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**The impact of Internet
connectivity on economic
development in Sub-Saharan
Africa**

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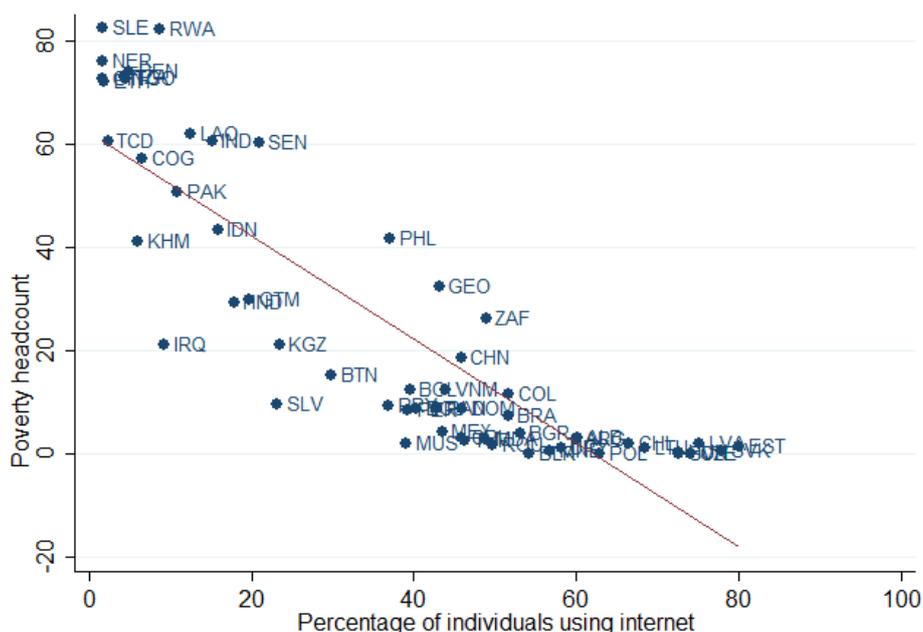
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Abbreviations

AMREF	African Medical Research and Education Foundation
BIC	Brazil, India, China
CIS	Commonwealth of Independent States
GDP	Gross Domestic Product
GNI	Gross National Income
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Federal Enterprise for Technical Cooperation)
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
ITU	International Telecommunication Union
Mbps	Megabit per second
MDG	Millennium Development Goal
POS	Point of Sale
PPP	Purchasing Power Parity
SME	Small- and Medium-sized Enterprise
SSA	Sub-Saharan Africa
UNPACS	United Nations Public Administration Country Studies
USD	United States Dollar
WHO	World Health Organization

development and established that the Internet is a dynamic tool for stimulating growth. In particular, with specific reference to developing countries, a macro-level econometric analysis performed by the World Bank (2009) reports that a 10% increase in broadband and a 10% increase in wire line Internet penetration are associated to a 1.38% and a 1.12% increase in GDP growth, respectively¹. Despite the attempt to provide robust estimates, the study does not explicitly deal with the endogeneity issue originated from the potential reverse causality between Internet penetration and economic growth. This could have biased the results, which need to be carefully looked at.

Figure 2: Percentage of Internet users and poverty headcount ratio, \$2/day (2011-2013).



Source: Adapted from ITU and World Bank data.

Empirical literature has also studied the impact of broadband accessibility and speed on development. A microeconomic study (Ericsson, 2013) using survey data of both developing and developed countries established that doubling broadband speed can increase GDP growth of an economy by 0.3%. Specifically in BIC countries, introducing a 0.5 Mbps broadband connection increases household income by USD 800 per year, and upgrading the broadband connection from 0.5 to 4 Mbps raises household income by USD 46 per month. However, as also mentioned in the report, the sample size for BIC countries (just above 3,000 respondents aged 15-69) is relatively small, and consequently the results should be interpreted with care.

As a consequence, existing cross-country differences in Internet penetration and access may create significant long-run growth benefits for the most connected countries.

1.2 Aim of the report

The purpose of this report is to identify and analyse existing evidence on the impact of increased Internet connectivity on economic development in Sub-Saharan Africa (SSA). In particular, the study attempts to summarise key findings from the literature on the benefits and opportunities for business development (including SMEs) and poverty reduction (focusing on the impact on lower income Internet users) in the developing world.

¹ The same study also concludes that the Internet has a higher growth impact relative to other Information and Communication Technologies (ICTs), such as for example fixed and mobile telephony (0.73% and 0.81% increase in GDP growth, respectively).

The report intends to inform wider strategy for economic development in SSA through the promotion of Internet connectivity and usage policies and programmes.

1.3 Methodology

The analysis contained in this report has been conducted through desk research. The report describes evidence available from a literature review on the impact of Internet usage on economic development – covering research papers, government, multilateral and independent reports, as well as discussion and working papers. In addition, the study also discusses data and findings from various broad-based surveys of individuals and firms in SSA, as well as a few success stories of initiatives and programmes implemented in various Sub-Saharan African countries.

The literature on the advantages and disadvantages of the diffusion and use of the Internet for economic development is growing quickly, although extremely recent. For the purpose of this study, the discussion of case studies and impact estimates mainly focuses on Sub-Saharan African countries. Contrary to many previous studies, which define 'economic development' narrowly by concentrating mainly on GDP levels and growth, we expand our focus to many different dimensions of socio-economic development, attempting to provide a detailed analysis of the value of the Internet.

1.4 Structure of the report

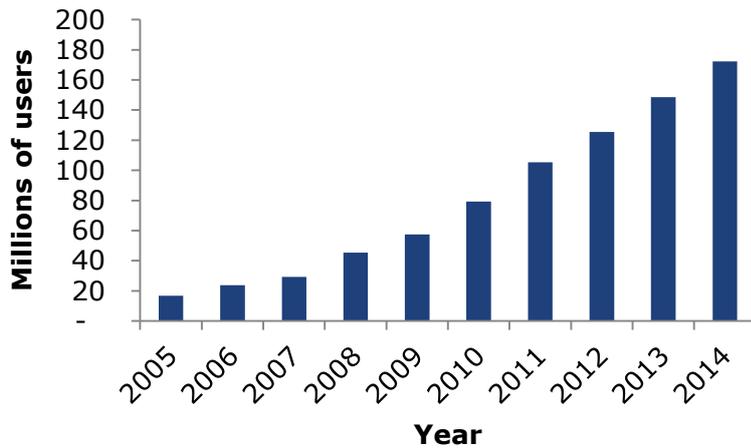
The report proceeds as follows. Section 2 will provide a background on Internet connectivity in SSA, and analyse Internet use and penetration, as well as Internet access and some relevant issues related to it (such as, for example, Internet prices and speed). Section 3 will examine, with the use of data and findings from business surveys, the effect of Internet connectivity on SMEs development, growth and survival. Section 4 will discuss the impact of Internet on other dimensions of socio-economic development, such as social and financial inclusion, health, education and agriculture, with a particular focus on the poor and also including a few successful Internet connectivity initiatives. Section 5 will summarise the main findings of the report and suggest conditions and implications for policy implementation.

2 Internet connectivity in Sub-Saharan Africa

2.1 Internet penetration and accessibility

The ITU (2014c) estimates that by the end of 2014 there will be almost 3 billion Internet users in the world. About two thirds of them will come from the developing world, where the number of Internet users has been growing rapidly and is expected to double in only 5 years (from 974 million in 2009 to 1.942 billion in 2014). In Africa, in particular, Internet penetration has grown more than tenfold, from 17 million Internet users in 2005 to an estimated 172 million in 2014 (see the Figure below).

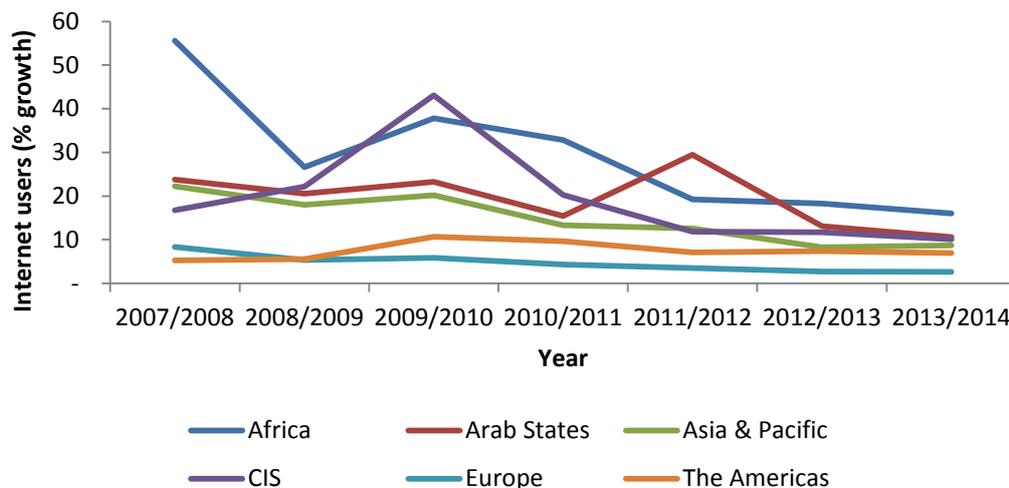
Figure 3: Individuals using the Internet in Africa, in millions (2005-2014).



Source: Adapted from ITU data.

According to the ITU statistics (2014a), Africa is the fastest growing region in the world in terms of Internet penetration, with a growth rate in Internet users (see Figure 4 below) of 16.05% between 2013 and 2014 (more than twice as high as the global average growth of 7.85%).

Figure 4: Individuals using the Internet by region, annual growth rates (2007-2014).

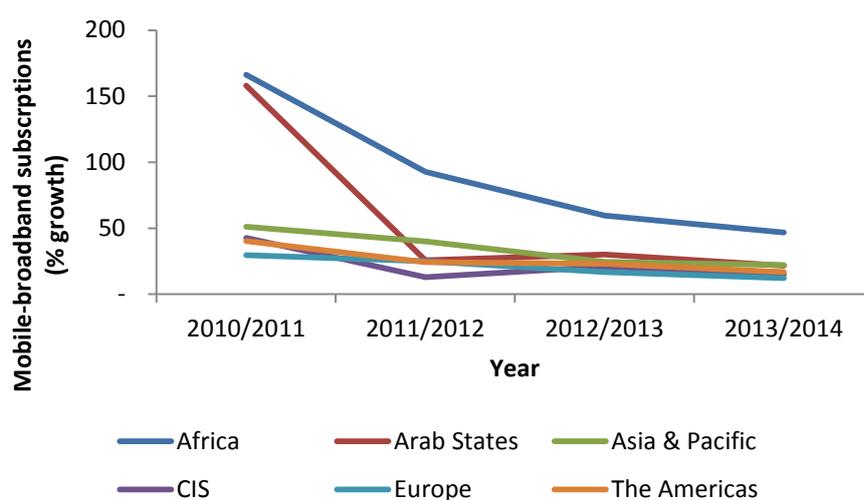


Source: Adapted from ITU data.

This growth has been mainly driven by a vast expansion in mobile-broadband, a market segment growing very fast in the whole world. Mobile-broadband penetration in Africa is

estimated to reach 19.0% in 2014², up from only 1.8% in 2010. Moreover, despite a considerable slowdown in growth since 2010-2011, mobile-broadband subscriptions are still rising at a rate of 46.73% today (as can be seen in the Figure below). A great number of mobile Internet users are mobile-only, especially in developing countries³. In Africa, 38% of online page views are from mobile devices, and mobile continues to grow extremely quickly as a source of Internet traffic: mobile Internet usage (as a percentage of overall Internet use) in Africa has increased by 18% in the last year, between May 2013 and May 2014 (Meeker, 2014). Additionally, smartphone penetration is today 31% in Kenya, 29% in Nigeria and 47% in South Africa (On Device Research, 2014).

Figure 5: Active mobile-broadband subscriptions by region, annual growth rates (2010-2014).



Source: Adapted from ITU data.

However, the potential of the Internet is still largely unexplored in Africa, and in particular in SSA, which is the main focus of this study. As a matter of fact, Internet penetration in the continent, despite rocketing in recent years, was just 2.4% in 2005, 9.8% in 2010 and will reach only 19.0% by the end of 2014. This is a much lower figure than anywhere else in the world⁴. Moreover, only approximately 6% of the world's Internet users live in Africa, despite it being home to more than 15% of the world's total population (ITU, 2014a). Furthermore, Internet use in Africa is mainly an urban phenomenon: even in South Africa, only 24% of Internet users are rural (Balancing Act, 2014).

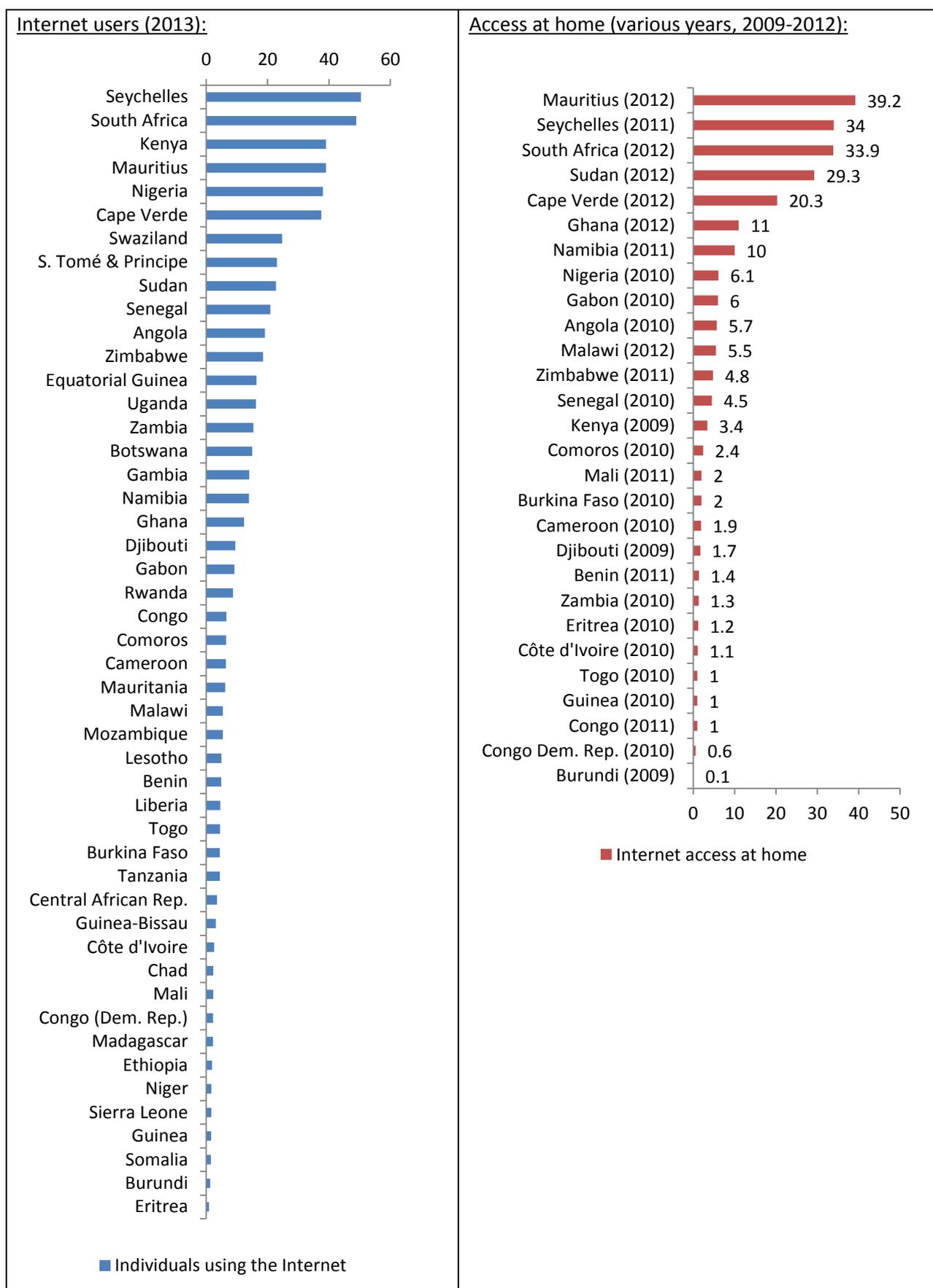
The diffusion of the Internet cannot be measured only in terms of the number of connected individuals, but also in terms of its accessibility. By the end of 2014, only around one out of ten households (11.1%) will have Internet access at home in Africa, contrary to an average of 31.2% in all developing countries (ITU, 2014a). Nevertheless, these figures were considerably lower in 2009-2010 when Internet access in the home was around 6.5% (average for a sample of Ghanaians, Kenyans, Tanzanians and Zambians) (Audience Scapes, 2010).

² On the contrary, despite double-digit growth over the last four years, fixed-broadband penetration in Africa is very low, at only 0.4% in 2014. This is to some extent due to low computer penetration (only 7.8% of households in Africa have a computer).

³ In Kenya, for example, mobile data/Internet subscriptions (13.26 million) account for 99.26% of total Internet subscriptions (13.36 million) (Communication Authority of Kenya, 2014).

⁴ Internet user penetration has reached 40% globally and 32% in the developing world (ITU 2014).

Figure 6: Percentage of individuals using the Internet and accessing it at home, SSA.



Source: Adapted from ITU data

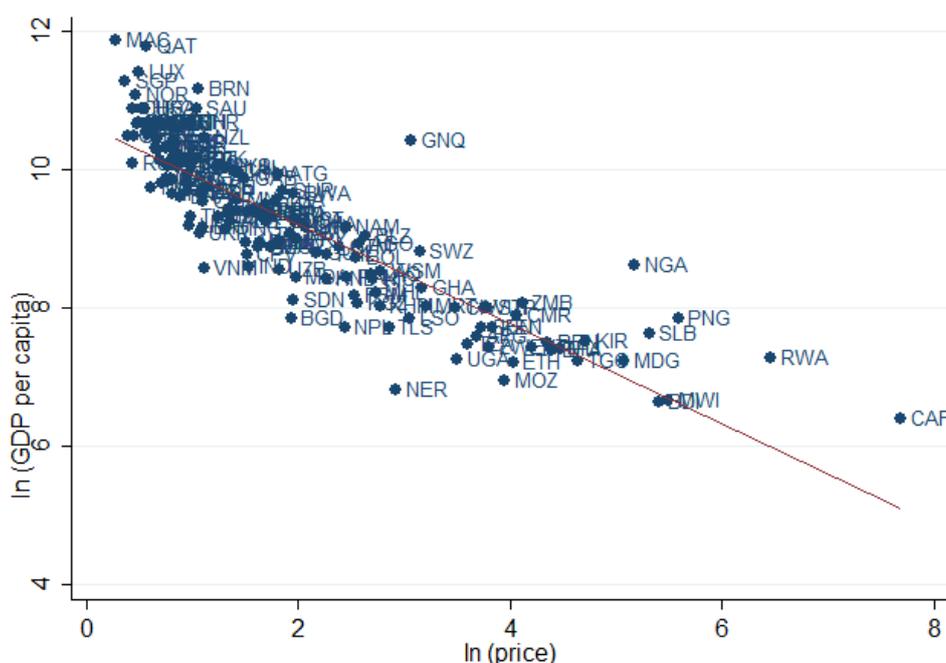
In the same survey of more than 8,000 adults in four Sub-Saharan African countries (Ghana, Kenya, Tanzania and Zambia) carried out in 2009-2010 by Audience Scapes (2010), among the Internet users only 18.6% are found to access Internet most frequently at home, the other respondents are connected mainly at work (16.7%), in Internet cafes (31.7%) and via mobile phone or other devices (7.1%).

Nonetheless, large variations exist across different countries. In particular, in SSA (see the Figure above), Seychelles and South Africa rank highest in Internet penetration (with 50.40% and 48.90% of Internet users, respectively); while the countries with the least Internet penetration are Eritrea and Burundi (only 0.90% and 1.30%, respectively). Seychelles and South Africa are also among the top three countries in SSA in terms of Internet access at home (where 34.0% and 33.9% households have access to Internet, respectively), together with Mauritius (39.2%); whereas Burundi appears again at the bottom of the ranking (with only 0.1% of the households connected to the web) (ITU, 2014a).

2.2 Barriers to the expansion of the Internet: price and speed

A variety of factors may impede the access and penetration of the Internet. Only 26.6% of the individuals sampled in Ghana, Kenya, Tanzania and Zambia (Audience Scapes, 2010) think that the Internet is easy to use, 40.7% of them believe that it is difficult to find places where they can access the Internet, and for 45.3% of the respondents Internet access is expensive. In particular, the price of the Internet is very critical for policies aimed at increasing Internet connectivity in developing countries. Despite the fact that broadband is becoming more affordable in the world – over the past five years, fixed-broadband prices as a share of GNI per capita have dropped by 65% (Broadband Commission, 2014b) – the Internet is still too highly priced in a variety of developing countries. Affordability relates to service pricing, as well as the cost of smart-phones, tablets, laptop computers or other devices which permit Internet access.

Figure 7: Fixed-broadband prices and PPP GDP per capita, current international \$ (2013).



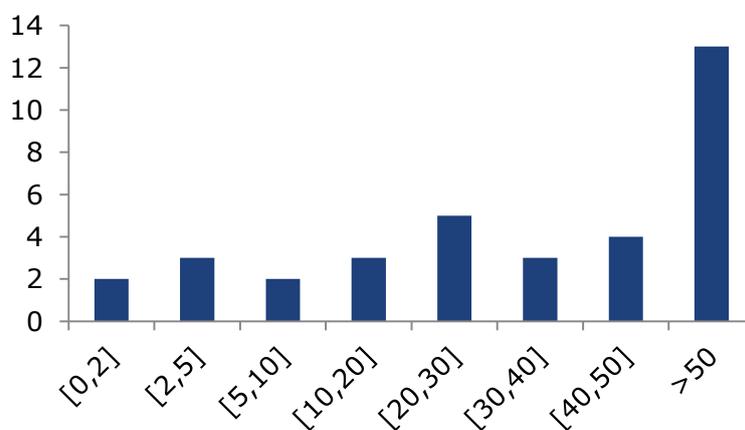
Source: Adapted from ITU and World Bank data.

If we assume that individuals can afford broadband only if it costs less than 5% of their annual income, around 1.7 billion people around the world do not possess enough money to have fixed-broadband access and over 2.6 billion people cannot afford mobile-broadband

(Broadband Commission, 2014b). At the end of 2013, on average, the cost of an entry-level fixed-broadband plan in the developing world was 25.8% of GNI per capita (ITU, 2014b)⁵. Fixed-broadband prices (relative to GDP per capita) seem to be negatively correlated to the level of economic development of the country. Figure 7 above plots cross-country data on fixed-broadband prices and GDP per capita. The diagram exhibits a strong negative correlation between the two variables.

Africa is the region with the most expensive fixed-broadband prices, with an average price of more than 100% of GNI per capita, consistent with fixed-broadband penetration in the region. Figure 8 below shows how, in SSA, fixed-broadband prices are higher than 5% of GNI per capita in 30 out of 35 countries (ITU, 2014b). Moreover, in 13 countries in SSA the cost of the Internet is greater than 50% of GNI per capita. In particular, the figure is shockingly high for the Central African Republic, where the price of fixed-broadband is 2193.65% of GNI per capita; in other 6 Sub-Saharan African countries (Togo, Madagascar, Nigeria, Burundi, Malawi and Rwanda) the cost of fixed-broadband is also more than 100% of GNI per capita (ITU, 2014b).

Figure 8: Fixed-broadband prices, as a percentage of GNI per capita, SSA, 2013.



Source: Adapted from ITU data.

Despite it being the conventional measure of broadband prices proposed by the ITU, it could be argued that expressing broadband prices as a percentage of GNI might reflect the level of economic development of the country more than the cost of broadband. Consequently, we collect data on monthly fixed-broadband prices (PPP USD) from the International Broadband Pricing Study (2014). When ranking the prices of the cheapest listed plan by country in December 2013, it is possible to notice that 8 out of the 10 most expensive countries are in Sub-Saharan Africa (for example, the cheapest monthly fixed-broadband plan costs \$237.5 in Burundi, \$186 in Uganda and \$106.82 in Madagascar).

Despite mobile-broadband penetration in Africa being higher than fixed-broadband, a similar story can be told in relation to its prices. The average prices for a computer-based mobile-broadband service with 1GB monthly data allowance and a handset-based plan with 500MB monthly allowance are more than 22% and 15% of GNI per capita in Africa, respectively. In the rest of world, average prices for mobile-broadband are less than 10% of GNI per capita⁶ (ITU, 2014b).

Another important issue related to Internet connectivity in SSA is related to the reliability of the Internet connection: in the continent there are indeed vast cross-country and cross-city differences in broadband speed. The testing company Ookla provides monthly rankings of global Internet speeds in the form of an Internet index, NetIndex (Ookla, 2014). Today

⁵ As opposed to less than 2% in the developed world.

⁶ And again less than 2% in the developed world.

(November 2014), the countries with the slowest average broadband download speed in the world are in SSA – Niger (0.60 Mbps), Burkina Faso (0.84 Mbps), Gambia (1.39 Mbps), Guinea (1.40 Mbps) and Benin (1.52 Mbps) –, with figures much below the global average download speed (21.5 Mbps). Also, Sub-Saharan African countries retain the slowest average broadband upload speeds – Niger (0.21 Mbps), Burkina Faso (0.29 Mbps) and Guinea (0.44 Mbps) –, as opposed to a global and a G8 average of 9.8 and 11.4 Mbps, respectively. In terms of mobile data speed, Sudan is at the bottom of the rankings, with 1.85 Mbps download and 0.46 Mbps upload speed⁷. Even the Sub-Saharan African countries with the fastest connectivity are very far from the world averages⁸ (Ookla, 2014).

However, the speed of the Internet connection is accelerating fast in all Sub-Saharan African countries, and in particular in urban areas. This is evident by looking at data for the last 4 years in some of the largest cities in the continent. The average broadband speed in Lagos, Nigeria, was 0.77 Mbps in November 2010 and 5.71 Mbps today; Johannesburg, South Africa, saw a doubling of average broadband speed, from 3.09 Mbps in November 2010 to 7.41 Mbps today; Dar Es Salaam, Tanzania, experienced an even greater acceleration, going from an average of 0.6 Mbps 4 years ago to 6.7 Mbps today (Ookla, 2014).

In conclusion, Internet access and use is increasing, and it is expected to continue to do so over the next few years, in many Sub-Saharan African economies. According to a survey of Internet users in Tanzania and Zambia (Audience Scapes, 2010), a sizeable 27.7% of the individuals who access the Internet today started using it less than a year ago, nearly half (45.9%) of them between 1 and 5 years ago, while only 14.7% started using it more than 5 years ago. Concerning mobile Internet in Kenya, Nigeria and South Africa (On Device Research, 2014), the figures are similar, with nearly one third (29%) of the users coming online for the first time on their phones in the last 12 months, 41% between 1 and 5 years ago and 30% of them going online over 5 years ago. Internet users in SSA are consequently young and unexperienced. However, there is increasing awareness of the significance of the Internet: 49% of the adults in Ghana, Kenya, Tanzania and Zambia (Audience Scapes, 2010) intend to use the Internet in the future.

This point is fundamental when analysing the impact of Internet connectivity, expected to increase significantly in the next few years. World Wide Worx (2012) suggested that *"it is time on the Internet, rather than numbers on the Internet"* to determine its impact. As a matter of fact, only individuals with some experience (around 5 years) on the Internet are ready to engage with the high-end services of the digital economy (such as, for example, Internet finance and online shopping).

A study by Balancing Act (2014), with consumer and business survey data from several Sub-Saharan African countries, predicts that Internet connection ownership will increase to 10-25% of the population over the next five years.

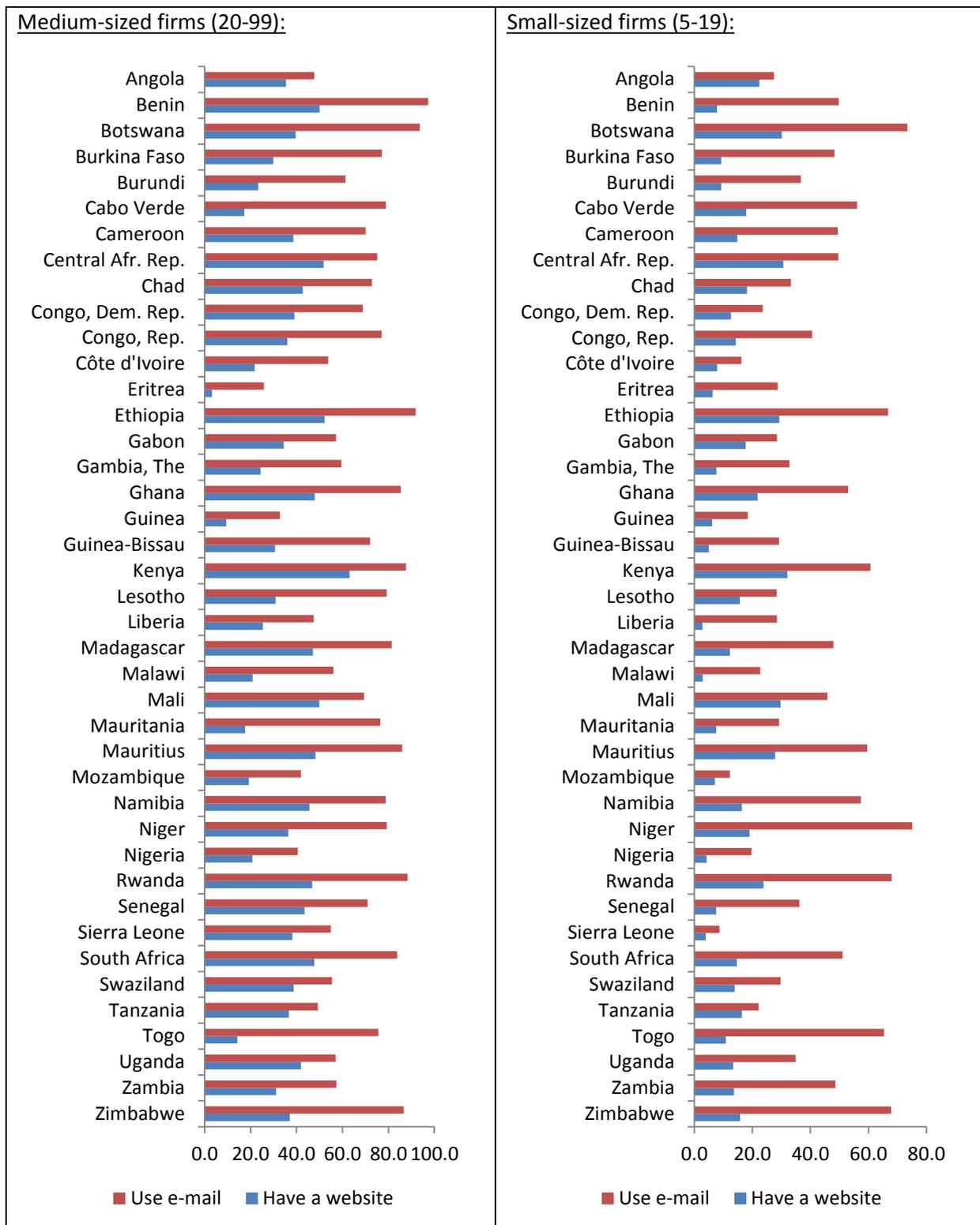
⁷ The world average download speed is 11Mbps and upload speed is 4.5Mbs.

⁸ Mauritius (16.89Mbps) has the fastest broadband download speed, Madagascar has the fastest upload speed (10.16Mbps) and South Africa has the fastest mobile data download and upload speed (9.64Mbps and 3.40Mbps, respectively).

3 Impact on SMEs growth

Small- and medium-sized enterprises (SMEs) are important drivers of economic development in SSA, where it is estimated that they account for about 90% of all businesses.

Figure 9: Use of emails and websites (as a percentage), SMEs, SSA, various years (2006-2013).



Source: Adapted from World Bank data.

They are, for example, 91% of formal businesses in South Africa, 92% in Ghana and 98% in Mozambique (Abor & Quartey, 2010; Accenture, 2014).

Recent studies (Madon, 2000) have found that Internet usage contributes to profitability, productivity, competitiveness and survival of SMEs. However, according to the World Bank Enterprise Survey data (World Bank, 2014a), a large number of companies in SSA are not connected to the web. For a majority of the countries, only 20% (or less) of small firms and 45% (or less) of medium firms have their own website, and only 60% (or less) of small firms and 80% (or less) of medium firms use emails to interact with clients and/or suppliers (see Figure 9 above). As a result, this is an important yet vastly unexplored opportunity for sector growth.

In particular, the Internet has been found to produce both top-line growth and bottom-line improvements for SMEs (Dalberg, 2013).

3.1 Firm profitability

On the one hand, SMEs are able to derive profits from the Internet as it enables companies to cut costs and increase revenues – in particular, they benefit from improvements in communications, access to information and marketing.

Firstly, Internet connectivity removes the need for proximity to customers, allowing businesses to market their products outside of their local community and consequently have access to a broader pool of clients and consumers (Dalberg, 2013).

Secondly, Internet connectivity lowers communication and transaction costs and it improves the availability and the exchange of information, reducing information asymmetries and enabling sellers and buyers to access markets at a cheaper cost (Clarke & Wallsten, 2006; World Bank, 2009). With the web, companies can establish increasing commercial connections with customers, business partners, suppliers and information resource providers (Madon, 2000).

Thirdly, the Internet provides an improved and cheaper platform for marketing and advertising, the effectiveness of which has been recently boosted by the exponential increase in social networking, where customers can share their experience with other online users (Chukwu & Uzoma, 2014). There are almost 80 million active social network users in Africa today, corresponding to a social penetration⁹ of around 7% of the total population (We Are Social, 2014). According to a survey of more than 8,000 adults in Ghana, Kenya, Tanzania and Zambia in 2009 and 2010 (Audience Scapes, 2010), 19.8% of the respondents who use the Internet visit a social networking website at least once a day, and an additional 15.2% at least once a week. Similarly, there are almost 10 million Facebook users in South Africa, where Facebook penetration is approximately 19%¹⁰. These individuals spend on average approximately three hours per day on social media channels (We Are Social, 2014). Internet users who also utilise social networks are more likely to be active online. For example, in South Africa, online social media users are more than twice as likely to go online daily (75%) than other Internet users (35%) (Balancing Act, 2014).

Fourthly, Internet connectivity presents an opportunity for direct online sales. E-commerce has been growing rapidly in SSA, but hindered by the lack of support services such as delivery systems and online payment platforms, which generate resistance to electronic payments. These benefits are found to be particularly relevant for firms in information-intensive service sectors, such as financial markets, consulting, travel and tourism, etc. (World Wide Worx, 2012). The McKinsey Global Institute (2013) estimated that, by 2025, e-commerce will account for 10% of total retail sales in Africa's main economies (corresponding to \$75 billion in annual online sales).

Finally, another potential positive impact of Internet connectivity on the SMEs sector relates to business creation. By enabling innovation, quicker diffusion of ideas and knowledge, and greater networking, the digital economy allows access to new markets. However, despite a

⁹ Based on active users of the largest active social network in the country.

¹⁰ There are also 12 million Facebook users in Nigeria, almost 4 million in Kenya and almost 2.5 million in Ghana.

very large contribution of SMEs development to the overall national growth, the creation rate of new SMEs in Africa is low.

In Nigeria, the initiative 'Get Nigerian Businesses Online' has helped small businesses gain online presence, bringing more than 25,000 businesses onto the web since 2011, driving marketing and awareness, and consequently business growth in the Nigerian SMEs sector (Dalberg, 2013). Similarly, in South Africa, 'Woza Online', launched in January 2012, enabled SMEs to build their own websites at no cost. In the first two months following its introduction, 11,200 SMEs created a website (World Wide Worx, 2012).

Concerning the opportunities for expanding e-commerce, in Nigeria, Cash on Delivery solutions, as seen for example with Jumia and Konga Nigeria Limited, two major online retailers (Chukwu & Uzoma, 2014), have been gradually substituted by cashless policy campaigns. Cash payment systems, in fact, are more costly (in terms of banking, cash transfer services, risk of robberies and damage to cash) and less transparent than electronic payments. Also, if predominant, they result in great amounts of money outside of the formal economy, which limit the effectiveness of the monetary policy. In 2011, the Nigerian Central Bank pushed for the implementation of the Cashless Initiative Nigeria, which aimed at encouraging the use of Internet banking, point of sale terminals and mobile money payment systems (Odior, & Banuso, 2012). As a consequence, the number of Internet banking transactions increased to over 1.5 million in 2011, with a total value of over 2 billion Naira (equivalent to 11.31 million USD), the number of POS terminals rose to 103,000, and the Central Bank experienced savings of about 1.2 billion Naira (equivalent to 6.79 million USD).

3.2 Firm efficiency

On the other hand, Internet connectivity increases SMEs' firm efficiency by improving internal information, business organisation and supply chain management. Firstly, important gains originate from network integration and diffusion of corporate information and knowledge (World Bank, 2009). Secondly, cloud computing may help scale up businesses by decreasing labour and equipment, as well as software and electricity bills¹¹. This seems to be particularly promising in sectors like agriculture and heavy industries (Dalberg, 2013).

According to a survey of over 1,300 businesses across Ghana, Kenya, Nigeria and Senegal (Dalberg, 2013), more than 80% of SME owners believe that their businesses benefit from the Internet, and 70% of them expect this would lead them to hire new employees as a result of such a business expansion.

This is consistent with the results of a survey of 2,000 SME owners and decision-makers in South Africa (World Wide Worx, 2012), which observes that having a website is positively correlated with profitability and survival of the business. Among the companies which have a website, 30% declare that their business would not be possible without it¹², and 79% of them report to be profitable (with 30% of these stating to be strongly profitable). These are much larger figures compared to those of companies without a website (only 59% of these report profitability, and just 14% declare to be strongly profitable). In addition to this, only 5% of SMEs with a website declare running at a loss, contrary to 16% of those without a website. It is difficult to infer causality from these statistics; however, given a high number of profitable companies declared that their businesses would not be possible without the Internet, we can deduce a general positive effect of the Internet on profitability.

Finally, in support of the previously mentioned arguments, a high proportion of SME owners (between 39% and 42%) regard the Internet as a key tool to contact and be contacted by customers, important to update the inventory and display the latest available products, and significant for company sustainability, business growth and competing for a market share with other equivalent businesses (World Wide Worx, 2012). Another important finding of the South African study is that the larger or the older an organisation, the more likely it is to have a

¹¹ However, the usefulness of cloud computing is obstructed by the fact that more than 50% of SMEs surveyed in Ghana, Kenya, Nigeria and Senegal in 2013 still managed less than 50% of their business administration digitally (Dalberg, 2013).

¹² This means that around 1.56 million jobs in South Africa would be in jeopardy in the absence of the Internet.

website (World Wide Worx, 2012). Consequently, if a recently formed SME immediately creates a website, this could help by giving customers the impression that it is actually an established and/or a large business, thus potentially boosting its development.

Besides business owners, individuals as consumers also perceive the relevance of the Internet for SME growth. As recorded by a previously mentioned survey of Ghanaian, Kenyan, Tanzanian and Zambian individuals aged 15 or older (Audience Scapes, 2010), 47.5% of the respondents think that the Internet is useful in business and 79.3% of the Internet users believe that the web is an important source of information on business issues, for example market opportunities. Additionally, among the Internet users, a significant number of individuals regularly use the web for financial transactions, such as paying bills and money transfers (3.4% of them at least once a day and an additional 3.0% at least once a week) or to purchase a product or service (2.3% of them at least once a day and 3.0% at least once a week).

The McKinsey Global Institute (2013) estimated that, by 2025, Internet-related productivity and efficiency gains (including cost savings, consolidated supply chains and digitised payment collections) in the African retail sector will be between \$16 billion and \$23 billion.

4 Impact on economic development and the poor

Governments and international agencies have widely recognised the relevance of furthering the access to the Internet especially in developing countries, where the potential marginal impact of enhanced network communications is very high (Madon, 2000). Also, the Internet can serve as a useful tool to fulfil the new post-2015 development agenda, which aims at creating an inclusive knowledge-based society, as well as partnerships and integrated solutions with the community. Evidence shows that poor and vulnerable people can be empowered by strengthening their capacity of receiving and using knowledge and helping them make more informed decisions, with benefits in terms of social and financial inclusion, access to education and health, agriculture, governance and sustainable development (Broadband Commission, 2014b).

According to Audience Scapes (2010), in fact, the web is an important source of information on health issues (for example, treatments and vaccination, as well as the cost of care) for 82.5% of Internet users in Ghana, Kenya, Tanzania and Zambia; while 86.5% of Internet users believe it is important for information on education (for example, school enrolment and training); 68.3% of them considers it key for information on agriculture (such as crop and livestock management and agricultural market prices); and 65.0% think it is relevant for information on government services (for example, national social security). Particularly concerning government services, a relatively large share of the population regularly uses the Internet to obtain information from their websites (7.8% at least once a day and 10.4% at least once a week).

In a survey of 2,000 mobile Internet users conducted by On Device Research (2014) in October 2014, 68% of Kenyans, 62% of Nigerians and 61% of South Africans find that mobile Internet has “greatly improved” their lives, helping them save time and money. In particular, they opine that mobile Internet has provided better access to education, entertainment, news, health and job related information. It has also made it easier to pay bills, send money and airtime to others, and check their bank balance. Finally, it has improved relationships, allowing people to feel more connected to the world, stay in touch with friends and family, meet new people and make friends.

This chapter will consequently summarise the known impact of Internet connectivity on the following sectors:

- a. Financial inclusion
- b. Social inclusion
- c. Health
- d. Education
- e. Agriculture

4.1 Financial inclusion

The already mentioned e-business and e-commerce, as well as other online financial services, may help increase financial inclusion. Despite the recent advancements in mobile payments and money solutions, according to the World Bank (Demirguc-Kunt & Klapper, 2012), only 24% of the population (and only 13% of the bottom 40% income population) in SSA has access to a formal financial institution. Mobile and Internet-enabled solutions, therefore, have the potential to drive financial inclusion, providing a full set of financial services – payments, credit, asset financing, loans, savings and insurance – to individuals and businesses, reducing transaction costs and distance, and therefore allowing for the expansion to a broader base of the population (McKinsey, 2013).

With the adoption of Internet-enabled solutions (online payments, as well as online micro-savings, microcredit and micro-insurance), by 2025, more than 60% of Africans could have access to financial services and more than 90% could perform daily transactions on the mobile (McKinsey Global Institute, 2013).

Specifically, insurance services seem to be a key area to develop. According to Demirguc-Kunt and Klapper (2012), only 3% of adults in SSA have access to health insurance (and only 1-2% of individuals have access to life insurance), and only 6% of people have an agricultural insurance that could safeguard against commodity price and weather shocks. Health problems, in particular, can adversely affect the finances of poor families, which may be forced to draw on existing savings, sell assets, withdraw children from school, etc.

An example of the benefits of the Internet for financial inclusion is given by the digitisation of Kenya's National Health Insurance Fund¹³. In 2006, claims processing was digitised, enabling faster operations, decentralisation and efficiency; members were able to register online and link their bank account for payroll deductions; also, a common platform for bank and hospital information was created. Dalberg (2013) argued that this procedure made claims processing six times faster and helped reduce administrative costs by 47%, with 2/3 of the operational efficiency gains to be attributed to the Internet.

4.2 Social inclusion

With the Internet, poor people have the potential to be better organised, better connected to each other, to the state and to the people abroad (Madon, 2000). As already mentioned, the intensified use of social media is one of the main stylised facts characterising the increased access to the Internet in the developing world. Social media have the potential of boosting collaboration and social inclusion, at all levels of the society, as well as increasing freedom of expression (Broadband Commission, 2014a). Also, they have been able to promote the diffusion of crowdsourcing.

Furthermore, e-governance helps promote inclusive societies and boosts accessibility to services for all individuals. E-governance, e-diplomacy and e-voting help enhance the interactions between government and citizens and can generate improvements in transparency and accountability, and prevent corruption. The Internet can help make decision-making processes easier to trace and to understand, reinforcing the electoral and legislative systems, improving the access to justice and increasing the government's service delivery capacity. This is especially relevant in SSA, where public administration is characterised by inefficiencies and limited capacities, labelled as not very responsive to citizens and not always legitimised (Schuppan, 2009). Sub-Saharan African countries, in fact, rank very low in the world in terms of governance indicators (World Bank, 2014a)¹⁴.

Many countries implemented platforms where citizens can participate in processes involving land-use plans and/or budgetary decisions. Also, drafts of legislations are now available online in a variety of countries, and it is possible for citizens to discuss them and give their feedback.

Nevertheless, e-government in SSA is widening at a relatively slow pace, because of not sufficient e-readiness and the presence of a few failure cases (Heeks, 2002). According to UN data (UNPACS, 2014), the e-government development index in Africa is on average 0.2660 (compared to a world's average of 0.4712), with only Mauritius (0.5338, ranked 76th in the world), Seychelles (0.5113) and South Africa (0.4869) above the world's average, and with 17 Sub-Saharan African countries among the worst 20 ranked countries in 2012. Similarly, the e-participation index in Africa is on average 0.2189, with only Kenya (0.6471, ranked 33rd in the world), Mauritius (0.5294), Rwanda (0.5098) and Zimbabwe (0.4510) above the world's average of 0.3947.

An example of a successful e-governance story is a system of online reporting of corruption ('Business Keeper Monitoring System') introduced in Kenya in 2006 by the GTZ. Previously, corruption cases could only be reported personally – by e-mail, telephone or fax, but without the protection of anonymity –. As a result of the establishment of the online monitoring system, the quality of corruption reports improved. In 2009, investigators classified 37.8% of online reports as relevant, contrary to 21% of reports received in-person. Also, the majority (67%) of all whistle-blowers used the new online system (Schultz, Osore, & Vennen, 2010).

¹³ This is the oldest government insurance scheme in Africa.

¹⁴ Poor governance could indeed represent one of the potential causes of the slow diffusion of the Internet in Sub-Saharan Africa.

With respect to Internet-enabled governance initiatives, Kenya has been one of the most progressive countries in SSA, with 24% of its government departments online and 24% of all government information systems online today (McKinsey, 2013). In 2011, the Kenyan government introduced an 'Open Data Initiative', making freely available to the public through a single online portal more than 430 datasets containing key government data, therefore enabling transparent access to information and reducing corruption. To date, more than 50 mobile applications have been developed using the information available online (Open Development Technology Alliance, 2011).

4.3 Health

Despite large investments in recent decades targeted towards improvements in health outcomes, SSA still carries 25% of the world's disease burden (with around 90% of global malaria deaths and 67% of all HIV/AIDS cases in the world), it receives only 1% of the global health expenditure (WHO, 2014), and it possesses only 3.5% and 1.7% of the world's trained healthcare workers and physicians (Dalberg, 2013). Additionally, access to healthcare (in terms of cost, transport and distance), especially for vulnerable groups of individuals, is still extremely difficult.

In recent years, we have witnessed various attempts to introduce networks and Internet solutions in healthcare. Firstly, Internet-enabled technologies can be extremely useful for promoting access to health information. The introduction of digital health, in particular e-health and telemedicine, has been found to significantly improve access to and use of health services, especially for patients in rural and remote areas. As a consequence, it may help produce efficiency gains for health delivery and information (Broadband Commission, 2014b). Blaya et al. (2010), in a review of the evaluations of e-health implementations, conclude that the most promising systems are those which can improve communications among healthcare institutions, provide support to the ordering and managing of the medications, and facilitate the monitoring of patients. McKinsey Global Institute (2013) estimated that remote diagnostics could address 80% of the health problems of patients in poorly staffed rural clinics.

In various developing countries, for example, Internet has been widely and successfully used to disseminate early warnings and education on prevention and management of diseases, as well as for real-time data collection. Already in September 1993, a 'Program for Monitoring Emerging Diseases' mailing list was established following the Ebola virus outbreak in Zaire. It has now more than 50,000 participants in over 185 countries in the world (Yu, & Madoff, 2004). More recently, the Government of Kenya, in order to improve information for patients seeking medical services and providers, has mapped all the accredited hospitals (www.ehealth.or.ke), allowing citizens to access information and contact details of the closest hospitals and doctors. Moreover, a few Internet-enabled solutions in SSA have tried to address the problem of extremely low doctor-to-patient ratio (less than 0.5 physicians per 1,000 people). For example, in 2010 a website ('AskADoc', www.askadoc.co.ke) was created in Kenya to provide online consultations to those who cannot access healthcare easily. The website now receives more than 35,000 hits and 15,000 page views per month (Dalberg, 2013).

Secondly, Internet-enabled technologies can encourage behavioural change and empower people to make informed decisions about their health. Consequently, they can drive the demand for healthcare services. For example, access to e-information has the potential to improve antenatal care and encourage safe deliveries (Abekah-Nkrumah, Guerriero, & Purohit, 2014). 'Every1Mobile' has created seven mobile channels, including websites and social networks, currently available in South Africa, Nigeria, Ghana, Kenya, Tanzania and Uganda. Among these channels, 'SmartSex' (channel on sexual education) has 60% women users and receives 687,092 monthly visits with 5,686,667 page views, and 'Hiv360' (channel on HIV/AIDS education) receives 78,974 monthly visits with 338,826 page views.

Finally, Internet technologies seem to produce a positive impact on the efficiency of healthcare systems, improving health administration and management, as well as the delivery of health training through e-learning. One example of the use of e-learning models is provided by AMREF in Kenya. In 2007, AMREF introduced an online course to upgrade nurses' skills aimed at addressing the problem of chronic shortage of skilled nurses in SSA (where there are only

2.3 nurses per 10,000 people). The course has to be completed in 24 months and it allows nurses to upgrade their qualification while remaining in the workforce. Until today, the programme has trained more than 5,000 nurses since its first pilot and has enabled nurses in rural areas to access training they could not before, improving equality. The training capacity has increased 35 fold, at a pace such that the entire workforce could be potentially upgraded within 8 years – a reduction of 88% from the figure of 65 years required to upgrade the workforce with the old system (Nguku, 2009).

Another example of the application of networks to healthcare is given by the initiative 'HealthNet', promoted by the international not-for-profit organisation SatelLife (Groves, 1996). The initiative aims at facilitating linkages among health professionals in the developing world, and between them and their colleagues in the developed world (through email, electronic publications and database access).

Finally, also worth mentioning is the initiative 'ChildCount+', established in 2009. It consists of a health platform designed to improve child survival and maternal health through patients registration and monitoring, and prompting immunisation and/or treatment (Broadband Commission, 2014b).

4.4 Education

According to the World Bank (2014b), over half of the world's out of school children live in SSA. Access to and quality of education are, in fact, two of SSA main challenges of socio-economic development. The continent, in fact, lags behind the rest of the world in enrolment rates, completion rates and pupil-teacher ratios in schools. The Internet, with its ability to gather and share knowledge, has the potential to provide useful solutions to these issues. Also, it contributes to a better and more diverse access to information (World Bank, 2009).

Firstly, Internet connectivity has allowed for the possibility of distance and online learning, regardless of location and level of development (Broadband Commission, 2014b). This is especially useful in developing countries where there are large numbers of geographically disseminated individuals and access to education, especially for girls, is low (Madon, 2000). The initiative 'ConnectToLearn' provides scholarships for children in deprived areas to attend secondary school with the help of mobile-broadband technology and cloud solutions. It was founded in Tanzania and Ghana in 2010. It has expanded considerably since its start and it now supports hundreds of students across 10 Sub-Saharan African countries (Ericsson, 2013). Similarly, another initiative ('Worldreader') has distributed more than 100,000 e-readers to classrooms in Kenya, Ghana, Uganda, Rwanda and Tanzania since November 2010. Notable of mention is also the 'iSchool' programme in Zambia, a complete interactive e-learning solution that covers all Zambian primary schools which used a low-cost low-power tablet and is also available via netbook devices or via the web (Broadband Commission, 2014b).

Massive Online Open Courses (MOOCS), where students can benefit from borderless learning and global exchange of ideas, have exploded in recent years. In March 2014, more than 7 million people were taking University courses online through Coursera¹⁵, approximately 6% of them were in Africa (Meeker, 2014). Also virtual learning universities are expanding, in order to respond to overcrowding (Dakar University, for example, has 75,000 enrolled students but physical capacity only for 16,000). The African Virtual University (AVU) has now 10 Open Distance and eLearning centres, and an Open Educational Resource portal with 219 textbooks (which were accessed approximately 200,000 times between December 2010 and June 2011), and it also offers more than 750 scholarships, 70% of which went to women (African Virtual University, 2011).

The rapid growth of the Internet and mobile web has also facilitated increasing access to information outside of the classroom, making it easier to acquire skills and develop social networks, as well as facilitating integration in the community and the economy. The web can help provide cost-effective access to educational materials, increase literacy and engagement of people living in poverty. For example, in April 2014, approximately 25 million people in the

¹⁵ This is the most popular provider of MOOCS. It was created only in April 2012.

world, including 1.25 million in Africa, were using the mobile application Doulingo to learn a new language (Meeker, 2014).

However, barriers to access the Internet (such as access to reliable networks and cost) are severe obstacles to exploiting the Internet potential for education. E-learning, for example, involves large investments in ensuring sufficient bandwidth, hardware, teacher training, etc. These are the main reasons why education initiatives have not been fully developed in SSA.

4.5 Agriculture

Growth in agriculture is at least twice as effective in reducing poverty as growth in other sectors of the economy. More than 280 million farmers live in SSA. Because of various factors including information asymmetry and geographic constraints, they are very vulnerable to shocks and food security. In addition to this, up to 40% of Africa's agricultural production is lost because of limited storage facilities, poor infrastructure and the potential risk of theft (IFAD, 2010).

In agriculture, Internet connectivity may help improve supply chain management and operational inefficiencies, as well as promote price transparency and disseminate climate data, thus substantially reducing costs and increasing incomes of the farmers (Broadband Commission, 2014b). One example of how the Internet can be useful for the success of agricultural businesses is provided by the application 'Agrimanagr', created by Virtual City in Kenya in 1999. Agrimanagr offered instantaneous market intelligence, linking stakeholders with the agricultural value chain and therefore allowing more efficient field collection of produce for farmers. Farmers were able to manage the invoicing of produce and sync information between their mobile data collection devices and a database with their historic sales; they could then pay suppliers using cashless transactions and use the receipts as credit history when seeking input financing. The impact of this programme has been very positive, both in terms of efficiency (reducing the duration of supply chain tracking) and profitability (because of price transparency, lower administrative costs and improved management), leading to an increase in the income of 350,000 farmers, affecting 1.5 million people in the country. Impact studies estimate a 9% increase in farmers' incomes (Qiang, Kuek, Dymond, & Esselaar, 2012).

Through the Internet, farmers can gain precise weather information and commodity prices, and they can also order inputs online (for example, seeds and fertilisers). The programme Manobi in Senegal, for example, was founded in 2003 to enable farmers to obtain real time data on local and international sales prices, mainly through mobile Internet applications. In addition to this, it also provided other Internet/mobile services involving the monitoring of agricultural production, product traceability to importers, retailers and customers, sale of agricultural goods and access to credit. It appears that this programme has boosted farmers' incomes by 40-50% (Dalberg, 2013).

Other examples of agriculture-related initiatives are online libraries of agricultural information compiled by agriculture ministries, such as Kenya's Kilimo Library. This initiative, together with Kilimo Salama seed insurance programme (which relies on climate and vegetation growth data from the United States National Oceanic and Atmospheric Administration), increased the income of small farmers by approximately \$150 (Qiang, Kuek, Dymond, & Esselaar, 2012).

Another programme, founded by the Songtaaba Association in Burkina Faso in 2005, allowed female agricultural producers to more than double their profits in two years, and become economically empowered through the use of the Internet. The association set up tele-centres in two villages, with mobile phones and computers with high-speed Internet connections, and managed by trained rural women (Agenda, 2007).

5 Conclusions and policy recommendations

Despite the total estimated worldwide contribution of the Internet being \$1,672 billion (2.9% of global GDP), Internet connectivity is still in its early stages. Especially in developing countries, and in particular in SSA, there is a large room for expansion: in Africa, the Internet's contribution to overall GDP is approximately 1.1% (McKinsey Global Institute, 2013). Internet connectivity has the potential to drive competitiveness in the private sector, but also fundamentally transform government operations, healthcare and education (McKinsey Global Institute, 2011).

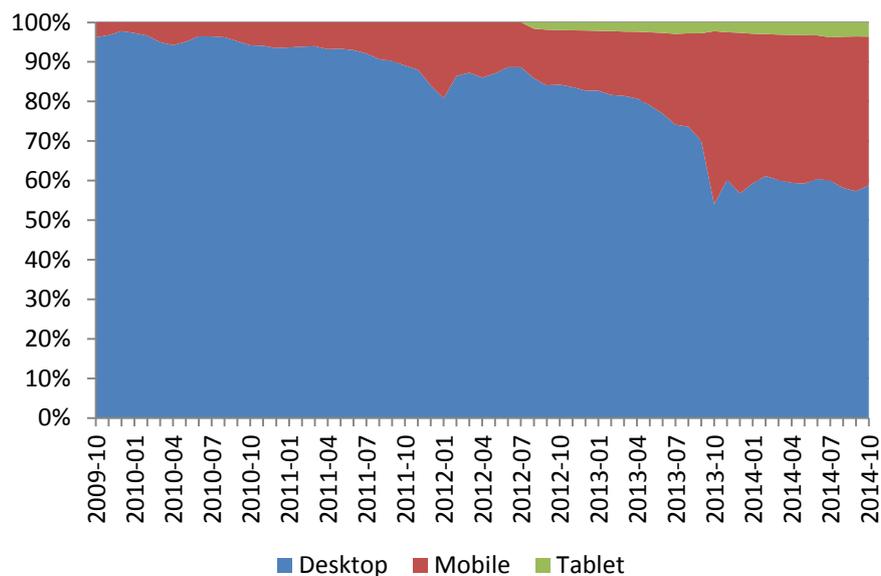
SSA has witnessed a sustained increase in Internet penetration in recent years. World Wide Worx (2012) identified a few main drivers:

- 1 Proliferation in the use of smart-phones;
- 2 Increase in the number of ADSL connections for SMEs and new service providers;
- 3 Large popularity of social networking - For many individuals, even in rural areas, social networks represent the entry point to the Internet. They help participate in the digital community (and economy) and provide a platform for marketing, communication and information sharing;
- 4 Local content on the Internet - Local content is on the rise and it is expected to drive Internet uptake and job creation in the future.

Additionally, Internet-enabled solutions have moved from basic marketing and communication to more integrated solutions for service delivery and information management (Dalberg, 2013).

In order to enhance the positive impacts of the Internet, it is necessary to understand all these transformations, to make sure policymakers keep pace with the new needs of the web. In particular, one of the most striking facts is related to the rapid expansion of the use of mobile phones for Internet access. StatCounter (2014) provides statistics on mobile and desktop access to the Internet. While desktop is still the most popular device to access the web in Africa, mobile is becoming more and more popular and it has overtaken desktop usage in several countries (see the Figure below)¹⁶.

Figure 10: Platform comparison, Africa, October 2009-October 2014.



Source: Adapted from StatCounter data.

¹⁶ In South Africa, for example, mobile access represents 55.67% of Internet use, in Kenya 74.42% and in Nigeria 68.83%.

In South Africa, smart-phones sales overtook sales of ordinary phones in 2013 (World Wide Worx, 2012). More generally in SSA, it is expected that one in four Africans will be using smart-phones over the next five years. The most common smart-phones in the Sub-Saharan African market are low-cost smart-phones which use the Android operating system (World Wide Worx, 2012).

This implies the need to think about the infrastructure requirement. On one side, governments should promote high-speed access, which is particularly useful to allow for cloud computing and more advanced operations, and will probably be more useful for SMEs growth. On the other side, governments should devise low-bandwidth intensive Internet solutions, which are easily accessible for individual consumers via mobile phones.

A 2011 study (McKinsey Global Institute, 2011) established that a mature Internet "ecosystem" – where competition is fostered, innovation is encouraged, human capital and Internet infrastructures are developed, and Internet access is boosted – enables a country to secure the maximum possible benefit in raising living standards. Moreover, a few indicators have been identified as relevant for policymakers to improve the supply of the Internet and optimise the Internet impact. They can be classified into environmental characteristics, such as physical infrastructure (e.g. electricity access and cellular network coverage) and business environment (e.g. ease of starting a business and accessing credit), and stakeholder characteristics, such as citizen (e.g. education, literacy levels and poverty rates) and business demographics (e.g. local competition and cluster development) (Dalberg, 2013).

Firstly, policymakers and business leaders should collaborate to insure optimal conditions for the improvement of the Internet ecosystem. As a matter of fact, Internet initiatives perform best when nationally co-ordinated (Broadband Commission, 2014a), such as in the case of the Nigeria MDG Information System (NMIS), a platform launched in August 2014 which consists of a nationwide data-management system mapping more than 250,000 health, water and education facilities.

Secondly, access infrastructure is still limited to major urban areas, and quality and stability of the Internet connection represent a critical obstacle to improve Internet penetration. In order to ensure digital inclusion, for example, the South African Government has recently (December 2013) developed a Broadband Policy, 'South Africa Connect', which set a target of universal average download speed of 10 Mbps by 2030 (with a speed of 5 Mbps to be available to 50% of the population by 2016 and to 90% by 2020). Specific targets have also been set for Internet connectivity in schools, clinics and other public sector services.

Thirdly, governments should attempt assisting in the lowering of costs of Internet access, devices and equipment, thus generating greater incentives to engage with the Internet. This can be achieved by reducing duties and taxes, or providing subsidies and tax credits, on Internet-related products. Taxation, usually implemented to finance spending and generate positive externalities in the sector, has a negative impact on broadband service adoption. A study by Katz et al (2010), for example, found that in South Africa, for every dollar reduced in mobile-broadband taxes on over 5 years, there will be USD \$1.9 to \$24.9 in additional GDP and 0.6%-1.2% additional mobile-broadband penetration, so that the foregone tax revenues will be partially compensated by taxes collected on a larger GDP. These estimates, although extremely interesting, seem moderately high, especially if compared with the average estimates across four emerging countries (Brazil, Mexico, Bangladesh and South Africa): for every dollar reduced in taxes, they will generate between USD \$1.4 and \$12.6 in additional GDP.

Nevertheless, the beneficial effects of the Internet on SMEs development depend on the firms' ability to restructure themselves to integrate the new technologies with their business process and their organisational strategy (Madon, 2000).

Finally, despite Internet connectivity has been found to being mainly beneficial to SMEs and individual consumers, many governments themselves could gain from improving their own use of the Internet to transform the efficiency and effectiveness of the public sector.

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