1.11: Overview of the different mobile technology generations

[Source: Analysys Mason, 2014]



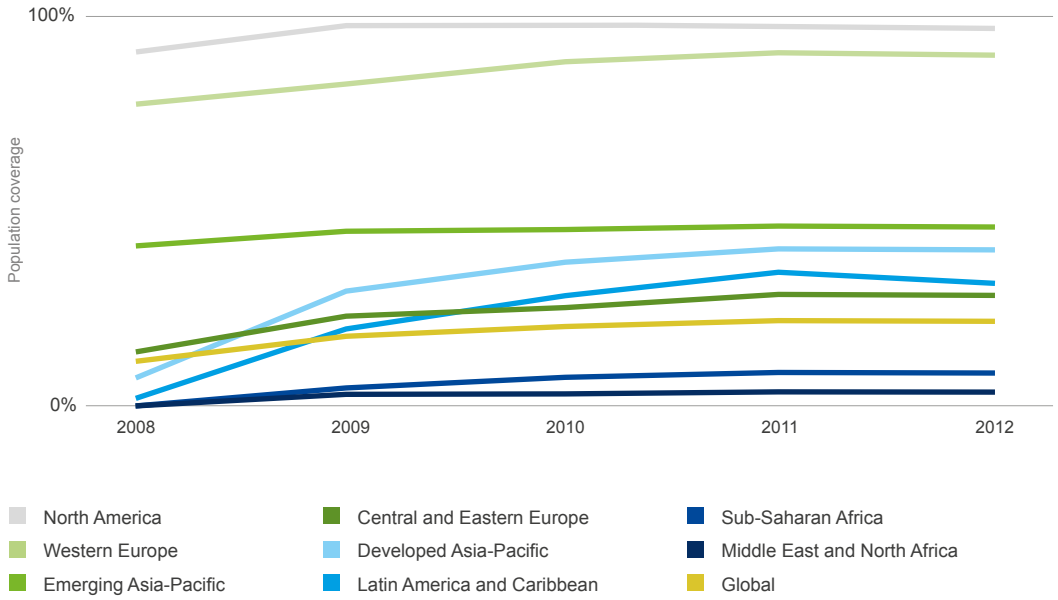
Note: 2G and 3G are widely available whilst 4G is in its early stages of deployment

Reach of mobile broadband access

The coverage of mobile broadband access is expanding significantly, particularly in regions with lower fixed broadband coverage. As can be seen in Figure 1.12, the proportion of the global population covered by a mobile service of at least 3G standard rose from 12% in 2008 to 22% in 2012.

Figure 1.12: Proportion of population covered by at least 3G

[Source: ITU, 2013]



As shown in Figure 1.11, 3G networks offer several times greater bandwidth speed than the earlier 2G technology generation. This allows for Internet access at higher speeds, enabling applications such as audio and video streaming, video conferencing, and online TV. This greatly enhanced user experience for Internet services means that the significant majority of mobile Internet traffic today is carried over 3G or more advanced technologies.

Industry rollout of 4G (and more advanced future generations) serves to further increase the network capacity and bandwidth speeds available. Mobile access technologies are now even more capable of supporting the data-intensive Internet services demanded by users.

The increased coverage of these mobile network technologies with faster Internet speeds is not simply arising from expanding coverage of existing networks, but also

from the deployment of new, or upgraded, networks across a larger number of countries. As can be seen in Figure 1.13, by the end of 2012 3G networks were active in 181 countries. Meanwhile, 4G networks have been deployed in 63 countries.

These upgraded mobile networks are clustered across certain regions, with 100% of Western European, North American, and developed Asia-Pacific countries operating 3G networks, as can be seen in Figure 1.14. More than 50% of countries in these regions also operate 4G networks. A lower proportion of Middle-Eastern and North African, Central and Eastern European, sub-Saharan African, Latin American, and emerging Asia-Pacific countries have rolled out 3G and 4G networks.

Figure 1.13: Number of countries with mobile network deployments using different technologies

[Source: Analysys Mason, 2013]

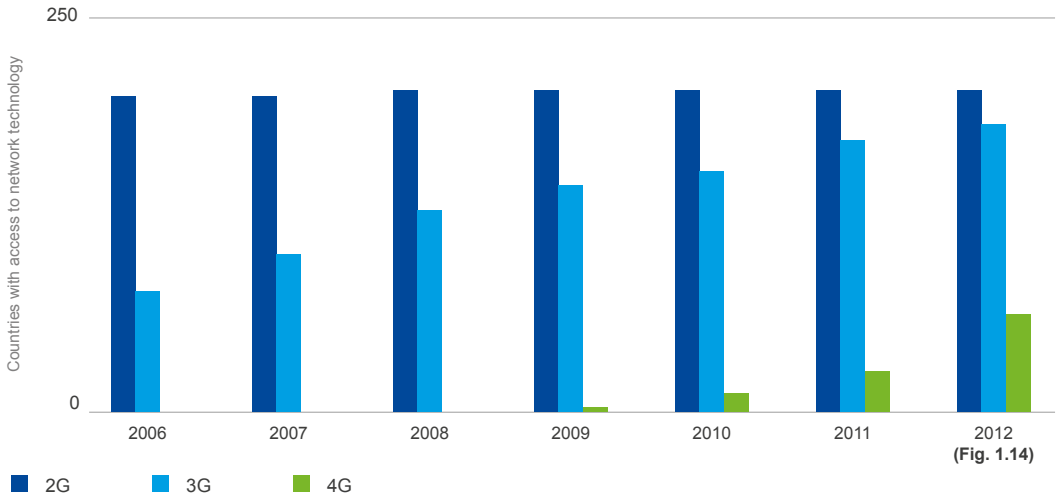
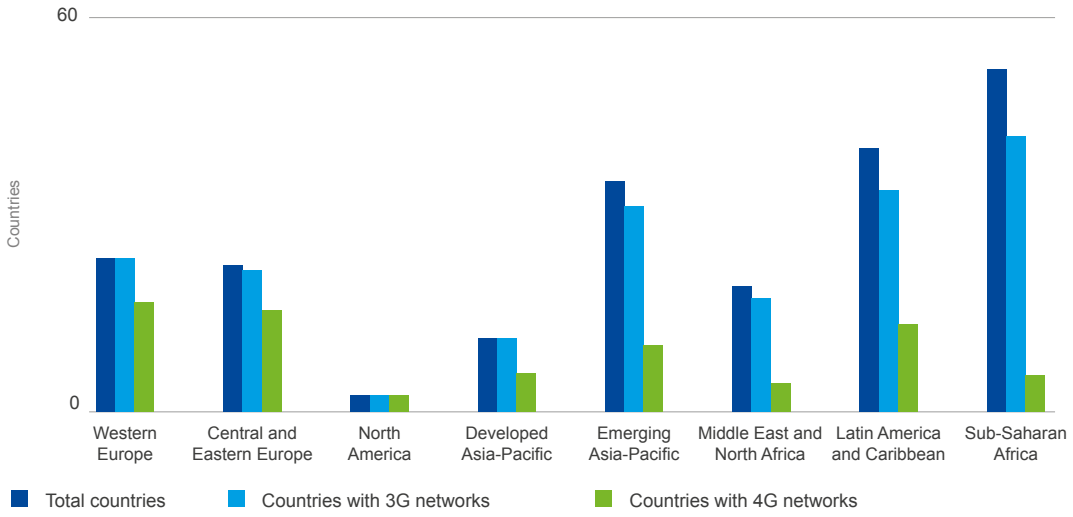


Figure 1.14: 3G and 4G network deployments by region in 2012

[Source: Analysys Mason, 2014]



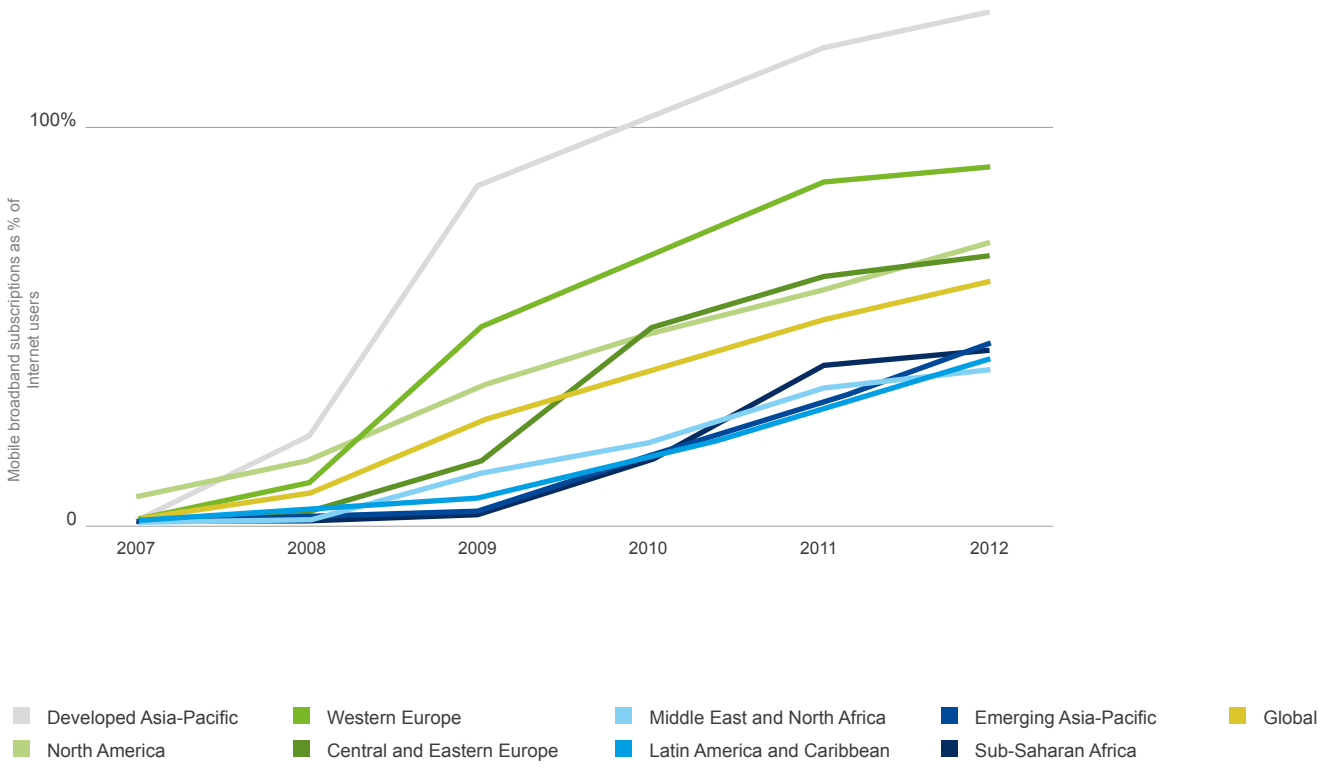
The increase in the deployment of 3G and 4G mobile networks across all geographies has led to a rise in the combined penetration of mobile broadband-compatible devices, including handsets. As a result, mobile broadband subscriptions are growing as a proportion of total Internet users, with the number of mobile broadband subscriptions reaching 60% of global Internet user numbers in 2012, as shown in Figure 1.15. This indicates that mobile broadband access is becoming increasingly important relative to all other forms of Internet access.[17]

As can be seen from the chart above, in the developed Asia-Pacific region, mobile broadband subscriptions have actually exceeded the number of Internet users, indicating that some users have multiple mobile broadband subscriptions. In developing regions, mobile broadband subscriptions have grown to roughly 40% of Internet users. However, we would expect there to be sharing of mobile broadband subscriptions in these regions, suggesting that more than 40% of Internet users may have access to such services.

In the next section, we examine further the breakdown in adoption and usage, with forecasts out to 2018.

Figure 1.15: Relationship between Internet users and mobile broadband subscriptions

[Source: Analysys Mason, 2014]



Mobile broadband adoption and usage

Mobile broadband connections are forecast to continue to grow across all geographies to 5.3 billion in 2018, as shown in Figure 1.16A below.[18] This will be approximately six times the number of fixed broadband connections forecast for 2018, reflecting in part the personal nature of mobile access devices,[19] but also the available range and wide appeal of these devices.

Mobile data traffic, from all connections, both those shown in Figure 1.16B and 2G handsets, is expected to continue growing rapidly, with global mobile Internet traffic forecast to increase more than six-fold over the period 2013-2018, as shown in Figure 1.16B.

As with fixed broadband access, mobile data traffic is forecast to grow faster than mobile broadband connections, due to the significant increases projected for mobile data traffic per device. This can be seen in Figure 1.16C below.

The rise of relatively data-heavy applications is one reason for the growth in mobile Internet traffic per connection. As with fixed Internet traffic, while traffic is expected to grow across all applications, video applications are expected to make up an increasingly large proportion of total consumer traffic, forecast by Cisco to rise from 33% to 56% over the period 2012-2017. In North America, YouTube[20] video traffic has grown to a monthly average level of nearly 74MB per mobile Internet subscriber per month, representing nearly 16.7% of peak mobile traffic.[21]

This increase in Internet traffic per device can also be partially attributed to the migration of users to devices more suited to mobile data, such as smartphones. The Analysys Mason forecasts in Figure 1.17 show that post-2013 the majority of mobile handsets shipped will be smartphones. Shipments of smartphones will increase steadily to reach 1.37 billion in 2017 compared to 0.59 billion for other handsets.

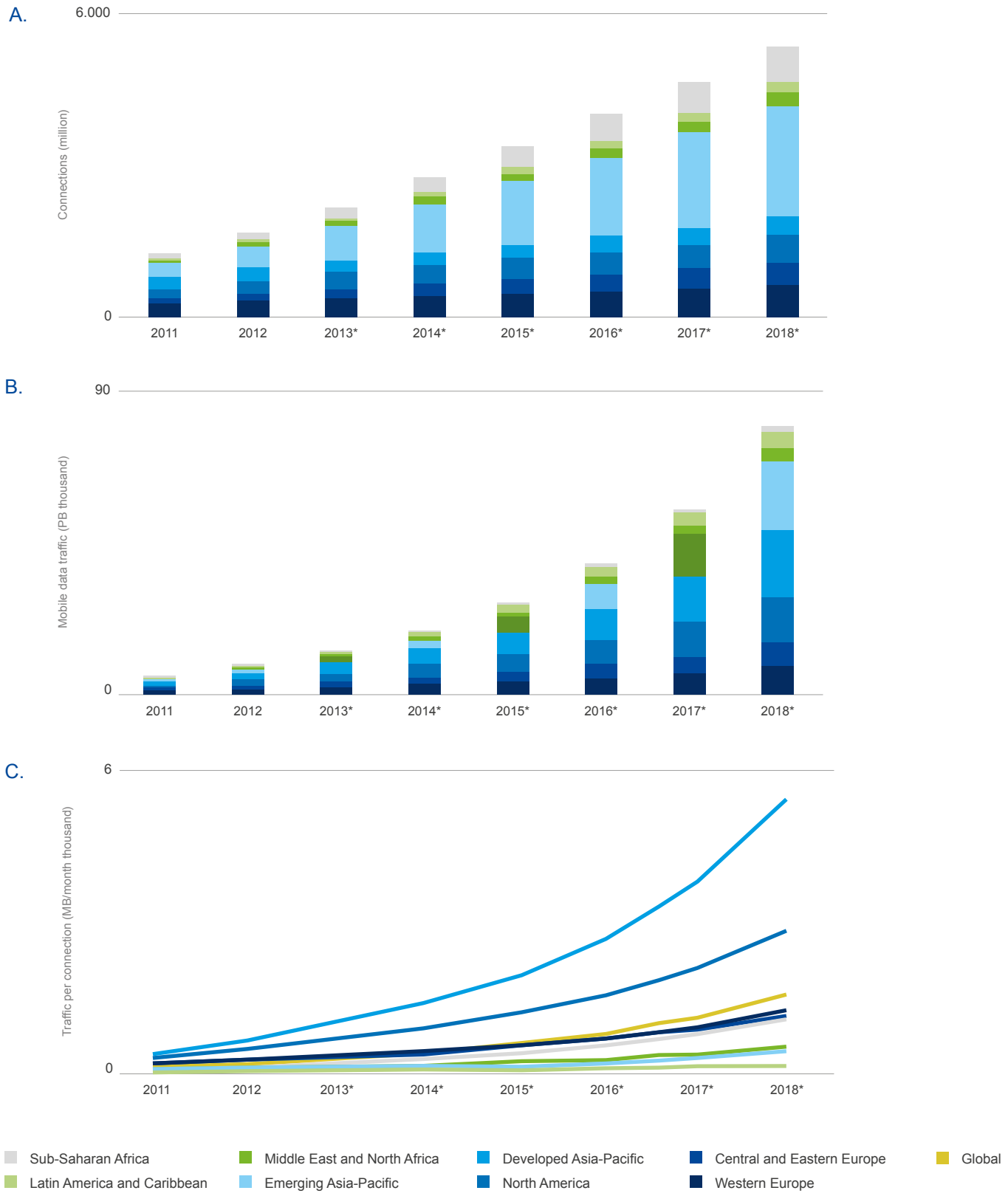
Figure 1.16: Mobile broadband

A. Global mobile broadband connections

B. Global mobile Internet traffic

C. Monthly mobile Internet traffic per device

[Source: Analysys Mason, 2013]



The increase in the volume of smartphone shipments shown above is in part a result of price reductions. As shown in Figure 1.18 below, as the global average smartphone price has fallen, from around USD305 in 2011 to a forecast USD220 in 2014, the volume of smartphones shipped has risen from 491 million to a forecast of over one billion.

A number of companies provide low-cost smartphones for developing countries, for example MTN Zambia offers a 'Nokia Asha 210', with a variety of advanced features, for USD80.50.[22] Similarly, in Kenya, the 'Tecno M3' can be bought for USD102; and the 'Alcatel One Touch T'Pop', with the Android Gingerbread operating system and multitouch display, for USD68.[23]

Smartphones provide a more data-intensive service to consumers than other handsets, with their ability to support Internet access via traditional applications such as web browsers and email clients, as well as a new category of mobile apps – application software written for smartphones and tablets – that enable a huge array of Internet services including video calling, games, and a variety of location-based services. In conjunction with high-speed mobile networks, the mobile broadband Internet service available via handsets and dongles can be a substitute for fixed broadband Internet access.

As with fixed broadband access, one of the significant challenges over the next few years for network operators and policy-makers will be addressing the increase in mobile Internet traffic volume. Mobile operators are assigned a finite amount of spectrum, which must be shared among all their users in the vicinity of the same cell tower. An increased number of users – each sending and receiving more Internet traffic – leads to more congestion, particularly in crowded areas of cities.

To address the resulting congestion, on the demand side it is already common to impose usage charges or caps, which may reduce usage, but tend not to be targeted to reduce congestion at peak times or in peak usage areas. As a result, they may also restrict usage in areas where there is no congestion; however, even where there is congestion, efforts to accommodate growing usage, rather than stifle it, should be encouraged.

Figure 1.17: Global shipments of handsets

[Source: Analysys Mason, 2013]

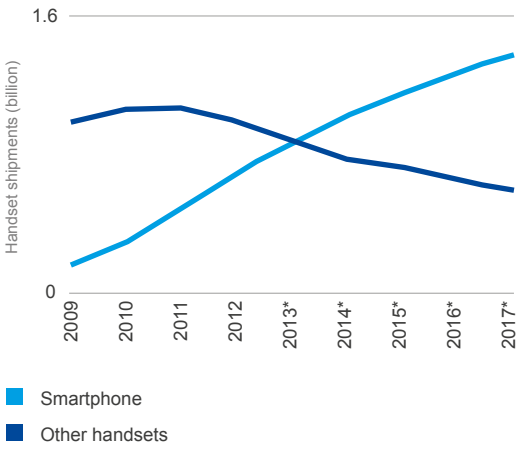
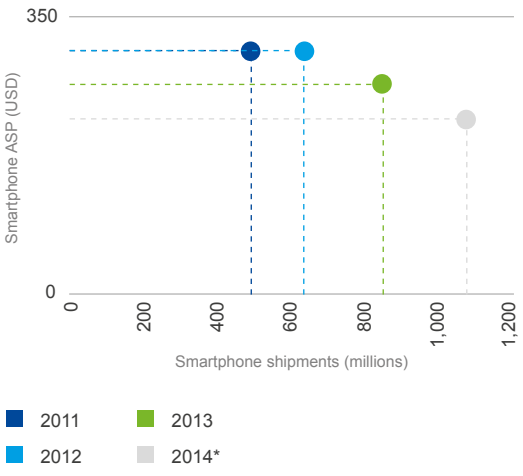


Figure 1.18: Relationship between global average smartphone prices and retail shipments

[Source: Oppenheimer, Analysys Mason, 2014]

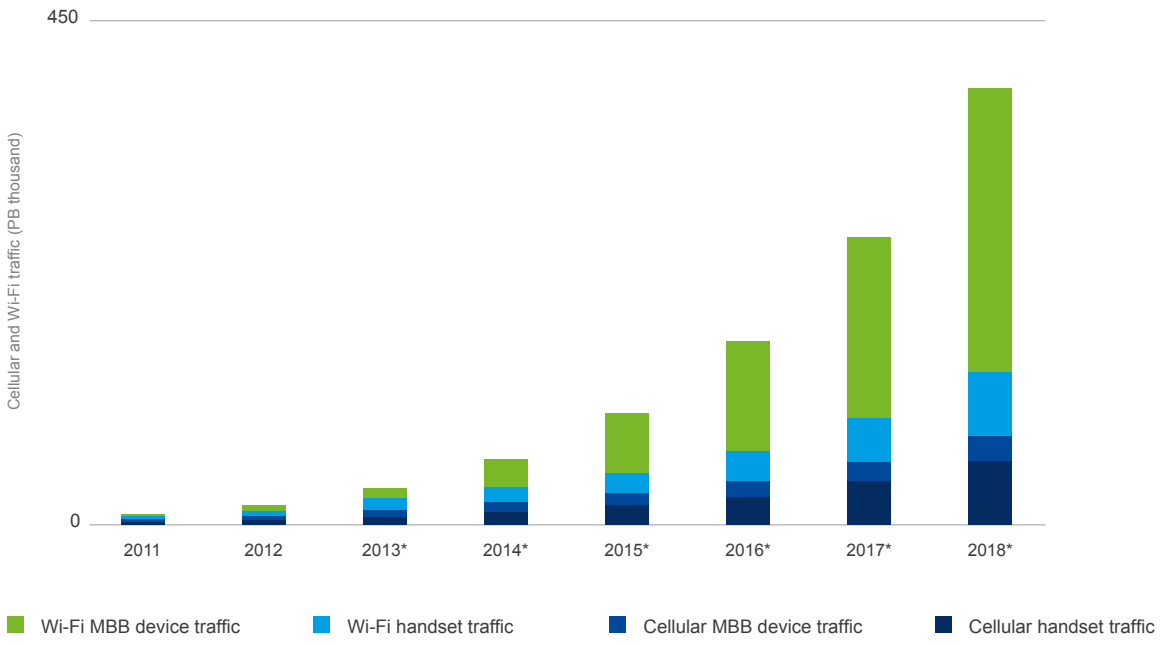


On the supply side, several efforts are underway to increase the capacity of mobile networks. First, in many countries significant efforts are underway to increase the amount of spectrum available. For example, the UK government in 2011 committed to releasing at least 500MHz of public sector spectrum holdings below 5GHz by 2020.[24] Additionally, the upgrade of networks to 4G allows operators to take advantage of the greater spectral efficiency provided by those bands to increase capacity on the existing spectrum bands.[25]

Another way to address the increase in traffic is to 'offload' the traffic to Wi-Fi, where it can be carried over a fixed-wired or wireless network. This trend is increasing globally, as illustrated in Figure 1.19. By 2018, the proportion of Internet traffic generated from mobile devices and carried over mobile networks is forecast to fall to just 20% of total mobile traffic from its 2013 level of around 38% (while the absolute level of traffic carried on mobile networks continues to rise).

Figure 1.19: Total annual cellular and Wi-Fi Internet traffic originating from mobile devices

[Source: Analysys Mason, 2013]



These efforts will help to accommodate and promote growth in mobile broadband access and usage, enabling a greater number of users around the world to benefit from the increasing amount of content and applications optimized for the broadband experience.

1.5 Trends

Currently, fixed and mobile broadband access methods are both extensively used, with mobile broadband appearing particularly important in regions such as sub-Saharan Africa where mobile infrastructure and access is more widely available than fixed networks. As a result, mobile broadband is following the trend of mobile telephony, and surpassing the uptake of comparable fixed services. In developed areas, where Internet penetration is already high, access is increasingly moving towards mobile broadband subscriptions, often alongside fixed broadband connections at home or in the office.

As shown in Figure 1.20, the past five years have brought increases in total Internet users and in global fixed and mobile broadband subscriptions. The rate of growth in mobile broadband subscriptions for the period 2008-2012 is significantly higher than the rate of growth in Internet users, with a marked difference in developing regions. This indicates that mobile broadband is becoming an increasingly common method of Internet access. On the other hand, fixed broadband subscription growth rates are approximately in line with those for overall Internet use. This suggests that fixed broadband, while maintaining its importance, is not dramatically increasing the share of Internet access it provides.

474%

Annual growth rate in mobile broadband subscriptions in Emerging Asia-Pacific, 2008-2012

[Source: Analysys Mason, 2014]

Figure 1.20: Summary of growth in Internet users and broadband subscriptions, 2008-2012

[Source: Analysys Mason, 2014]

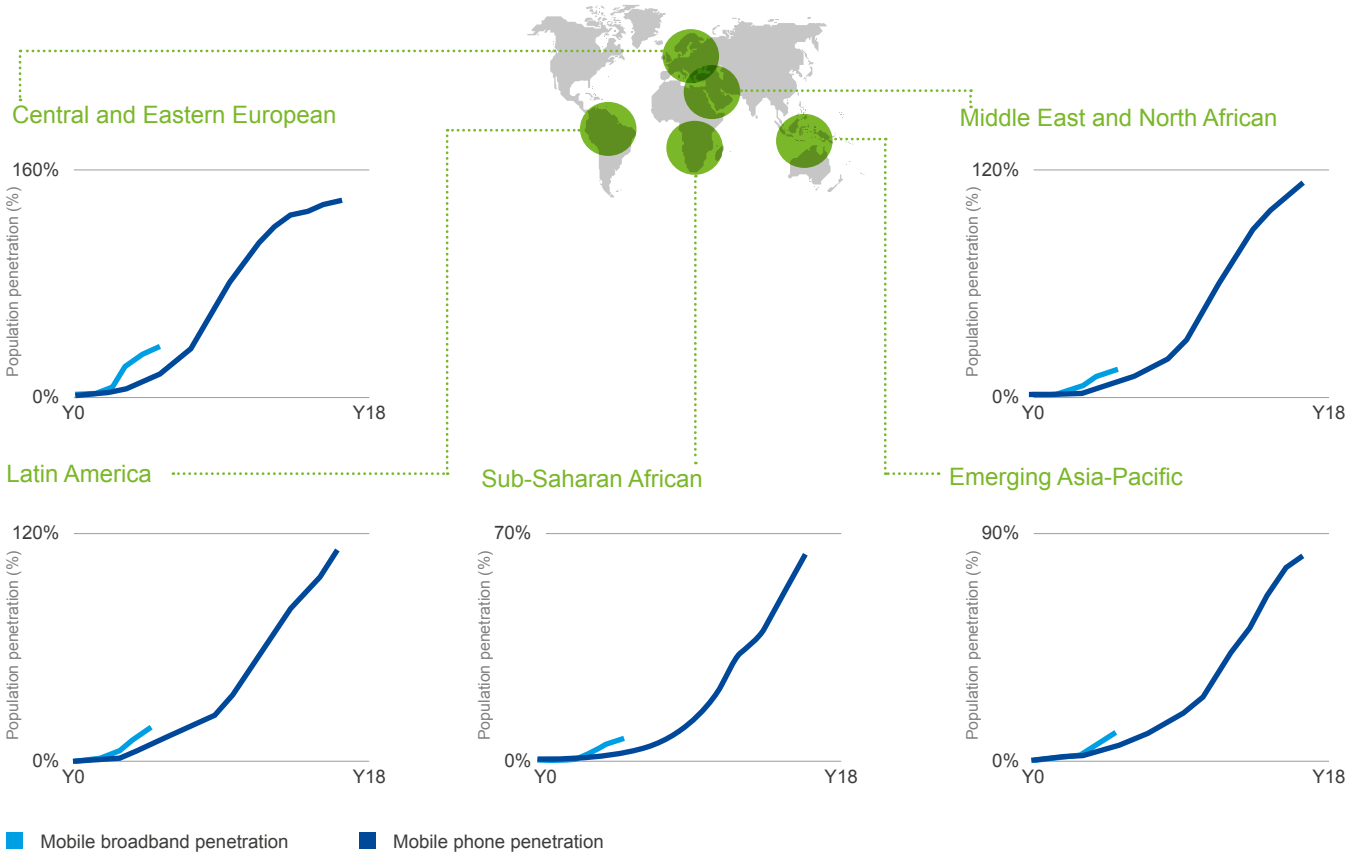
	Internet users		Fixed (wired) broadband		Mobile broadband	
	2012 users (million)	CAGR 2008-2012 (%)	2012 subscriptions (million)	CAGR 2008-2012 (%)	2012 subscriptions (million)	CAGR 2008-2012 (%)
Western Europe	326	4%	129	6%	227	50%
Central and Eastern Europe	210	12%	55	16%	140	161%
North America	286	3%	101	4%	253	76%
Developed Asia-Pacific	192	2%	70	4%	243	57%
Emerging Asia-Pacific	947	20%	214	22%	419	474%
Middle East and North Africa	140	20%	14	23%	54	256%
Latin America and Caribbean	262	14%	49	16%	109	129%
Sub-Saharan Africa	137	28%	2	26%	59	264%
World	**2500**	**12%**	**634**	**11%**	**1504**	**88%**

The impact of mobile networks in developing regions can hardly be overstated. In those regions, mobile phone penetration far exceeded early predictions, and in so doing became one of the fastest adopted technologies in history. In 1999, for example, Safaricom projected that Kenya would have a total of three million mobile subscriptions by 2020.[26] And yet, in November 2013, Safaricom alone reported 20.8 million subscribers.[27] Early indications are that mobile broadband is actually being adopted at an even faster pace than mobile cellular.

Figure 1.21 compares mobile broadband device penetration to that of mobile phone subscriptions for the regions in which mobile can be considered the dominant method of broadband access, with Y0 indicating the year in which services launched in that geography.[28] Thus, for instance for Central and Eastern Europe, Y0 is 1996 for mobile phone, and 2007 for mobile broadband.[29] By lining up the start point for the services, it is possible to compare their early growth rates, and see that mobile broadband is easily outpacing the earlier growth of mobile phones.

Figure 1.21: Comparison of mobile broadband and mobile phone penetration

[Source: Analysys Mason, 2013]



Y0 is the year services were launched
Y0=1996 for mobile phone (1994 for Latin America)
Y0=2007 for mobile broadband

As can be seen in Figure 1.21, the regional growth rates in mobile broadband population penetration appear to be significantly higher than the already high corresponding historical growth in mobile cellular penetration. By Y5 (which corresponds to 2012 for the mobile broadband data), mobile broadband penetration exceeds cellular penetration by between 5 and 19 percentage points. Given the increasing reach of mobile broadband networks, and upgrades to newer technologies, the fast uptake of mobile broadband access is very encouraging for increasing overall Internet penetration.

Box 1: Global Internet User Survey

The Global Internet User Survey (GIUS) is a globally scoped survey developed by the Internet Society to provide reliable information relevant to issues important to the Internet's future.[30] The GIUS focuses solely on the views of users as the source of innovation that has driven the Internet's development, evolution, and dramatic growth over the past four decades.

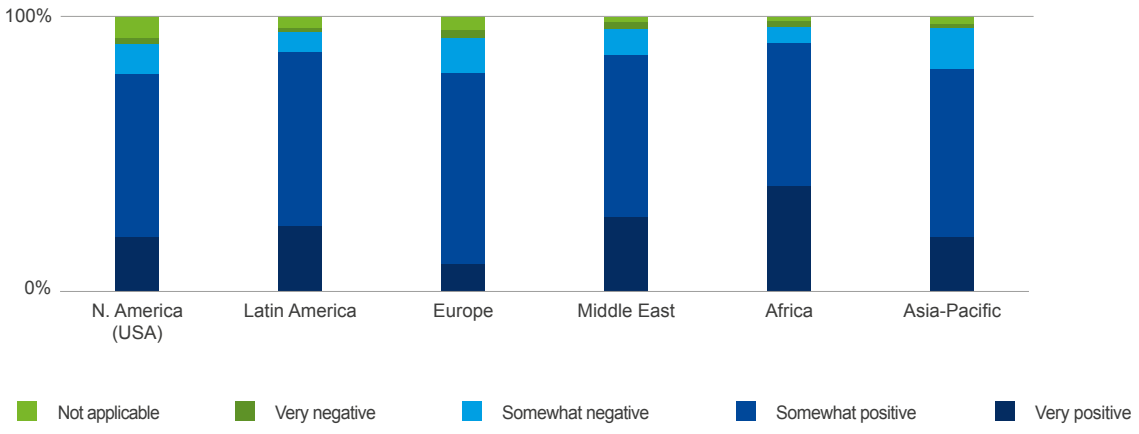
In 2013, the GIUS interviewed 10,500 Internet users in 20 countries around the world. Details about the countries, gender, and age distribution are contained in Annex B. We show results from this survey throughout this report, and note that the results represent the views of the users surveyed rather than the positions or views of the Internet Society, or its global community.

As a starting point, the following figure shows that, on average, the users surveyed are "very positive" or "somewhat positive" about the general state of the Internet today. In a theme that is consistent throughout the survey responses, users in Africa and Latin America express the most optimism about the general state of the Internet, as well as the specific impact that it can have on their lives, as shown further below in Section 3.

Survey responses

How do you view the general state of the Internet today?

[Source: Internet Society, Global Internet User Survey, 2014]



1.6 Conclusion

The number of Internet users is approaching 3 billion. Against the backdrop of an ever-increasing number of users, Internet access is increasingly shifting to broadband and, in particular, mobile broadband access using a smart device. As a result, users are generating more traffic in general and, specifically, more high bandwidth video traffic. At the same time, the geographic centre of gravity is shifting to developing countries, whose users now outweigh those in developed countries.

The result is a network of networks encompassing an increasing proportion of the world's population, engaged in an increasing amount of online activity. In the following sections of the report, we examine how the open Internet is sustained by open multi-stakeholder governance, the benefits that the resulting platform generates, and the emerging challenges to the intrinsic nature of the open and sustainable Internet.

SECTION 02

Open and Sustainable Internet

2.1 Introduction

The Internet has changed the world. Open access to the Internet has revolutionized the way individuals communicate and collaborate, entrepreneurs and corporations conduct business, and governments and citizens interact. At the same time, the Internet established a revolutionary open model for its own development and governance, encompassing all stakeholders.

In this context, openness should be understood as including:

- decision-making with a sense of equity and fairness among participants, based on broad consensus, transparency, and thoughtful consideration of diverse interests and viewpoints, and,

- the ability for any interested and informed party to participate and contribute in the development of standards or decisions.

The development of the Internet relied critically on establishing an open process. Fundamentally, the Internet is a 'network of networks' whose protocols are designed to allow networks to interoperate. In the beginning, these networks represented different communities – including academia, research, and defence – whose members needed to cooperate to develop common standards and manage joint resources.

As the Internet was commercialized, vendors and operators joined the open protocol development process and helped unleash an unprecedented era of growth and innovation.[1] Vendors found value in adopting standards that promoted interoperability between products across the industry, including their competitors, which in turn ensured that operators' networks could interconnect globally.

"A working definition of Internet governance is the development and application by governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet."

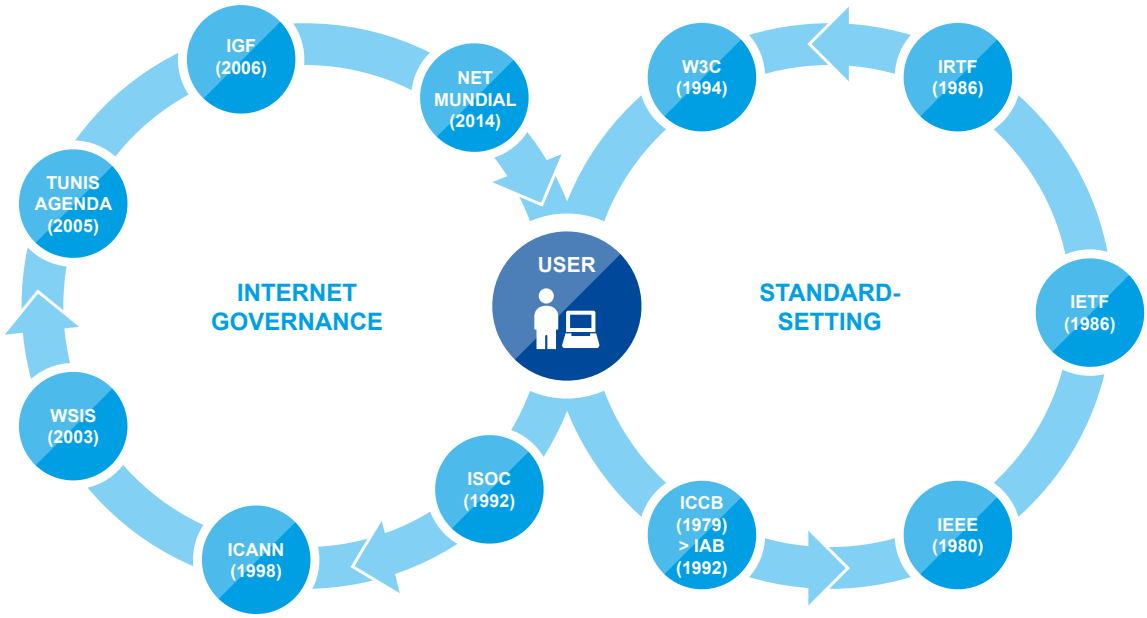
Tunis Agenda for the Information Society, 18 November 2005, Paragraph 34

The collaboration between the communities of interest was made possible by the tools they themselves created to communicate and share information across this global internetwork, such as email, file transfers, and then the World Wide Web. Indeed, the users, innovators, and stewards of the network were one and the same, creating a vital feedback loop among all parts and interests in the system. This loop has ensured that the openness of the process developing the network is reflected in the open usage of the network, and vice versa.

The spirit of collaboration that underpinned the foundation of the Internet has now extended to a multistakeholder governance model for determining policy over shared Internet resources. The result is an infinite loop, as shown in Figure 2.1, in which users of all kinds develop the standards underpinning the Internet and in turn provide stewardship for the resulting resources and related policies. This leads to a common, interoperable, and accessible environment that fosters seamless connectivity, consumer choice, and fundamental rights of expression, and it enables end users to advance their social and economic objectives.

Figure 2.1: Infinite feedback loop of Internet development and governance

[Source: Internet Society, 2014]



Standards: The Internet Configuration Control Board (ICCB) became the Internet Advisory Board in 1984, then the Internet Activities Board in 1986, and finally the Internet Architecture Board (IAB) in 1992, operating under the auspices of the Internet Society. IEEE traces its roots back to 1884, but its first involvement in networking standards that are today used to access the Internet dates to 1980, with the first 802 working group, whose standards include IEEE 802.3, better known as Ethernet, and IEEE 802.11, better known as WiFi. For a history of the latter, see http://www.ieeeghn.org/wiki/index.php/Wireless_LAN_802.11_Wi-Fi .The Internet Engineering Task Force (IETF) and Internet Research Task Force (IRTF) are overseen by the IAB, and all work on Internet standards. The World Wide Web Consortium (W3C) works on Web standards. For more details, see the Brief History of the Internet, at http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet.

Internet governance. For more on the Internet Society (ISOC) see www.internetsociety.org; for more information on the World Summit on the Information Society (WSIS) and the Tunis Agenda see http://www.itu.int/wsis/index.html; for more information on the Internet Governance Forum (IGF) see http://www.intgovforum.org/cms/. For more information on NETmundial, see http://netmundial.br. The Internet Corporation for Assigned Names and Numbers (ICANN) manages resources for global naming and addressing capabilities. See www.icann.org.

In particular, arising from the Internet's historical roots is a system in which users actively participate in decision making over standards and governance. By ensuring that no single stakeholder 'owns' Internet development or governance, the open model ensures that the Internet continues to meet the needs of all stakeholders.

In the following sections, we provide an overview of the Internet ecosystem and the involvement of different parties in different processes. We then proceed to highlight openness as it pertains to Internet governance and standard setting, and also how the underlying multistakeholder model can be applied to selected regional development efforts.

Internet ecosystem

'Internet ecosystem' is the term used to describe the organizations, communities, and interactions that have evolved to guide the operation and development of the technologies and infrastructure that comprise the global Internet. The term implies an evolution, focusing on the rapid and continued development and adoption of Internet technologies. It is characterized by the involvement of a broad range of stakeholders; open, transparent, and collaborative processes; and the use of services and infrastructure with dispersed ownership and control.

Organizations that comprise the Internet ecosystem include:

- Technical standards bodies, such as the Internet Engineering Task Force (IETF), the World Wide Web Consortium (W3C), and the Institute of Electrical and Electronic Engineers (IEEE)

- Organizations that manage resources for global naming and addressing capabilities, such as the Internet Corporation for Assigned Names and Numbers (ICANN) (including its current operation of the Internet Assigned Numbers Authority (IANA) function), Regional Internet Registries (RIRs), and Domain Name Registries and Registrars

- Companies that provide network infrastructure services, such as domain name service providers, network operators, cloud and content delivery network providers, and Internet exchange points (IXPs)

- Individuals and organizations that use the Internet to communicate with each other and offer services and applications, or develop content, and

- Organizations that provide education and build capacity for developing and using Internet technologies, such as multilateral organizations, educational institutions, and governmental agencies.

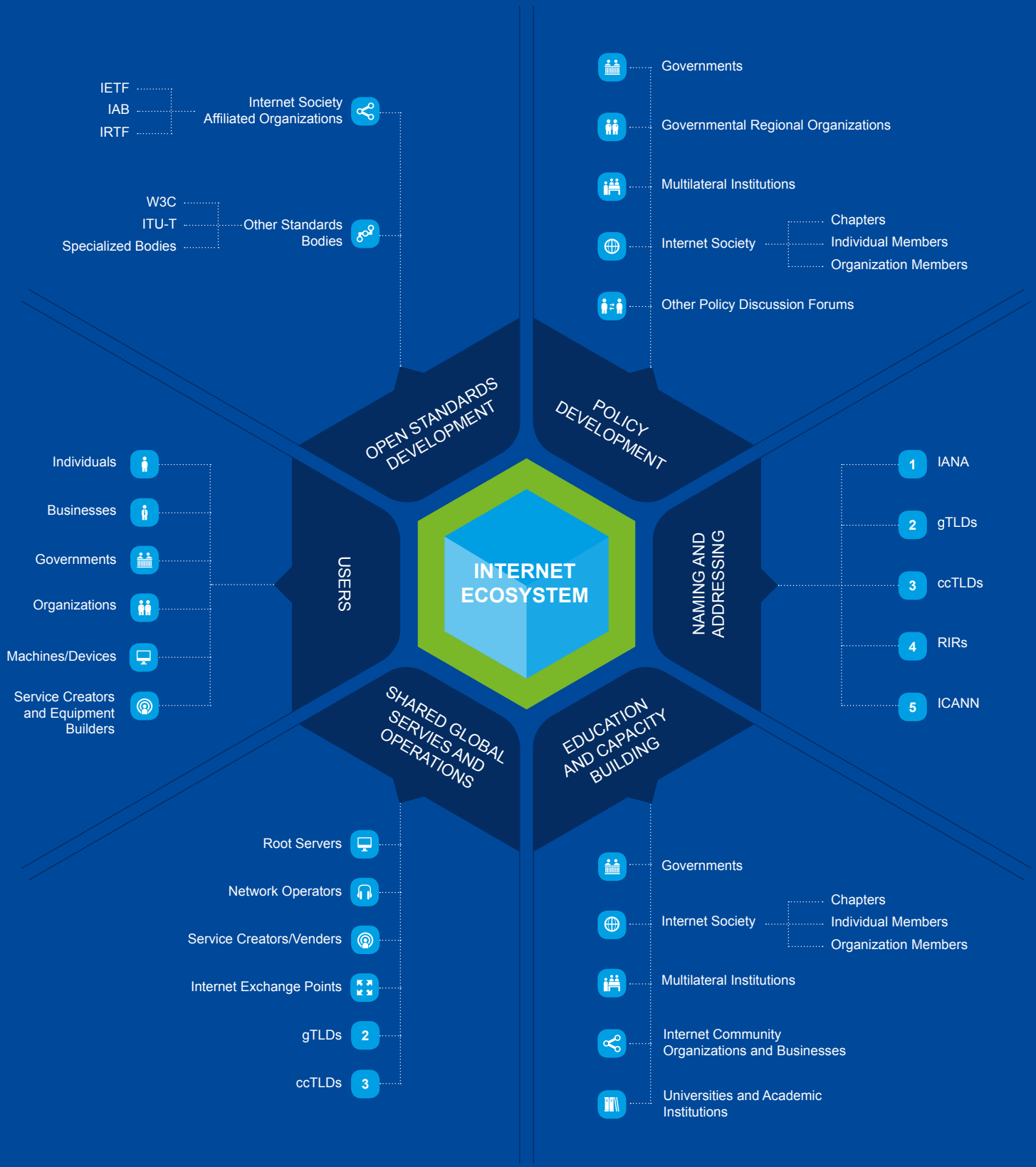
Within the Internet ecosystem, these organizations have responsibilities for the protocols and standards that enable basic end-to-end communications (such as the Internet Protocol); the resources that direct these communications (such as IP addresses and the Domain Name System (DNS)); the provision of reliable connectivity that ensures the communications reach their intended destinations (such as undersea and terrestrial cable systems, access networks, and IXPs); and the policies, frameworks, and educational activities necessary to ensure the Internet's openness, continuity, and flexibility.

As evidence of the continued evolution of the ecosystem, in March 2014 the US National Telecommunications and Information Administration (NTIA) announced its intention "to transition key Internet domain name functions to the global multistakeholder community".[2] IANA, which is currently administered by ICANN, manages the DNS root zone, IP addresses, and the IP technical parameter registries. NTIA has asked ICANN to convene global stakeholders to develop a proposal to transition NTIA's current role as steward of the IANA functions, thereby recognising the interest and ability of the multistakeholder community to absorb this key role.[3]

The technologies, resources, and services of the Internet ecosystem are all highly interdependent and require a significant amount of coordination. Each organization involved has a specific role and provides fundamental value to the overall functioning of the Internet. These organizations and roles are highlighted in Figure 2.2.

Figure 2.2: Internet ecosystem

[Source: Internet Society, 2014]



These organizations have a proven, long-standing relationship with one another and have contributed to the Internet's incredible growth and stability. They make use of well-established mechanisms, including open, public meetings, mailing lists, and bottom-up policy development processes that enable direct participation by any interested party. These attributes give the system the flexibility to respond and adapt to the Internet's rapidly evolving technology and to the changing needs of the Internet community. The result is a significant body of knowledge and experience in the successful administration and management of the technologies, resources, and services that make the Internet the success it is today.[4]

Multistakeholder model

The development, governance, and coordination of the Internet results from discussions, debates, and policy development processes in many specialized forums. Active participation by end users, governments, business, civil society, and technical experts (whether as individuals or organizational representatives) is essential to develop the policies, approve the procedures, and write the standards that make the Internet the efficient and effective system it is today.

We will now examine, in turn, how such multistakeholder participation operates, specifically with respect to Internet governance, open standard setting, and regional development efforts.

2,632

Participants from 111 countries at the IGF in Bali, Indonesia, 22-25 October 2013

[Source: Internet Governance Forum, 2014]

2.2 Internet governance

Introduction

Internet governance first came to the fore at the United Nations World Summit on the Information Society (WSIS) in 2003. WSIS was held in two phases: in Geneva in 2003, and in Tunis in 2005. At the first summit, governments, being confronted with difficult questions relating to Internet governance, decided to set up a working group to examine the issue and develop a definition of Internet governance. The resulting Working Group on Internet Governance (WGIG) ushered in a new form of collaboration between governments and non-state actors, and greatly influenced the second phase of the Summit in 2005, which adopted the Tunis Agenda for the Information Society.

The WGIG process illustrated the importance of non-state actors – and led to the realization by governments that permitting an inclusive transparent structure, where

constructive contributions from new parties could be incorporated, would ultimately lead to a more informed debate and to potentially better results. WSIS by and large endorsed the Internet model of multistakeholder cooperation and accepted the working definition of Internet governance proposed by WGIG, as quoted on the first page of this section.[5]

In the text that followed, governments went on to recognize the important roles and expertise of stakeholder groups, while holding for themselves "policy authority, rights and responsibilities for international Internet-related public policy issues". Importantly, however, they committed:

> *to improve the coordination of the activities of international and intergovernmental organizations and other institutions concerned with Internet governance and the exchange of information among themselves, [stating clearly that a] multistakeholder approach should be adopted, as far as possible, at all levels.*[6]

The Tunis Agenda has become a foundational document in the discussion on Internet governance, and the WSIS process itself has come to serve as a baseline not just for Internet governance, but also for governance discussions more broadly.

Since 2005, more governmental and intergovernmental processes have begun experimenting with, and benefiting from, the principles of the open, multistakeholder model that has shaped the Internet. The result is a number of international, regional, and national organizations, meetings, and discussions allowing multistakeholder participation:

- The Internet Governance Forum (IGF), created by WSIS, pioneered an open and inclusive form of multistakeholder cooperation under the UN umbrella. The IGF is now in its ninth year and has influenced other organizations and processes to open up to multistakeholder cooperation.

- The 2008 OECD Ministerial Meeting on the Internet Economy resulted in the introduction of two new advisory committees to the OECD focusing on Internet issues, one comprising global civil society, the second drawing on the organizations of the Internet technical community.

- As discussed above, NTIA has announced its intention to allow the IANA functions to evolve, based on a multistakeholder transition process, while specifying that NTIA's role cannot be replaced by a government-led solution.

- Several regional organizations, such as the Council of Europe, the African Union (AU), the Inter-American Telecommunications Commission (CITEL), the Caribbean Telecommunication Union (CTU), and the Asia-Pacific Economic Cooperation (APEC), have welcomed the contributions of qualified organizations and stakeholders to their work.

- At the national level, the Brazilian Internet Steering Committee (CGI.br) was created by an interministerial order in 1995, and consolidated in a presidential decree in 2003, to address the full range of national-level Internet governance activities on a multistakeholder basis, with representatives of the government, corporate sector, academia, and civil society. The *Marco Civil da Internet*, the Brazilian Internet Bill of Rights, signed on 23 April 2014, aims to safeguard the rights of Internet users and ensure that the multistakeholder approach continues to guide the development and use of the Internet.

- In April 2014, Brazil hosted the Global Multistakeholder Meeting on the Future of Internet Governance, or NETmundial, a multistakeholder set of discussions on Internet Governance principles and a roadmap for future evolution of the Internet Governance Ecosystem. The preparations and resulting document showed multistakeholder consensus building in action, along with a template for further steps.

The debates that will take place in the next few years on a variety of topics, including the evolution of the IANA functions, are critical to the continuing evolution of the open, multistakeholder model of Internet governance and to the sustainability of the open Internet itself.

30 Sept. 2015

Expiration of current IANA functions contract

[Source: NTIA]

It is important for organizations and individuals who care about the future of the Internet to act on the opportunities to contribute and participate in these meetings, and thereby to demonstrate the effectiveness of the model. Open and inclusive processes are based on bringing civil society, business, the Internet technical community, and governments together to shape a common approach that meets the challenges of an increasingly complex world.

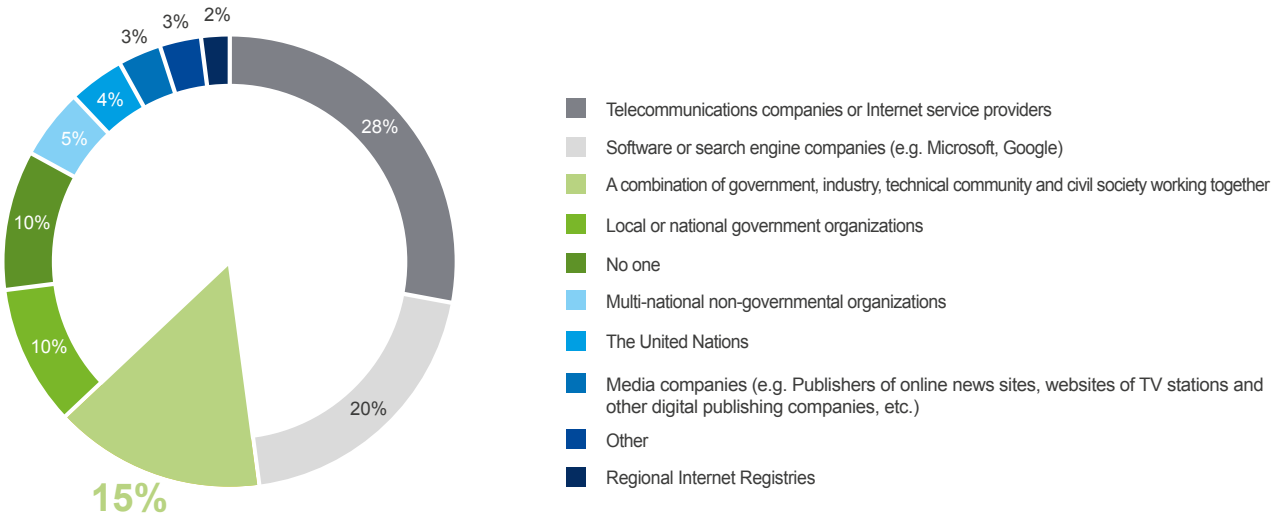
As indicated in the results of the GIUS survey, in spite of the coverage of a number of important governance issues in recent years, when asked who is responsible for managing the global Internet, only 15% of respondents correctly indicated that the responsibility is shared among “[a]

combination of government, industry, technical community and civil society working together" (see Figure 2.3). Clearly, it will be easier for the community to preserve and evolve the current model if it is better understood.

Figure 2.3: Survey results

Who do you think is responsible for managing the global Internet?

[Source: Internet Society, Global Internet User Survey, 2014]



Multistakeholder processes have been recognized as a way to provide the flexibility and agility necessary to develop timely, scalable, and innovation-enabling Internet policies. Inclusiveness, transparency, and collaboration are the fundamental pillars of the Internet model and must be nurtured to preserve the benefits of the open Internet and ensure that it remains sustainable.

Below we present a case study on how a group of stakeholders can coalesce to address important issues, in this case the proliferation of spam.

Case study: Combating Spam Project

Unsolicited bulk electronic communication, or "spam" as it is more commonly known, has significant economic and consumer implications. According to Kaspersky, nearly 70% of emails sent in 2013 were spam.[10] In addition to the resources that end-users may spend to download and delete spam, the malicious web addresses and attachments often

present in spam can affect end users' computing devices. Combating spam requires a multistakeholder approach, including governments, the technical community, network operators, and end users. Recently, the Internet Society launched the Combating Spam Project, to share the spam mitigation expertise of developed world stakeholders with interested participants in developing regions.

The Combating Spam Project evolved from discussions at the 2012 World Conference on International Telecommunications (WCIT), where developing country governments expressed a need to combat spam, which wastes much-needed Internet resources, thus creating a significant impact on user costs and Internet accessibility. While the industry and global technical community have made great strides in creating best practices and developing the technical tools to combat unwanted forms of electronic communication, this information has not, in many cases, reached policymakers and the technical communities in developing regions.

70%

Estimated percentage of all emails sent in 2013 that were spam

[Source: Kaspersky]

The Internet Society's work in this area aims to help build capacity to address spam in developing regions with three programmes.[11] The first programme focuses on developing and collecting materials, documents, and interactive training modules on spam. The second part of the project is a series of workshops for policy makers, which presents best practices and operational tools while also establishing partnerships between experts and participants to work together to combat spam. The third part of the project is a programme that provides technical and operational training about spam mitigation to technical communities in developing countries.

Three workshops were held in 2013, in Kenya and Argentina, as well as a webinar targeted at the Latin American region. In total, 237 participants attended these workshops and gained concrete skills, knowledge, and strategies to effectively combat spam on multiple levels. Feedback from the participants included requests for additional assistance in the use of mitigation tools, along with more information on spam and what they can do to address the problem within their country and region. This feedback has been incorporated into the Combating Spam Project approach for 2014 and beyond.

Spam is a pervasive problem that requires global partnerships to mitigate its proliferation. The Internet Society's Combating Spam Project focuses on filling that gap by playing an active role in convening experts to help in the common global fight against the negative consequences of unsolicited bulk

electronic communications. In addition to fighting spam, the project demonstrates the value of partnerships and the multistakeholder process to create a sustainable model for engagement and problem solving.

Summary

Existing Internet governance arrangements have evolved organically and are based on a voluntary collaboration between the many actors in the Internet ecosystem. The distributed nature of these arrangements corresponds to the underlying Internet architecture and relies on a model that allows collaboration and exchange of information between actors that have diverse areas of expertise, knowledge, and know-how. This model is based on multistakeholder participation, in which all interested and relevant actors work together, as can be seen in the example of the Combating Spam Project.

2.3 Standardisation

Introduction

The Internet is based on open, globally accessible and applicable technical standards — communication protocols, data exchange formats, and interfaces — which allow different computers and networks to talk to each other. They are the global lifeblood for multibillion-dollar industries that did not exist 20 years ago. Standards are created in a collaborative, open process for which success is measured by the depth and breadth of their acceptance across a hodgepodge of vastly different technologies that together form the network of networks that is the Internet.

Internet standards are developed in response to the evolution and growth of the Internet, thereby further facilitating the exponential growth rates in adoption and usage. The processes by which these open standards are developed have matured along with the Internet. The development paradigm that has been successfully used to create those standards has emerged as an important piece of the Internet's widespread success.

Technology and its use evolve at a rapid pace, and standards must be able to develop accordingly in a flexible and scalable way. By allowing the community of Internet technology developers and users to create and experiment, build without requiring permission, and feed their real-world

experience back into the standards process, the open development paradigm supports the uniquely innovative character that is the hallmark of the Internet. The alternative – an imposition of mandatory standards by a governmental or standards body – runs contrary to this process, preventing or inhibiting standards from developing in response to fast-paced technological evolution and market needs.

From the beginning, the Internet's creators understood that, in the absence of global and interoperable standards, networks would be fragmented and incompatible, isolated, and unable to communicate among each other. The technical community's desire to develop an efficient system of communication has driven the creation of the Internet as we see it today. The achievement of these technical outcomes has not been easy; it continues to require constant commitment and re-examination of core values to remain relevant and effective. These core values underpinning the collaborative means of setting standards have recently been embodied in a new set of principles known as OpenStand.

7,259

Total number of RFCs, as of 20 May 2014.

[Source: IETF]

OpenStand

In 2012, the IEEE, Internet Architecture Board (IAB), IETF, Internet Society and W3C — five organizations deeply involved with developing the technical standards the Internet runs on — affirmed a set of principles called "OpenStand".[12] These principles define the characteristics of a modern standards paradigm that depends on the Internet's diversity and flexibility, making technical excellence its primary focus.

The OpenStand principles offer a concrete picture of the process and philosophy behind Internet standards' development:

- cooperation among standards organizations
- adherence to due process, broad consensus, transparency, balance, and openness in standards development
- commitment to technical merit, interoperability, competition, innovation, and benefit to humanity
- availability of standards to all
- voluntary adoption

In line with this ideal, the IETF Mission Statement highlights the fundamental value of an open model by stating:

> *We embrace technical concepts such as decentralized control, edge-user empowerment and sharing of resources, because those concepts resonate with the core values of the IETF community. These concepts have little to do with the technology that's possible, and much to do with the technology that we choose to create.*[13]

The way standards are developed varies from one organization to the next, but OpenStand represents a shared commitment to open processes and consensus-based decision making that allows for transparency and balance. And, though the OpenStand announcement was made in 2012, this paradigm has been at the heart of the Internet's development from the outset. Since the announcement, companies and other organizations that build and use the Internet have added their support for its principles.

As the Internet continues to grow, it is increasingly important to recognize this approach's unique qualities and contribution to the Internet's overall success — and how it has been part of the equation for successful companies and organizations that use the Internet. The OpenStand approach has given us the building blocks to create previously unimaginable services and opportunities to interconnect the world's population. By tapping into the world's greatest engineering talent, and more directly translating those talents into technical solutions, it creates the platform that generates innovation for everyone.[14] Below we present a case study of how the OpenStand principles work in practice.

Case Study: Opus

The Opus audio codec is an excellent example of how standards developed under the OpenStand paradigm are key to the Internet's future development.[15] An audio codec is needed to translate analogue audio into digital streams for delivery, which are then turned back into analogue audio for listening. This enables users to send and receive audio signals, including voice and music.

A notable characteristic of codecs is that the same standard is required at both ends – thus, the more users there are, the more beneficial the codec. In economics, this phenomenon is known as a network effect. In this situation, a common standard, such as one developed using OpenStand principles, is beneficial as it ensures that the standard meets a broad range of needs and is widely adopted as a preferred standard, thereby delivering the greatest network effects.

More and more audio is moving to the Internet, ranging from voice-over-IP (VoIP) services to high-quality audio streaming. As such, a codec that covered a wide range of uses – measured by frequency ranges – is most useful. Further, audio is delivered over a wide range of access technologies, and thus a codec that adapts to the amount of available bandwidth is important. The Opus codec is the result of addressing both these challenges, thereby ensuring high-quality audio at varying bandwidths.

The development of the Opus codec was initiated by several companies including Skype, which had started to develop its own variable-rate speech codec named SILK in 2007. At the same time, Xiph.Org contributors had been working on the CELT codec, an audio codec aimed at the most demanding audio applications. The SILK and CELT codecs were in many respects perfect complements to each other, which led to the creation of a hybrid mode that would later become the Opus codec.

In 2010, a prototype of the hybrid was developed and submitted to the IETF as a proposal for standardization. After more than two years' work, the Opus codec was finally published as a RFC in September 2012 under the name RFC 6716.[16] To date, it has been adopted as the required audio codec within WebRTC,[17] resulting in support in Google Chrome, Mozilla Firefox, and other browsers that support WebRTC. Additionally, it is supported in several open-source softphones and a variety of audio players.[18]

RFC 6716

Definition of the Opus Audio Codec

[Source: IETF]

It is worth noting that the Opus codec not only meets the technical demands for different services delivered over varying bandwidths, as shown in Figure 2.4, but it is also royalty-free to ensure open and equal access to a core Internet technology. While other codecs share these technical characteristics, they are proprietary and patent-protected.

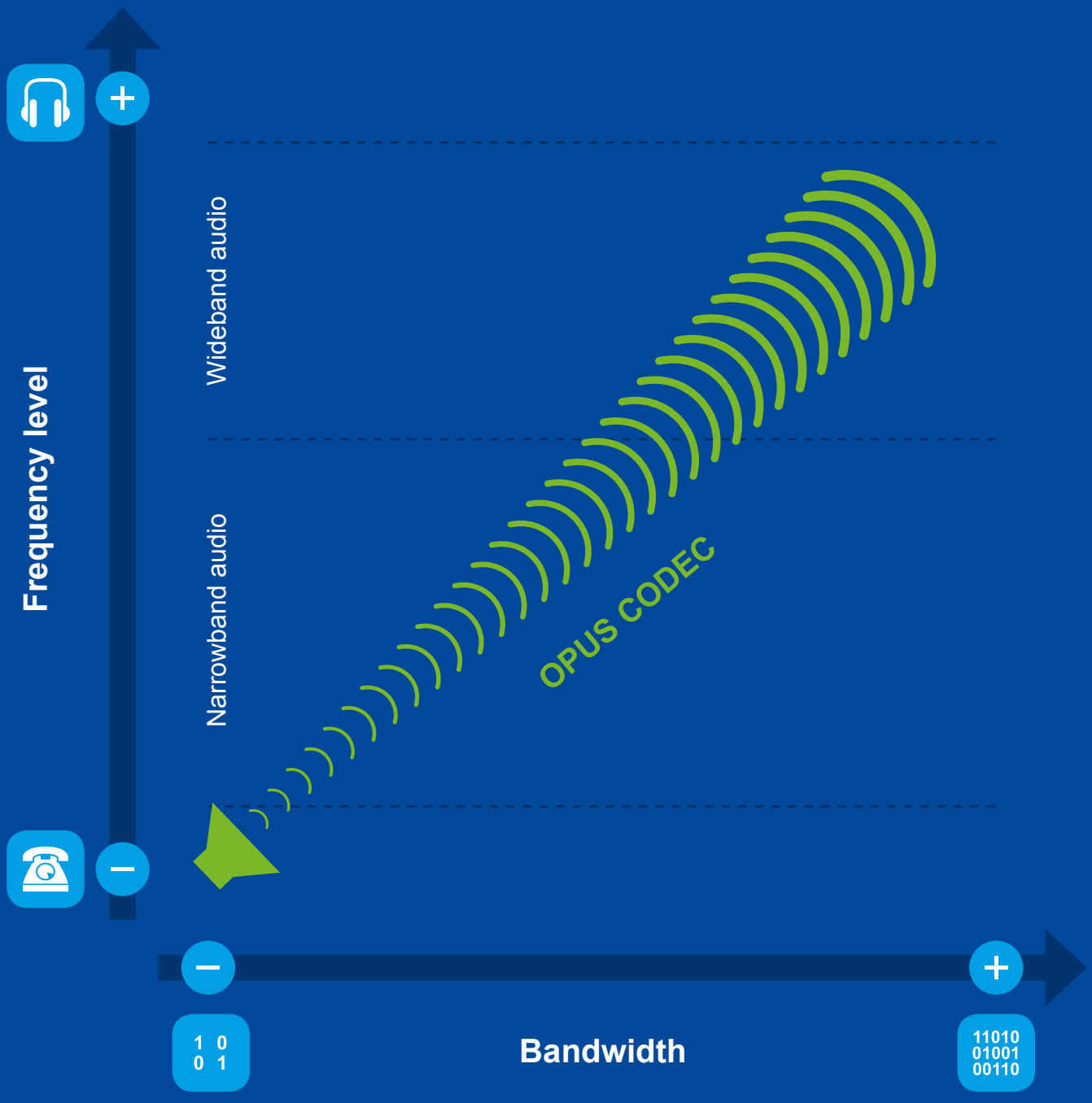
The story of the Opus codec illustrates how the development of open standards is closely linked to its implementation, through a feedback loop. Through the multistakeholder approach, a key technological standard can be created with the input of preferences from a broad set of actors, which in turn are the users of the same technology. This ensures that the technology adheres to the requirements of a variety of applications, and the applications are interoperable. The fact that the standard is royalty-free and accessible to anyone increases its use as a standard and enables innovators to build on an existing framework.

Figure 2.4: OPUS Codec case study

[Source Internet Society, 2014]

The Opus Codec automatically adjusts to the bandwidth environment. Trading sound quality for speed, the codec allows for communication across different connection speeds at a minimum delay.

The result is a optimization of audio quality. If the bandwidth level goes down. Opus narrows the frequency range that is transmitted, and coversely increases the frequency range if the connection improves.



Summary

On many levels, the Internet is about uniting diversity — bringing together communities of people with common interests, while enabling independent networks to communicate through established technical protocols. Those protocols, in turn, are developed by people, collaboratively, as open Internet standards. Standards developed with global input from a diversity of sources through open processes have the greatest chance of producing outcomes that are technically exceptional, leverage cutting-edge engineering expertise, and support interoperability and innovation in technology markets.

2.4 Smart Development

Introduction

While much of the deployment of Internet infrastructure is undertaken by private operators, or governments, there are examples in which the open multistakeholder approach is well suited to the physical development of the Internet. At the Internet Society, we refer to this approach as Smart Development, which recognizes that the most effective Internet development programmes do not simply involve deploying equipment, but have always been built on three fundamental pillars:[19]

- *Human infrastructure* – The trained, educated, and engaged technologists who create, populate, and maintain networks at a local and regional level
- *Technical infrastructure* – The networks, connections, routers and other hardware on which the Internet runs, and through which the unconnected become connected
- *Governance infrastructure* – The frameworks, guidelines, and rules that promote Internet use, innovation, and expansion

Smart Development simply describes an approach that incorporates all three of those pillars, putting individual stakeholders, communities, nations, and regions in the best possible position to achieve success and sustainable Internet engagement. We now provide two case studies of how Smart Development can help to fill gaps in access and connectivity.

61,753

Internet Society Members

18 May 2014

[Source: Internet Society]

Case study: African Internet Exchange System (AXIS)

An example of Smart Development in action is the Internet Society's partnership with the African Union (AU) to implement the African Internet Exchange System (AXIS).[20] This partnership continues a critical process that the Internet community has successfully implemented for more than twenty years – building bottom-up communities that sustain technology and, in particular, Internet Exchange Points (IXPs).

IXPs play a critical role in routing traffic more efficiently, by enabling local Internet service providers (ISPs) to exchange traffic directly with one another in the country, rather than doing so indirectly over international transit links. This has the benefit of reducing the latency of traffic exchange, as it does not have to travel outside the country, and sometimes the continent, to be exchanged, while also saving money that was being spent on international transit links.[21]

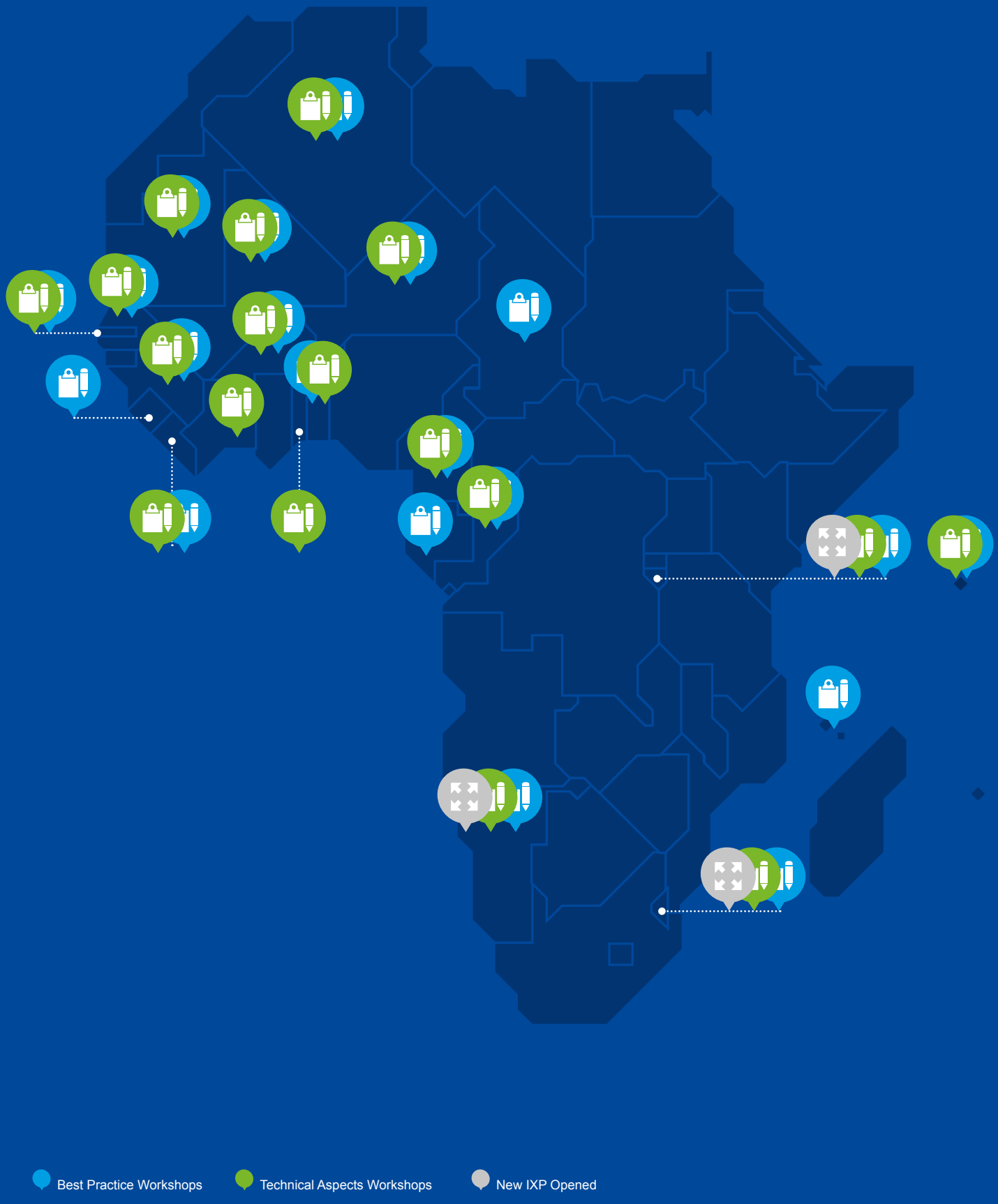
This grant project with the AU and stakeholders across Africa aims to conduct sixty Best Practices (BP) and Technical Assistance (TA) workshops in thirty African countries over two years. AXIS aims to reduce Internet traffic costs, build African expertise, and facilitate additional services and content development. At the local level, AXIS aims to build the critical communities that sustain an IXP, provide stakeholders with training, and build the local Internet infrastructure to keep "local traffic local".

By marrying resources and expertise, and by working with key technical experts from the IXP and Internet technical community (including AfriNIC, Lyons-IX, France-IX, and Jaguar Networks), this project implements the Smart Development approach:

- it trains people and builds capacity (human infrastructure)
- it lays the groundwork for Internet infrastructure development and technical upgrades to existing infrastructure (technical infrastructure), and
- it works with stakeholders to ensure a participatory and bottom-up sustainable buy-in for IXP development and to implement best practices for IXP governance and management (governance infrastructure).

Figure 2.5: AXIS workshops

[Source: Internet Society, 2014]



Since mid-2012, the Internet Society African Regional Bureau and Internet community experts have conducted 22 BP workshops and 15 TA workshops. The impacts of the workshops have included: raising awareness about international best-practices and core community building in countries; educating government officials about the important role of the technical community in managing and running IXPs; and providing a platform to continue a dialogue that will allow for IXP development in targeted countries.

The map in Figure 2.5 details the workshops that have taken place to-date, which cover both best practices and technical aspects of setting up an IXP. A recent success from this initiative was the opening of the first IXPs in both Namibia and Burundi in March 2014, one in Swaziland in April 2014, with another scheduled to open in the Gambia in July 2014.[22]

As the Internet Society's African team and expert partners continue to provide training throughout 2014, the team will augment its activities through funding provided by an IXP Toolkit & Best Practices grant provided by Google.org,[23] and bolstered through an equipment grant from Cisco Systems as needed.[24]

Case study: Wireless for Communities (W4C)

Last-mile Internet connectivity is typically provided by a for-profit private operator deploying fixed or mobile service. In rural areas, where it may be difficult or impossible to cover costs, much less generate profits that attract investment, government funds may support private deployment (often via a universal service fund) or the government may deploy its own service. The W4C initiative in India shows a third way, focused on community deployment for community usage, leveraging a Smart Development approach that has yielded significant success in bringing new populations online.

The Internet Society, along with the Digital Empowerment Foundation (DEF), started the W4C initiative in 2010.[25] This initiative focuses on providing assistance on how to establish and operate community wireless networks using Wi-Fi technology, while also training the local community in Internet use, digital literacy, and micro-entrepreneurial skills.

The pilot programme was initiated in Chanderi, India, a small rural town with a population of 40,000, 40% of whom are illiterate. Before 2010, there were no computers in Chanderi, until a 'digital design resource centre' was set up to provide training and the first Internet access. The resulting W4C network covers a radius of 5 kilometres, and today 11 out of 13 schools have Wi-Fi connections, as do several computer centres, hotels, and private homes. The network boasts 50 nodes in total, and 1,563 users.

The W4C initiative has moved to six more communities in India, with a total of 4,025 new Internet users, alongside a cadre of trainers who have been trained in deploying networks to ensure that the system can expand further. These citizens now have access to a number of e-government initiatives, as well as the possibility to sell their goods beyond their customary markets. For instance, Facebook hosts an active market for traditional Chanderi saris.[26]

Summary

Smart Development represents a positive, inclusive, and proven alternative to top-down efforts to spur development through prescriptive regulatory fiat. It offers an apolitical, non-interventionist method of building Internet connectivity and engagement that is accessible anywhere in the world, and delivers documentable, cost-effective, and replicable results. In short, Smart Development provides the tools to transform non-users into users, users into creators, and creators into innovators.

2.5 Conclusion

The Internet has evolved from its creation as a research network to become a ubiquitous platform, with an influence that extends far beyond basic data communication. Human networks of trust were established among Internet technical experts, and the Internet infrastructure grew and proved its resiliency. However, these principles are not limited to the development of technological standards; they also provide a basis for understanding how the Internet is governed and how bottom-up development can occur.

By virtue of the fact that the Internet ecosystem has been created by multistakeholder efforts, the open processes that have enabled the Internet's evolution and growth have also acted to ensure the Internet itself remains open for end users. As a result, the Internet is as open for usage as it is for development and governance, in an infinite loop of evolution and growth.

As such, openness represents the very essence of the Internet's success and must be preserved and encouraged to allow end users, businesses, and governments to reap the benefits of the Internet, as described in the following section. As such, all Internet stakeholders need to work together to protect and promote the open Internet and the underlying principles of multistakeholder Internet governance.

SECTION 03

Benefits of an Open and Sustainable Internet

3.1 Introduction

The open Internet has become a medium like no other, one that merges the most notable characteristics of traditional media such as broadcast and telecommunications, while also augmenting them in ways that have revolutionized aspects of civil society, business, and government.

Before the Internet, traditional mass media such as television and newspaper were the main means through which a large number of people could be reached. These mass media have a number of important characteristics, however:

- First, they are 'one-to-many', allowing the owner, be it a business or government, to broadcast content to viewers, listeners, or readers
- Second, they are mainly 'one-way', in that they do not allow for a return path for the receivers of the broadcast to communicate back to the originator over the same medium
- Finally, these media essentially are limited to a national reach, for commercial reasons or due to license conditions.[1]

Telecommunications, on the other hand, differs from traditional mass media in several key ways.

- First, telecommunications are 'one-to-one', allowing any user to call any other user (or at most 'few-to-few' with conference calls)
- Second, they are 'two-way', allowing the originator and receiver to communicate with one another equally
- Finally, telecommunications is global, with any user able to call any other user.

2,153,212,834

Total edits in Wikimedia Projects (including Wikipedia)

20 May 2014, 13:00 CET

[Source: tools.wmflabs.org/wmcounter]

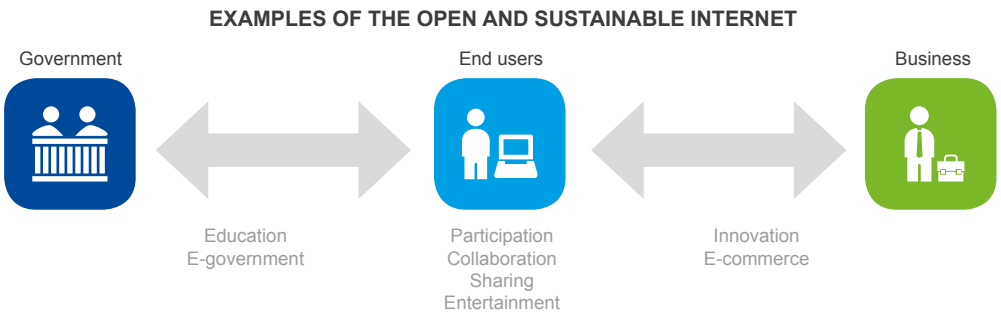
The open Internet is an amplified combination of these two media. As with mass media, it allows one-to-many broadcasts, such as websites or blogs; and as with telecommunications it allows one-to-one communications, such as email or instant messages – in both cases on a global scale. However, it also enables a new mass media paradigm of 'many-to-many', allowing communications between and among all Internet users, as well as more targeted 'some-to-some' collaboration between users with common interests or goals.

As a result, the nearly 3 billion Internet users are both creators of information as well as consumers. Websites, blogs, videos, and tweets, can all be broadcast and accessed in the largest mass medium imaginable. Audio and video calls and conferences can be set up and received without regard to distance or cost.

However, these interactions are not just limited to traditional media. Governments can use the Internet to deliver services and levy taxes, and in turn can choose to enable citizens to elect, petition, and oversee their governments online. Entrepreneurs not only have new markets for their goods or services, but also a new means to raise money online to finance their dreams. Likewise, entertainers have a new global medium to share or sell their endeavours, while new artists can be discovered and grow online. See Figure 3.1 for an overview of the examples in this section.

Figure 3.1: Section overview

[Source: Internet Society, 2014]



With open access to the Internet and an appropriate enabling environment, the resulting benefits of the Internet are limited only by the imagination and efforts of its users. Here we provide some examples that demonstrate the value of the open Internet for creating benefits among the global users of the Internet.

Conversely, as we show in the following section, differences in user experience across countries, whether based on the digital divide, or based on limited access to content and applications, reduce these benefits for all users.

3.2 The Internet is Open for Education

One of the most notable trends in recent years is the increased focus on the Internet as a platform for education. The Massachusetts Institute of Technology (MIT) jump-started the movement in 2001 by introducing the OpenCourseWare project to put their course materials online, beginning in 2002.[2] Subsequent to MIT's announcement, UNESCO held a forum on open courseware in 2002 where the term "Open Educational Resources" was coined, adopting the following definition: "The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes."[3]

Significant work has gone into open educational resources since 2002, with a number of universities around the world joining MIT in publishing courseware, and UNESCO continuing to be active in promoting this movement. As of 2014, MIT announced that it has published materials from 2150 courses. At the primary and secondary level, Bangladesh digitized all textbooks and has made them available online for free.[4]

More recently, Massive Online Open Courses, commonly referred to under the acronym 'MOOCs', have emerged. These courses broadcast classroom lectures, either in real time or via streaming, and can be standalone or part of a more traditional course that includes homework and exams.

152,347,354

Total online visits to MIT OpenCourseWare as of March 2014.

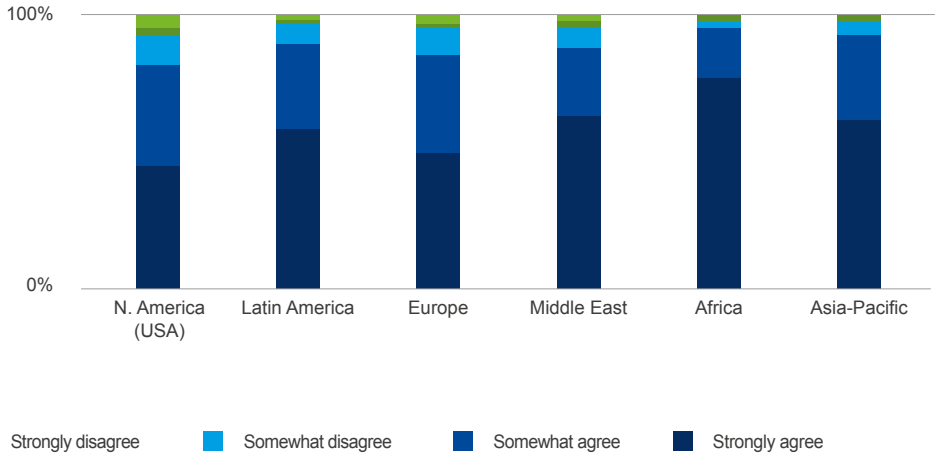
[Source: MIT OpenCourseWare]

Box 2: Survey result

The Internet is essential for my access to knowledge and education

[Source: Internet Society, Global Internet User Survey, 2014]

Although the Internet is considered important for access to knowledge and education globally, the survey respondents in the developing regions perceive it as more important, likely given the opportunity it provides to overcome local shortfalls



The separation of teacher and student in time and space is not new. Early examples of organized forms of distance education can be traced back as early as the 1840s and the Phonographic Correspondence Society that offered courses in shorthand writing through postcards. Postcards may have been replaced by bytes, but the core remains, of lessons delivered through a contemporary means of communication to increase the reach of education.

In both cases, education adapted to new means of access. The development of distance education in 19th century England was, for example, enabled by the so-called 'penny post', a reform that cut the cost of postal services for the large public. Likewise, online education benefits from the decreasing costs of Internet access worldwide, which has broadened the potential student base – just as in the case of the penny post.

The difference today is the scale, as seen in Figure 3.2. Where the old form of distance learning was confined to a national or regional student base, the Internet is global. Students who used to be restricted by geographical or economic constraints are now able to attend classes provided by the top-tier universities in the world, regardless of where they live.

The relationship is mutually beneficial – students get access to top education, and universities get access to a student body that may contain the next Einstein. A good example of this relationship is the story of Battushig Myanganbayar, a 15-year old from Mongolia who was discovered and accepted at both UC Berkeley and MIT after obtaining a perfect score in MIT's online class "Circuits and Electronics".[5]

Box 3: Survey results

The Internet can play a signfiicant role in improving the quality of education

[Source: Internet Society, Global Internet User Survey, 2014]

There is a clear belief that the Internet can play an important role in improving the quality of education, not least in Africa and Latin America.

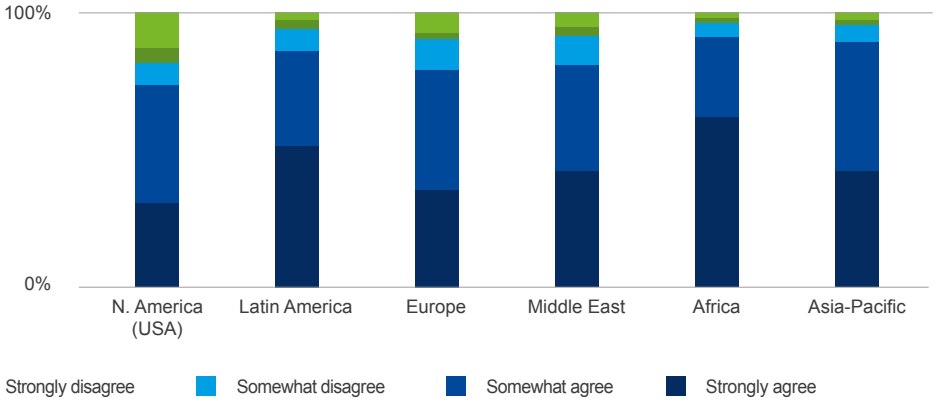
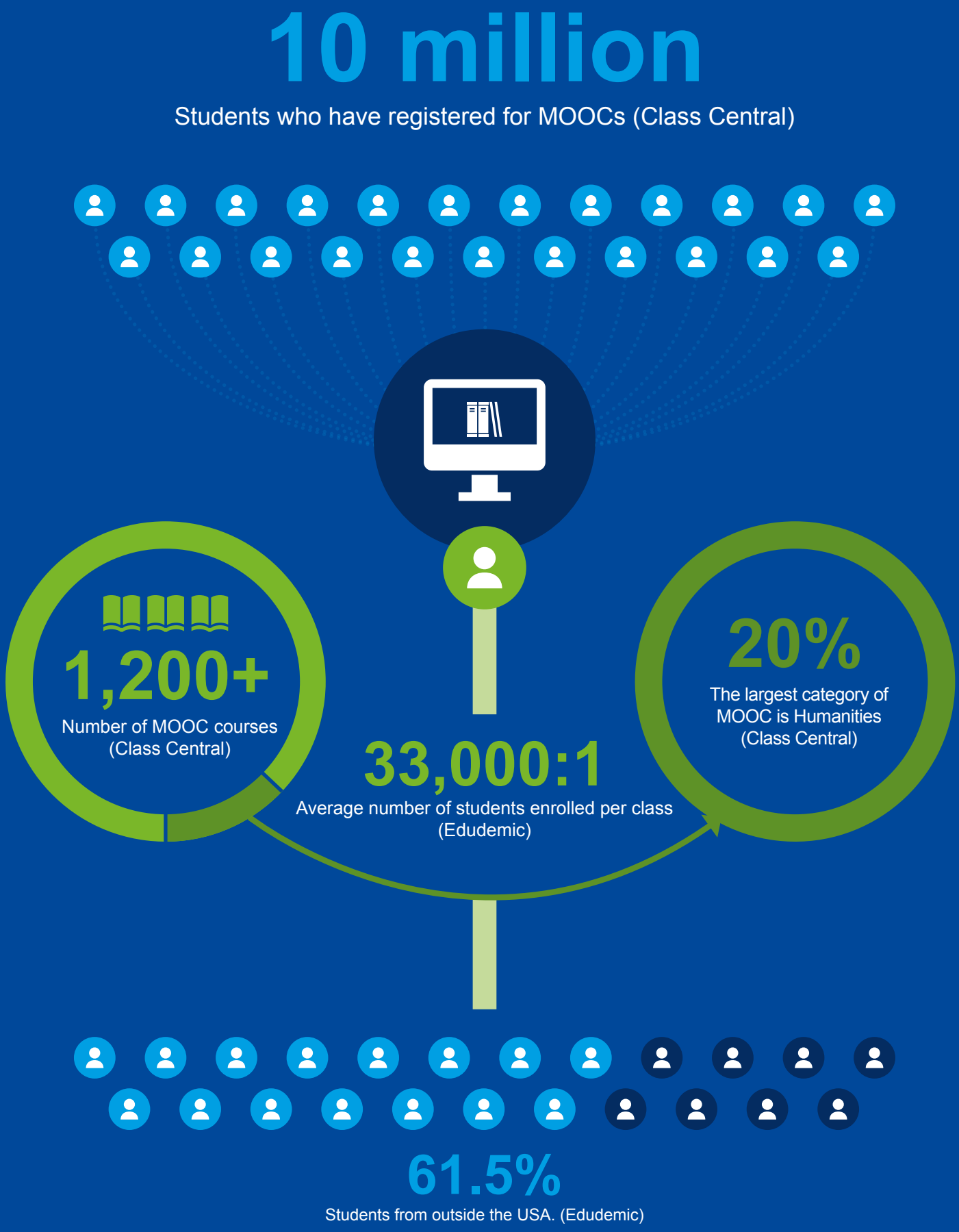


Figure 3.2: Massive Online Open Course Statistics

[Source: Internet Society, Class Central, Edudemic, 2014]



The demand for online education is only likely to increase. For example, UNESCO has estimated that 80 million additional people will be seeking higher education by 2025.[6] To meet this increasing demand with traditional campuses, three new universities, accommodating 40,000 students each, would have to be established every week for the next 12 years. Online education is able to meet this demand in theory, but in practice it is still evolving.

Online education is an efficient means of reaching a global audience, because the production and delivery exhibits economies of scale – once the course is developed, there is little additional cost of delivering it multiple times, anywhere in the world. As a result, the cost to the students can be lower than a traditional education, to the extent that the provider wishes to charge fees.

Language may be an issue, however. Many universities providing MOOCs, for instance, are predominantly American with English being the primary language for course production, irrespective of country of origin. This present dominance, together with a business model inherently linked to economies of scale, may thus consolidate English as the lingua franca of online education, creating a potential language as well as cultural barrier to participation.

Finally, the underlying hurdle to overcome in order to make online education viable an alternative to traditional forms of education around the world is technical. In particular, in addition to the basic reach of Internet access, the bandwidth of the connection is important to enable live-streamed lectures or videoconferences used in the teaching. Without the required speed, it is simply not possible to participate in elements of the course.[7]

Summary

While it is true that the challenges of online education have not all been met, it is equally true that the opportunities would not be possible without the open Internet. As the digital divide is bridged, educational opportunities will increase in underserved markets the world over, at lower costs. The students reached through these efforts will no doubt make their mark on all endeavours, including new innovations that will continue to enable the Internet to grow and remain sustainable.

As noted recently by Hal Varian, Chief Economist for Google:

The biggest impact on the world [of the Internet-enabled revolution in education] will be universal access to all human knowledge. The smartest person in the world currently could well be stuck behind a plow in India or China. Enabling that person – and the millions like him or her – will have a profound impact on the development of the human race. Cheap mobile devices will be available worldwide, and educational tools like the Khan Academy will be available to everyone. This will have a huge impact on literacy and numeracy and will lead to a more informed and more educated world population.[8]

3.3 The Internet is Open for Government

A number of governments have chosen to conduct elements of governance and the democratic process partially, or entirely, online. This starts with campaigns and elections and allows the electorate to continue their involvement and influence over government behaviour through petitions and other means of online engagement. Additionally, a large number of countries now have online portals for paying taxes to provide funding for government functions, and many offer a wide and growing variety of e-government services online.

The wide reach and many-to-many communication properties of the open Internet make it particularly well suited to these purposes. Of course, governments must choose to create an enabling environment for citizen engagement, and in turn citizens must have access to the Internet and appropriate online literacy to use these services.

Online political campaigns

Election campaigns are increasingly run online. Google has sought to assist voters in researching their choices by developing a Politics and Elections hub, which launched during the run-up to the 2012 USA election.[9] The page aims to group online resources related to the candidates and election in one place, making resources easier to find and review. Information provided included trend data on Google searches, Google News mentions, and YouTube video views for each candidate, giving an indication of their popularity.

While initially targeting the USA election, the site has since covered elections across a number of countries, including Chile, Japan, and Australia. As shown in Figure 3.3, for the Chilean election, the resulting search term data gave insight into the election race, which was won by Michelle Bachelet on 15 December 2013.

The Italian MoVimiento 5 Stelle (M5S) movement is an example of a political party that has taken advantage of online campaigning in the run-up to the 2013 general election in Italy. The party was launched in 2009 in response to the corruption being reported in Italian politics and advocates participatory democracy, including e-democracy. To this end, the party engages with supporters online, incorporating their opinions in decision- making to make them active participants rather than passive followers.

Figure 3.3: Indexed volumes of searches for the presidential candidates in the 2013 Chilean election

[Source: Google Trends, 2013]

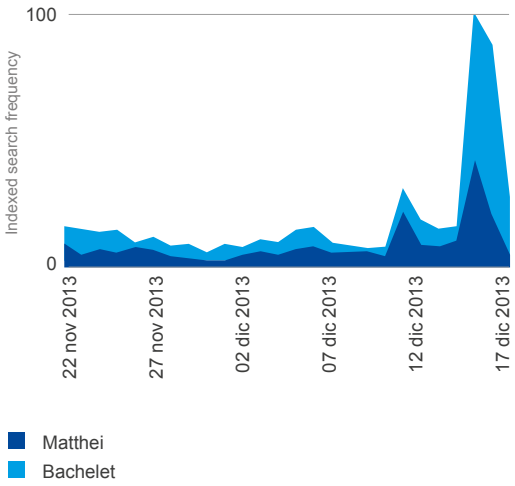
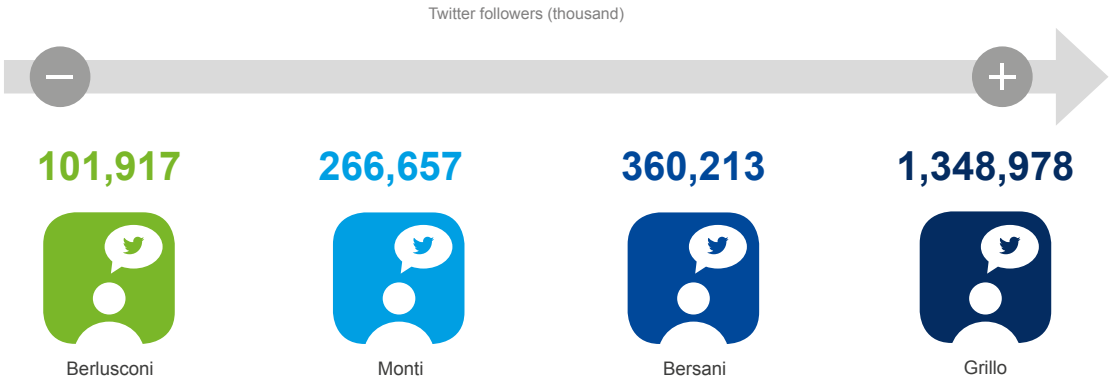


Figure 3.4: Twitter followers of candidates in the Italian presidential election, in December 2013

[Source: Analysys Mason, 2013]



The e-democracy was put into practice in the M5S primary election, which was conducted entirely online. In that election, 95,000 virtual ballots were counted to select the party's candidates for the General Election and the party leader, the comedian Beppe Grillo, stated afterward that this was done "at zero cost – we didn't even spend a euro".[10]

The party also operates an online TV channel[11] and Beppe Grillo's blog,[12] which can be used by potential voters to interact with him, is the most widely read in Italy.[13] On Twitter, he has around four times the number of followers of any of the other presidential candidates for the election, with over 1.3 million, as shown in Figure 3.4.

Similarly, Grillo has over 1.4 million likes for his Facebook page. A survey of 2,245 of these followers, conducted by Demos, found that 20% of the respondents say they are 'formal members of M5S',[14] indicating that the movement has likely been successful in moving its supporters beyond simply following the party via social media and on to formal party membership.

Partly as a result of this online campaigning, the party was able to go, in four years, from launch to receiving 25.5% of the popular vote in the 2013 election, thereby achieving more seats in the House of Deputies, 108, than any other single party.[15]

Online elections

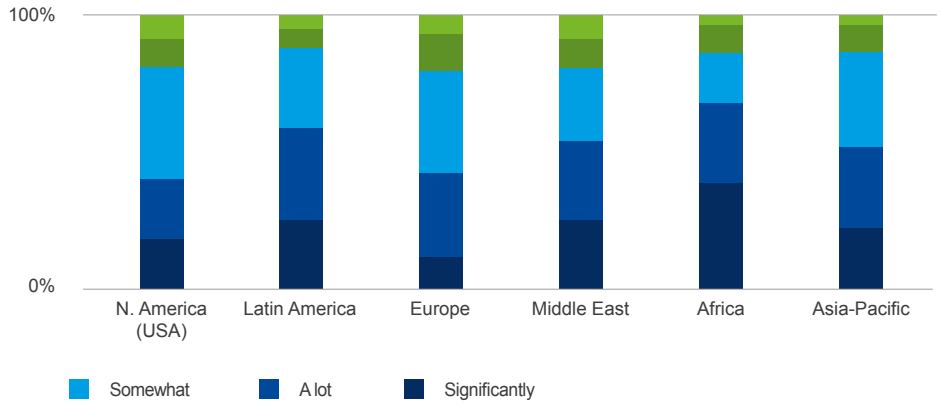
While the M5S party conducted its primary election over the Internet, several governments have also begun to experiment with online voting for the national election. While India, Kazakhstan, Brazil, and the Philippines have used some element of electronic voting in past elections, the majority of electronic voting to date has been in Europe and North America.

Box 4: Survey results

How much has access to the Internet contributed to civil action or political awareness in your country?

[Source: Internet Society, Global Internet User Survey, 2014]

The graph illustrates the impact of the Internet on political awareness, with more positive results particularly in Africa.

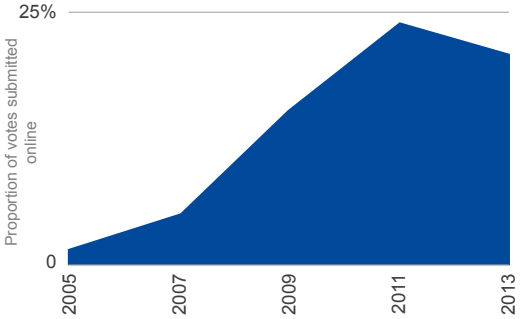


Estonia was the first country to host legally binding elections over the Internet when it ran a pilot scheme during the 2005 local elections. The success of this scheme encouraged the country to continue using online voting for the 2009 and 2013 local elections and the 2007 and 2011 parliamentary elections. Online votes can be submitted at any time during the early voting period and can be changed an unlimited number of times, with only the final submission counted. As can be seen in Figure 3.5, the proportion of votes generated online is now in the region of 20% of total votes in Estonia.[16]

The rapid uptake of online voting in Estonia can be explained in part by the fact that, as of 19 December 2013, approximately 1.21 million of the 1.34 million inhabitants possess a national ID card that enables secure remote authentication and can provide a legally binding digital signature.[17] This type of ID card, with its many possibilities for online activities, does, however, raise a few concerns regarding security and privacy.

Figure 3.5: Proportion of votes generated online in the Estonian elections, 2005–2013

[Source the Estonian National Electoral Committee, 2013]



Online lobbying and campaigning for change

Once a government or parliamentary representative has been elected, the Internet provides channels for the electorate to continue to influence policy and hold its elected officials accountable. These channels can be both government-run, as discussed in the examples below, or privately run, as discussed in the following sub-section.

Both the UK and USA governments operate e-petition sites that respectively will put an issue forward for debate in the UK House of Commons or receive an official response from the USA government, if sufficient signatures are received.

The UK site allows any e-petition that receives at least 100,000 signatures to be considered for debate. For instance, a petition to reconsider the decision to award the West Coast Mainline rail franchise[18] to FirstGroup was allocated a debate slot on 17 September 2012.[19] This petition (along with court proceedings commenced by another competitor for the franchise, Virgin Trains) led to the overturning of the decision to award the franchise and the reopening of the competitive bid process.[20]

The White House also runs an e-petition site that seeks to promote the First Amendment right to petition the government.[21] With enough support, White House staff will review the petition, ensure that it is sent to the appropriate policy experts, and issue an official response. As of January 2013, 100,000 signatures in 30 days is the threshold for consideration. These petitions can be serious policy issues, such as the question of reform of the banking sector,[22] or more frivolous ones, such as the August 2012 request for the release of the White House beer recipe[23] or the November 2012 request to secure resources and funding and begin construction of a Death Star from the movie *Star Wars*.[24]

Tax administration and collection

The Internet can also be used for running various aspects of government, particularly taxation. The Kenya Revenue Authority (the Kenyan tax collection agency) has migrated much of its activities online. Kenyans can use the site to file tax returns, and businesses can interact with customs for declarations of goods and imports.[25] Similarly, in the UK much of the tax system can be managed online, and on 5 December 2013 the Chancellor of the Exchequer, George Osborne, announced in his autumn statement that from October 2014, the tax disc to show motorists have paid vehicle excise duty is to be entirely replaced with an electronic system.[26]

E-government

E-government initiatives are an area of increasing interest for governments and the public, given their potential to revolutionize how governments use technology to provide public services more broadly and with greater efficiency. E-government covers a multitude of services. For example, in the Asia-Pacific region, e-government initiatives have been explored since the mid-1990s to enable governments to spearhead various initiatives of national interest, including poverty reduction, mass education, universal healthcare services, anti-corruption drives, open governance, and promoting business and investments, among other topics.

The spread of these initiatives has been fostered, and studied, by a variety of organizations. For instance, the World Bank has an Open Government Data Toolkit, which provides resources and describes the benefits of Open Government initiatives.[27] Waseda University in Japan has an Institute of e-government, which ranks e-government programs based on a variety of indicators such as the digitalization of citizen consultation, taxation, and the electronic provision of social security services.[28]

Singapore has long been at the top of the Waseda ranking and was recognized as the leading country in 2013.[29] With long-term strategies of continuously developing new digital solutions for the provision of public services, the government has implemented a series of e-government master plans, the latest of which is eGov2015, and initiatives include the OneInBox, which replaces hard-copy correspondence from the government.[30] To support the overall approach, the Infocomm Development Authority of Singapore (IDA) has "a national role to identify and facilitate the adoption of infocomm technologies to enhance Singapore's competitiveness" across a variety of key sectors including education, healthcare, and government.[31]

€0

Stated cost for MoVimento 5 Stelle party to hold primary online, in which 95,000 ballots were cast.

According to party leader Beppo Grillo

Summary

The use of the Internet for campaigning, accountability and government financing is a growing trend, empowering citizens and facilitating greater efficiency and reach of government services. However, as discussed further in Section 4, some governments have chosen to block or filter access to certain content and applications, discouraging or forbidding citizens from participation, while in other countries, governments' efforts to leverage the Internet may be slowed by a digital divide preventing citizens from going online.

3.4 The Internet is Open for Participation

As discussed in the previous section, governments can host petitions to garner feedback and suggestions from citizens. However, the Internet enables citizens to participate in ways beyond those encouraged or even allowed by national governments.

In particular, the Internet can act as a digital Speaker's Corner, allowing users to air grievances, gather support, organize, and take collective action, creating a global version of Hyde Park. The activism can target local, national, or international issues, and focus not just on governments but also businesses.

Online advocacy

Online advocacy is not limited to local organization and politics, with a number of websites in existence that host international petitions relating to a range of topics, from climate change and corruption to the policies of retail companies and television programming schedules.[32]

35,739,246

Avaaz members worldwide

20 May 2014 13:30 CET

[Source: Avaaz]

For instance, Avaaz was launched in January 2007 as an international citizen's group and it has seen a rapid increase in membership. It campaigns in 15 languages across 194 countries, and in the words of The Guardian newspaper in the UK, "has exploded to become the globe's largest and most powerful online activist network".[33]

From its January 2007 launch to December 2013, Avaaz has been involved in 166 million 'actions'.[34] These have included fighting corruption in India, Italy, and Brazil; protecting the world's oceans, rainforests, and endangered wildlife; and defending Internet and media freedoms.

Change.org is another organization that facilitates online advocacy; since its February 2007 launch it has grown to a user base of over 40 million across 196 countries.[35] While it is open for anyone to start a petition about any local or international issue, the site is funded by running advertisements or sponsored petitions for not-for-profit groups and political campaigns, such as Amnesty International.

One case, with a national business focus, in which change.org was able to influence the outcome, was that of Bank of America's proposals to introduce a USD5/month

banking fee to their USA customers. In October 2011, a 22-year-old American nanny, Molly Katchpole, started a petition that received over 300,000 signatures, including that of President Barack Obama. By November 2011, the proposed fee was cancelled.[36]

Additionally, independent sites are using the Internet in an attempt to fight corruption and keep politicians honest. The ipaidabribe.org initiative was developed in India, by the not-for-profit organization Janaagraha, and allows citizens to report on the details of any acts of corruption they encounter. ipaidabribe.org uses these reports to argue for improving governance systems, procedures, and regulation to reduce the scope for corruption. From the launch of the site in August 2010 to December 2013, 18,000 Indians have reported paying bribes with a total value of INR592 million (USD9.5 million).[37] This initiative has been adopted elsewhere, operating in 11 countries at the end of 2013 and is expected to arrive in 12 further countries in the near future.

In Cambodia, the Cambodian Center for Human Rights (CCHR), which promotes democracy and protects human rights in the country, has become a good example of how advocacy can be made effective using the Internet and its outreach activities.[38] CCHR's progressive outlook and innovative management has also garnered it many awards and recognition from the international community.

The organization's project Sithi.org is a good example of how the Internet is an important tool to gather and spread information about the human rights situation in Cambodia. By collecting reports from human rights activists, organizations, and even regular citizens from across the country, the project has created a unique database of human rights violations. Through a simple online reporting system, registered users can file reports and provide detailed information of the nature of the abuse. This provides important information about the extent of violations in general but additionally identifies types of abuse and if there are sector-specific problems.

Internet-assisted engagement

In the 2011 uprising in Egypt that resulted in the resignation of President Mubarak on 11 February 2011, the Internet in general, and social media in particular, was used for a number of purposes including spreading awareness of the issues, organising the protests, and acting as an alternative

press to report on the details to the wider world. Egypt is one of a number of countries in which activists made use of the Internet to further their cause during the Arab Spring and beyond.

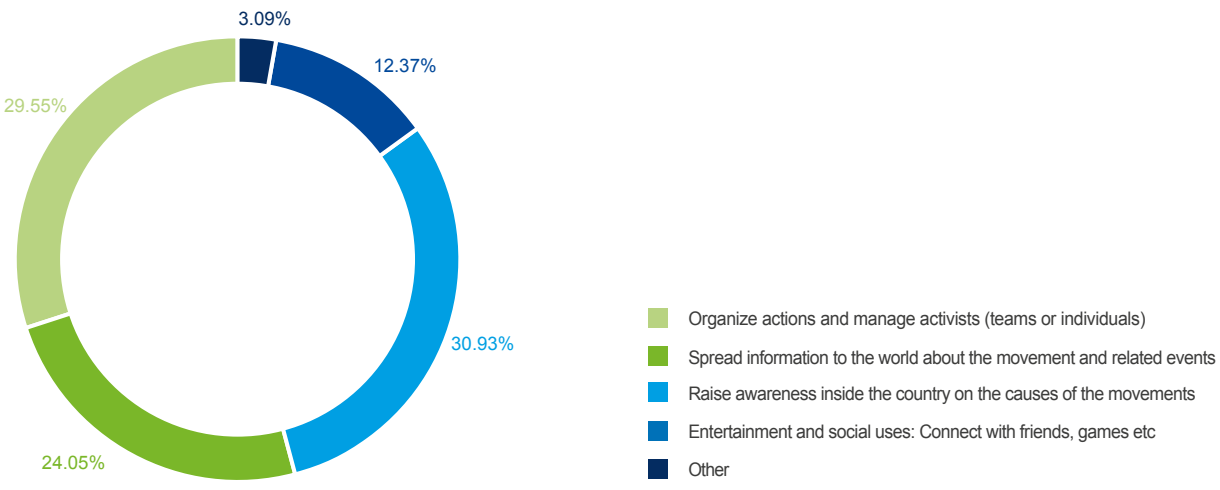
Of particular note in raising awareness of the plight of the Egyptian people under President Mubarak was the creation of the Facebook group 'We are all Khaled Said'[39] in July 2010, after the young blogger was arrested and beaten to death by police officers. This became a prominent platform for dissemination of information on the case and the government's response. At the peak of its popularity, the group had over 400,000 members and was used to spread word of the planned protest in Tahrir Square on 25 January 2011.

In response to these protests, the Egyptian government shut down the Internet access services in the country on 26 January 2011 (see Section 4.2 for more examples of government shutdowns). In order to maintain the ability for Egyptians to continue communicating with the rest of the world and report events on the ground, engineers at Google and Twitter combined forces to create speak2tweet,[40] a service that allowed users to call an international number and leave a voice message which would then be transposed into a tweet.

During the uprisings, social media in Egypt was dominated by the events unfolding. As can be seen in Figure 3.6, when surveyed retrospectively, Egyptian Facebook users believed that 85% of Facebook use at the time was in some way related to the protests.

Figure 3.6: Proportion of Facebook use for different purposes during the uprising according to Egyptian Facebook users

[Source: Dubai School of Government, 2013]



Additionally, 94% of these users got at least some of their news during the uprising from social media[41] and '#jan25', in reference to the Tahrir Square protest, became one of the highest trending twitter hashtags in the region during the first quarter of 2011, with over 1.2 million mentions.

Summary

The ability of the Internet to allow its users to reach such a wide audience allows for citizen advocacy to exist at an unprecedented international level. This is generating reform across the globe, allowing Internet users to influence businesses, governments, and industry regulators. Government involvement in this trend is mixed across countries, with a broad spectrum of reactions ranging from active encouragement to shutting off the Internet at the height of protests, as shown further in Section 4. Regardless of the government acceptance, however, users have often managed to leverage the open Internet to route around any challenges in order to continue with their activities.

3.5 The Internet is Open for Business

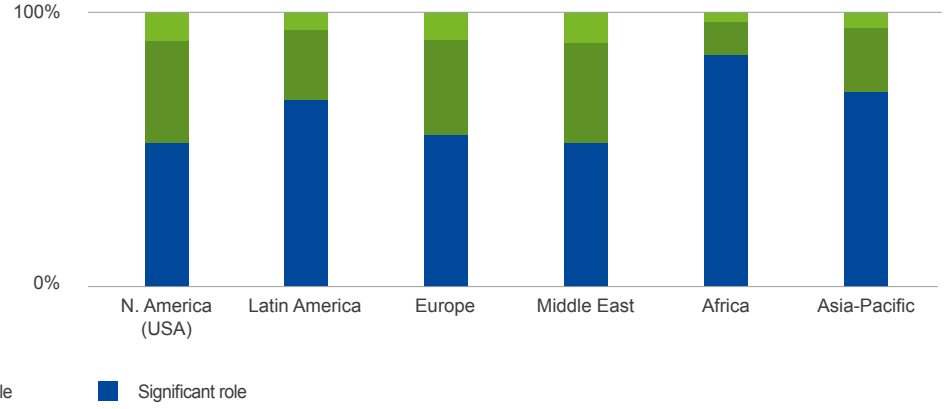
By creating a potential market of billions of users, the Internet is a natural venue to conduct business, both for traditional 'brick-and-mortar' retailers as well as new online businesses that have emerged, such as Amazon.com, which in many cases compete strongly with traditional vendors. However, the many-to-many nature of the Internet has also led to the emergence of a new segment of retailers, which are essentially online street markets that provide a platform in which anyone can sell to anyone else with low costs.

Box 5: Survey results

What type of role do you believe the Internet can play in improving the economic situation in your country for using technology to run a better business?

[Internet Society, Global Internet User Survey, 2014]

The graph shows that the Internet is believed to play an important role for business, in particular in developing regions, in recognition of the role that the Internet can play in 'leapfrogging' gaps in existing traditional offerings.

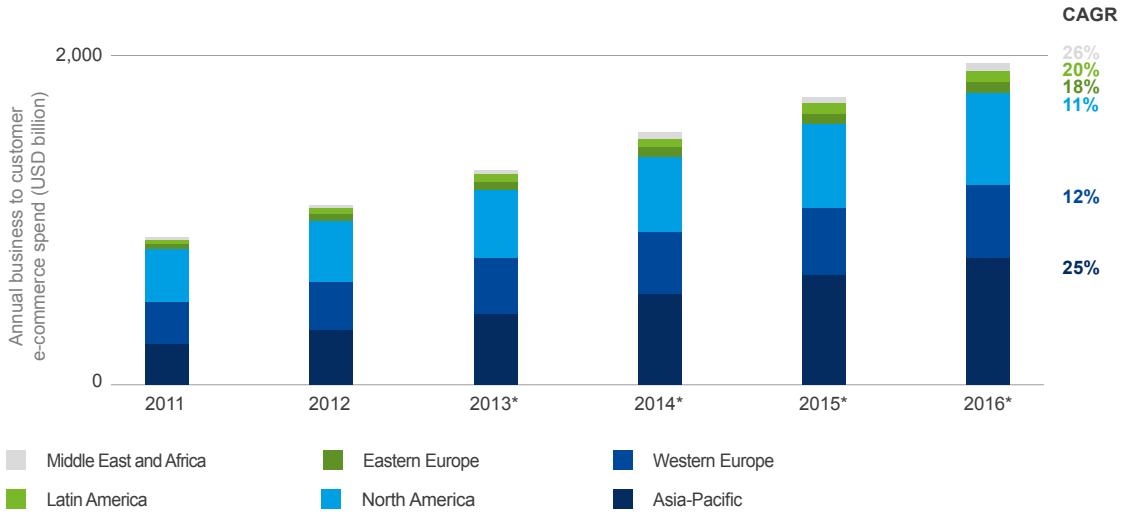


E-commerce

In general, online selling of goods and services can be categorized as e-commerce and includes sales of digital material, such as streaming media as well as physical goods. These sales can take place via auction, digital trading marketplaces, and online shops. The size of the e-commerce market is growing internationally, as shown in Figure 3.7, with growth coming from both increases in customer volumes and spending per customer.[42] Growth is robust in all regions, including emerging markets in the Middle East and Africa.

Figure 3.7: Annual spending on e-commerce by region

[Source: eMarketer, 2013]



By leveraging the reach of the Internet, retailing has transformed from a local to a national or international affair, thereby increasing the number of potential buyers. At the same time, the Internet has lowered the cost of selling and increased the number of vendors. Etsy is a good example of a successful e-commerce marketplace, which focuses on the sale of unique handmade or vintage items.

Etsy sellers are able to immediately take advantage of the global customer base provided by the Internet, and the awareness of the Etsy marketplace within that. Not only is there an instant customer base available, but also sellers are able to launch with low up-front investment; in a survey, 35% of sellers stated their shop did not require much investment, with only 1% taking out a bank loan. As a result, Etsy hosts over 1 million 'shops' or sellers, each of whom pays a fee of USD0.20 to list each item in their personal storefront. In 2012, USD895million of merchandise was sold to customers across 200 countries.[44]

E-commerce can enable trade in areas with a relatively underdeveloped retail sector. This is very much the case in

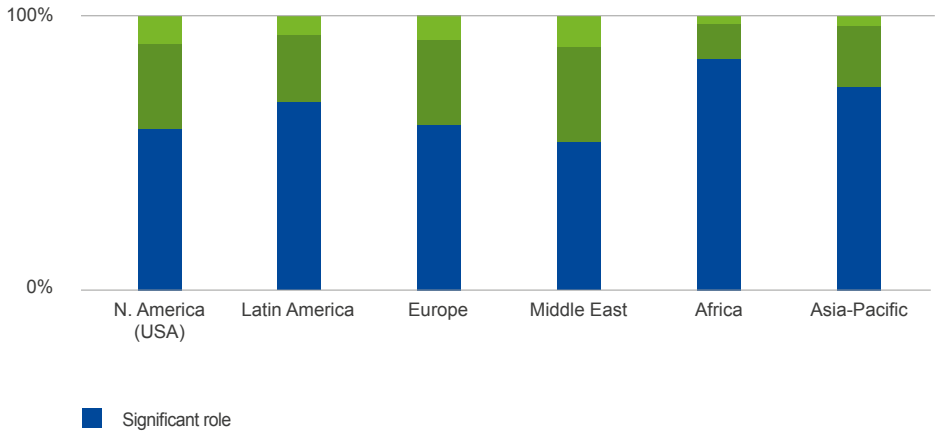
developing countries where the demand of a growing middle class can be met through online services, which can be offered with less overhead than opening traditional retail shops. Regional differences in payment systems and online access can be overcome by targeted services that adapt to the specific environment.[45]

Box 6: Survey results

What type of role do you believe the Internet can play in improving the economic situation in your country for expanding the availability of goods and services on-line?

[Source: Internet Society, Global Internet User Survey, 2014]

There is clearly a positive belief in the Internet's ability to improve the economic situation in general. As indicated by the data, this belief is even stronger in developing markets, most notably Africa where more than 80% ascribe the Internet a "significant role".



The Nigerian company Jumia.com is one example of how e-commerce can create business in countries with a growing middle class. With a presence in Nigeria, Côte d'Ivoire, Egypt, Kenya, and Morocco, the company offers more than 100,000 products that can be ordered online, through SMS, phone, or agents.

Competitive effects

In addition to enabling an increase in online retailing, the Internet also allows customers to find more information about products they wish to buy than ever before, particularly with regard to prices. This increased price transparency can be delivered through customer searches or via specialized sites and smartphone apps. Such price transparency helps increase the efficiency of retail markets, and encourages retailers to price more competitively.

KAYAK,[46] launched in 2004, is one example of a price comparison service, which focuses on travel, particularly flights, hotels, and car rentals. It enables the easy comparison of hundreds of options at once, so that consumers can find the best deals available. While these deals could be found by review of each individual site, such services significantly reduce the time required, and users may find offers that would otherwise have been missed.

Of course, at the same time, the Internet is a disruptive technology, as e-commerce has a downside for traditional vendors. For instance, many products such as books, music, and video, can be sampled, ordered, and delivered online, leading to the retrenchment of retail staff or bankruptcy of large numbers of traditional retailers that were slow, or unable to respond to the challenges.

While consumers may be hesitant to purchase other items, such as clothes, without at least seeing them, a phenomenon known as 'showrooming' has emerged, whereby consumers make their choices in stores and then buy the items online, with predictable negative effects for the stores, and those suppliers that rely on the stores to attract customers.[47] Indeed, in markets where it is available, the Amazon Price Check App allows consumers to scan a product barcode in the store, determine whether Amazon offers a cheaper price, and order the product immediately.[48]

The business downside of the Internet is not restricted to retailers, as it has fundamentally challenged a host of industries including entertainment, travel, and journalism, among others, while also facilitating outsourcing that has shifted jobs to lower cost countries. It is thus important, when considering the impact of entrepreneurs using the Internet to disrupt business, and the consumers who benefit from that, to take into account the traditional businesses that have been disrupted and ensure that they have the capacity to also leverage the Internet to fully compete.

Summary

The Internet opens up global markets for businesses, allowing start-up firms immediate access to a wide, international customer base directly or via an intermediary market. Additionally the Internet is encouraging innovation and promoting consumer interests by giving them access to increased information, both in terms of pricing and quality of products and services, for example with online reviews, to enable individuals to make the most well-informed decisions about spending. The downside, however, should not be ignored, as the Internet is disruptive for many traditional sectors.

3.6 The Internet is Open for Sharing

The idea of collaborative consumption is not new. For instance, hunter-gatherer societies often made use of the 'social refrigerator', wherein, following a successful hunt, tribe members shared surplus meat that would spoil in the absence of an actual refrigerator. In return, the hunter could expect meat in the future when other tribe members had a successful hunt.

Trust was implicit, as the tribes were small and members were interdependent for survival.

Today, members of modern societies acquire much more than food in their day-to-day lives: automobiles, dwellings, and money, for starters. This capital is not always used in part or fully, and capital not used is 'wasted', at least in a temporal sense. In order to capitalize on unused assets, a 'sharing economy' has arisen in which owners of capital can rent it to others when not in use, while simultaneously creating the trust mechanisms needed to protect both sides of the transaction.

1,122,257,615

Total US dollars pledged to Kickstarter projects.

20 May 2014 11:46 CET

[Source: Kickstarter]

If sharing was once caring, it can also be a business today. Innovative websites have enabled small-scale entrepreneurship, where private apartments become hotels, a family's mini-van turns into a taxi, and queuing an occupation. Just as the money in a bank account is lent to a borrower that pays interest, so can renting out a boat generate an income. For its owner, capital goods that were acquired for own consumption now have a productive value that can generate an income.

There are two key developments that enable this sharing economy, as highlighted in Figure 3.8.

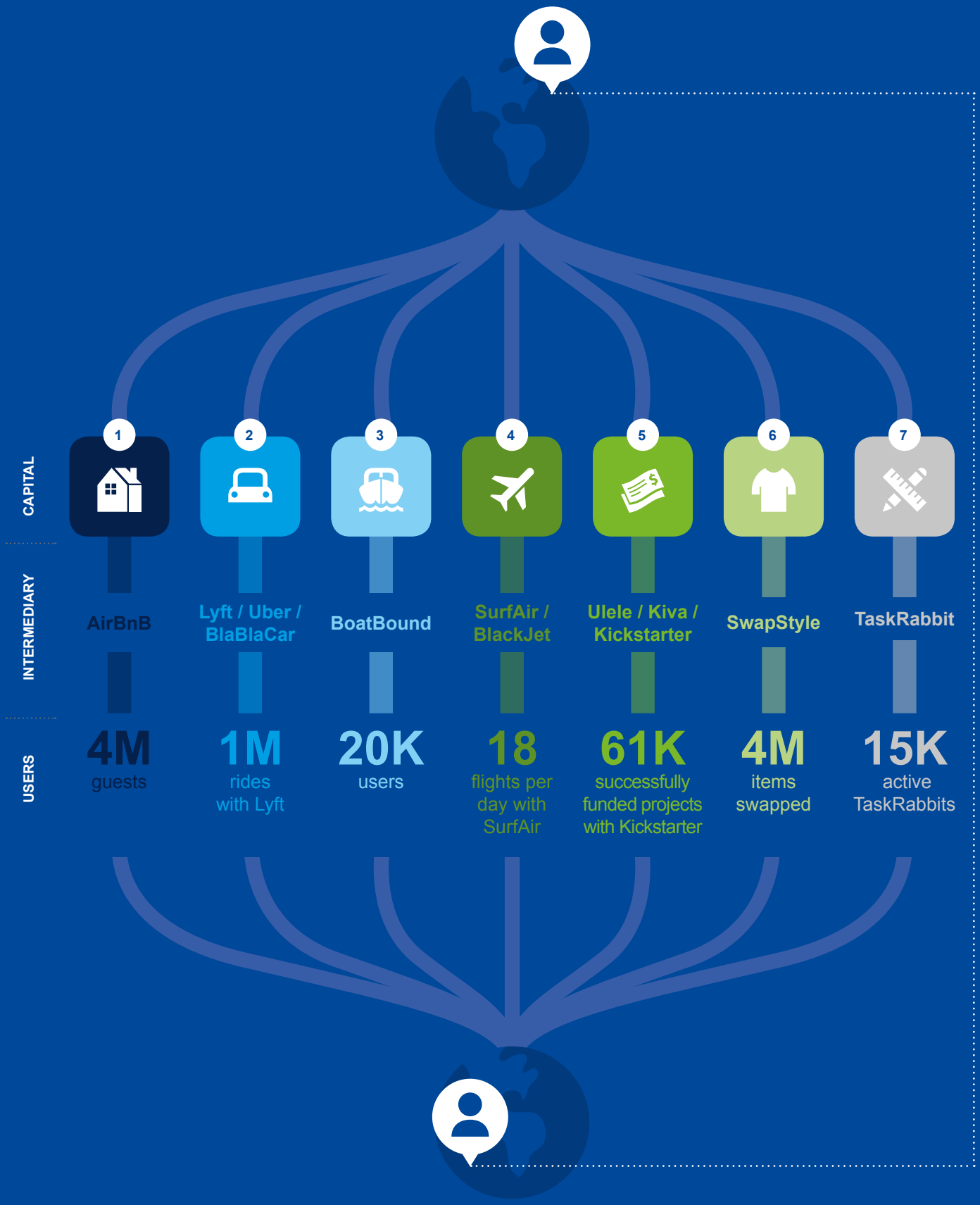
The first can be illustrated by websites such as AirBnB, Lyft, or TaskRabbit, which are the driving forces behind the growth of the sharing economy, using their innovative solutions and ability to generate a critical mass of users. As a result of their scale and scope, a service that was once offered on the noticeboard at the local supermarket is now advertised globally through a refined system that allows strangers to do business at low costs and by facilitating the complete process of contracting − from the introduction of buyer to seller to the payment and delivery arrangements.

Second, the real innovation in the sharing economy lies with solutions to communicate trust, which is essential to transactions involving significant amounts of capital or personal interaction. Just as trust among the members in a hunter-gather society enabled the inter-temporal sharing of food through the social refrigerator, so is trust needed to rent a stranger your car or a room in your house.

Trust in the sharing economy is often communicated through a feedback system, identifying the 'good' and 'bad' users. As such, it is a crucial part of business, valued by both buyers and sellers, making the provision of trust a business idea in itself. Websites such as Fidback or TrustCloud are specifically designed to produce an online reputation that is based on information across different websites, increasing both the benefit of being trustworthy and the consequences of violating trust. In some cases, such as AirBnB, trust is enhanced through insurance that is offered on transactions. [49]

Figure 3.8: The sharing economy

[Source: Internet Society, 2014]



Summary

The sharing economy is both something new and something old. As illustrated by history, humans have always found social arrangements to share their consumption. Whether it is the meat of a deer or the use of a car, sharing it with others optimizes consumption. The new thing is the innovative arrangements, enabled by technology, which create the trust needed to do business with strangers. If the collaborative consumption was once limited to the tribe, that tribe has now gone online and become global.

3.7 The Internet is Open for Innovation

The Internet is not only the result of innovation, it is also a significant facilitator. We have illustrated in the previous sections how the Internet can provide an entrepreneur with all the basic ingredients for innovation: education, research to gather ideas, capital for investment, and a marketplace for the results.

Without the Internet, access to the building blocks of innovation can be challenging, not least in the West African country of Togo, categorized as a so-called 'Least Developed Country' (LDC)[50] by the United Nations and ranked by the World Bank as one of the most difficult countries in which to do business.[51] However, as shown by the story of the W.Afate 3D Printer, creativity can still have a chance through the hard work of dedicated individuals, facilitated by Internet access.

WoeLab is a small business incubator situated in the capital of Lomé. As a small community of creative people, sharing a common philosophy of collaborative work based on open-source technology, WoeLab represents the resourceful spirit that is the foundation of innovation around the world. This spirit is embodied in one WoeLab participant, Kodjo Afate Gnikou, the inventor of the W.Afate 3D Printer, who sees in the mountains of e-waste (see box) an opportunity for business.

Using the components often found amongst discarded electronics, Mr Gnikou began sketching a 3D printer that could be built using only e-waste. To fund the project, Mr Gnikou and WoeLab set up a fundraising campaign on the crowdfunding website Ulule in March 2013. By the middle of June, the project had already reached its fundraising goal of USD4,000.

Box 7: E-waste

The rapid developments of past decades have led to a flood of new technology and devices, which are in turn continually improved according to Moore's law and new innovations. The downside of these developments is the increase in electronic, or e-waste.

By one estimate, up to 50 million tonnes of e-waste was created last year. Some discarded items are re-used, others recycled, and a significant amount is left in landfills, often toxic due to the materials used.

The high costs of recycling have in turn led to an extensive North-South trade in e-waste, sometimes legal but often illegal, with massive landfills in the developing world as a result.[52]

Based on an existing 3D printer design available online, the Prusa Mendel model, the W.Afate prototype is unique. At a production cost of only USD100, the 3D printer integrates e-waste gathered from old computers, printers, and scanners found in local dumping places, alongside a few new parts such as motors that had to be purchased.[53]

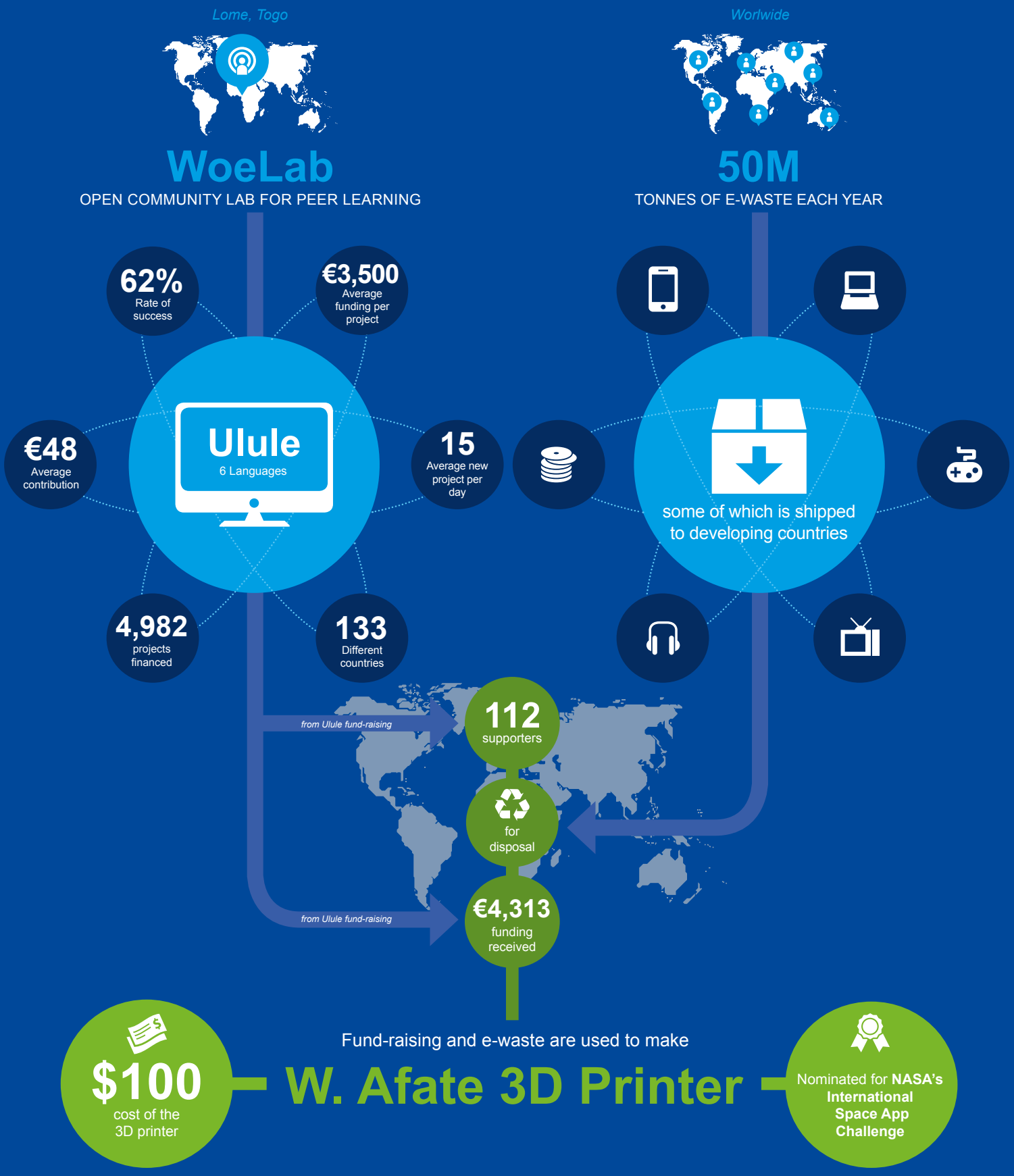
The W.Afate 3D printer is about more than the clever use of e-waste: it is about showing that all countries can be a part of the new technological revolution thanks to increasing Internet access. The fact that the W.Afate printer is part of this revolution was confirmed by the project's nomination to NASA's International Space Apps Challenge, a competition for technology that can contribute to space exploration, including a mission to Mars.[54]

The crowdfunding that helped develop the 3D printer not only matches investors with inventors, it can also eliminate bottlenecks and provide a closer link between innovation and consumer demand. The Pebble watch is the perfect example of this process, in which an inventor presented an idea that spoke to a demand that major companies had not yet addressed.

The Pebble is a watch that communicates with a smartphone, enabling users to see alerts, control the phone, and use new apps that take advantage of the accessibility of the watch, such as providing times when running. It is to-date the most successful funding project at Kickstarter, raising USD10,266,845 from almost 69,000 investors who received discounts on their watches.[55] It is arguably also the most successful Kickstarter project in having launched an entirely new segment, the smartwatch, which has so far seen Samsung and Sony join the ranks, with others set to follow.

Figure 3.9: W.Afate 3D Printer

[Source: WoeLab, Ulule, The Guardian, Internet Society, 2014]

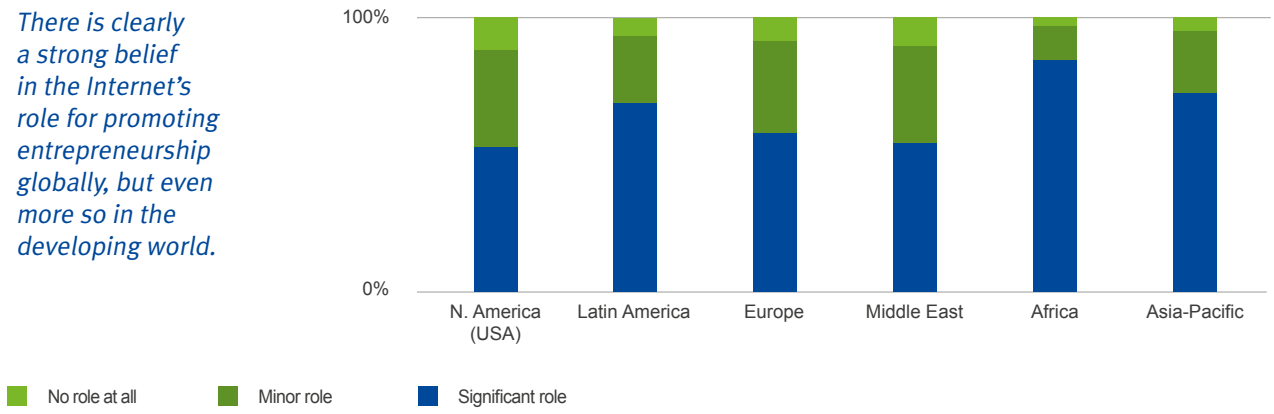


Box 8: Survey results

What type of role do you believe the Internet can play in improving the economic situation in your country for allowing entrepreneurs to conduct business through the Internet across all countries?

[Source: Internet Society, Global Internet User Survey, 2014]

There is clearly a strong belief in the Internet's role for promoting entrepreneurship globally, but even more so in the developing world.



Summary

Innovation does not just require inspiration, it also requires research, funding, and a sales channel. While nothing can replace a good idea, the open Internet can provide all the other ingredients needed to turn the idea into an innovation, and the innovation into income. This does not just mean that entrepreneurs such as those behind the Pebble watch can emerge to take on the largest companies in the world, but that local innovators can address local challenges and opportunities, turning e-waste in Togo into a printer that can allow others to invent and create new products and help develop a cycle of innovation.

3.8 The Internet is Open for Collaboration

The Internet is the result of a broad collaboration among its founders, and the resulting spirit of collaboration has spread to many diverse activities, facilitated by the open Internet. User contributions, from the origins of the Internet to present day, have fostered a culture of cooperation that is as vital to its continued development as any of its technical parts. Open standards and software have long represented this culture but have also inspired and contributed to collaborative projects with goals beyond the digital realm.

Collaboration continues to be the driver of developing the standards underlying the Internet. The work of organizations such as the IETF or open-source software developers behind Mozilla continuously push the digital frontier through the joint effort of dispersed individuals.[56] GitHub is a good example of efforts to promote such developments by providing a platform specifically designed to facilitate collaboration in the development of new software.[57] It is an innovation for innovations, providing a catalyst to the decentralized type of cooperation that has signified the Internet's creation and evolution.

Wikipedia, the online user-generated, free-content encyclopaedia, is a leading example of the potential for collaborative efforts to create one of the most widely visited websites around the world. There were, as of March 2014, 287 different versions of Wikipedia, separated by language. These vary in size from the original English language Wikipedia, with over 32 million total pages, to the Herero[58] language with just 118 pages.[59] Visitor numbers are growing globally, with 530 million unique visitors in October 2013 up from 277 million in October 2008.[60] At the same time, as of April 2014, users had made over 2.3 billion edits to existing and new pages.[61]

Collaboration extends well beyond the development of the Internet. Fold.it is an example of an innovative form of collaboration for scientific research that has been enabled by the Internet.[62] By making use of the so-called gamification technique, individual users are engaged in protein folding simulations to help fight diseases. By playing what appears to be a three-dimensional puzzle, the player is actually helping science to understand how different protein structures fold into their functional shapes. This innovative way of using volunteers' creativity has not only resulted in important contributions to the study of protein folding, but also to a broader field of science by collecting data on humans' pattern-recognition, which could be used to teach human strategies to computers.

Summary

The Internet is the result of open collaboration, as well as a facilitator of collaboration across fields. As a platform for instant communication with a global reach, it can facilitate cooperation with participation from all corners of the world. The result is not only innovative applications of existing technology, but also the development of new ones.

3.9 The Internet is Open for Fun

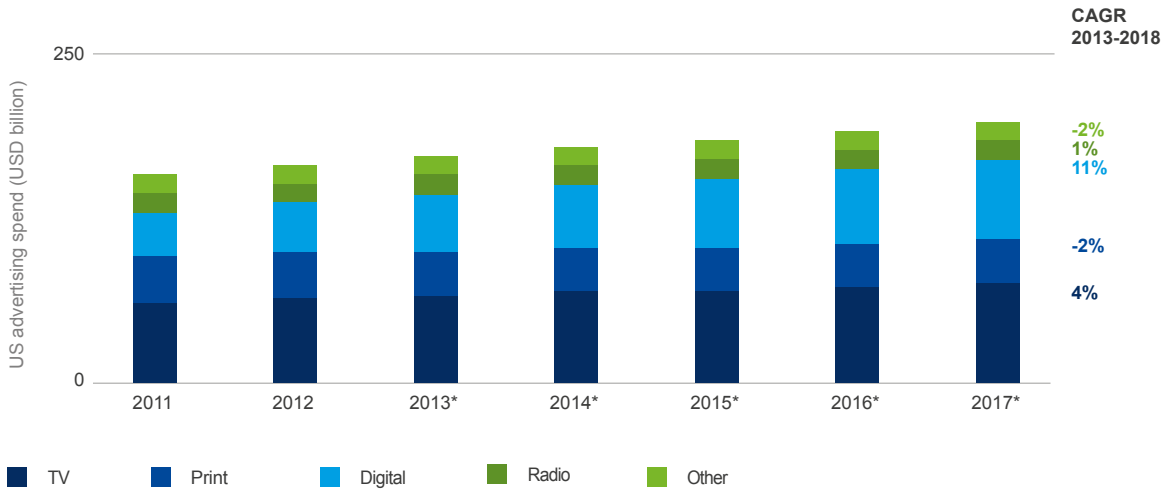
The Internet is rapidly becoming a primary destination for accessing media, due to the availability of huge volumes of users and low cost of delivery. This includes written media, in the form of news websites or blogs, music, or video content, all of which can be digitized, delivered, and consumed over the Internet.

The many-to-many nature of Internet communication has also facilitated the rapid development of a multitude of social media platforms, such as Facebook and Twitter, which are making it easier than ever for users to keep in touch.[63]

An indicator of the value that media consumers receive from the content and services available online is provided by the shift in the proportion of advertising expenditure from traditional forms of media to online (digital) media. As shown in Figure 3.10 below, spending on advertising in the USA is forecast to rise particularly rapidly in digital media, websites, and mobile apps, increasing from 22% of total spend in 2012 to 31% by 2017.[64]

Figure 3.10: USA advertising spend by medium

[Source: eMarketer, 2013]



Social media

Social media platforms have made it easy to reach many more people than more traditional media formats, which are often constrained by national borders. For example, the newspaper with the highest circulation in the world, Yomiuri Shimbun, has 10 million readers;[65] Barack Obama, with his 40.6 million Twitter followers, can reach more people with a single tweet than this, or any other, newspaper.

While social media, as mentioned above and discussed in Section 3.3, can be used by citizens to interact with governments, or by businesses with customers, its dominant use is for entertainment. This can be seen by considering the top Twitter accounts, as shown in Figure 3.11 below. Seven of the top ten accounts (by number of followers) are for musicians, while a further two are for entertainment-related services, YouTube, and Instagram. President Obama is the only politician in the top ten.

Figure 3.11: Top twitter accounts, 20 December 2013

[Source: fanpagelist.com, 2013]

Account	Category	Twitter followers (million)	Facebook fans (million)
Katy Perry	Musician	48.6	61.0
Justin Bieber	Musician	47.8	60.5
Lady Gaga	Musician	40.9	61.2
Barack Obama	Politician	40.6	37.8
Taylor Swift	Musician	37.7	51.6
YouTube	Product	37.4	77.3
Britney Spears	Musician	34.8	34.1
Rihanna	Musician	33.3	81.5
Instagram	Product	29.8	7.1
Justin Timberlake	Musician	29.3	29.4

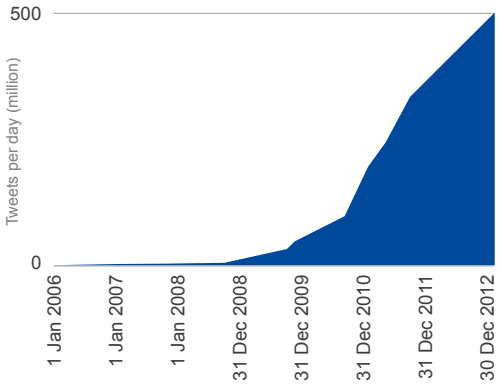
Likewise, of the top 20 Facebook fan pages on 20 December 2013, seven are musicians, two actors, and one an athlete. The remainder are brands, films, TV shows, and games.

The use of social media sites is vast, with 6,282 tweets, 786 Instagram photo uploads, and 1,109 Tumblr posts every second on one recent day, 20 December 2013.[66] Twitter's use has grown dramatically since its March 2006 launch, as shown in Figure 3.12, with over 500 million tweets now sent every day by over 230 million active users. The service is truly global, operating in 35 languages, with 77% of accounts originating from outside of its home market, the USA. [67]

Recent trends reveal that emerging regional or local social media platforms are able to compete with the largest global ones, namely Facebook (with 1.15 billion monthly active users) and Twitter (with 240 million monthly active users). Examples of emerging platforms include WeChat from China (with 236 million monthly active users), and vkontackte from Russia (with 31 million monthly average users).[68]

Figure 3.12: Tweets per day

[Source: internetlivestats.com, 2013]



The Internet also hosts other entertainment forms, including gaming, music, and online video services.

Online gaming

By November 2013, the gaming market in the USA, including downloadable, social, mobile, and MMO (massively multiplayer online) games was valued at USD11.8 billion.[69] This strong performance of the gaming market is not exclusive to the USA, with the Brazilian Internet gaming market expected to be valued at USD1.4 billion for 2013, up from USD72 million in 2008.[70]

Angry Birds is an instructive example of a game designed for mobile use that has seen huge levels of success, with over 1.7billion downloads by November 2013[71] generating over USD199 million in revenues during 2012.[72] The game was originally released on the Apple App Store in December 2009 and has since built on its addictive nature and low price to generate a following that has allowed it to develop games for other mobile devices, video game consoles, and PCs. A full-length feature film based on the game is in development and expected to be released in 2016.

Multi-player games are also very popular, using the Internet to connect players online. Having launched in November 2004 and peaked at approximately 12 million subscribers in 2010, World of Warcraft remains the most popular MMO.[73] The game is funded on the basis of a paid subscription, with expansion packs available to buy. The game has developed a virtual economy, with items such as virtual gold and services available for sale. The most expensive World of Warcraft transaction publicized to date is the September 2007 purchase of an account, based on a particularly well-equipped character, for USD9900.[74]

Online music

Accessing music via the Internet is becoming increasingly popular, with growth in spending on online distributed music growing at a rate such that, in 2012, the overall value of the recorded music market grew (by 0.3%) for the first time since 1998.[75] This value has arisen from using the Internet for both streaming and downloading of music.

Internet radio services such as Pandora, available in the USA, Australia, and New Zealand, provide an interactive service by recommending music to users based on their tastes, selected artists, and feedback on earlier suggestions. This service is available free of charge, funded by advertising, or on a subscription basis with the advertising removed. As of April 2014, Pandora had 76 million active users, who listened to 1.70 billion hours in that month.

143,199

Record number of tweets per second, during an airing of the classic anime film "Castle in the Sky" in Japan.

3 August 2013, 23:21:50 JST

4,500,000,000

Hours of Spotify streamed in 2013

[Source: Spotify]

The Internet also enables digital downloads of music via stores such as iTunes, Apple Inc.'s online media library service. This allows users from approximately 115 countries spread across all regions[76] to download and organize digital video and audio content on PCs, laptops, and Apple devices. The third-party content in the library is available to purchase or to rent from the iTunes store. The service offered is very popular: in February 2013, Apple announced that over 25 billion songs had been purchased from the iTunes store.[77]

Online video

The range of video content available on the Internet is vast, ranging from the seven-second user-generated Vine clips to short YouTube videos and full-length TV and film content available through downloading and subscription services such as iTunes and Netflix. Since its 2012 founding, Vine has been used for everything from journalism to advertising – showing the scope of Internet video, even within the confines of such a short video clip – however, its major use has been for entertainment purposes. Similarly, YouTube's top trending videos for 2013 included parody music, such as Ylvis' 'The Fox', with close to 320 million views, and a promotional prank for the film Carrie, the 'Telekinetic Coffee Shop Surprise'.[78]

1,992,738,923

Views of the "Gangnam Style" official music video, by South Korean singer PSY.

20 May 2014 13:45 CET

[Source: YouTube]

Uptake of Netflix's online streaming service is significant in the USA, where by the end of 2013 it had 33.42 million members.[79] As can be seen in Section 1 above, Netflix-related traffic constitutes a significant portion of aggregate traffic in the USA, particularly over fixed access networks. Netflix is replicating this success in its new markets, with services available in 41 countries with almost 11 million international members.[80] Netflix is now extending into developing its own content[81] and continuing to sign deals for content from major studios.[82]

Summary

The Internet has acted as a new channel for the distribution of entertainment, as well as enabling new, more interactive and personalized media. The open Internet has enabled consumers to generate their own videos, articles, and music, and share them with a truly global audience.

3.10 Conclusion

The open Internet, by connecting nearly 3 billion users in one network, has had a significant impact on a number of traditional services that were traditionally delivered on a 'one-to-one' or 'one-to-many' basis. In addition, however, it has led to entirely

new services and applications by enabling ‘many-to-many’ interactions, as well as interactions between smaller groups for a host of issues.

With respect to more traditional services, the Internet has had an almost revolutionary impact by lowering the cost of delivering and receiving information, eliminating borders so that any service can reach a broader audience, and allowed for interaction where services were formerly one-way. This has affected education, with the rise of MOOCs; allowed international distribution of entertainment and e-commerce; enabled governments to deliver online services, while receiving citizen feedback in the form petitions; and empowered online advocacy.

At the same time, new forms of interaction have been established. Social media enables family, friends, colleagues, and fans to be connected, and send and receive updates, announcements, and messages. The sharing economy has arisen to allow consumers to make their time or possessions available to others for money or barter. Innovators can now research ideas, borrow money from others, and sell their goods online. And finally, volunteers can build on the ethos that led to the Internet itself to collaborate on new software, create a new online encyclopaedia, and cure diseases.

These new modes of interaction based on the Internet have economic and social benefits that are significant, growing, and almost limitless. In the next section, we discuss some of the existing challenges to the open Internet and some that are emerging, resulting in a different Internet experience within and between countries, which should be addressed to protect the open Internet and promote its spread so all can realize the benefits described here.

SECTION 04

Challenges to the Open and Sustainable Internet

4.1 Introduction

The benefits of the open Internet flow from the development and adoption of a set of underlying protocols that are in use worldwide. These protocols help to create the base of nearly 3 billion users, allowing them to communicate with one another to generate the benefits described in the previous section. However, while the Internet is often called the 'network of networks', all networks are not created alike.

Creating a global network of networks based on a standard platform is a foundational success of the Internet. To highlight both the benefits of the common platform and where Internet networks and services fall short of delivering a uniform user experience, we consider first what is basic to the Internet experience across countries, and then the differences.

First, the IP platform represents a truly unique global standard. By way of contrast, a maze of standards are involved in the experience of getting online, illustrating the difficulty of achieving a global standard. With respect to the computer, there are different operating systems, different keyboards,[1] and even significant differences in electricity standards needed to power the computer.[2] Likewise, as a legacy of differentiated telecommunications networks, there are a variety of access standards for fixed and mobile broadband access.[3]

Once the user has the device charged and ready to go, however, the Internet is an oasis of standardisation. Regardless of the type of fixed access, the Ethernet connection used to connect the device to the Internet is the same everywhere. Likewise, the same Wi-Fi standards can be used to connect all over the world and, once online, the same applications, such as email and browsers, will work without any sort of adaptation or conversion.

1,215,936

Apps available in Google Play

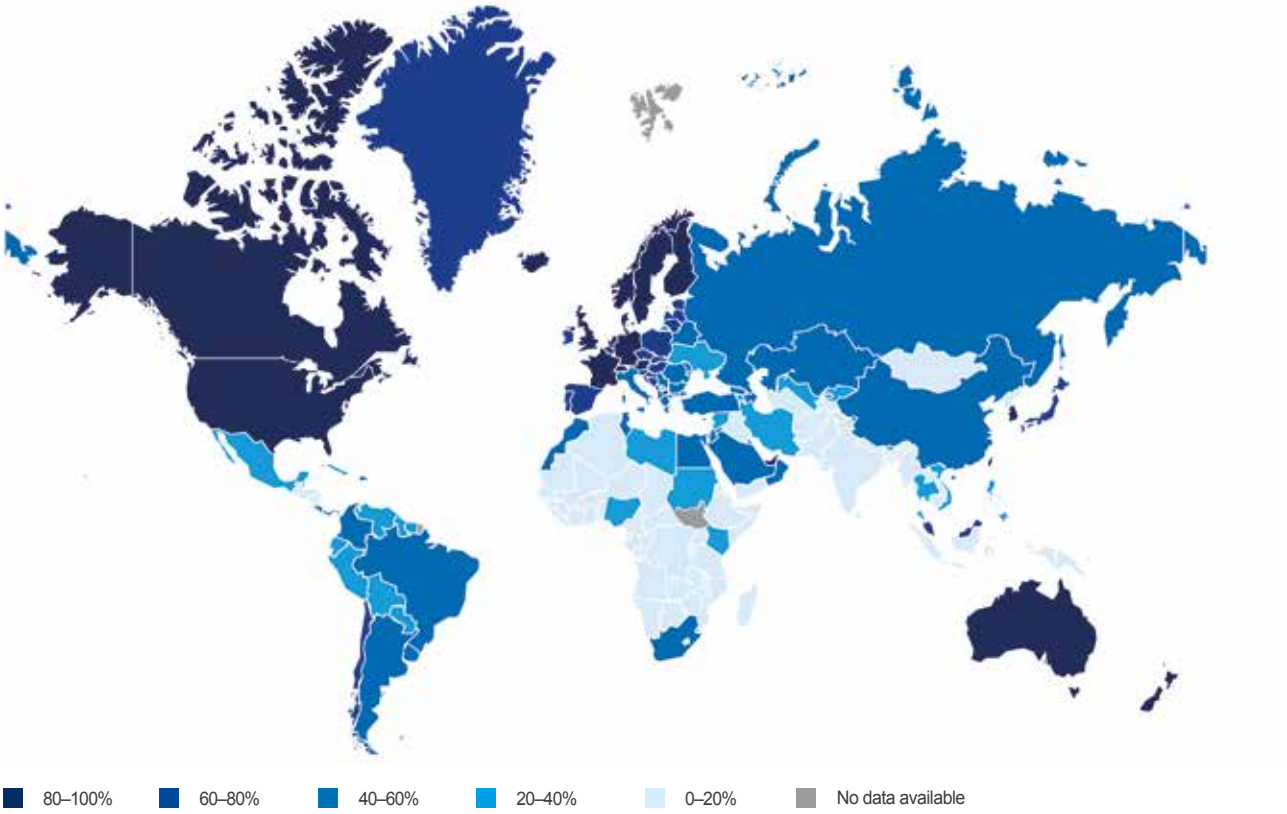
19 May 2014

[Source: AppBrain]

That is not to say, however, that there are not significant differences between countries in terms of Internet access and usage. The first, highlighted in Figure 4.1, relates to the penetration of Internet users between countries. The more users within a country and in neighboring countries, the more benefits to any other user in being online.

Figure 4.1: Illustration of global Internet penetration levels in 2012

[Source: ITU, 2013]



Further, for those users already online, the overall user experience can differ significantly by country. Any such differences, however, do not originate from technical standards, but rather from government policy and economic reality. In particular, these differences can arise at two layers of the Internet:

- Infrastructure. Countries can differ by the affordability and bandwidth of access networks, and by the resilience of their international connections to other countries, based on economic factors and policy and regulatory choices.

- Content and applications. Some governments require network operators to filter content or block applications, using political or legal justifications. In other cases, content may not be available or locally relevant for economic reasons.

In summary, while the open Internet is an unparalleled positive force for advancement, it is not immune from economic and political influences that act to limit benefits. An affordable and reliable Internet is not yet a reality for the majority of people in the world. At the same time, where access is available it should not be taken for granted. The mere fact of being connected does not guarantee one will be able to innovate or freely share information and ideas; these abilities require an enabling Internet environment, one that is based on unrestricted openness.

The best antidote to challenges to openness is a multi-stakeholder model for technical, policy, and development solutions as described in Section 2. This must apply both within and among countries, to ensure that all voices are heard and the benefits of the open Internet are maximized. This is particularly relevant as the aftershocks of the recent revelations regarding global online surveillance are absorbed and adapted to by governments, companies, and users.

4.2 Infrastructure

Access to the Internet is necessary, but not sufficient, to fully participate in the global information society. Access can be provided via mobile or fixed technologies, which are increasingly of the broadband variety in order to let users take advantage of faster speeds and 'always-on' service. The access networks connect to the Internet via domestic and international connectivity, increasingly based on fibre-optic networks that provide both the high speeds and the capacity needed to accommodate all types of traffic.

Access may not be available to all citizens because of the high costs of network deployment or low-income levels of intended users, rendering the services unaffordable. The resulting digital divide separates users within a country, based on a region or income levels. However, the digital divide also separates countries, with more advanced economies forging ahead with fixed fibre broadband networks and the latest 4G mobile networks, leaving behind other countries with older fixed networks and earlier generations of mobile access networks.

Finally, access is contingent on the resilience of all parts of the network, including in the face of natural disasters, technical mishaps, or acts of government. The fewer the number and redundancy of connections, such as the number of submarine cables connecting a country, the more susceptible the

country is to an accidental cable cut. Likewise, as we have seen more often in recent times, governments' efforts to shut down the Internet in the face of protests are more successful in circumstances where the network is less resilient.

We now examine how the user experience across countries differs based on differences in access as well as events that restrict access such as cable cuts or government actions.

Digital divide

A digital divide exists globally, with different levels of access to Internet services available in different geographies. This digital divide has arisen in part due to disparities arising in the cost of devices, software, and infrastructure around the world, particularly relative to the economic status of countries and hence the 'affordability' of Internet services. With a typical Internet subscription making up anywhere between 0.1% of monthly average GDP per capita in Austria to 294.8% in Kiribati, there is a broad range in the affordability of Internet services.[4]

As can be seen in Figure 4.2, affordability is distributed on a regional basis, with the majority of North American, developed Asia-Pacific and European countries having access to Internet services at a value of less than 2.5% of their monthly average GDP per capita. However, in South America, Africa, the Middle East and Asia-Pacific, there are many examples of countries in which an Internet access subscription makes up over 10% of the average GDP per capita. These countries are often those in which both service costs are relatively high and GDP per capita levels are relatively low.[5]

The UN Broadband Commission has targeted entry-level broadband services being made available at less than 5% of average monthly income by the end of 2015.[6] While the overall majority of countries measured for 2012 have reached this target, the majority of developing countries have not yet.[7]

The cost, or more precisely affordability, of Internet access has a significant impact on the uptake of services. This relationship between affordability and Internet usage is illustrated in more detail in Figure 4.3 below.

Figure 4.2: Proportion of average GDP per capita required for broadband access in 2012

[Source: ITU; World Bank, 2013]

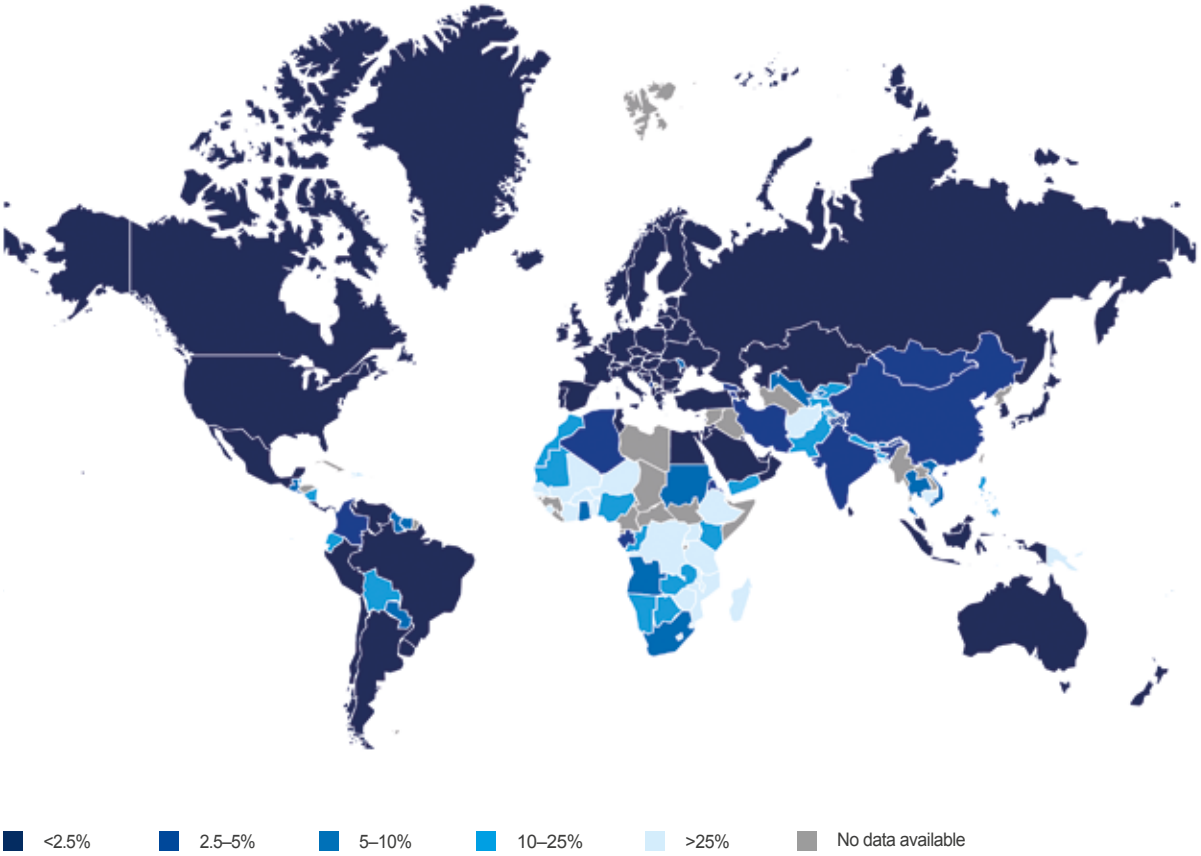
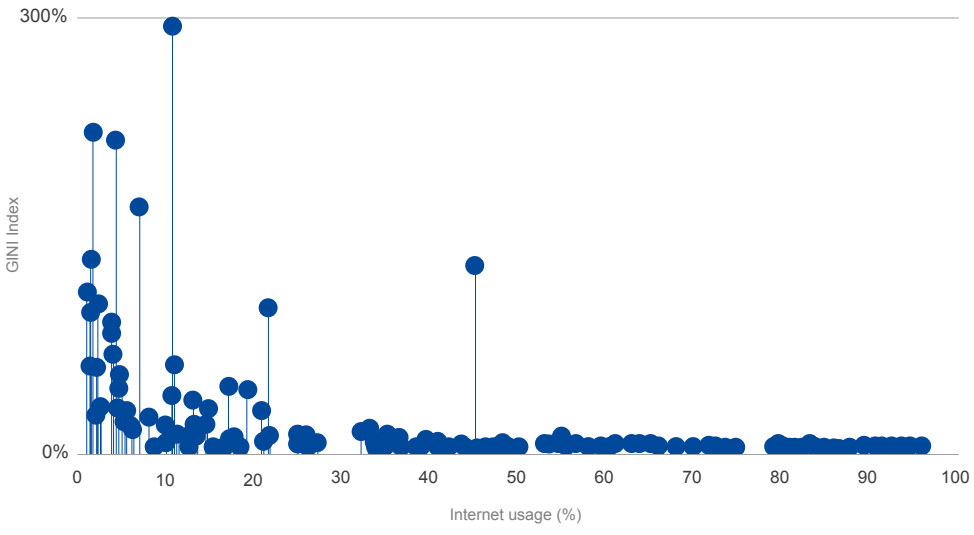


Figure 4.3: Relationship between proportion of GDP per capita for broadband access and Internet usage proportion in a country

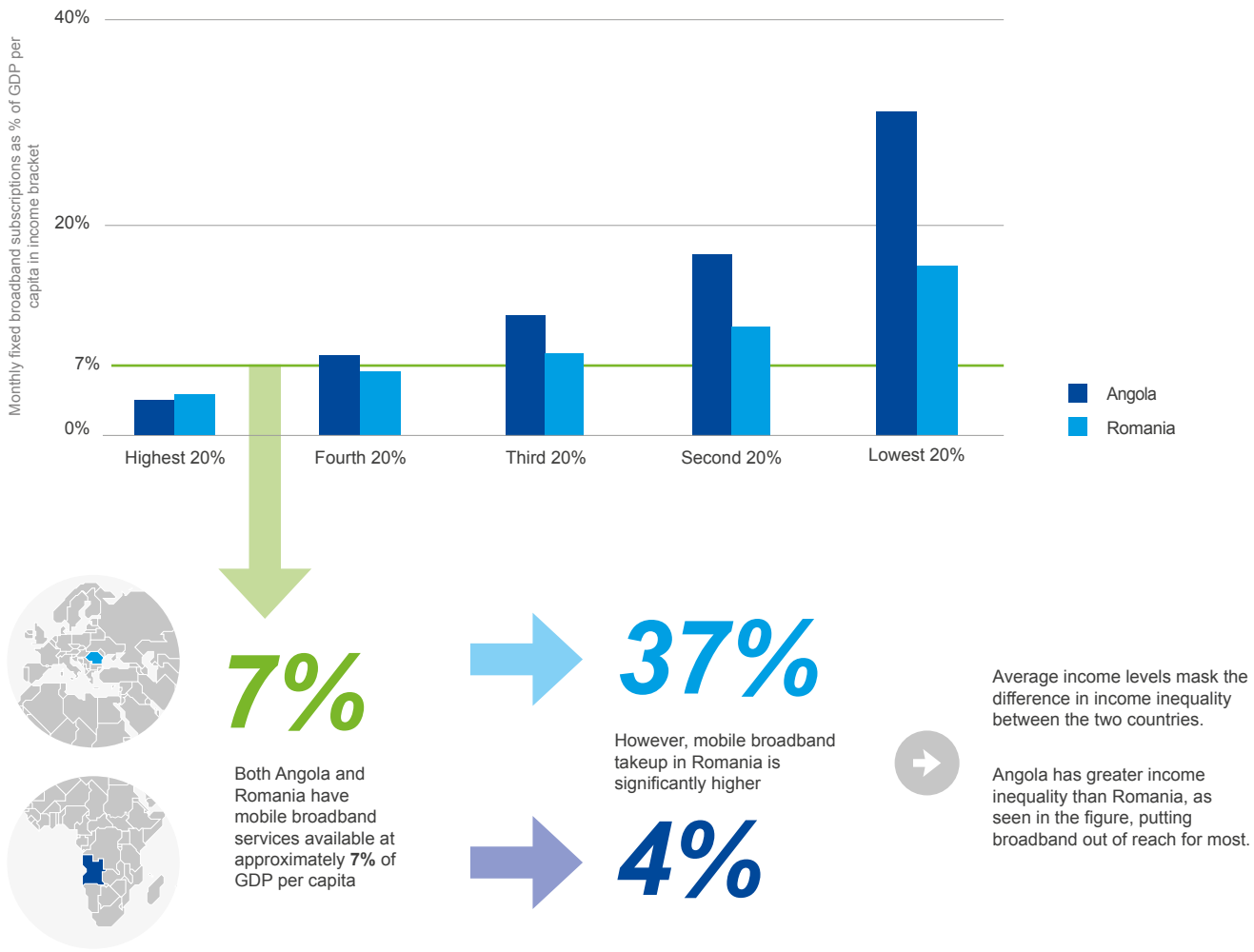
[Source: ITU; World Bank, 2013]



Internet adoption is not only influenced by the average income in a country, but also by the distribution of income within the country. By way of illustration, if a billionaire walks into a room, he/she will raise the average income in the room significantly, but that would not increase the buying power of anyone else in the room, for broadband or any other purchase. Thus, a high average income does not necessarily translate into higher affordability, if it results from significant inequality, as illustrated in Figure 4.4.

Figure 4.4: Analysis of the use of GDP per capita in computing affordability

[Source: Analysys Mason,ITU, World Bank, 2013]



In addition to affordability, countries and regions are divided by significant infrastructure differences, even where access is readily available. One measure is download speed for broadband Internet access,[8] as shown in Figure 4.5. The higher the bandwidth, the more users can access advanced services, particularly ones that rely heavily on video. The median download throughput achieved is governed by the quality of the country's infrastructure and hence the level of investment in telecommunications. It is, therefore, generally the wealthier countries in which the higher broadband speeds are available.

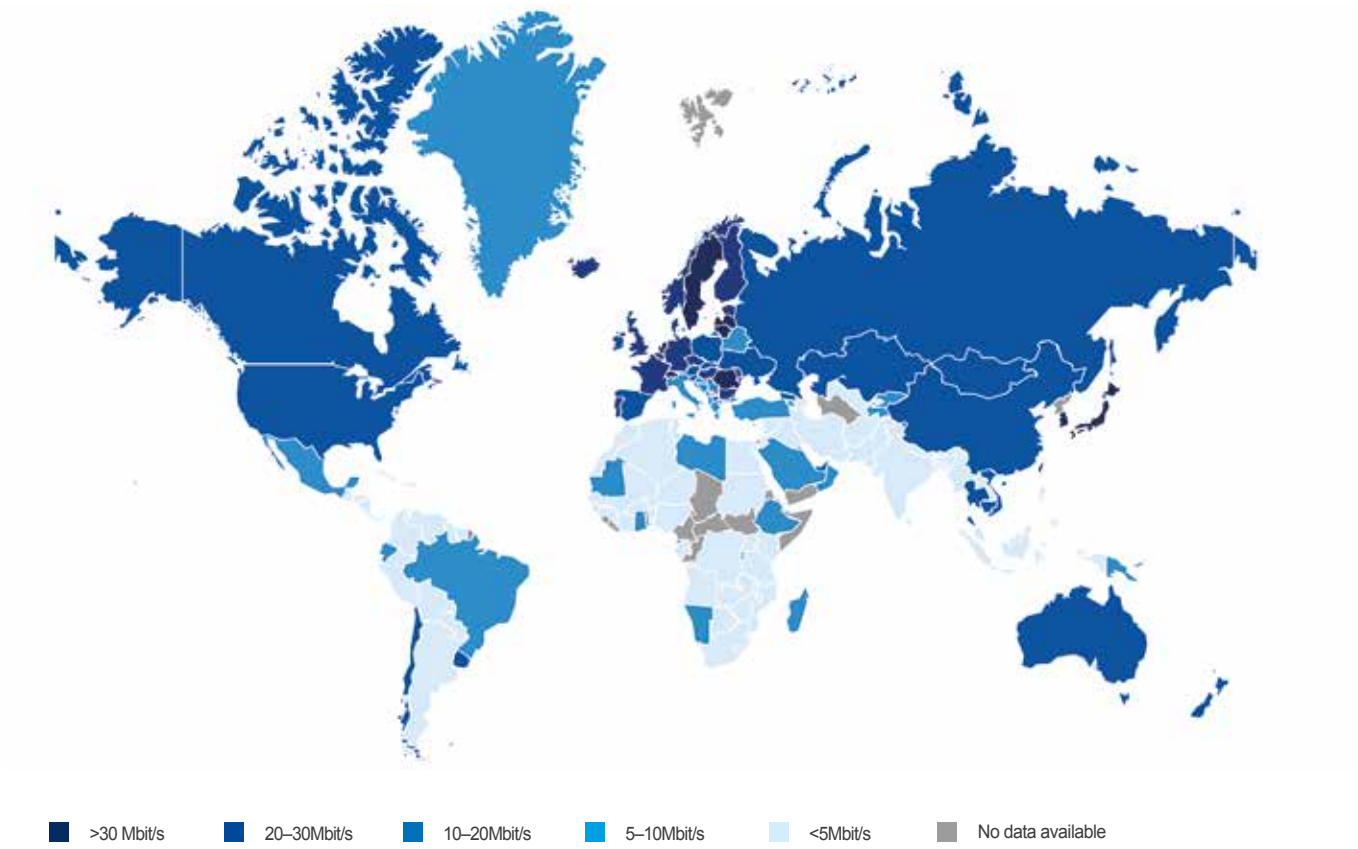
Of interest is that some of the larger countries underperform with regard to throughput when compared to how they score for affordability. For instance, compare Belgium and Australia, both countries in which less than 2.5% of average GDP per capita was required for broadband access in 2012. However, while 97.1% of Belgium homes had access to broadband speeds of over 30Mbit/s in 2012,[9] only 14% of Australian Internet subscribers received services with speeds of over 24Mbit/s in June 2013.[10] One significant difference between the countries is that Belgium has a population density of 364.84 per square mile, while it is just 2.91 in Australia,[11] significantly increasing the cost of rolling out an advanced broadband network in Australia. In order to overcome these challenges and increase download speeds across the country, the Australian government is proposing to invest AUD29.5 billion (USD26.1 billion) in the building of a fibre national broadband network.[12]

The digital divide has arisen due to a number of reasons, including differences in wealth between countries, differences in population density and other infrastructural challenges, and possibly differences in telecommunications policies and regulations. Efforts to remove barriers to connectivity and to promote infrastructure will help to both lower the cost of access and increase the quality of services offered.[13] For instance, efforts to promote the deployment of IXPs, as described in Section 2, help to lower the cost of traffic delivery while also reducing latency.[14]

The increasing affordability of the Internet across all nations will result in a narrowing of the digital divide between nations in terms of access, although regional disparities will remain. As less economically developed countries gain access to the open Internet on a wider level, users within their borders will obtain greater access to the benefits of the Internet, promoting innovation and the free sharing of information and ideas.

Figure 4.5: Median download speed for fixed Internet access across 2013 and 2014

[Source: NetIndex, 2014]

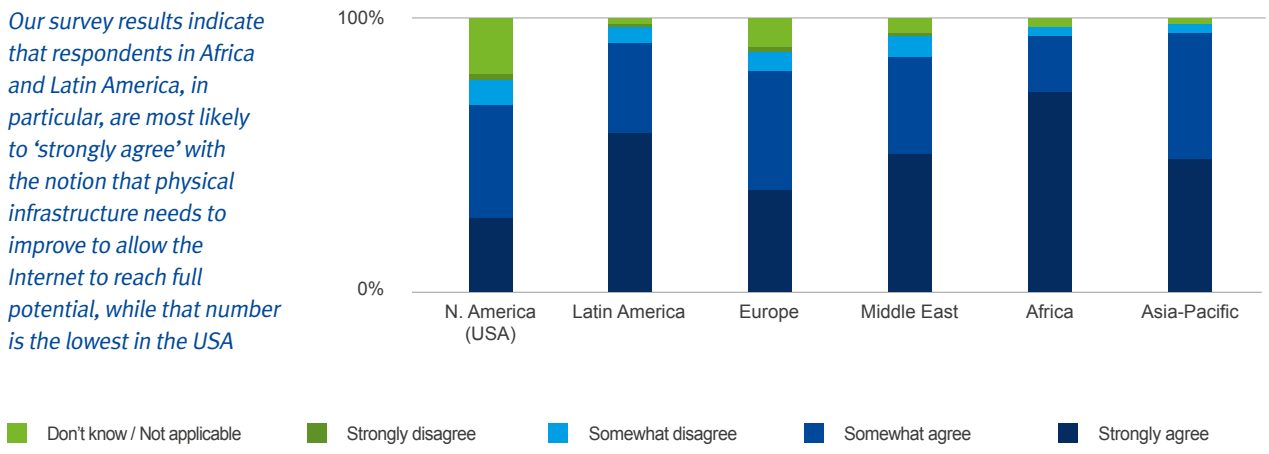


Box 9: Survey Results

Before the Internet reaches its full potential in your country improvements need to be made in the local physical infrastructure

[Source: Internet Society, Global Internet User Survey, 2014]

Our survey results indicate that respondents in Africa and Latin America, in particular, are most likely to 'strongly agree' with the notion that physical infrastructure needs to improve to allow the Internet to reach full potential, while that number is the lowest in the USA



Resilience and disruptions

Users in some countries may not just suffer from high costs or slow access speeds, but also from disruptions that may make the Internet inaccessible for a period of time. In addition to preventing user access to content and applications, this may inhibit investments in online services that require reliable Internet access. In this section, we examine general resilience of the network, as well as incidences of specific disruptions in 2013.

Internet resilience denotes the risk of large-scale Internet disruptions, with those countries with low resilience having a high risk of disruptions. Resilience is impacted by the diversity of interconnections between national infrastructure and international data carriers. Where there are more international connections in place, it takes a greater amount of damage, infrastructure attacks, or government intervention to shut down access to the global Internet in the country.

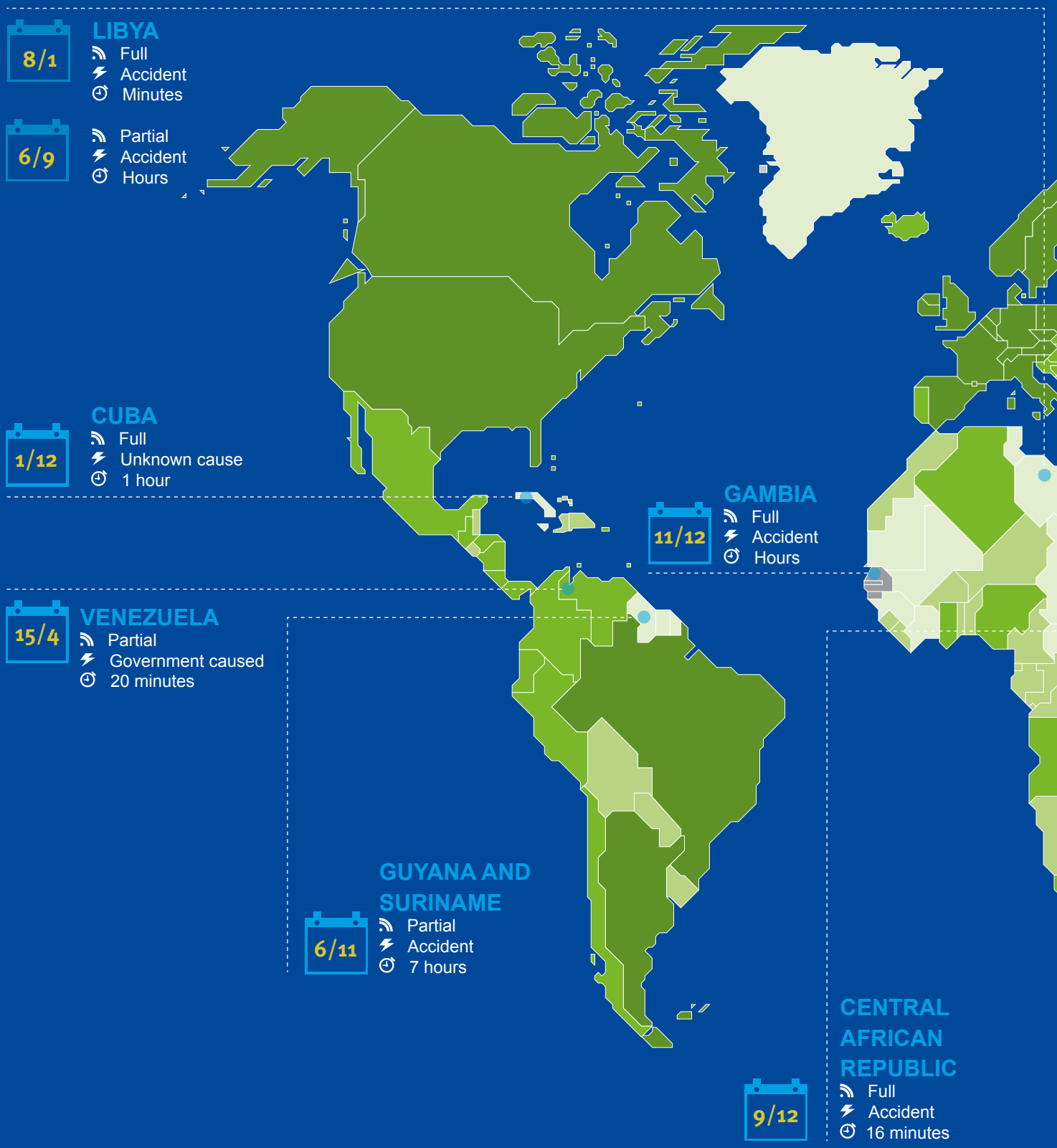
As an example of the risk of low resilience, in 2011 an elderly woman in Georgia inadvertently severed the main terrestrial fibre cable link to Armenia, cutting off the Internet in the latter country for up to five hours.[15] Undersea, a recent cut in the SEA-ME-WE 4 cable near Alexandria, Egypt, resulted in a significant slowdown of the Internet in Africa, the Middle East, and parts of Asia. In this case, there are multiple cables providing resilience, but several were being maintained, and thus could not provide diversity when needed.[16]

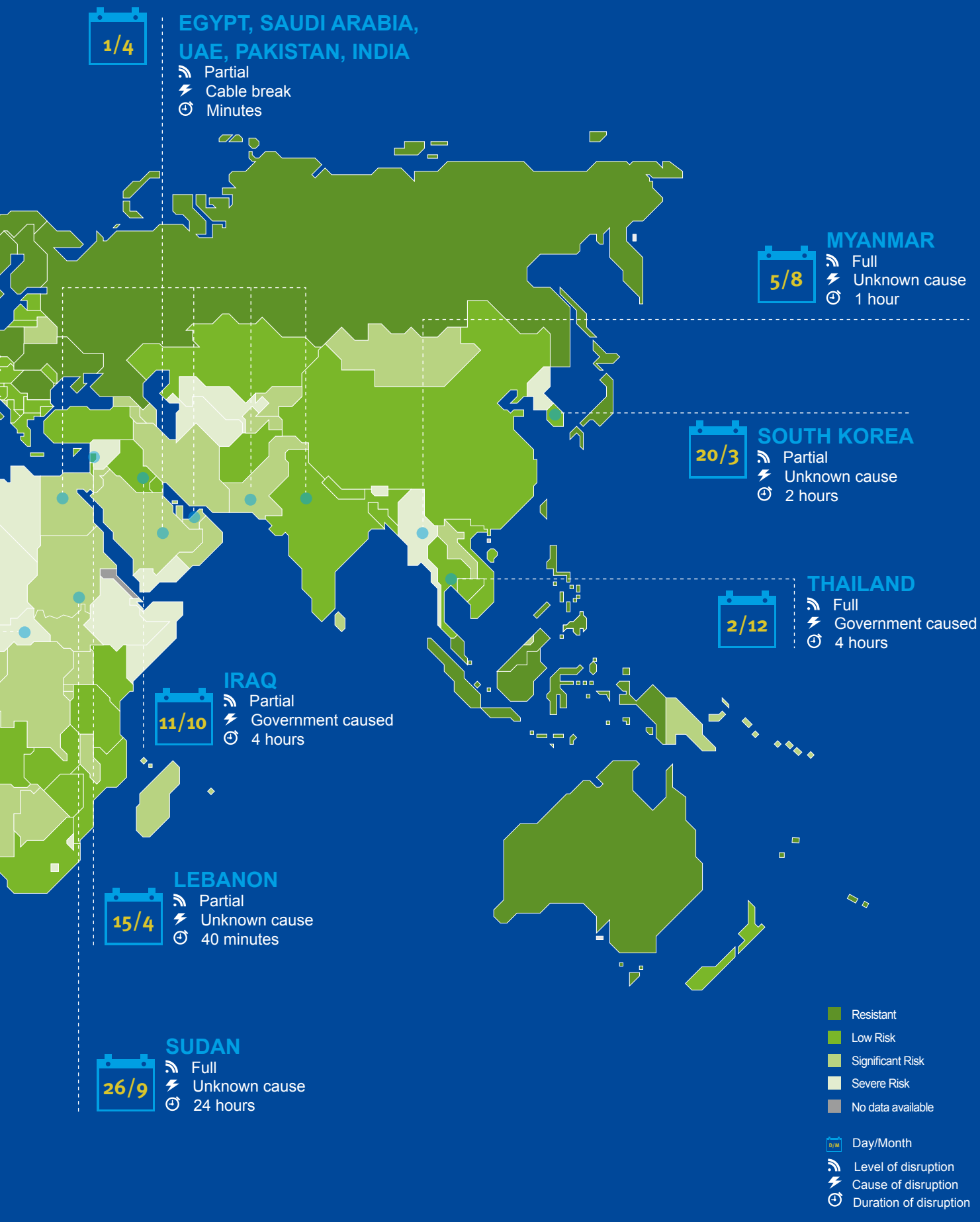
The history of government-led shutdowns extends back to 2007, when such a shutdown was used in response to Burma's Saffron Revolution.[17] In countries in which Internet access is controlled by a government-owned monopoly, such as in Syria, it is relatively simple for the government to switch off access to the Internet unilaterally – there is no diversity and the government has control over the provider.[18] On the other hand, in Egypt, where there are a number of ISPs, the government was still able to shut down the Internet, in part based on the control of Egypt Telecom, the majority government-owned incumbent, over the fibre-optic cables.[19]

Renesys, which gathers Internet intelligence to help organizations improve the reliability of their Internet usage, has scored the resilience of countries based on the number of direct connections between domestic and international Internet providers visible on a global Internet routing table.[20] Its research shows that the majority of Internet disruptions reported in 2013 occurred in countries considered to be at *severe* or *significant risk* (see Figures 4.6 and 4.7).

Figure 4.6: Illustration of the correlation between Internet resiliance and Internet disruption in 2013

[Source: Renesys, Analysys Mason, 2014]

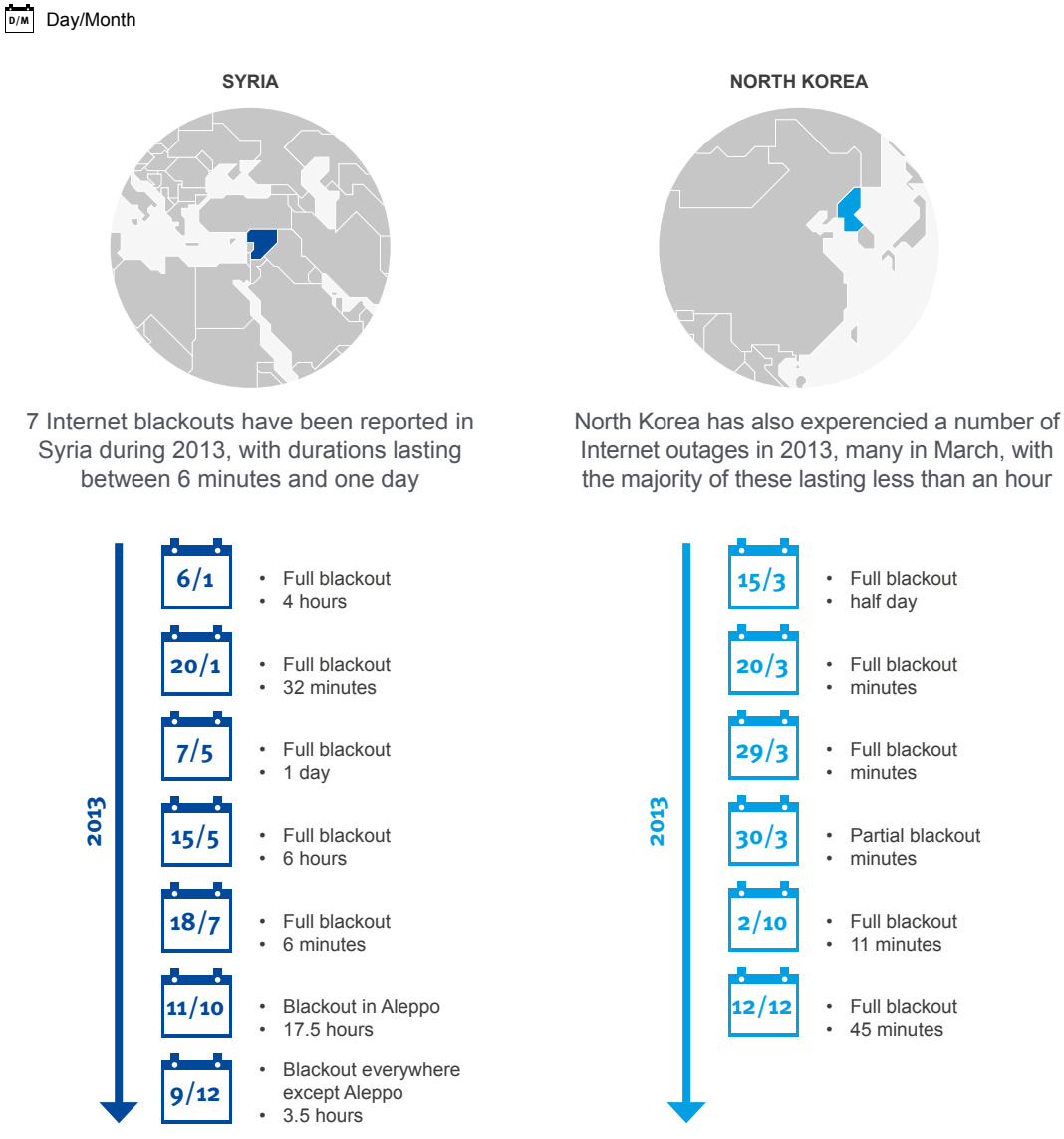



1/4
EGYPT, SAUDI ARABIA, UAE, PAKISTAN, INDIA
Partial
Cable break
Minutes
5/8
MYANMAR
Full
Unknown cause
1 hour
20/3
SOUTH KOREA
Partial
Unknown cause
2 hours
2/12
THAILAND
Full
Government caused
4 hours
11/10
IRAQ
Partial
Government caused
4 hours
15/4
LEBANON
Partial
Unknown cause
40 minutes
26/9
SUDAN
Full
Unknown cause
24 hours
Resistant
Low Risk
Significant Risk
Severe Risk
No data available
Day/Month
Level of disruption
Cause of disruption
Duration of disruption

The consequences of Internet disruptions include the loss of or reduction in the ability of the population to engage in economic activity, reach emergency services, and connect with loved ones. The only short-run resolution to be found is for the disruption to be lifted, either by repairing the damaged routes, lifting the regulatory block, or finding an alternative route by which to transmit the data. In the longer run, resilience must be built into the system with a greater diversity of international connections.

Figure 4.7: Case studies of disruptions to Internet connectivity

[Source: Analysys Mason, Huffington Post, 2013]



Deliberate government-initiated shutdowns are a breach of the UN's guiding principles on freedoms of opinion and expression. Article 19 from the International Covenant on Civil and Political Rights states with regard to the Internet that "States parties should take all necessary steps to foster the independence of these new media and to ensure access of individuals thereto"[21], and that:

> It is also inconsistent with paragraph 3[22] to prohibit a site or an information dissemination system from publishing material solely on the basis that it may be critical of the government or the political social system espoused by the government.[23]

Any such block of the Internet constitutes an intrusion into the basic rights of its citizens to communication and could in the long run have a detrimental impact on the economy and society of a country.

The Internet was designed to route around damage to the network, and this extends to efforts to block use of the Internet itself. Users of the Internet have been responsible for developing innovative methods to work around government blocks, particularly when these have occurred in times of civil unrest. The 26 September 2013 Internet shutdown in Sudan occurred on "Martyrs' Friday", a day promoted on social media as a time to protest in the country in remembrance of those who had died in previous protests. Activists responded to this shutdown by launching the Abena Crowd map,[24] which tracked demonstrations using SMS-based reports. While the Internet shutdown prevented those in Sudan from seeing the map, it gave those in the rest of the world an insight into the activities in the country beyond those reported by the government-censored media. Additionally, Twitter's Speak2Tweet service, launched during the 2011 Egyptian Internet shutdowns (as discussed in Section 3), was restarted as a way to sidestep the Syrian Internet shutdowns.[25]

Internet resilience can be improved through investment in infrastructure or removal of regulatory barriers prohibiting or discouraging new international connections. Such increases in Internet diversity may occur without intervention, as a result of economic growth making it profitable for new Internet providers to enter the market. Alternatively, local regulators can promote investment and new entrants, helping to overcome the monopoly advantage experienced by some strong incumbents in less developed markets.

An example of an international venture to increase connectivity and, therefore, resilience is the West Africa Cable System (WACS), a 14,000km submarine cable owned by a consortium of 12 operators and regulators. The cable was completed in late 2011 at a cost of USD600 million, with 14 landing sites across Western Africa and Europe. Five of these landing sites – those in Angola, Namibia, the DRC, the Republic of Congo, and Togo – were the first submarine cable landing sites in each country.[26]

Similarly, increases in the diversity of providers can result in improvements in resilience. For instance, the WACS cable was developed under an open access policy, allowing ISPs to access international capacity without having made the upfront investment.[27] Likewise, increasing the number of broadband providers in the country also increases diversity and resilience. In Costa Rica, for example, the June 2009 General Telecommunications law ended the monopoly of Kolbi, the telecoms division of the government-owned utility company Grupo ICE. Today there appear to be at least six broadband providers in the country.[28]

In general, according to the latest ITU annual regulatory survey for 2012, 93% of countries responding had competition in Internet services, and 85% had competition at international gateways.[29] This represents a significant increase over recent years, but nevertheless a number of countries still lack competitive diversity in these key services. Further, having allowed competition, not all competitors may enter with their own facilities, and thus competitive diversity may not result in route diversity.

Although Internet resilience is high in the majority of countries, many countries still experience Internet disruptions for a variety of reasons. Greater levels of infrastructure investment and action to circumvent government-initiated shutdowns may help to reduce the frequency of all forms of disruption in the future. This ensures a more stable Internet experience for users, and also helps to promote investment and availability of content and applications.

4.3 Content and applications

Internet infrastructure is a means to an end – accessing the vast amount of content and applications that are available on the Internet. In addition to the differences in

access conditions detailed in the previous section, content and application availability can differ significantly between countries based on government actions to restrict access or business decisions on availability.

Much more common than cutting off the entire Internet – an approach typically used in the short-term during a period of unrest – governments may choose to restrict access to specific content or applications over the long-term, for political or social reasons. Similarly, businesses may choose not to make content available for particular uses or in all countries based on copyright licensing decisions. At the same time, even content not subject to such restrictions may be realistically unavailable in countries with little or no content hosted locally – the international links needed to access content may add latency and cost that effectively restricts access.

Filtering and blocking

Governments can enact laws and measures that enable them to restrict access to content that they deem to be undesirable, which they extend to online content. The majority of such measures are associated with blocking content relating to pornography, gambling, and hate speech, in line with religious or social norms in the country. However, a number of countries are more interventionist, blocking social and news content, often in a politically motivated manner.

Freedom House, an NGO focused on promoting political freedom, published a report in October 2013 entitled *Freedom on the Net*.[30] This report analyses Internet freedom across 60 countries, focusing on developments between May 2012 and April 2013. Each of these countries was scored out of 35 for 'Limits on Content', with scores ranging from lows of 1 in Iceland and the USA to 32 in Iran.[31] As can be seen in Figure 4.8, countries with particularly high levels of limitation on content imposed by their government (scores greater than 20) appear to be concentrated in the Asia–Pacific region and in Africa, although we note that no data was available for a large number of countries.

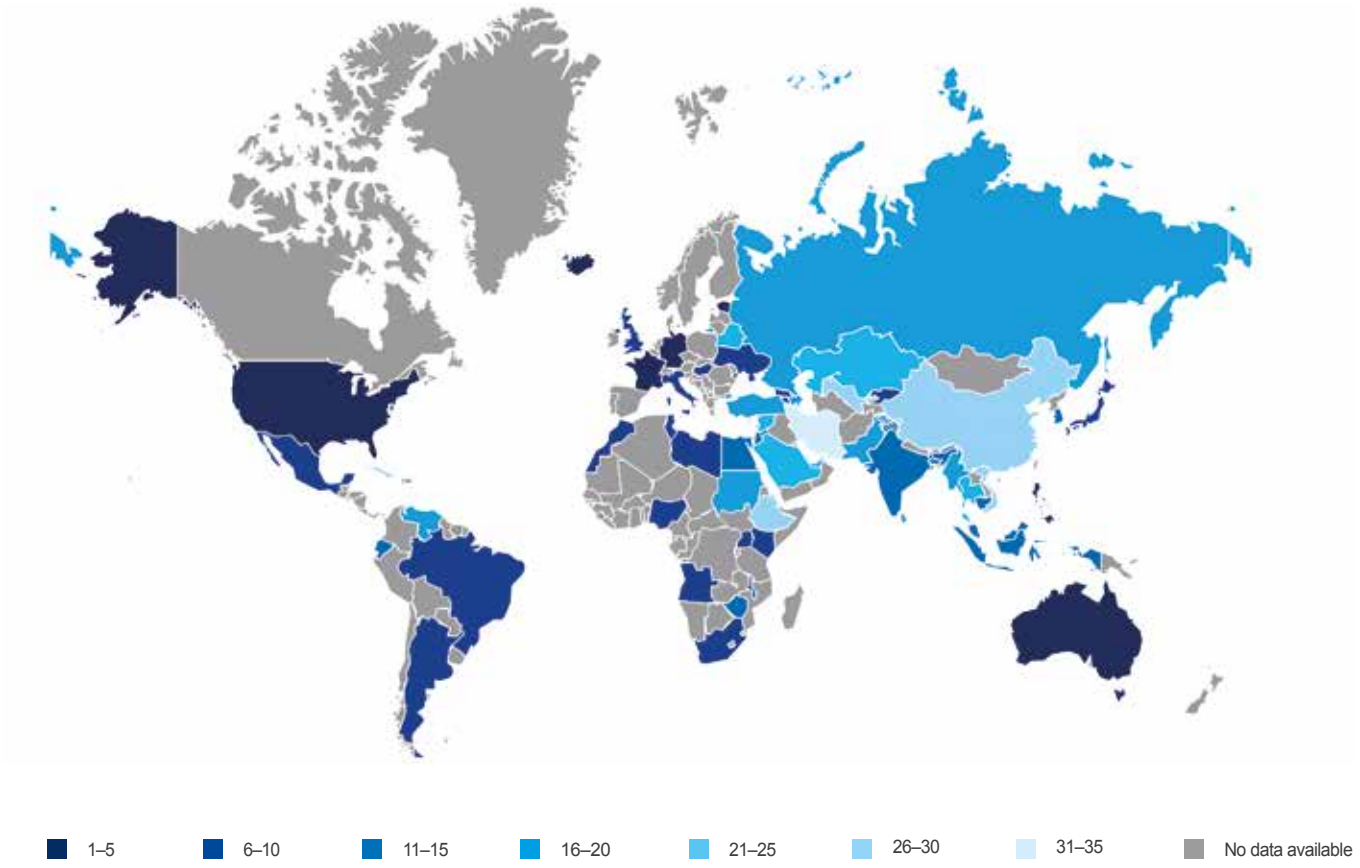
In some countries, the justifications for filtering are existing laws, such as those prohibiting Nazi imagery or child abuse images, which are extended to the Internet. In other cases, laws are passed specifically to block online activities, such as Italy's 2006 *Legge Finanziaria*[32] and France's 2011 LOPPSI 2,[33] blocking websites dedicated to gambling and illegal file-sharing alongside pornography.

The enforcement of these laws can be achieved with assistance from different stakeholders. For instance, in the United Kingdom the Internet Watch Foundation (IWF),[34] a registered charity, was setup in conjunction with government agencies to help block sites considered illegal on the basis of:

- child sexual abuse images hosted anywhere in the world
- criminally obscene adult content hosted in the UK
- non-photographic child sexual abuse images hosted in the UK

Figure 4.8: Freedom House limits-on-content score

[Source: Freedom house, 2013]

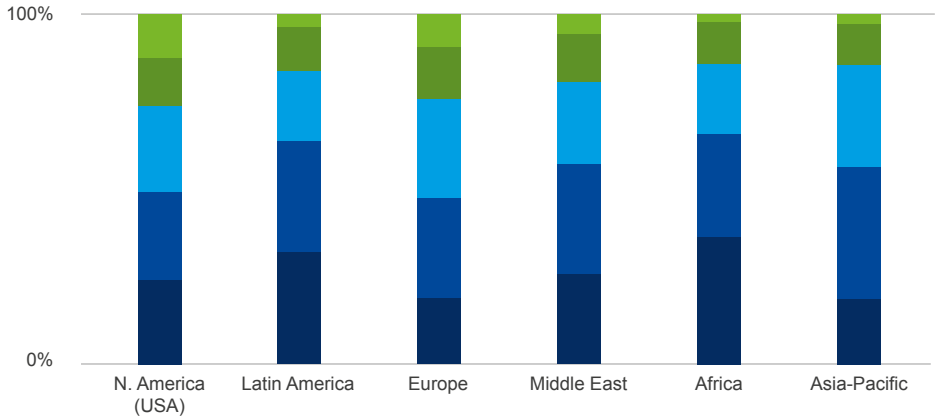


Box 10: Survey results

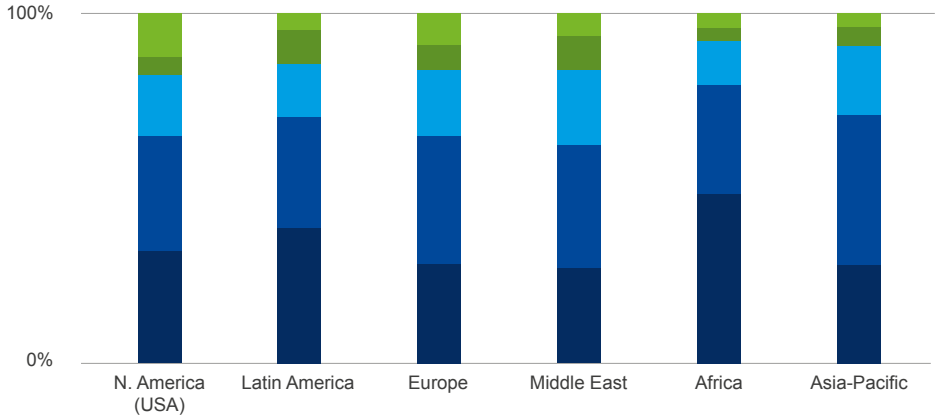
[Source: Internet Society, Global Internet User Survey, 2014]

The Global Internet User Survey asked subscribers a number of questions about the impact of government control over the Internet on freedom of expression and access to content, and the resulting impact on Internet use and growth. The majority of users in all regions strongly or somewhat agreed about the impacts of increased control, particularly so in Latin America and Africa, where the plurality strongly agreed with those sentiments.

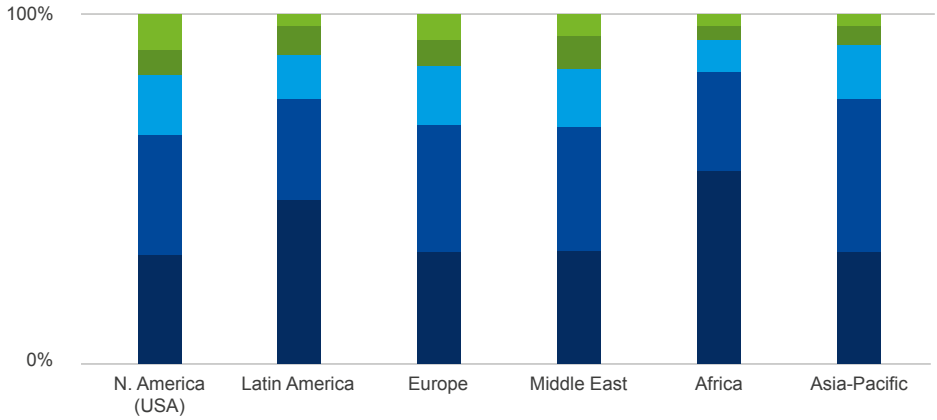
A. Increased government control of the Internet would make me use the Internet less

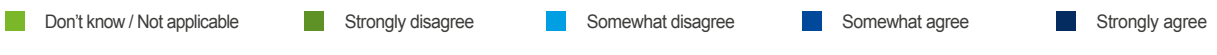


B. Increased government control of the Internet would inhibit the growth of the Internet



C. Increased government control of the Internet would limit my freedom of expression





In the case of the IWF, the public assists by reporting individual webpages that are compiled into a blacklist of sites. The blacklist is voluntarily applied by the ISPs responsible for the Internet service of 95% of the UK's customers.[35] In addition, the IWF continues to be supported by government and works with police to block illegal content.

However, such services are not infallible and can be responsible for the censoring of content not found illegal by a court of law. In 2008, the IWF blacklisted Wikipedia content relating to a 1976 album by the rock band Scorpion, due to the cover art.[36] This blacklist of a single Wikipedia article resulted in many UK Internet users being unable to edit any Wikipedia pages. However, the block was lifted after four days due to "the contextual issues involved in this specific case" including the length of time the album cover in question had already been widely available.[37]

Likewise, the Australian Communications and Media Authority (ACMA) is responsible for censoring websites in Australia, and it maintains a blacklist of sites with illegal content. This list was leaked online in March 2009 and approximately half of the 2,395 sites included were not illegal, including a Queensland dentist, the site of a school canteen consultancy, and a web hosting and design company based in New South Wales.[38] This cast doubt on the ability of governments to filter the Internet without inadvertently blocking legitimate websites.

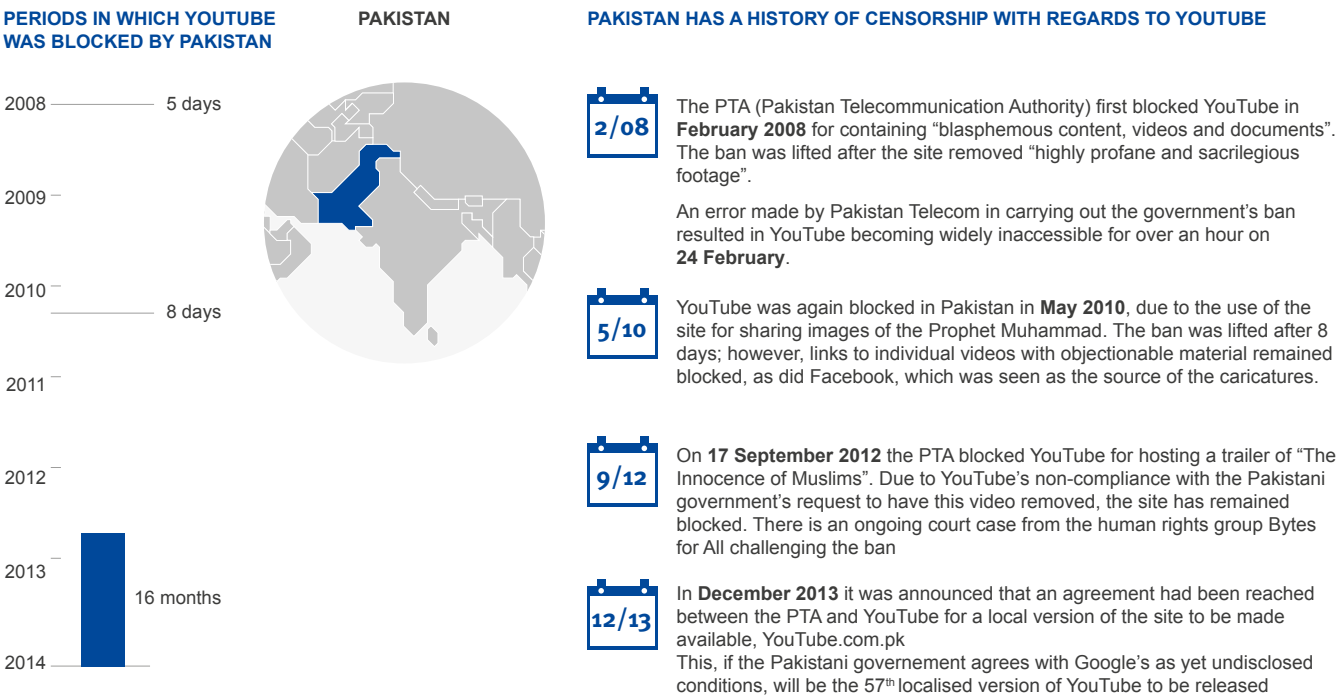
A number of countries go further, extending online prohibitions to political content. These countries score as among the most restrictive in the *Freedom on the Net study*. For instance, in Bahrain, where the limits-on-content score is 26, the IAA (Information Affairs Authority) is tasked with blocking or shutting down any websites including material "instigating hatred of the political regime",[39] giving the IAA free reign to block any site criticising the government or royal family. Of the 1,267 inaccessible-website reports in Bahrain made to monitoring site Herdict[40] since January 2009, 39% were political sites such as the Bahrain Centre for Human Rights,[41] and a further 23% were social, such as sites for gay dating and social networking services.

China, with an even higher limits-on-content score of 28, applies significant levels of censorship, particularly of international websites,[42] despite assurances from government officials that "the internet is open".[43] Many of these site blocks first came into force in 2009, prior to the 20th anniversary of Tiananmen Square.[44] As shown in Figure 4.9, blocking based on specific content, such as was done in Pakistan, can extend sometimes to more broad blocks, sometimes with unintended consequences for the rest of the Internet.

The filtering and blocking of Internet content can be circumvented by savvy and, in some cases, daring users; but its reversal can only be brought about by a change in government policies. While it appears that many countries are bringing in new laws to increase censorship, there is some evidence of moves to reduce censorship. For instance, the Burmese government began lifting blocks on foreign websites, such as the BBC and YouTube, in September 2011.[45] Then, in August 2012, The Press Scrutiny and Registration Department (PSRD) – the Burmese censorship body – announced that pre-publication censorship of both online and offline media, a policy in place for 50 years, would be abolished. Similar policies, lifting blocking orders and opening up access to social media tools, have recently been enacted in Morocco and Tunisia.

Figure 4.9: Censorship in Pakistan

[Source: Analysys Mason, 2014]



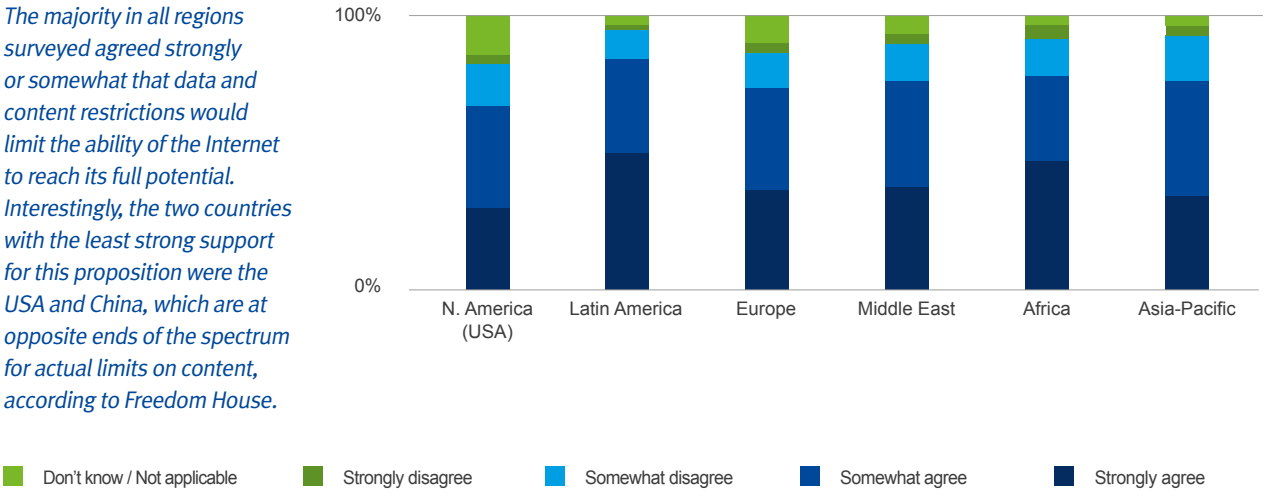
While many governments are using their blocking and filtering powers over network operators for the intended purpose of protecting their citizens, the trend towards more stringent controls does appear to be rising, with new laws being adopted more rapidly than old restrictions are removed. This is leading to a less open Internet, with governments seeking political gain, while users cannot experience the full benefits of the Internet.

Box 11: Survey responses

Before the Internet reaches its full potential in your country people need to be able to access the Internet without data and content restriction

[Source: Internet Society, Global Internet User Survey, 2014]

The majority in all regions surveyed agreed strongly or somewhat that data and content restrictions would limit the ability of the Internet to reach its full potential. Interestingly, the two countries with the least strong support for this proposition were the USA and China, which are at opposite ends of the spectrum for actual limits on content, according to Freedom House.

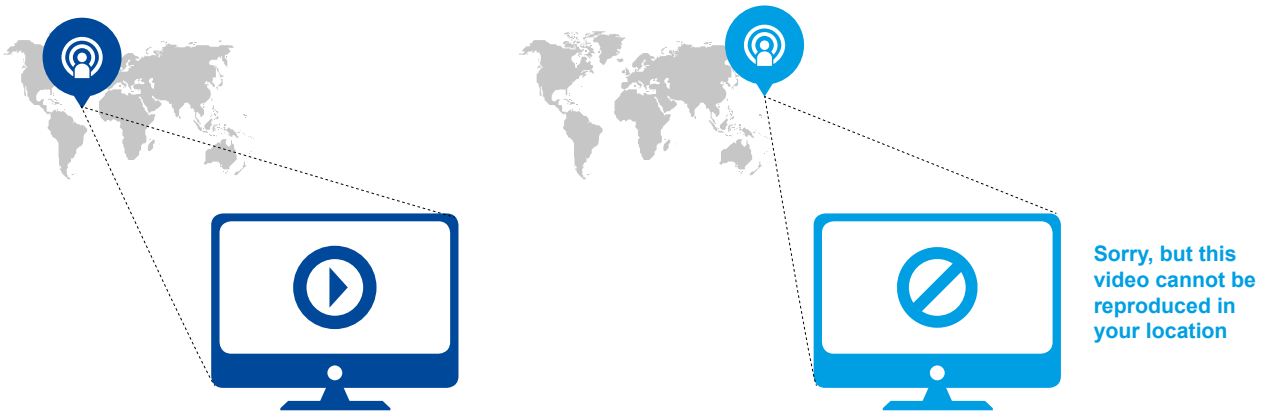


Copyright licensing

Content available in one country may not be available in other countries owing to copyright licensing. In some cases, this could mean that a commercial video service, such as Netflix, is territorially restricted. In other cases, this means that a user in one country may receive a message such as the one reproduced in Figure 4.10 when trying to view a video clip in a country other than the one in which the clip was made available. This can have a significant impact on users' experience, as they cannot always enjoy the full extent of the content otherwise available.

Figure 4.10: Licensing limits

[Source: Internet Society]



Governments grant copyrights, bestowing intellectual property rights that allow the creator of a given piece of content, whether physical or digital, the right to the use and distribution of their work. As a result, copyright holders are able to control access to their works and are responsible for agreements with individual distribution platforms. Such deals are often negotiated on a territorial basis, with the rights not extending beyond international borders.

For instance, BBC iPlayer is a free online catch-up service[46] available within the UK that enables users to access much of the radio and television-programming broadcast on the BBC throughout the previous week. While some of the BBC content is made available outside of the UK via the BBC iPlayer Global App,[47] rights agreements mean that the majority of television programmes are only available to users in the UK.

Even within the UK, the cost of acquiring the rights for online distribution of the content means that certain programmes will not be available via iPlayer. Films, international programming, and sporting events in particular are likely to fall into this category due to the cost and complexity involved in obtaining the rights.[48] For example, when considering the English Premier League, TV and Internet broadcast rights are held by different groups (BSkyB and BT hold TV rights, while News International holds Internet broadcast rights), therefore the BBC would have to acquire the rights to show the football twice if it wishes to also stream the matches online.

Similarly, programming on other catch-up TV services, as well as subscription streaming services, have different content available in different regions. Netflix's director of corporate communications explains the practice this way:

> [O]rganizations that own the rights to those shows license the rights by geography. So this means that we have to acquire rights on a territory-by-territory basis. And that's why Netflix is not available everywhere, and where it is available there are differences between Netflix in Brazil and in Sweden or the US.[49]

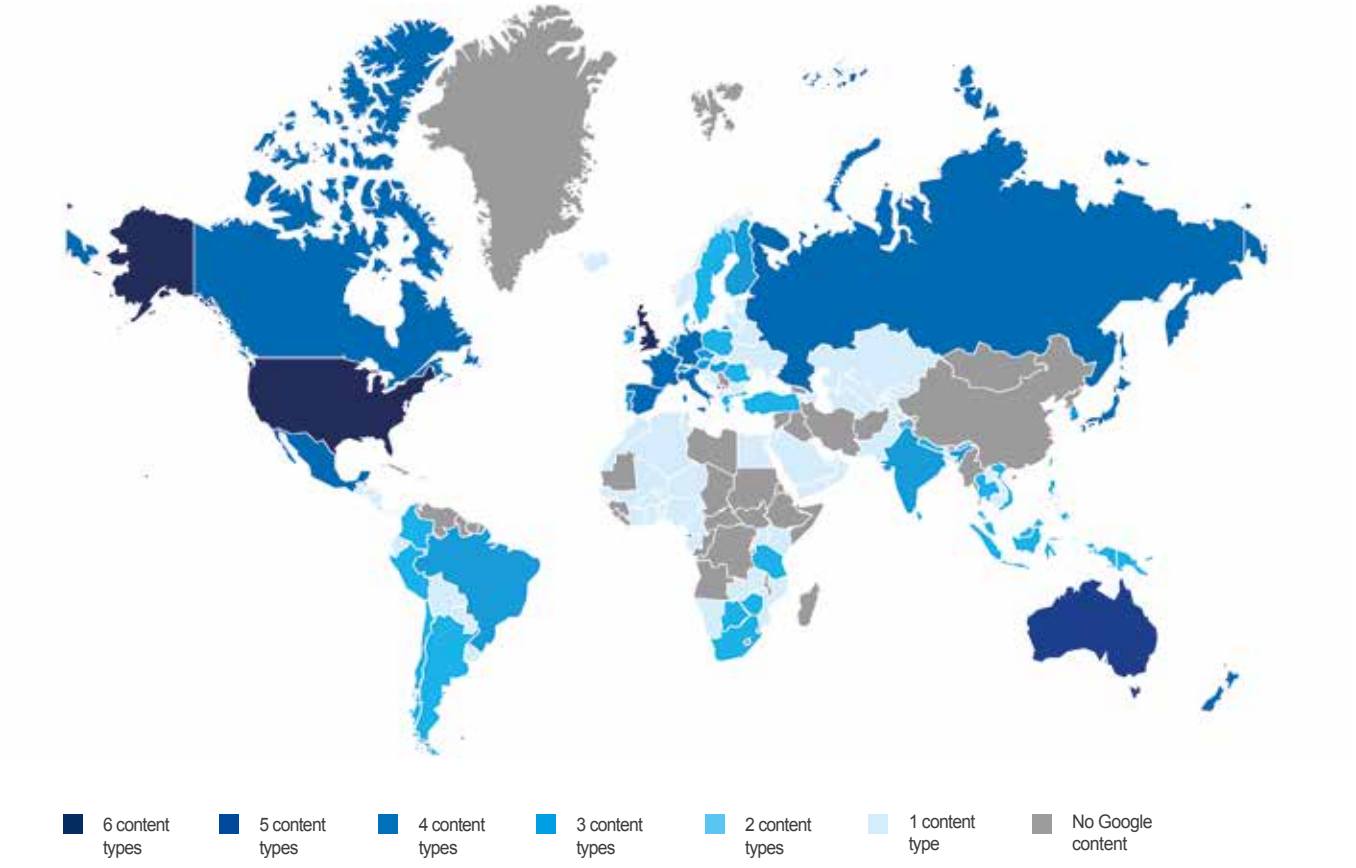
This can have a significant impact on the content available. For example, as of 13 January 2014, Netflix subscribers in the USA had access to 10,463 films or shows, while those in Canada only had access to 3,932.[50]

Similarly, Google Play – offering content for Android devices – has six content categories: paid apps, books, magazines, movies, TV shows, and music; and content availability varies by country. As of January 2014, only customers in the UK

and the USA had access to all of the Google Play content categories.[51] As shown in Figure 4.11, content availability appears to be particularly high in North America, Western Europe, and Australia, high-income countries in which acquiring the rights is more likely to be profitable.

Figure 4.11: Availability of Google content and apps

[Source: Google, 2014]

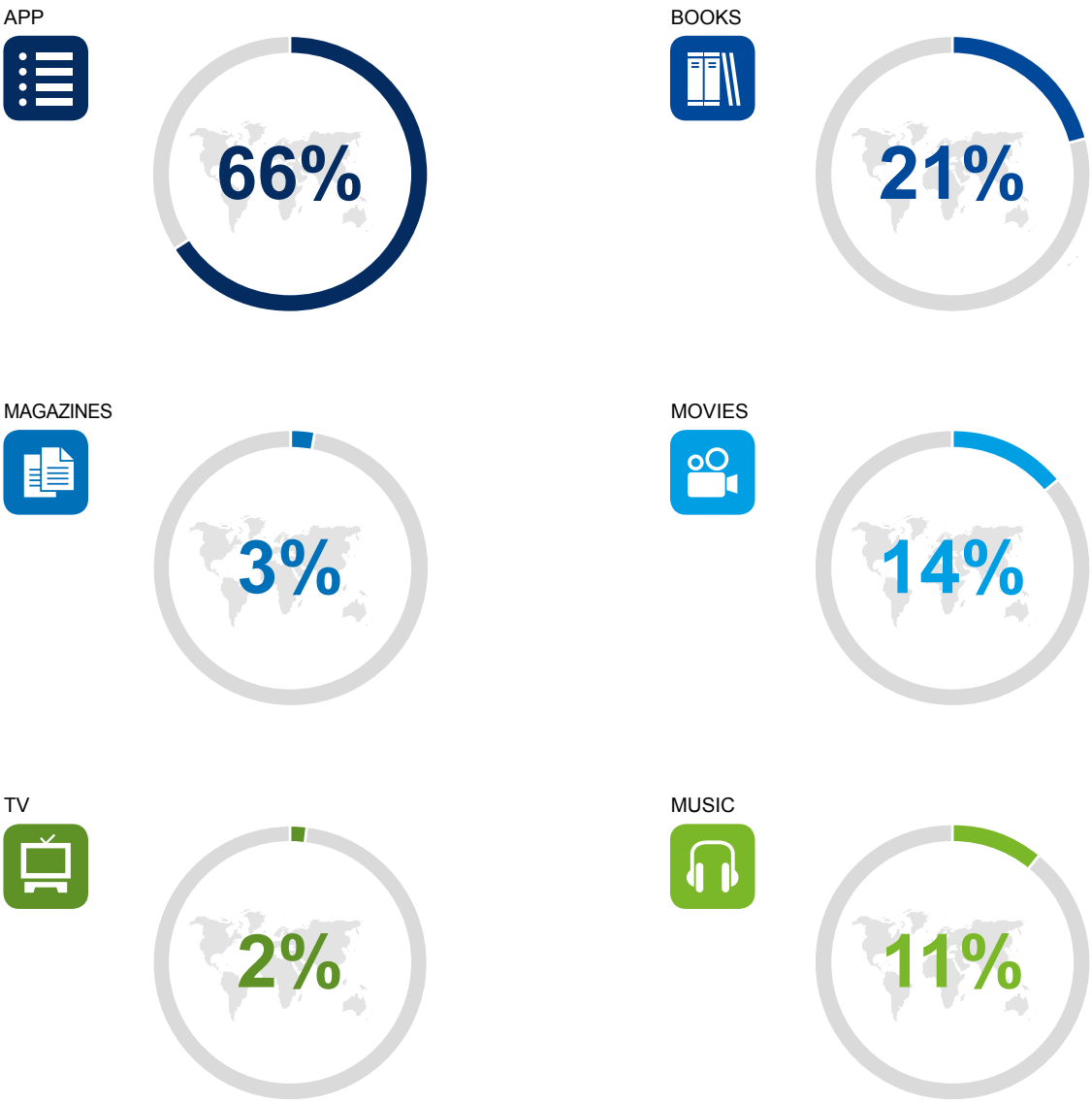


Paid apps are the most prevalent content category available, as shown in Figure 4.12. Unlike the other content categories whose rights Google has to acquire (such as those developed for more traditional platforms such as theatres or television), apps are developed specifically for compatible devices, and thus made available wherever the store is available (unless the app involves licensed content). Thus, we expect that paid apps are available in every country in which the Google Play service is available, for a total of 143 countries. On the other hand, those other content categories, such as books and movies, entail existing licensing arrangements and thus may not be available in every country.

For instance, the popular game app Angry Birds[52] was developed exclusively for the mobile app platform and is, therefore, made available in every possible country to maximize the size of the addressable market. However, the forthcoming Angry Birds movie is likely to have a more complex release window, owing to traditional movie distribution patterns. The distribution contracts for the movie will be driven by the need to keep intact the entire release window across all platforms, including cinema, DVD, digital downloads, and TV broadcast, and as a result it may not be available on Google Play in many countries where the app is available.

Figure 4.12: Proportion of countries with access to each category of Google content

[Source: Analysys Mason, Google, 2014]



We note also that 33% of countries have no access to any Google Play content, including paid apps. These countries are clustered in developing economies, with 25 in sub-Saharan Africa, 17 in emerging Asia–Pacific and 11 in Central and Latin America. The lack of access to any Google Play content in these countries serves to restrict users from using an increasingly popular service and also inhibits them from developing and selling apps in their own country, where they would have an advantage in targeting apps for their local environment.

Due to the profit-making incentives governing the behaviour of both content rights owners and media broadcast organizations, it is unlikely under the current international licensing regimes that content will become universally available. However, the legality of licensing on a country-by-country basis has been called into question in some cases. In 2011, in the UK, pub landlady Karen Murphy appealed in the European Court of Justice (ECJ) a fine for using a Greek TV decoder to show live Barclays Premier League football matches at a cost lower than that of the local service. On 4 October 2011, the ECJ ruled that:

> a system of exclusive licences is also contrary to European Union competition law if the licence agreements prohibit the supply of decoder cards to television viewers who wish to watch the broadcasts outside the Member State for which the licence is granted.[53]

While this case focused on TV and not Internet rights, court rulings such as this may encourage rights holders to pursue an alternative approach to the licensing of programming, perhaps taking a pan-European tender approach in this example. Regardless of the decisions made by the rights holders, any move towards the ending of exclusive territorial distribution is likely to increase content availability and benefit consumers.

A revision of the licensing regime and copyright laws at regional or international levels could bring about a move towards the liberalisation of content, such that Internet users in the developing world have access to the same resources as those in more developed nations, helping to equalize user experience around the globe. However, even if content is available in a country, there may be other challenges to access the content, based on where it is hosted.

Content divide

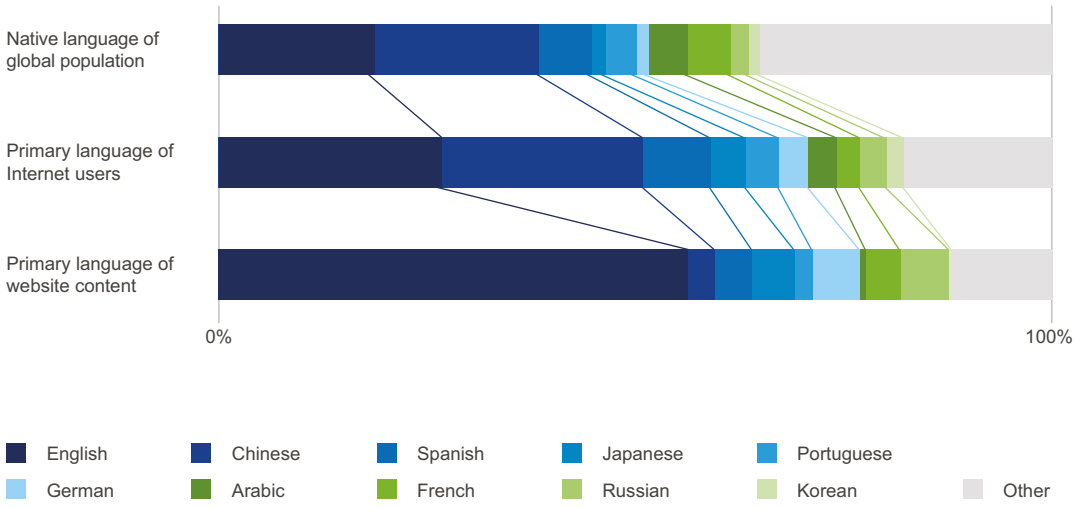
The availability of content – whether licensed or not - does not always translate into usage, for several reasons. First, content must be locally relevant, based on language and context. Second, the location where the content is stored can have a significant impact on the cost and latency of the access, which in turn affects the usage of the content.

Content must be locally relevant for maximal usage, and a key factor in determining the usefulness of content is the language in which that content is provided. Figure 4.13 considers the top ten languages that are spoken as the primary language of Internet users. For each language, the chart compares the proportion of Internet users for whom the language is their primary language with the proportion of Internet websites for which content is primarily provided in that language. By way of comparison, the proportion of the world's population for whom the language considered is their native language is also provided.

The chart shows that English-speaking Internet users are over-represented compared to global population share, but they also enjoy an abundance of English-language websites compared, for instance, with Chinese-speaking Internet users. While 27% of Internet users are classified as (primarily) English-speaking, more than twice as many websites are classified as offering content (primarily) in English. In contrast, Chinese speakers make up 25% of Internet users, but only 3.3% of websites offer content primarily in Chinese.[54]

Figure 4.13: Proportion of Internet users, websites and native language speakers for the top-ten Internet user languages

[Source: internetworldstats.com, W3Techs, 2014]



Other language challenges relate to differences in alphabet script. Historically, Internet naming has been based on the English alphabet, as encoded in ASCII.[55] This has significant limitations on the use of domain names for speakers of languages that use other characters, including not just Chinese and Russian, but even languages using the Latin alphabet, which comprises the English alphabet along with diacritical markings, such as the accents used over vowels in French. In 2009, ICANN approved the use of Internationalized Domain Names (IDNs), using non-ASCII characters, which are now in use, and other efforts at the IETF are enabling non-ASCII characters to be used in email headers.[56]

While language is critical, the underlying content must still be relevant to the context of the users. By way of example, *Extra News* is a community newspaper in Chicago, Illinois, which is bilingual in English and Spanish for both print and online versions.[57] While this is very useful for Spanish-speaking residents of Chicago, it is of no benefit to Spanish speakers in Latin America who would instead benefit from a local newspaper in their own community.

A recent study conducted by the Internet Society, the OECD, and UNESCO titled *The Relationship between Local Content, Internet Development and Access Prices* highlights the benefits of promoting local content that can foster local talent, protect local culture and languages, and create more local traffic.[58] The study also highlighted policies to help promote local content creation.

However, the availability of local content may still be insufficient to maximize usage by end users, if the content is not easily accessible. According to a recent presentation, the five largest Kenyan websites are all hosted in Europe, along with most international content delivered to Kenya.[59] Accessing this content from abroad over international links can add significant latency to communications for Kenyan end users; given the cost of those international links, they may be under-provisioned, and the resulting congestion may render the content all but unusable.

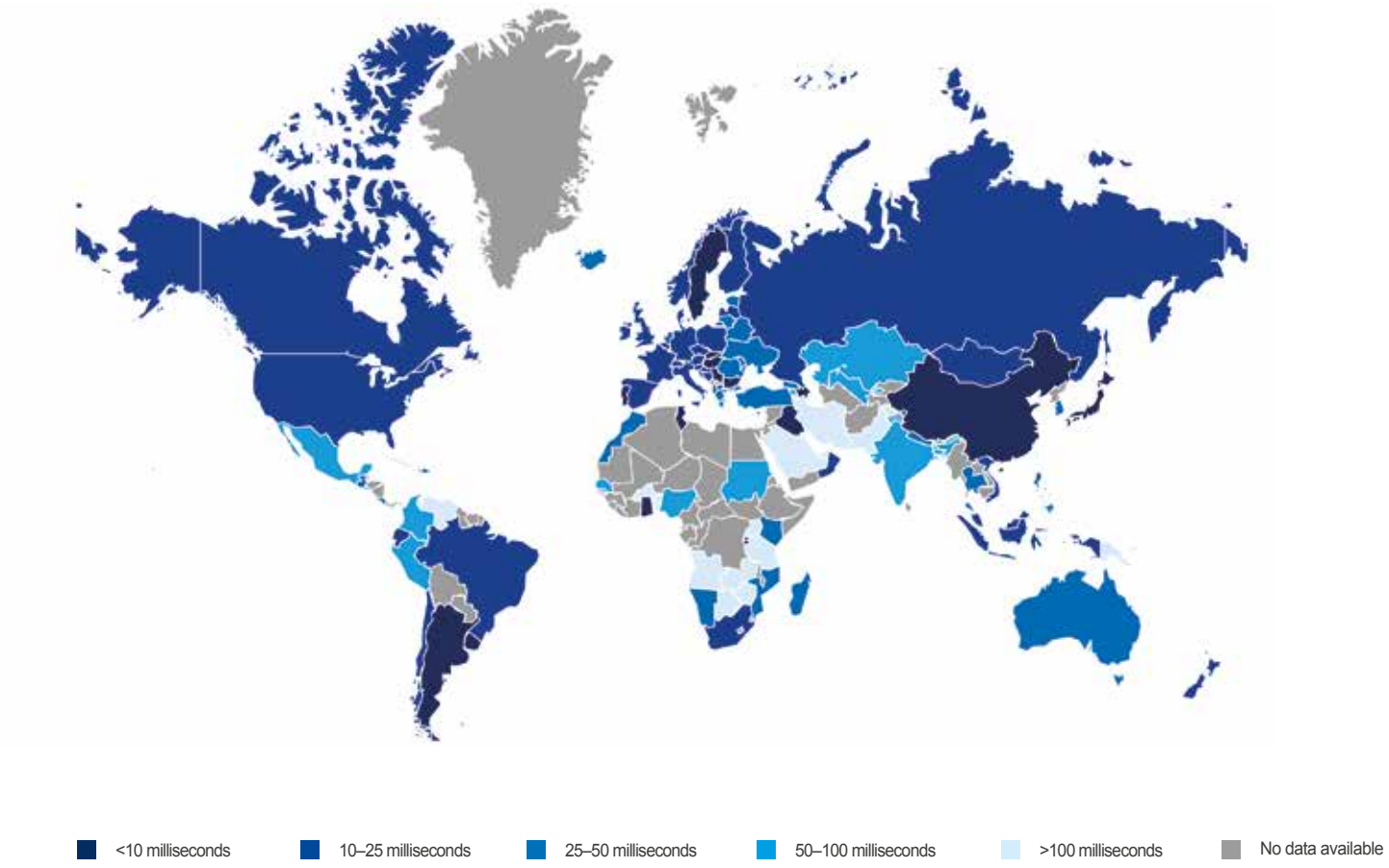
As shown in a recent Internet Society study, when Google installed a cache in Nairobi, Kenya, for static content such as YouTube videos, allowing for local access to the videos via the Kenya Internet Exchange Point (KIXP), there was a significant increase in Google usage.[60] This increased usage came at relatively low cost to the Kenyan ISPs, which did not have to use expensive international submarine cable capacity to access the traffic. In addition, it increased their revenues, based on the usage charge per MB for the additional traffic.

There can, therefore, be significant differences between countries in the latency of access to content. RIPE NCC has a program called Atlas, which distributes probes to users and organizations around the world, which are attached to Internet connections and can be programmed to test latency across these geographies.[61] The Atlas probes were recently configured to test the round trip time needed to access YouTube and Facebook.[62] Without specifying the location of the server to access, this test measured the end-user experience in accessing www.youtube.com or www.facebook.com.

As shown in Figure 4.14, there are big variations in the median result across countries, with European, developed Asia-Pacific, and North American countries generally having lower latency. These differences in latency can generally be attributed to the quality of the network and how close the content is to the country, either the original in a data centre or a duplicate in a cache.[63]

Figure 4.14: Median round trip time for YouTube ping

[Source: RIPE Atlas, 2014]

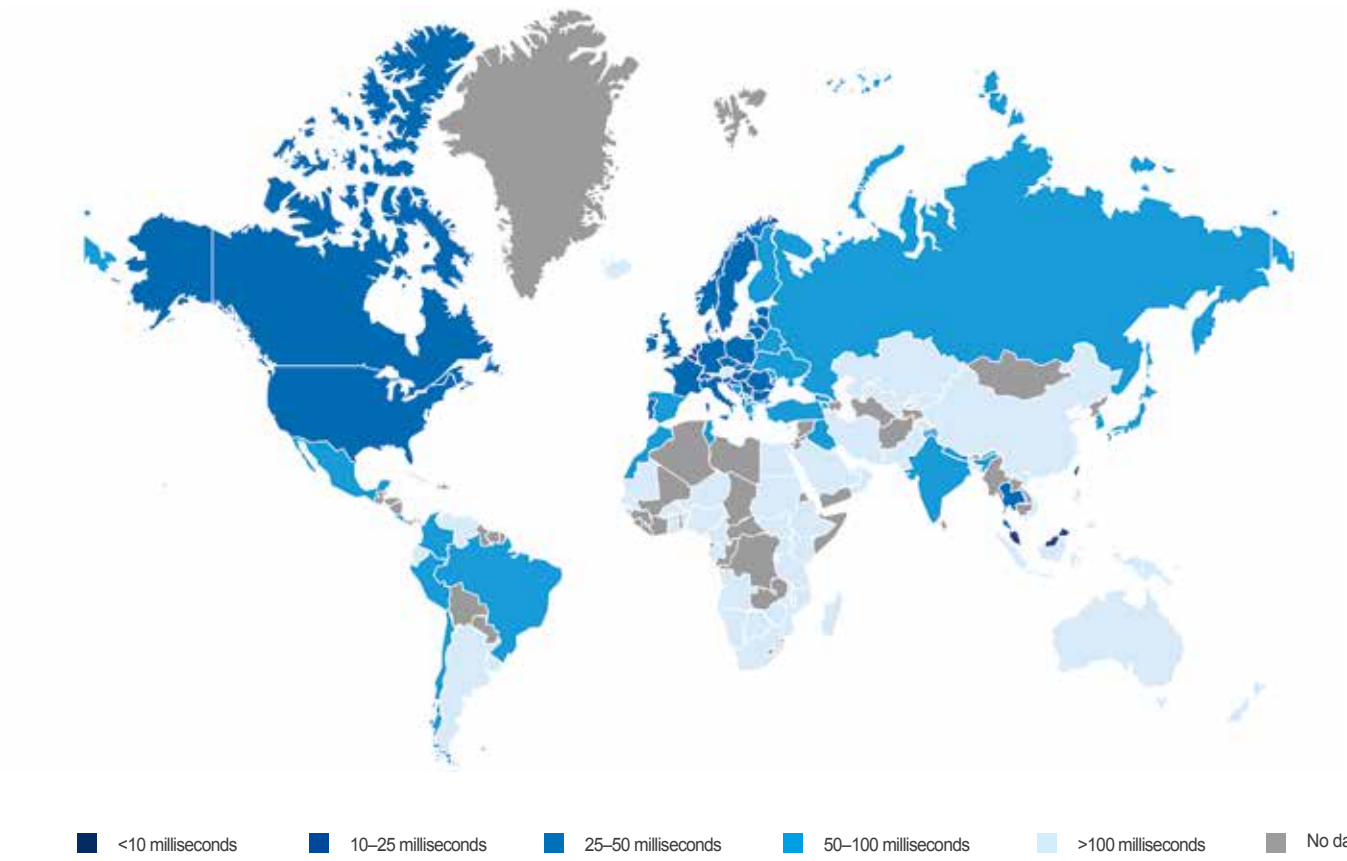


The same test was carried out for Facebook with albeit universally higher latency. As shown in Figure 4.15 it is once again generally the European, developed Asia-Pacific, and North American countries that have lower latency.

The contrast between Facebook and YouTube latencies results in part from differences in the type of content, and in part from different strategies for data delivery. First, YouTube videos are static and, therefore, lend themselves well to caching, while Facebook content is largely dynamic, changing as users continuously update their information. Second, as described above, in order to improve the delivery of videos, Google has introduced caches around the world as part of their Google Global Cache (GGC) program, which extends Google's delivery platform into more than 100 countries.[64] By contrast, Facebook opened its first data centre outside the United States in mid-2013, and there is no evidence of a widespread international content delivery strategy.[65]

Figure 4.15: Median round trip time for Facebook ping

[Source: RIPE Atlas, 2014]



In summary, to remove disparities in access to locally relevant content, and thereby promote Internet usage, it is important to remove language disparities and foster both the creation and hosting of content that is relevant to local users.

4.4 Internet fragmentation

The examples above represent existing differences in the user experience between countries. While the causes, severity, and timing of these examples are all different, they all share the characteristic of being basically online extensions of offline issues. Countries that ban Nazi imagery offline, ban Nazi imagery online; emerging markets are developing infrastructure in general, including for Internet access; and regimes seeking to repress political protests may extend their efforts to shut down the Internet.

However, a new threat to the Internet experience is emerging in the wake of revelations of pervasive Internet surveillance by state actors, which has altered users' perception of their Internet usage. Perhaps even worse, government responses to this threat could begin to fundamentally fracture the Internet.

On 5 June 2013, the first article was printed based on the material obtained by Edward Snowden, a contractor for the US National Security Agency (NSA). New material has continued to emerge, setting off a series of shocks and aftershocks that continue through this writing.

Trust is the foundation of our online lives, underpinning the benefits outlined in Section 3. Many online activities – ranging from e-commerce to the delivery of government services – depend in some part on users inputting sensitive personal data, such as financial or health records, and relying on it to remain confidential. In other cases, users rely on anonymity to participate in protests or 'whistle blow'.

The revelations detailed an approach to global online surveillance as broad as the Internet itself, and thus what has been revealed has cracked the foundation of trust in the Internet. Users are learning that some providers have enabled access to their data, the providers themselves are learning that their unencrypted transmissions have been tapped, while encryption itself may have been subverted in some cases. Further, governments partnered together in their surveillance efforts, while at the same time they may have spied on each other.

In addition, what is known may only be the tip of the iceberg – in December 2013 an editor of British newspaper the Guardian claimed that only 1% of documents had been released,[66] while representatives of the US government are seemingly unsure of what is in the remaining 99% of the documents.[67] One of the journalists who has had access to the Snowden documents since the beginning, Glenn Greenwald, shed some light recently on what is to come, explaining that he views the revelations like a "fireworks show: You want to save your best for last", with the final big stories coming in June and July 2014.[68] The uncertainty about what remains stokes doubts about our online privacy and security.

As a result, organisations seek to switch Internet providers, while the providers are changing the way that they supply services. Evidence is already emerging that companies and governments are avoiding companies from the USA and/or solutions that involve storing data in the USA. Estimates for costs to the USA cloud computing and web hosting industry range up to USD180 billion.[69]

In response to these losses, new solutions are emerging to increase users' control of the storage of their information. Microsoft for example declared recently that it would enable its users to choose the country in which their personal information is stored. As explained by Brad Smith, general counsel of Microsoft: "People should have the ability to know whether their data are being subjected to the laws and access of governments in some other country and should have the ability to make an informed choice of where their data resides."[70]

More fundamentally, a number of governments are debating requirements for national service delivery, which would act to localize Internet services within their borders. For instance, Brazil considered amendments to the *Marco Civil da Internet* bill, which would have required large content providers such as Google or Facebook to store user data on Brazilian territory.[71] While this clause was omitted from the legislation that was finally adopted, other countries have examined similar initiatives.[72]

Requirements of local data processing could have substantial implications for Internet companies, with increased costs as a result. As an example, a recent study by the Brazilian telecommunications group Brasscom found that the operating costs of a data centre in Brazil can be up to 100 per cent higher than in the USA, mainly due to electricity costs and taxation.[73] While Brazil chose not to require local data processing, the same cost dynamic may be true in other countries, which could act as a barrier to entry for companies.

The results of any data localisation requirements would be unique in several ways. The very goal of these policies would be to separate one country's Internet experience from another's, with potentially irreversible consequences. Requirements to store or process data locally could lead to some companies declining to offer service in particular countries owing to the increased cost. At the same time, local companies, which could benefit from those policies, might find it difficult to expand to other countries with similar policies, a result akin to the 'beggar thy neighbour' trade wars of the 1930s.[74]

4.5 Conclusion

In spite of the singular success of the Internet in creating a global platform, connecting nearly 3 billion users together to reap the many benefits of the open Internet, there are still significant differences in user experience between countries. Some of these differences arise from economics – richer countries can afford to invest more for infrastructure than poorer countries. Further, even where private sector investment has resulted in advanced mobile networks in a number of developing countries, effectively leapfrogging legacy fixed networks, penetration is lower because of lower income levels.

At the same time, business decisions can have an impact on the availability and provision of capacity for Internet access, affecting the download speeds and quality of service experienced by the users. Further, similar decisions can influence the amount of content available in a country along with the location where the content is hosted, which in turn can have consequences regarding what users can access online and the quality of the access.

Of course, businesses are affected by government policy and regulations, which can create an enabling environment for Internet access and services. For instance, the diversity of international interconnections can have an impact on the resilience of the network, and diversity can be increased by government decisions regarding the ownership of the incumbent and the entry of competition. Further, several governments have imposed restrictions on content availability within their borders and also have taken steps in recent years to shut down the Internet at the borders for varying lengths of time. These decisions can have repercussions for the usage of the Internet within a country and for the willingness of companies to invest in providing access and content. In the next section, we turn to recommendations for addressing the challenges raised here.

SECTION 05

Recommendations

5.1 The Internet is for Everyone

Although the Internet is held together by a global set of standards, we have shown here that there are divisions in the user experience between countries. Further, in spite of the striking, once unimaginable, growth in Internet adoption and usage, the majority of the world population is still not online. Addressing the challenges in the previous section will not just improve the user experience of those currently online, but will also contribute to the Internet Society's overarching vision, that the Internet is for Everyone.

As we see in Section 1, progress towards our vision is proceeding quickly around the world, as access continues to grow at a significant pace. However, much development work remains to be done to bring the economic and social benefits of the Internet to everyone. Further, those who are online are experiencing significant variations in their user experience.

For non-Internet users, sitting on the other side of the so-called digital divide, Internet access is clearly a critical component. With the advent of mobile broadband, which can be rolled out faster and at lower cost than fixed broadband, access is no longer as critical an issue. Nonetheless, affordability remains as a significant roadblock. As we showed in Section 4, the average cost of broadband access in many countries is still too high, and in some countries is even greater than the average income of the citizens.

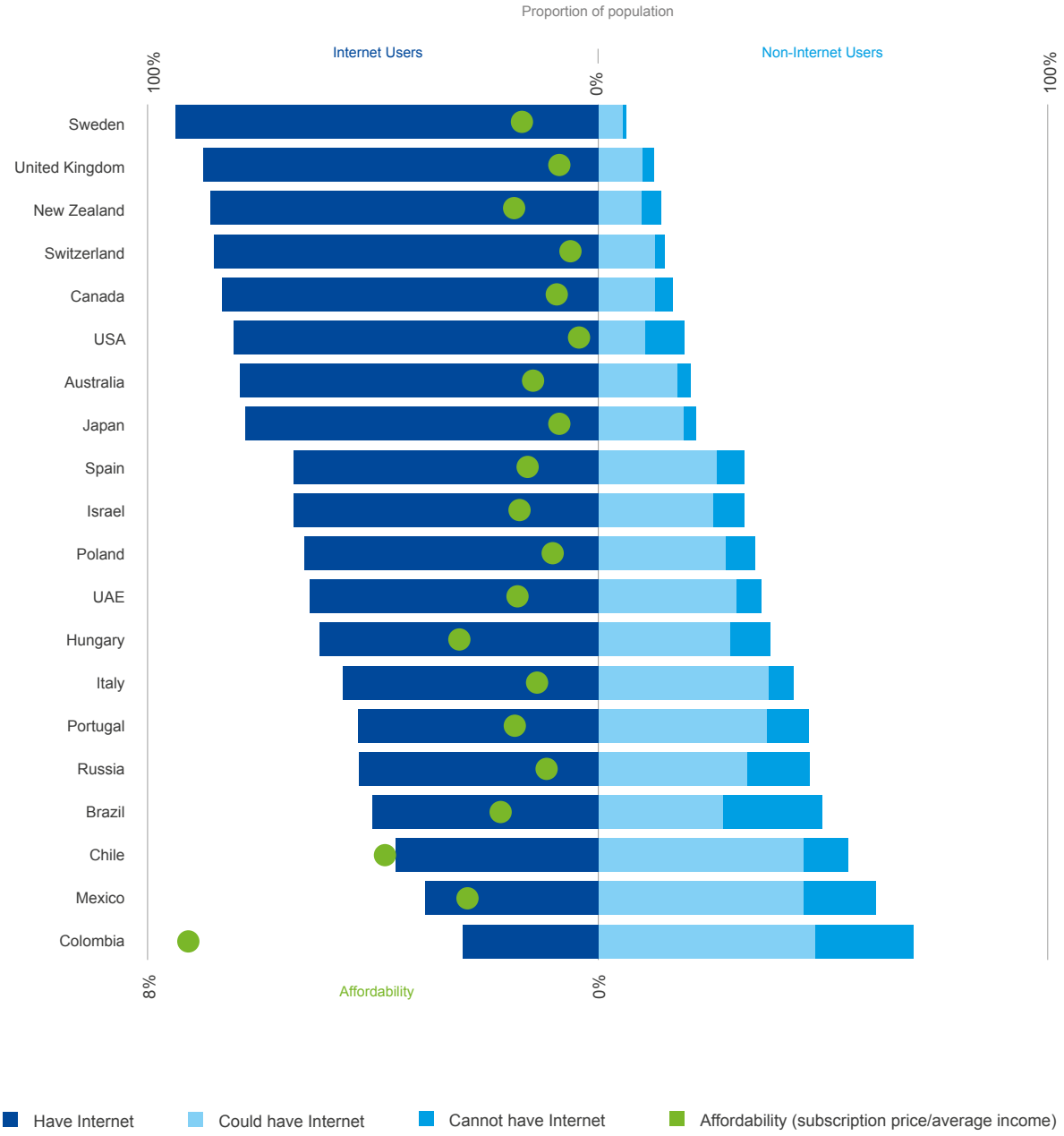
However, there is evidence that among those who have access to the Internet and are able to afford it, there are still many who choose not to go online. The PewResearch Internet Project published the results of a May 2013 survey in the United States, which revealed that 15% of American adults did not use the Internet at all. Asked why, 34% of non-users claimed that the Internet is not relevant to them and 32% do not like to use the Internet because it is difficult to use, while only 19% cite the cost and 7% the lack of availability.

Similar results are found for other developed and emerging countries. In a series of annual reports, the World Internet Project polled non-adopters in a variety of countries to find their reasons for not going online, with the possible choices including "No interest/Not useful", "Don't Know How to Use/ Confused", "No Computer/Internet", "Too Expensive", or "No Time".

We interpret that the traditional digital divide, relating to lack of access or affordability, pertains to those who answered “No Computer/Internet” or “Too Expensive”, while for the others the primary reason was a lack of training, or interest, or the time to access the Internet. In almost every country polled, regardless of affordability, more non-users cited a lack of interest than availability or affordability, as shown below, in Figure 5.1.

Figure 5.1: Population of Internet users and non-users

[Source: Survey responses: Mexico, Poland, Russia, Sweden, United States, World Internet Project International Report 5th Edition (2013), Australia, Canada, Italy, New Zealand, Spain, Switzerland, United Kingdom World Internet Project International Report 4th Edition (2012), Hungary, United Arab Emirates, Chile, Israel, Japan, Portugal, World Internet Project International Report 3rd Edition (2011). Affordability data: ITU 2013 Measuring the Information Society. Internet penetration data: ITU 2013, 2012, 2011.]



As a result, when considering how to increase Internet penetration, it is important to differentiate those who could have Internet access, but lack the interest, or training, from those who do not have access or could not afford it anyway. For those who cannot have Internet, significant efforts are underway at the national and international level to study and address the issues of the digital divide. For instance, the Broadband Commission for Digital Development aims to expand broadband access, while the Alliance for Affordable Internet (A4AI) works to see the Broadband Commission affordability target realised. The World Bank, Inter-American Development Bank, regional clusters of countries, and many, if not most, national governments are also working on a variety of means to increase Internet access and affordability.

What is noticeable in the previous graph, however, is that the proportion that seemingly could have Internet access, but choose not to take it, remains significant, even in the countries with lower penetration rates (and generally lower affordability). This likely has to do with the fact that while the Internet is an unparalleled network for facilitating global access, the local experience is also critical. In countries with fewer users, the Internet for many is less critical to everyday life, since there are fewer local friends and family to contact, businesses are less likely to arise to sell to a smaller market, and the government cannot focus on the online experience at the expense of the majority who are still offline. As a result, non-users may be prone to express less interest in the Internet, which serves to maintain a lower penetration status quo.

In addition to efforts to bridge the digital divide and increase interest in the Internet among non-users, it is also important to address the issues raised in Section 4 that impact those already online, such as security and privacy concerns. Addressing those issues will not just impact those already online, but improve the experience for those considering going online.

Based on the issues raised above, we think that the issues in the following table should be addressed to improve the Internet experience and increase access.

We note that any improvements for one group provide potential benefits for the subsequent group of adopters. For instance, addressing issues faced by current users, such as privacy concerns, will also make the Internet more attractive to those who have chosen not to access the Internet yet, while addressing the content divide will make the Internet more attractive to those for whom access is not yet possible.

Group	Issue	Remedy
Have Internet access today	Resilience	Increase diversity in two ways: first, increase operator diversity by liberalising the international gateway market, lowering licensing costs, and reducing other barriers to the development of international and domestic connectivity; second, increase network and route diversity by working at the regional levels to reduce barriers to cross-border connectivity so that more cross-border infrastructure can be deployed and interconnected. The Internet Society has made it a key priority to advance the deployment of core Internet infrastructure and evolution of technology to ensure the sustainability and reliability of the Internet. This work includes extending our work in developing Internet Exchange Points and addressing barriers to connectivity.
	Security and privacy	If the "Internet" becomes the "monitored Internet", many of the economic and social benefits that have emerged over the last 10 years will simply disappear. One country, one stakeholder group or one individual cannot overcome this threat alone: but one country can, through local policies, pose a significant threat to the Internet as a global tool for social good. There is a real need for the global community to come together to agree on strong ethical principles for Internet data-handling. The Internet Society has made it a key priority to promote the robustness and resiliency of Internet security and privacy through technology standards and deployment.
	Content availability	Content is the key driver and main facilitator for the Internet's presence and future. The Internet has provided users with the ability to become authors, creators, and publishers, while, at the same time, engaging in various forms of social interaction. Users depend on the Internet to retrieve information, exchange knowledge and know-how, interact with their peers, and contribute to various discussion fora. The Internet Society has made it a priority to seek ways to create an enabling environment for the creation, access, use, and dissemination of content on the Internet.
Could have access today	Content access	Countries should create an enabling environment for companies to deploy caches or servers to hold local or international content. As users connect to the Internet and are exposed to an unlimited and boundless amount of content, they are incentivized to create their own content and share their own ideas. Supporting and facilitating an Internet environment where content is not subjected to policy restrictions – be it in the form of liability or otherwise – is pivotal for a robust Internet ecosystem.
	Content creation	In order to help develop locally relevant content, governments can seed the market by developing their own content. In addition to extending the reach of government services, this can help to create online demand to access these services; create demand for data centres to hold the government servers; increase usage of an Internet Exchange Point, if available; and create jobs for local developers who can begin to innovate and create private content and applications for the market.
Cannot have Internet today	Access	In addition to the actions described above to address resilience issues, governments can remove domestic barriers to connectivity, such as high costs of accessing rights-of-way for deploying fibre, and for building cell phone towers. In addition, the government can facilitate infrastructure sharing using government property, such as deploying fibre ducts next to roads, railroads, or using electricity transmission networks, and encourage or require sharing of private infrastructure, including towers and existing networks.
	Affordability	Many actions outlined above will act to lower costs, by lowering the cost of deploying infrastructure and of accessing local content. Additional actions can include removing taxes on equipment, devices, and services that could act to depress demand. Finally, to the extent that a country has a universal service obligation fund, it could be used to subsidize construction of Internet access infrastructure in high-cost areas or to subsidize demand in low-income areas.

5.2 Conclusion

As we near three billion Internet users, it is appropriate to step back and marvel at the speed of adoption and changes that have taken place to date. The multistakeholder model that was central to the creation of the Internet has evolved and grown to encompass Internet governance and key development projects such as IXP creation.

As we look forward to the fourth billion user and beyond, it is clear that it will be as difficult to forecast the twists and turns we will collectively face as it would have been to forecast all the events of the past ten years. It is remarkable that only in 2004 did fixed-broadband exceed dial-up access, or that the first smartphone was only introduced in 2007. How many of us could have imagined back then that mobile broadband would so soon surpass fixed, developing country users surpass developed country users, and video traffic surpass all other?

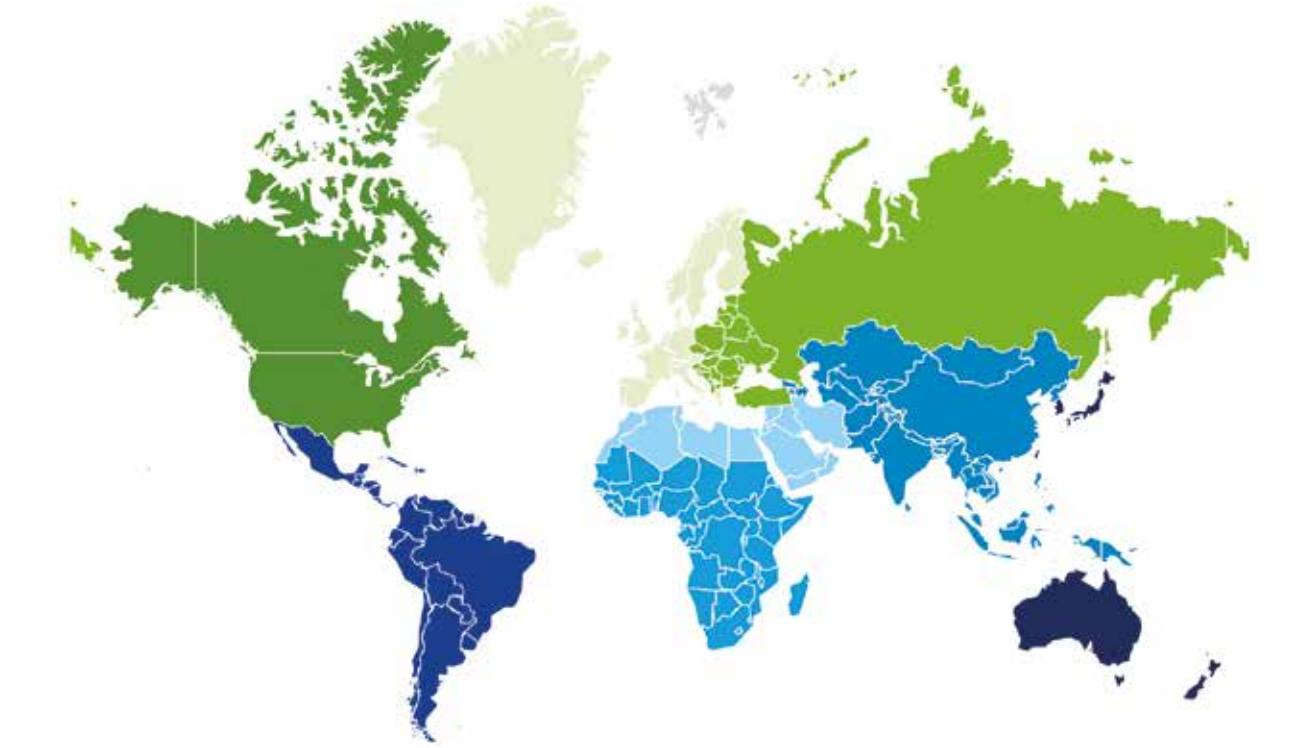
What is clear, however, is that the open Internet model, which helped to fuel the growth and navigate all the bumps in the road, continues to be the best way to ensure that the Internet remains sustainable and continues to grow. How else could an engineer in Togo raise money from strangers in Europe, design and build a USD100 3D printer made of e-waste, and submit his design for consideration to the US space agency, NASA? Or a teenager in Mongolia have his potential identified and end up a student at MIT? Or a new political party, led by an Italian comedian, organize a cost-free online primary, and within four years secure more seats in the House of Deputies than any other party?

Working together, and honouring the Internet model, all the stakeholders can meet the foreseen challenges outlined in this section – and others as they arise – to make the Internet yet more essential to end-users lives as citizens, consumers, and innovators. At the same time, we can address the digital divide that separates regions and people, and make sure that once online, everyone has the same user experience. With universal and uniform online access, anything is possible.

Annex A Definition of world regions

Figure A.1: Definition of world regions

[Source: Analysys Mason, 2013]



WESTERN EUROPE
- Andorra
- Austria
- Belgium
- Cyprus
- Denmark
- Finland
- France
- Germany
- Greece
- Iceland
- Ireland
- Italy
- Liechtenstein
- Luxembourg
- Malta
- Monaco
- Netherlands
- Norway
- Portugal
- San Marino
- Spain
- Sweden
- Switzerland
- United Kingdom

CENTRAL AND EASTERN EUROPE
- Albania
- Belarus
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- Czech Republic
- Estonia
- Hungary
- Latvia
- Lithuania
- T.F.Y.R. Macedonia
- Moldova (Rep. of)
- Montenegro
- Poland
- Romania
- Russian Federation
- Serbia
- Slovakia
- Slovenia
- Turkey
- Ukraine

NORTH AMERICA
- Canada
- United States of America

DEVELOPED ASIA-PACIFIC
- Australia
- Brunei Darussalam
- French Polynesia
- Guam
- Hong Kong (S.A.R.)
- Japan
- Macao (S.A.R.)
- New Caledonia
- New Zealand
- Northern Marianas Islands
- Singapore
- Korea (Rep. of)
- Taiwan, Province of China

EMERGING ASIA-PACIFIC
- Afghanistan
- American Samoa
- Armenia
- Azerbaijan
- Bangladesh
- Bhutan
- Cambodia
- China
- Cook Islands
- Fiji
- Georgia
- India
- Indonesia
- Kazakhstan
- Kiribati
- Kyrgyzstan
- Lao P.D.R.
- Malaysia
- Maldives
- Marshall Islands
- Micronesia (Fed. States of)
- Mongolia
- Myanmar
- Nauru
- Nepal
- Niue
- Dem. People's Rep. of Korea
- Pakistan
- Palau
- Papua New Guinea
- Philippines
- Samoa
- Solomon Islands
- Sri Lanka
- Tajikistan
- Thailand
- Timor-Leste
- Tonga
- Turkmenistan
- Tuvalu
- Uzbekistan
- Vanuatu
- Viet Nam

MIDDLE EAST AND NORTH AFRICA
- Algeria
- Bahrain
- Egypt
- Iran (Islamic Rep. of)
- Iraq
- Israel
- Jordan
- Kuwait
- Lebanon
- Libya
- Morocco
- Oman
- Palestine (State of)
- Qatar
- Saudi Arabia
- Syrian Arab Republic
- Tunisia
- United Arab Emirates
- Yemen

LATIN AMERICA AND CARIBBEAN
- Anguilla
- Antigua and Barbuda
- Netherlands Antilles
- Argentina
- Aruba
- Bahamas
- Barbados
- Belize
- Bermuda
- Bolivia (Plurinational State of)
- Brazil
- Cayman Islands
- Chile
- Colombia
- Costa Rica
- Cuba
- Dominica
- Dominican Republic
- Ecuador
- El Salvador
- Grenada
- Guatemala
- Guyana
- Haiti
- Honduras
- Jamaica
- Mexico
- Montserrat
- Nicaragua
- Panama
- Paraguay
- Peru
- Puerto Rico
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Suriname
- Trinidad and Tobago
- Turks and Caicos Islands
- Uruguay
- Venezuela (Bolivarian Republic of)
- Virgin Islands (British)
- Virgin Islands (US)

SUB-SAHARAN AFRICA
- Angola
- Benin
- Botswana
- Burkina Faso
- Burundi
- Cameroon
- Cabo Verde
- Central African Republic
- Chad
- Comoros
- Congo
- Côte d'Ivoire
- Congo (Dem. Rep. of the)
- Djibouti
- Equatorial Guinea
- Eritrea
- Ethiopia
- Gabon
- Gambia
- Ghana
- Guinea
- Guinea-Bissau
- Kenya
- Lesotho
- Liberia
- Madagascar
- Malawi
- Mali
- Mauritania
- Mauritius
- Mayotte
- Mozambique
- Namibia
- Niger
- Nigeria
- Réunion
- Rwanda
- Sao Tome and Principe
- Senegal
- Seychelles
- Sierra Leone
- Somalia
- South Africa
- Saint Helena
- Sudan
- Swaziland
- Tanzania (United Rep. of)
- Togo
- Uganda
- Zambia
- Zimbabwe

Regional groupings according to Analysys Mason; Country names from United Nations Statistical Division

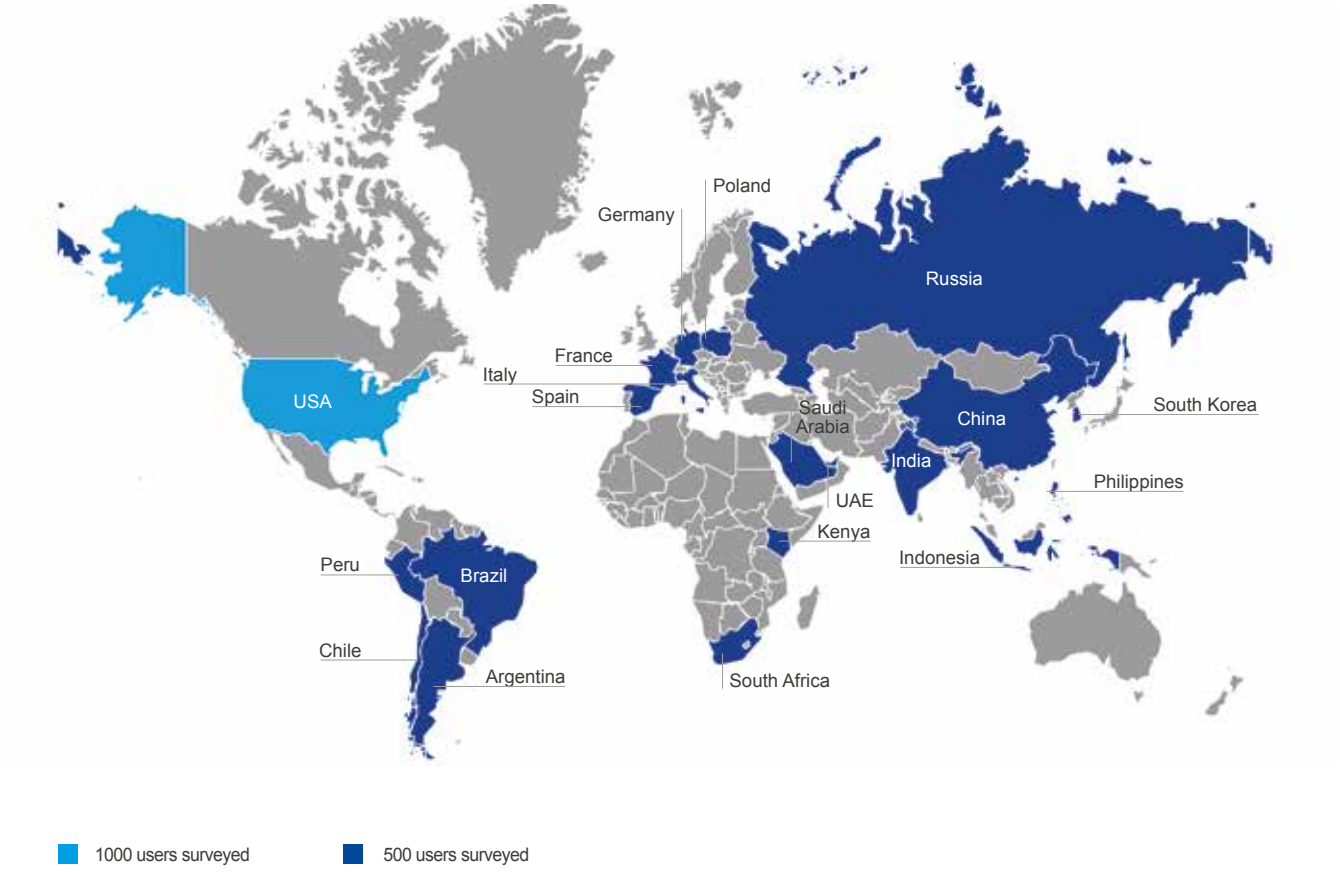
Annex B Global Internet User Survey 2013 methodology

The Global Internet User Survey (GIUS) was commissioned by the Internet Society and conducted among 10,500 Internet users across 20 countries. All were people who have access to the Internet, either at home, at work, or via mobile access. People with no access to the Internet, or who choose never to access the Internet, are excluded from the study.

Redshift Research conducted the interviews online in December 2013 and January 2014 using an email invitation and an online survey. Respondents were drawn from online consumer panels in the relevant target countries.

Figure B.1: Survey responses
Gender distribution
[Source: Internet Society, Global Internet User Survey, 2014]

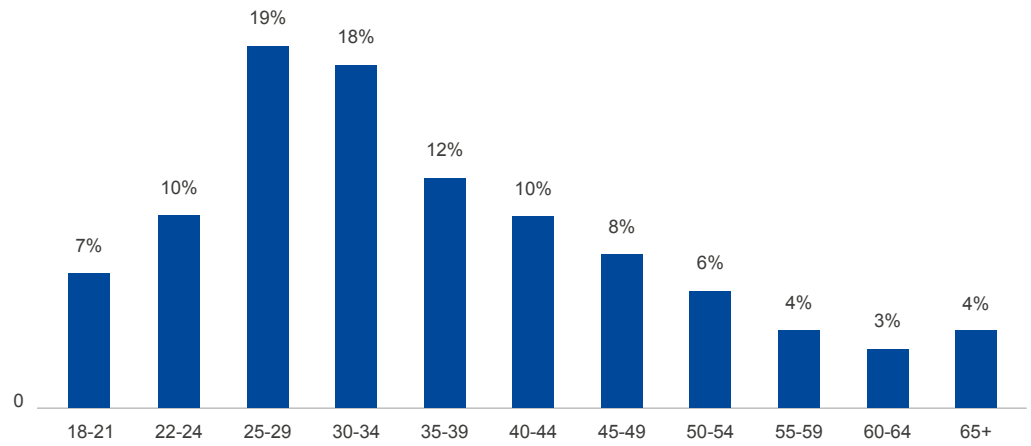
Figure B.2: Survey responses
Participating Countries
[Source: Internet Society, Global Internet User Survey, 2014]



Results of any sample are subject to sampling variation. The magnitude of the variation is measurable and is affected by the number of interviews and the level of the percentages expressing the results. In this particular study, the chances are 95 in 100 that a survey result based on all 10,500 respondents does not vary, plus or minus, by more than 1% from the result that would be obtained if interviews had been conducted with all persons in the group represented by the sample. Results based on the sub-samples in individual countries, being smaller (typically 500 in each country) will be subject to a greater degree of error as a result (up to +/- 4.4% at 95% confidence limits).

The sample was selected from a variety of consumer panels in each country. Every effort was made to ensure that the final sample structure was as representative of the local population of Internet users (in terms of age and gender) as possible (remembering that the Internet population is not necessarily the same as the general population). In developed economies, such as the USA and western European countries, the population of Internet users has a very similar profile to the general population (as Internet use is now extremely widespread). However, it should be noted that in developing countries, the Internet population may well have a younger age bias or, in some instances, be more male-dominated than the general population. In general, the panel composition in each country represents a live record of Internet users that is broadly representative of the Internet population at that point in time.

Figure B.3: Survey responses
Age distribution
[Source: Internet Society, Global Internet User Survey, 2014]



References

CHAPTER 1 - THIS IS YOUR INTERNET: TRENDS AND GROWTH

1. "ITU releases 2014 ICT Figures", 5 May 2014, http://www.itu.int/net/pressoffice/press_releases/2014/23.aspx#.U23BbV73qQk
2. All ITU statistics used in this section can be found at http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx.
3. The definitions of each region we refer to in this report are set out in Annex A. The ITU will release country data for 2013 after the deadline for printing this report. As a result the regional level data in Figure 1.3 and other figures that rely on ITU country level data will be for 2012 in the print version. However, we will update the data online, at https://www.internetsociety.org/global-internet-report.
4. The five RIRs are:
   - African Network Information Centre (AfriNIC) serving Africa
   - American Registry for Internet Numbers (ARIN) serving the United States, Canada, and many Caribbean and North Atlantic islands
   - Asia-Pacific Network Information Centre (APNIC) serving the Asia-Pacific region
   - Latin American and Caribbean Network Information Centre (LACNIC) serving Latin America and parts of the Caribbean
   - Réseaux IP Européens Network Coordination Centre (RIPE NCC) serving Europe, the Middle East, and parts of Central Asia.
5. See http://www.internetsociety.org/what-we-do/internet-technology-matters/ipv6.
6. A /8 ("slash 8") is a Classless Inter-Domain Routing (CIDR) block containing 16,777,216 addresses. There are 256 /8 blocks in the IPv4 address space.
7. See Section 3 for examples of the uses and benefits of the Internet today.
8. These numbers come from the Internet Domain Survey conducted by the Internet Systems Consortium. For more details, see https://www.isc.org/services/survey.
9. ISC's definition of a host is "a domain name that has an IP address (A) record associated with it. This would be any computer system connected to the Internet (via full or part-time, direct or dialup connections). ie. example.com, www.example.com". See ISC's definitions: https://www.isc.org/services/survey/definitions.
10. Broadband access networks can be used by network operators to deliver managed Internet services, such as IP television (IPTV), which we do not address in this report.
11. Broadband is defined as speeds above the 0.128Mbit/s available on a narrowband network
12. In addition to traditional fixed connections, we include fixed wireless here. Fixed wireless broadband uses radio waves to transmit data to the customer, but using equipment that is not easily moved – this could include an outdoor antenna, and it is typically connected to a computer rather than a tablet or smartphone.
13. Video applications are defined here as including downloads and streaming, as well as short-form video such as YouTube, and webcam viewing.
14. Cisco Visual Networking Index (VNI), http://www.cisco.com/web/solutions/sp/vni/vni_forecast_highlights/index.html.
15. See Sandvine Global Internet Phenomena 2H 2013: https://www.sandvine.com/trends/global-internet-phenomena.
16. See OECD Broadband Portal: http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm.
17. We expect that the majority of mobile access subscriptions will be mobile broadband services. However, this is difficult to assess precisely because the number of 2G mobile subscriptions that are, at least in part, used for Internet access is not known.
18. Here, mobile broadband connections comprise 3G and 4G handsets, mid-screen devices, dongles, routers, and machine-to-machine (M2M) connections.
19. Fixed line services are typically purchased on a per-household basis. Mobile services, on the other hand, may be purchased by each individual within a household. In some cases, individuals may even have more than one mobile access device (e.g., a smartphone, a laptop, and a tablet). On the other hand, as mentioned above, in other cases individuals within a household may share one device.
20. This is the most popular video application on mobile in North America, unlike for fixed connections, where it is Netflix.
21. YouTube traffic fell from a peak of nearly 25% of peak mobile traffic in the first half of 2013. See Sandvine Global Internet Phenomena H2 2013: https://www.sandvine.com/trends/global-internet-phenomena.
22. Features include Dual SIM, QWERTY keypad, SD card slot up to 32GB, Internal memory 64MB, Stereo FM radio, Wi-Fi, 2.0 MP camera, MP3/MP4. See MTN Zambia list of smartphones: http://mtnzambia.com/index.php/en/personal/shop/smart-phones.
23. The Tecno M3 has the Android 4.2 Jelly Bean operating system, a dual-core processor, video calling and accelerated graphics, See Price in Kenya: http://www.priceinkenya.com/tag/0-9-999.
24. See the UK Department for Culture, Media & Sport, "The UK Spectrum Strategy": https://www.gov.uk/government/publications/spectrum-strategy.

25. A 2011 Real Wireless report for Ofcom on 4G capacity gains found that a 1.2 times improvement in spectral efficiency was realistic between high-end 3G networks and initial 4G network deployments. See: http://www.apwpt.org/downloads/ofcommay2011_4gcapacitygainsfinalreport_main.pdf. However, this difference is expected to grow with future 4G releases.
26. See Moore Stephens "Africa Desk News Bulletin": http://www.moorestephens.co.za/images/uploads/MS-Africa_News_Desk_Kenya.pdf.
27. See Safaricom Ltd Hi FY14 Presentation, 5th November 2013: http://www.safaricom.co.ke/images/Downloads/Resources_Downloads/Half_Year_2013-2014_Results_Presentation.pdf?itembanner=31.
28. For mobile phone, Y0 may be a few years after the initial launch of the technology and, in fact, in line with when penetration levels of any note arose and were reported.
29. These launch dates are common to all the developing regions shown in the charts, aside from Latin America, for which the cellular Y0 is 1994.
30. For all of the results and a description of the methodology, see https://www.internetsociety.org/survey.

CHAPTER 2 - OPEN AND SUSTAINABLE INTERNET

1. For a brief history of the Internet, written by a number of its founders, including Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Lawrence G. Roberts, and Stephen Wolff, see http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet.
2. See NTIA's Press Release: http://www.ntia.doc.gov/press-release/2014/ntia-announces-intent-transition-key-internet-domain-name-functions.
3. For the Internet Society's statement, see http://www.internetsociety.org/news/internet-technical-leaders-welcome-iana-globalization-progress.
4. For more details on the Internet ecosystem and its participants, see http://www.internetsociety.org/internet/who-makes-it-work.
5. The working definition of Internet governance proposed by WGIG can be found in the WGIG Report. See: http://www.wgig.org/WGIG-Report.html.
6. ibid
7. See CGI website: http://cgi.br.
8. See http://www.cgi.br/noticia/lei-do-marco-civil-da-internet-e-uma-grande-vitoria-para-os-brasileiros-considera-cgi-br/408.
9. For more information on NETmundial, along with a link to the NETmundial Multistakeholder Statement, see http://netmundial.br. For reaction, see http://www.internetsociety.org/blog/institutional/2014/04/netmundial-variations-theme-multistakeholder-consensus-building-action.
10. See Kapersky "Security Bulletin. Spam Evolution 2013": for more details. http://www.securelist.com/en/analysis/204792322/Kaspersky_Security_Bulletin_Spam_evolution_2013.
11. For more details on the Combating Spam Project, and links to further resources, see http://www.internetsociety.org/what-we-do/policy/combating-spam-project.
12. See http://open-stand.org.
13. See RFC 3935: http://www.ietf.org/rfc/rfc3935.txt.
14. See Daigle, L. 2013 "The Internet and OpenStand: The Internet Didn't Happen by Accident": http://www.circleid.com/posts/20131014_internet_and_openstand_the_internet_didnt_happen_by_accident.
15. For more information, see http://www.opus-codec.org.
16. RFC stands for 'Request for Comments' and refers to official publications of the IETF. See http://tools.ietf.org/html/rfc6716.
17. WebRTC (which stands for Web Real-Time Communication) is a set of protocols defined by the W3C to support browser-to-browser communications such as voice over IP without the use of plug-in software.
18. For more examples, see http://en.wikipedia.org/wiki/Opus_(audio_codec).
19. For more information, see http://www.internetsociety.org/development.
20. See http://www.internetsociety.org/events/workshops/axis-project-and-axis-workshops.
21. The process of sending domestic traffic outside the country to be exchanged and then routed back to the same country is sometimes known as 'tromboning'. For a review of the benefits of an IXP, see Kende, M. & Hurpy, C. 2012 "Assessment of the Impact of Internet Exchange Points – Empirical Study of Kenya and Nigeria", see http://www.internetsociety.org/news/new-study-reveals-how-internet-exchange-points-ixps-spur-internet-growth-emerging-markets.
22. See http://www.internetsociety.org/news/internet-exchange-point-launched-7-march-2014-windhoek-namibia, http://www.internetsociety.org/news/internet-exchange-point-launched-21-march-2014-bujumbura-burundi, and http://www.internetsociety.org/news/internet-exchange-point-launched-10-april-2014-mbabane-kingdom-swaziland
23. See http://www.ixptoolkit.org.
24. See http://www.internetsociety.org/cisco-signs-three-year-commitment-internet-society-programs-including-interconnection-and-traffic.
25. For further details, see http://www.internetsociety.org/what-we-do/where-we-work/asia/south-asia/wireless-communities.
26. See https://www.facebook.com/chanderisaris.

CHAPTER 3 - BENEFITS OF AN OPEN AND SUSTAINABLE INTERNET

1. Newspapers largely focus on their home markets, while radio and television requires spectrum to broadcast, which is licensed on a national level. As a result, traditional broadcast media content can typically only extend beyond borders through agreement between owners of the content in one country and owners of a mass medium in another.
2. See http://ocw.mit.edu/index.htm.
3. See OECD 2002, "Forum on the Impact of Open Courseware for Higher Education in Developing Countries": http://unesdoc.unesco.org/images/0012/001285/128515e.pdf.
4. For the announcement of the textbook repository, see http://news.priyo.com/video/2011/04/24/pm-opens-online-version-textbo-24346.html. The textbooks are made available by the National Curriculum and Textbook Board, at http://www.nctb.gov.bd/downloadpage22.php.
5. See the New York Times, 13 September 2013, "The Boy Genius of Ulan Bator": http://www.nytimes.com/2013/09/15/magazine/the-boy-genius-of-ulan-bator.html?_r=0.
6. See Van den Berg, D.J. 2013, "Why MOOCS Are Transforming the Face of Higher Education", http://www.huffingtonpost.co.uk/dirk-jan-van-den-berg/why-moocs-are-transforming_b_4116819.html
7. For further discussion of the digital divide between countries, see Section 4.
8. See Pew Research Center "Predicting the Future on the Web's 25th Anniversary", http://www.pewinternet.org/2014/03/11/predicting-the-future-on-the-webs-25th-anniversary.
9. See http://www.google.com/elections/ed/us.
10. See BBC News, "Italy's Five Start protest party makes waves", 5 December 2012, http://www.bbc.com/news/world-europe-20643620.
11. See http://www.ustream.tv/recorded/29567161.
12. See http://www.beppegrillo.it.
13. See, The Guardian 2013, "How Beppe Grillo's Social Media Politics took Italy by Storm": http://www.theguardian.com/commentisfree/2013/feb/26/beppe-grillo-politics-social-media-italy.
14. See Demos 2013, "New Political Actors in Europe: Beppe Grillo and the M5S", http://www.demos.co.uk/publications/newpoliticalactorsineuropebeppegrilloandthem5s.
15. However, both Bersani and Berlusconi were leading coalitions and therefore able to receive a greater proportion of the vote, M5S came third overall.
16. See Estonian National Electoral Committee, http://www.vvk.ee/voting-methods-in-estonia/engindex/statistics.
17. See http://www.id.ee/?lang=en.
18. Passenger rail services in the UK are franchised for a pre-defined period of time to train operating companies that purchase wholesale access to the tracks, run train services, and retail these services to end customers.
19. See "Reconsider West Coast Mainline franchise decision", http://epetitions.direct.gov.uk/petitions/37180.
20. See BBC News, "West Coast Main Line deal scrapped after contract flaws discovered," 3 October 2012, http://www.bbc.com/news/business-19809717.
21. See "We the People: Your Voice in our Government", https://petitions.whitehouse.gov.
22. See "A Comprehensive Approach to Wall Street Reform", https://petitions.whitehouse.gov/response/comprehensive-approach-wall-street-reform.
23. The White House released several beer recipes (featured ingredient: honey) in response to the petition. See https://petitions.whitehouse.gov/petition/release-recipe-honey-ale-home-brewed-white-house/XkpkYwc0.
24. According to the White House, "a Death Star isn't on the horizon." See https://petitions.whitehouse.gov/petition/secure-resources-and-funding-and-begin-construction-death-star-2016/wlfKzFkN.
25. See Kenya Revenue Authority, http://www.revenue.go.ke.
26. See Chancellor George Osborne's Autumn Statement 2013 speech, https://www.gov.uk/government/speeches/chancellor-george-osbornes-autumn-statement-2013-speech.
27. See The World Bank – Open Government Data Toolkit, http://data.worldbank.org/open-government-data-toolkit.
28. See http://www.e-gov.waseda.ac.jp/ranking.htm.
29. "Institute of e-Government released the 2013 World –Government Ranking," 26 March 2013, http://www.waseda.jp/eng/news12/130326_egov.html.
30. Singapore e-Gov, see http://www.egov.gov.sg/home.
31. See Infocomm Development Authority of Singapore, http://www.ida.gov.sg/Business-Sectors/Overview.
32. For instance, a change.org petition in the UK asked the BBC to reverse their decision to cancel Ripper Street, see http://www.change.org/en-GB/petitions/reverse-the-bbc-s-decision-to-cancel-ripper-street.
33. See The Guardian 2012, "Avaaz faces questions over role at centre of Syrian protest movement", http://www.theguardian.com/world/2012/mar/02/avaaz-activist-group-syria.
34. See http://www.avaaz.org/en/about.php.
35. See http://www.change.org/en-GB/about.

36. See Tell Bank of America: No $5 Debit Card Fees, http://www.change.org/petitions/tell-bank-of-america-no-5-debit-card-fees.
37. See http://www.ipaidabribe.com/bribe-trends.
38. See http://www.cchrcambodia.org.
39. See https://www.facebook.com/elshaheeed.co.uk.
40. See http://googleblog.blogspot.co.uk/2011/01/some-weekend-work-that-will-hopefully.html.
41. See the Government of Dubai, 2011, "Arab Social Media Report: Civil Movements: The Impact of Facebook and Twitter", http://www.dsg.ae/en/publication/Description.aspx?PubID=236&PrimenuID=11&mnu=Pri&AspxAutoDetectCookieSupport=1.
42. See eMarketer, 2013, "Ecommerce Sales Topped $1 Trillion for First Time in 2012", http://www.emarketer.com/Article/Ecommerce-Sales-Topped-1-Trillion-First-Time-2012/1009649.
43. See Etsy 2013, "Redefining Entrepreneurship: EtsySellers' Economic Impact", https://blog.etsy.com/news/2013/redefining-entrepreneurship-etsy-sellers-economic-impact.
44. See http://www.etsy.com/uk/press.
45. McKinsey & Company, 2013 "Lions go digital: The Internet's transformative potential in Africa", see http://www.mckinsey.com/insights/high_tech_telecoms_internet/lions_go_digital_the_internets_transformative_potential_in_africa.
46. See http://www.kayak.co.uk.
47. See http://en.wikipedia.org/wiki/Showrooming.
48. See http://www.amazon.com/gp/feature.html?docId=aw_ppricecheck_iphone_mobile. An additional benefit of this app for Amazon is that it can build a database of retail pricing, which it can use to refine its own pricing.
49. Of course, trust violations occur, and often receive significant press, but not with a frequency that appears to impede the growth of the market. See Techcrunch 2014, "How Modern Marketplaces Like Uber and AirBnB Build Trust to Achieve Liquidity": http://techcrunch.com/2014/03/04/how-modern-marketplaces-like-uber-and-airbnb-build-trust-to-achieve-liquidity.
50. "State of the Least Developed Countries 2013", UN-OHRLLS 2013.
51. Ranked 168th in the category "Starting a Business" and 130th in "Getting Credit" out of 189 countries surveyed.
52. The Guardian, 14 December 2013 "Toxic 'e-waste' dumped in poor nations, says United Nations", http://www.theguardian.com/global-development/2013/dec/14/toxic-ewaste-illegal-dumping-developing-countries.
53. Fast Company 2013, "This African Inventor created a $100 3-D Printer from E-waste", http://www.fastcompany.com/3019880/this-african-inventor-created-a-100-3-d-printer-from-e-waste.
54. See https://2013.spaceappschallenge.org/project/wafate-to-mars.
55. PC Advisor 2013, "The top 5 Kickstarter success stories: Oculus Rift, Pebble smart watch, Ouya and more", http://www.pcadvisor.co.uk/features/internet/3471652/top-5-kickstarter-successes.
56. "The Mozilla Manifesto", https://www.mozilla.org/en-US/about/manifesto.
57. See https://github.com.
58. A language of the Bantu family, native to parts of Namibia, Botswana, and Angola, and spoken by 240,000 people. See http://en.wikipedia.org/wiki/Herero_language.
59. See http://en.wikipedia.org/wiki/List_of_wikipedias.
60. See Wikimedia Report Card at http://reportcard.wmflabs.org.
61. See http://en.wikipedia.org/wiki/File:Wikimedia_projects_edits_counter_2010-04-16.png.
62. See http://fold.it/portal.
63. Unfortunately, these platforms also carry the potential to be misused for cyberbullying, or hacked, leading to significant negative consequences. See for example USA Today, 2013, "AP Twitter feed hacked; no attack at White House" http://www.usatoday.com/story/theoval/2013/04/23/obama-carney-associated-press-hack-white-house/2106757/.
64. See eMarketer, 2013, "US Total Media Ad Spend Inches Up, Pushed by Digital": http://www.emarketer.com/Article/US-Total-Media-Ad-Spend-Inches-Up-Pushed-by-Digital/1010154.
65. World Association of Newspaper and News Publishers, http://www.wan-ifra.org.
66. See Internet Live Stats, http://www.internetlivestats.com/one-second.
67. See https://about.twitter.com/company.
68. Business Insider, 2013, "Our List Of The World's Largest Social Networks Shows How Video, Messages, And China Are Taking Over the Social Web", see http://www.businessinsider.com/the-worlds-largest-social-networks-2013-12.
69. See Superdata 2013, "INFOGRAPHIC: Digital games year in review 2013" http://www.superdataresearch.com/blog/infographic-digital-games-year-review-2013.
70. See Superdata 2013, "Brazil online games market report" http://www.superdataresearch.com/market-data/brazils-online-gaming-market.
71. Forbes 2013, "Rovio Execs Explain What Angry Birds Toons Channel Opens Up To Its 1.7 Billion Gamers", see http://www.forbes.com/sites/johngaudiosi/2013/03/11/rovio-execs-explain-what-angry-birds-toons-channel-opens-up-to-its-1-7-billion-gamers.

72. See Bloomberg 2013, "'Grand Theft Auto V' Debut Expected to Reap $1 Billion", http://www.bloomberg.com/news/2013-09-17/scuba-diving-thugs-to-reap-1-billion-with-grand-theft-.html.
73. See http://users.telenet.be/mmodata/Charts/Subs-1.png.
74. See BBC 2007, "The high cost of playing Warcraft", http://news.bbc.co.uk/1/hi/technology/7007026.stm.
75. IFPI 2013, "Digital Music Report 2013"; http://www.ifpi.org/digital-music-report-2013.php.
76. See http://www.apple.com/choose-your-country.
77. Apple Press Info 2013, "iTunes Store Sets New Record with 25 Billion Songs Sold", http://www.apple.com/uk/pr/library/2013/02/06iTunes-Store-Sets-New-Record-with-25-Billion-Songs-Sold.html.
78. Youtube Official Blog 2013, "YouTube Rewind: What you watched in 2013", http://youtube-global.blogspot.se/2013/12/youtube-rewind-2013.html.
79. Letter to shareholders, 21 April 2014, http://files.shareholder.com/downloads/NFLX/3161131289x0x745654/fb5aaae0-b991-4e76-863c-3b859c8dece8/Q114%20Earnings%20Letter%204.21.14%20final.pdf.
80. See Netflix Investor Relations: http://ir.netflix.com/results.cfm.
81. See The Wall Street Journal, 2013, "Netflix Makes Some History With Showing at Emmys", http://online.wsj.com/news/articles/SB10001424052702303759604579092061505560526.
82. Los Angeles Times 2013, "Netflix and Disney's Marvel strike blockbuster deal for new shows", http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-netflix-marvel-disney-20131107,0,3396157.story#axzz2zi3JbTRS.

CHAPTER 4 - CHALLENGES TO THE OPEN AND SUSTAINABLE INTERNET

1. Apple alone lists a total of 33 different physical keyboard localizations that it supplies with its personal computers, ranging from Arabic to Turkish. See http://support.apple.com/kb/ht2841. Further, Apple offers 60 virtual keyboards for touch-screen devices such as iPhones.
2. To power the computer, worldwide there are fourteen different plug types that must be adapted, electricity of eight different voltages that must be converted, and two different frequencies for which transformation is not possible unless the capability is built into the device (see http://www.iec.ch/worldplugs/map.htm). Of course, most computer adapters can accommodate different voltages and frequencies automatically, but the need to do so highlights the impact of not having a global standard.
3. On the fixed side, modems are different for DSL access over telephone lines, cable networks, or fibre networks, while on the mobile side, there are a jumble of different standards and frequencies for accessing mobile broadband, meaning that a mobile may need to be multi-band or multi-mode to work internationally. See http://electronics.howstuffworks.com/cell-phone12.htm for more details.
4. The costs of Internet access used here are either fixed or mobile broadband computer-based costs, see ITU 2013 "Measuring the Information Society": http://www.itu.int/pub/D-IND-ICTOI-2013. We used the fixed or mobile broadband prices depending on availability and which is the cheapest in each country. In general the cheaper of the two prices is used, but where fixed broadband penetration (which is generally lower than mobile broadband penetration in developing countries) falls below 20% of households, the mobile broadband price is used, even where this is the higher of the two prices. The mobile broadband price is for 1GB of data accessed via a dongle that connects to a computer, rather than access for a mobile phone or tablet.
   Analysing the prices of Internet access using only fixed or only mobile products would not significantly change the findings. For example, all fixed broadband prices available for Western Europe, North America, and developed Asia-Pacific fall below 2.5% of GDP per capita, while mobile prices for all but three countries in those same regions also fall below the 2.5% of GDP per capita line. These three countries are Cyprus, Greece, and the Netherlands, where mobile prices for 1GB of computer-based mobile-broadband data are 2.9%, 3.0%, and 3.6% of monthly GDP per capita respectively.
5. Note that these broadband prices do not control for the quality of the service provided, as measured for instance by maximum or average download bandwidth speeds. Instead, the affordability measure shows the affordability of broadband offers available to users in their country. Later in this section, we show differences in broadband speeds, which also serve to differentiate user experiences by country.
6. The Broadband Commission 2011, "Broadband Targets for 2015", see http://www.broadbandcommission.org/Documents/Broadband_Targets.pdf.
7. The Broadband Commission 2013, "The State of Broadband 2013: Universalizing Broadband", see http://www.broadbandcommission.org/Documents/bb-annualreport2013.pdf, pp 44-45.
8. M-Lab - Visualizations of Network Performance, see http://www.measurementlab.net/visualizations.
9. See Digital Agenda Scoreboard 2013, Belgium: Broadband Markets https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/BE%20%20-%20Broadband%20markets.pdf.
10. See Australian Bureau of Statistics, Advertised Download Speed, http://www.abs.gov.au/ausstats/abs@.nsf/Products/8153.0~June+2013~Chapter~Advertised+download+speed?OpenDocument.
11. For population density data, see http://www.tradingeconomics.com.

12. See “The Coalition’s Plan For Fast Broadband and Affordable NBN”: http://lpa.webcontent.s3.amazonaws.com/NBN/The%20Coalition%E2%80%99s%20Plan%20for%20Fast%20Broadband%20and%20an%20Affordable%20NBN.pdf.
13. See for instance Kende, M & Schuman, R. 2013 “Lifting Barriers to Internet Development in Africa: Suggestions for Improving Connectivity”: http://www.internetsociety.org/doc/lifting-barriers-internet-development-africa-suggestions-improving-connectivity.
14. For further discussion of the opportunities and challenges of deploying an IXP, see also http://www.ixptoolkit.org.
15. See The Guardian 2011 “Georgian woman cuts off web access to whole of Armenia”: http://www.theguardian.com/world/2011/apr/06/georgian-woman-cuts-web-access.
16. Gigaom 2013, “Undersea cable cut near Egypt slows down Internet in Africa, Middle East, South Asia”, see http://gigaom.com/2013/03/27/undersea-cable-cut-near-egypt-slows-down-internet-in-africa-middle-east-south-asia.
17. See OpenNet Initiative, “Pulling the Plug: A Technical Review of the Internet Shutdown in Burma”, https://opennet.net/research/bulletins/013.
18. Renesys, 2012 “Syrian Internet Is Off The Air”: http://www.renesys.com/2012/11/syria-off-the-air.
19. Renesys 2011, “Egypt Leaves the Internet”, see http://www.renesys.com/2011/01/egypt-leaves-the-internet.
20. See Renesys, 2012, “Could It Happen In Your Country?” http://www.renesys.com/2012/11/could-it-happen-in-your-countr.
21. See http://www2.ohchr.org/english/bodies/hrc/docs/gc34.pdf at paragraph 15.
22. Paragraph 3 states that “Freedom of expression is a necessary condition for the realization of the principles of transparency and accountability that are, in turn, essential for the promotion and protection of human rights.” Id.
23. Id. at paragraph 43.
24. See https://abena.crowdmap.com/main.
25. See https://groups.google.com/forum/#!topic/crisiscommons/cqjic_InrtE.
26. See Song, S. 2014 “African Undersea Cables”, http://manypossibilities.net/african-undersea-cables.
27. See ITWeb Financial, 2011 “WACS to increase competition”, http://www.itweb.co.za/index.php?option=com_content&view=article&id=43079.
28. Netflix lists the speeds of six broadband providers, over which their customers are streaming video. See http://ispspeedindex.netflix.com/costa-rica.
29. See ITU ICTEYE, “Focus Areas – Regulatory Information”, at https://www.itu.int/net4/itu-d/icteye/FocusAreas.aspx?paramWorkArea=TREG.
30. See http://www.freedomhouse.org/reports#.UtP0EbnuN9M. Freedom House measures three aspects of Internet freedom: Obstacles to Access; Limits on Content; and Violations of User Rights. For purposes of this section, we focus on Limits on Content.
31. Low scores indicate high degrees of freedom with regard to content limits, i.e. filtering and blocking of websites, censorship and use of media for social and political activism.
32. See Agenzia delle Dogane e dei Monopoli (AAMS) http://www.aams.gov.it/site.php?id=2484.
33. See EDRi, 2011 “France: Loppsi 2 adopted – Internet filtering without court order”, http://edri.org/edrigramnumber9-4web-blocking-adopted-france-loppsi-2.
34. See https://www.iwf.org.uk/about-iwf.
35. See http://www.theyworkforyou.com/wrans/?id=2008-06-16b.209620.h; https://www.iwf.org.uk/members/member-policies/url-list/iwf-list-recipients.
36. See BBC, 2008 “Wikipedia child image censored”, http://news.bbc.co.uk/1/hi/uk/7770456.stm.
37. See http://en.wikipedia.org/wiki/Internet_Watch_Foundation_and_Wikipedia.
38. See The Sydney Morning Herald, 2009 “Dentist’s website on leaked blacklist”, http://www.smh.com.au/national/dentists-website-on-leaked-blacklist-20090319-93cl.html.
39. Bahrain Information Affairs Authority: http://www.iaa.bh/policiesPressrules.aspx.
40. See http://www.herdict.org/explore/indepth?fc=BH.
41. See http://bahrainrights.org.
42. YouTube, Facebook, Google+, and Twitter are among the international sites permanently blocked by China.
43. See China Digital Times, 2013 “Saying of the Week: China’s Internet is Open”: http://chinadigitaltimes.net/2013/02/saying-of-the-week-chinas-internet-is-open.
44. See CircleID, 2009 “China Blocks Twitter, Flickr, Bing, Hotmail, Windows Live, etc. Ahead of Tiananmen 20th Anniversary” http://www.circleid.com/posts/20090602_china_blocks_twitter_flickr_bing_hotmail_windows_live/
45. Yahoo News, 2011 “Myanmar authorities unblock some banned websites”, see http://news.yahoo.com/myanmar-authorities-unblock-banned-websites-050311492.html.
46. Live broadcasts are also available on BBC iPlayer, but consumers must purchase a UK TV license in order to watch these. However, this is only an additional cost for those consumers who do not own a TV set, since any household using a TV set is required to purchase a TV license whether or not they use the iPlayer service.

47. Available in Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, Switzerland, Australia, and Canada.
See http://www.youtube.com/BBCiplayerglobal.
48. See http://iplayerhelp.external.bbc.co.uk/help/programmes/availableprogs.
49. See YouTube 2013, "Netflix Quick Guide: Why Is Netflix Different in Each Country", http://www.youtube.com/watch?v=LxnpqobGSzg&feature=youtu.be.
50. See the blog "Netflix Canada vs USA" for more information http://netflixcanadavsusa.blogspot.co.uk/2014/01/alphabetical-list-kmon-jan-13-2014.html#more.
51. See https://support.google.com/googleplay/answer/2843119?hl=en-GB. We understand that content availability continues to expand, as more and more countries receive access to content, even since we gathered our data in January 2014.
52. With over 1.7 billion downloads of the game series by November 2013, see Section 3.
53. See http://europa.eu/rapid/press-release_CJE-11-102_en.htm.
54. Here Chinese refers to the Chinese language family, which includes Mandarin and Cantonese. See http://en.wikipedia.org/wiki/Chinese_language.
55. The American Standard Code for Information Interchange, a code for representing English characters as numbers, with each letter assigned a number from 0 to 127.
56. For more information on IDNs, see http://www.icann.org/en/resources/idn. For more on the IETF's Email Address Internationalization (EAI) see http://datatracker.ietf.org/wg/eai.
57. See http://extranews.net.
58. See http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/local_content_study.pdf.
59. Brian Muita, of Angani Limited, presented this at the Internet Society's African Peering and Interconnection Forum (AfPIF) in Casablanca, Morocco, 5 September 2013. See http://www.internetsociety.org/doc/panel-session-role-research-innovation-and-entrepreneurship-brian-muita-angani.
60. For further details, see Section 3.2.2 of the following paper: Kende, M. & Hurpy, C. 2012 "Assessment of the Impact of Internet Exchange Points – Empirical Study of Kenya and Nigeria", see http://www.internetsociety.org/news/new-study-reveals-how-internet-exchange-points-ixps-spur-internet-growth-emerging-markets.
61. According to RIPE:
RIPE Atlas is a global network of thousands of probes that measure Internet connectivity and reachability, providing an unprecedented understanding of the state of the Internet in real time. The entire Internet community can access the data collected by the network, as well as Internet maps, graphs and analyses based on the aggregated results. RIPE Atlas is coordinated by the RIPE NCC, one of five Regional Internet Registries (RIRs) that support the global operation of the Internet.
See https://atlas.ripe.net.
62. The probes were scheduled to provide a one-off ping measurement to www.youtube.com which was executed on 28 February 2014 at 05:17 UTC; 4,875 probes across 126 countries provided data. The probes were also scheduled to provide a one-off ping measurement to www.facebook.com on 24 April 2014 at 20:45 UTC; 5,257 probes across 136 countries provided data.
63. For more information on the operation and benefits of a cache, see http://en.wikipedia.org/wiki/Web_cache.
64. For more information on the GGC, see https://peering.google.com/about/ggc.html.
65. The Next Web, 2013 "Facebook opens its first data center outside the US, near the Arctic Circle in Luleå, Sweden": http://thenextweb.com/facebook/2013/06/12/facebook-opens-its-first-data-center-outside-the-us-near-the-arctic-circle-in-lulea-sweden.
66. See The Guardian 2013, "We cannot afford to be indifferent to Internet spying", http://www.theguardian.com/technology/2013/dec/09/internet-surveillance-spying.
67. See BBC, 2013 "Edward Snowden leaks: NSA 'debates' amnesty", http://www.bbc.co.uk/news/world-us-canada-25399345.
68. See interview with Glenn Greenwald, GQ, May 2014, "The Man Who Knows Too Much", http://www.gq.com/news-politics/newsmakers/201406/glenn-greenwald-edward-snowden-no-place-to-hide.
69. See The New York Times, 2014 "Revelations of N.S.A. Spying Cost U.S. Tech Companies", http://www.nytimes.com/2014/03/22/business/fallout-from-snowden-hurting-bottom-line-of-tech-companies.html.
70. See Financial Times, 2014 "Microsoft to shield foreign users' data", http://www.ft.com/cms/s/0/e14ddf70-8390-11e3-aa65-00144feab7de.html#axzz2ri2Hk2sM.
71. See The Huffington Post, 2013, "Marco Civil: Brazil's Push to Govern the Internet", http://www.huffingtonpost.com/t-a-ridout/brazils-push-to-govern-the-internet_b_4133811.html.
72. See Bloomberg, 2014 "Brazil House Passes Internet Bill as Data Demand Dropped", http://www.bloomberg.com/news/2014-03-26/brazil-house-passes-internet-bill-as-data-demand-dropped.html.
73. See Reuters, 2013 "Brazil's anti-spying Internet push could backfire, industry says". See http://www.reuters.com/article/2013/10/02/us-brazil-internet-idUSBRE9910F120131002
74. See http://en.wikipedia.org/wiki/Beggar_thy_neighbour.

Internet Society

A global, cause-driven organization, the Internet Society is a leading advocate for the ongoing development of the Internet as an open platform that serves the social, economic, and educational needs of people throughout the world.

Founded in 1992 by several Internet pioneers, the Internet Society works in the areas of technology, policy, and development to promote an open, accessible Internet for everyone. A shared vision of keeping the Internet open unites the 60,000 individuals, more than 100 Chapters, and more than 150 Organizations around the world that are members of the Internet Society. Together, we represent a worldwide network focused on identifying and addressing the challenges and opportunities that exist online today and in the years ahead.

To achieve our mission, the Internet Society:

- Champions public policies that support a free and open Internet;
- Facilitates the open development of Internet standards and protocols to allow everyone to connect to everything on line;
- Offers discussion forums on issues that affect Internet evolution, development, and use in technical, commercial, societal, and other contexts;
- Works globally on Internet issues, leveraging Regional Bureaus and Chapters for collaboration and engagement that strengthens our impact and relevance at the local level; and
- Promotes professional development and builds community to foster participation and leadership in areas important to the Internet's evolution.

For more information, visit www.internetsociety.org

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