

Value of connectivity Economic and social benefits of expanding internet access



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Foreword

The knowledge economy is the future of the world economy and the Internet is its backbone. Yet, currently, only about 1 out of every 3 people can go online. Internet.org's goal to make access available to the remaining two thirds of the world will bring the same opportunities available in the connected parts of the world to everyone.

As a global partnership, Internet.org is working to harness the experience, wisdom and resources of people and companies across the world to understand and solve the challenges of the connectivity gap. Driven by this goal, Facebook engaged Deloitte to assess the economic and social impact of extending Internet access in the developing world. This report is the outcome of that initiative. And Deloitte's conclusions are compelling: global connectivity will help lift millions out of poverty and drive important positive social and economic change.

This project is the first in an ongoing series of sponsored research projects that will also examine barriers to affordable access and the efficacy of potential solutions. We look forward to engaging with other independent research organisations and academics on projects that support the goal of extending access to the Internet.

At our core, we believe everyone, everywhere, should have the same opportunity and ability to be connected to each other and to connect to the knowledge economy.

Facebook, on behalf of Internet.org

Executive summary

Internet connectivity has already changed many aspects of the lives of individuals in developed economies and provided far-reaching economic and social benefits. Extending these opportunities is critical to accelerating economic and social growth in developing economies, while enabling the transition from a resource-based to a knowledge-based economy.

Of the world's 7 billion people, only 2.7 billion have access to the internet while the vast majority of the 4.3 billion that remain unconnected live in developing countries. The unconnected are typically the world's poorest and most disadvantaged populations.

Internet connectivity has already changed many aspects of the lives of individuals in developed economies: creating new ways to communicate and socialise, new business models and industries, and more efficient ways for firms and workers to operate. Innovations such as social media, search engines and online marketplaces as well as the convergence of these platforms with nearly all existing activities have permeated society and impacted productivity, economic growth and business creation. These platforms have also changed the way in which public services, healthcare and education are provided and shared. Many governments have recognised the role of internet access in enabling economic activity and social developments and have set out ambitious plans to promote investment in internet access, such as the National Broadband Plan in the US and the Digital Agenda in Europe, and capitalise on this opportunity.

In developing countries, the internet has the potential to do not just the same but more, as it allows the delivery of the knowledge economy of today without the need for some of the infrastructure that these countries have lacked for many years.

The internet is all about services to people and communities, allowing them to achieve their potential.

Facebook has launched a global partnership, Internet.org, with the goal of making internet access available and affordable to all. It has commissioned this study to examine the ways in which extending access can change economies and societies in developing countries and what benefits this would generate on a number of economic and social dimensions.

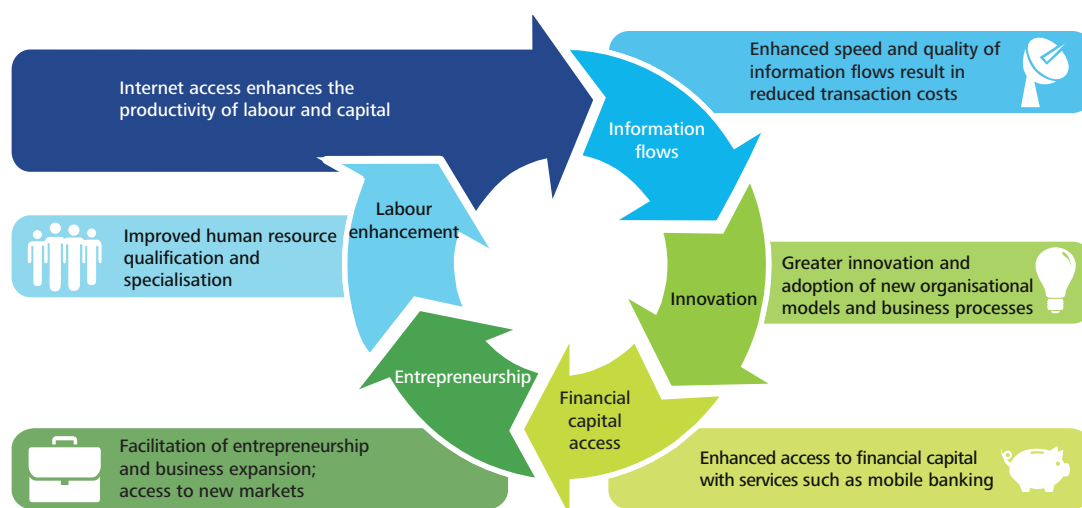
Deloitte has addressed this issue by combining analysis of a wide range of economic and academic studies, our own original quantitative research on technology impacts in developing economies and a review of a series of examples of how the internet has impacted developing economies. The findings suggest that if developing countries could bridge the gap in internet penetration to reach levels developed economies enjoy today, they would experience large increases in GDP growth and productivity and improvements in health conditions and education opportunities. Beyond the benefits that the internet is already bringing, this provides a clear potential to reduce poverty and promote long run economic and social development.

By acting as an enabler of economic activity and as an engine for information sharing, the internet complements primary necessities and basic economic activities, facilitating access to and provision of fundamental services. The internet accelerates economic and social growth and enables the transition from an economy based on resources, which typically cannot be shared, to one based on knowledge where ideas can be freely circulated to spur collaboration and innovation.

Economic development is not about choosing between access to the internet and basic necessities: they need to work together to allow societies to flourish.

How the internet enables economic growth

The internet offers unprecedented opportunities for economic growth in developing countries. By providing access to information, connecting people to businesses everywhere, and opening up new markets, the internet can transform the very nature of an economy and support economic development.



In developing countries where agriculture represents on average 40% of economic activity, mobile telephony and the internet enable access to market pricing information, weather forecasts, disease control information and livestock tracking. Small-scale farmers can access this type of information and markets directly instead of through costly intermediaries. In India, farmers and fishermen tracking weather conditions and comparing wholesale prices through mobile phones increased their profits by 8% and better access to information resulted in a 4% drop in prices for consumers. These benefits have the potential to be even greater with more sophisticated internet-based applications and extend more widely across the developing world.

The positive effects are potentially greater than in developed economies due to the reduced quality of physical and administrative infrastructure to support the functioning of markets. Small and medium size enterprises (SMEs) in developing countries are amongst the biggest winners from receiving access to the internet. By reducing transaction costs and the constraints of distance, throughout the world the internet has reduced barriers to market entry and allowed SMEs to innovate and reach a broader market. In countries as diverse as Mexico, Malaysia and Morocco, SMEs with internet access have been found to have experienced an average 11% productivity gain. Extending internet access to levels seen in developed countries today means that long run productivity could be enhanced by as much as 25% in developing economies.

Deloitte estimates that the resulting economic activity could generate \$2.2 trillion in additional GDP, a 72% increase in the GDP growth rate, and more than 140 million new jobs.

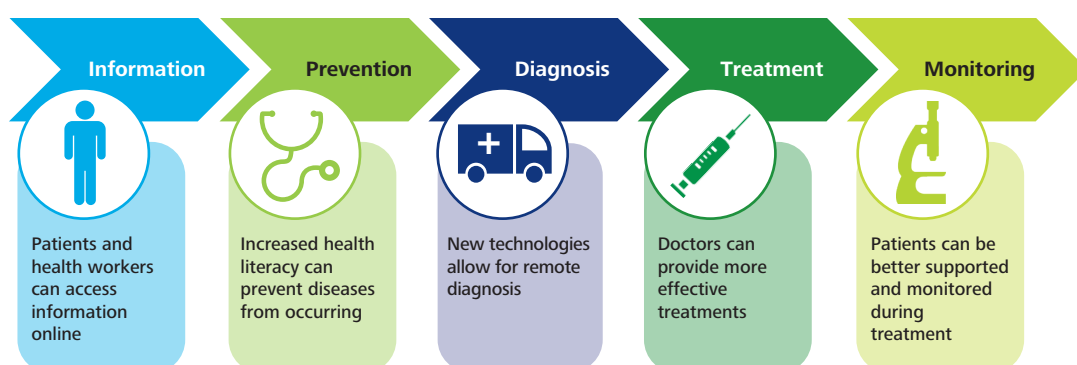
The internet fosters productivity and innovation across all sectors of the economy. In developing countries it has often spurred and enabled creative solutions to overcome the limitations arising from economic constraints and limited infrastructure. Extending internet access can give these regions an opportunity to leap-frog developed countries with the adoption of cutting-edge technologies, as observed for example with mobile banking. In regions that were largely “unbanked”, mobile banking services, from M-Pesa in Kenya to Wing Mobile in Cambodia, have successfully connected millions of people to banking facilities, reducing access costs and travel time and further supporting economic activity. Technology hubs such as Bangalore in India and Lagos in Nigeria have helped innovators and entrepreneurs share ideas and connect with investors across the world, leading to the emergence of new industries, increasing economic growth and skilled employment.

A number of policy and business actions aimed at reducing administrative burdens for SMEs and supporting investment can complement the success of these applications to unlock further economic benefits and support the development of local businesses. While more needs to be done in order to replicate and further scale these benefits, these experiences suggest that expanding internet access has the potential to lead to fundamental advancements in the structure of economies across the developing world. Countries that have implemented strategic infrastructure investments to ensure robust connectivity, such as Rwanda, have benefitted from increased investment in their economy.

Expanded access to information, increased business and job opportunities, and ultimately higher incomes are all factors that can combine to eradicate extreme poverty. Deloitte estimates that extending internet access in developing economies to the level seen in developed countries can raise living standards and incomes by up to \$600 per person a year, thus lifting 160 million people out of extreme poverty in the regions covered by this study.

How the internet enables health improvements

Access to the internet can improve health conditions by reducing the incidence of diseases through better information for both patients and health practitioners. In addition to extending access to medical information, the internet has the potential to improve medical behaviours for patients and healthcare professionals as well as the delivery of medical services.



The internet provides a route through which to improve awareness of diseases and provide information on health treatments. A number of free mobile-based and web-based applications exist in developing countries that provide information related to nutrition, hygiene and prevention of common illnesses. Evidence on the link between health literacy and mortality rates suggests that access to the internet has the potential to save nearly 2.5 million lives across the regions covered by this study, if they were to achieve the level of internet penetration seen in developed economies. In particular, Deloitte estimates that improved health information to expecting mothers and health workers could lead to a reduction of child mortality, saving 250,000 children who may otherwise have died during their first year of life.

Internet-enabled devices are already transforming the way healthcare professionals operate in developing countries by allowing remote diagnosis and more efficient ways of treatment.

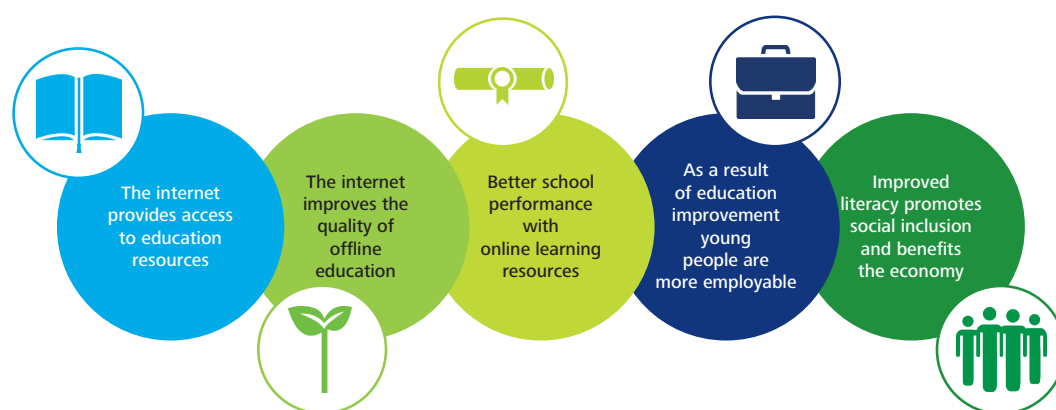
Patient information is sent to hospitals via mobile and internet applications, thus saving travel time and service costs and substantially improving access to healthcare, especially for rural populations. The internet complements and improves existing medical facilities. Health workers can connect a microscope to a mobile phone with a camera, take pictures of microscope images and send them to a central server, which clinicians can access to make diagnosis of diseases such as malaria and tuberculosis.

Monitoring of illnesses can also be enhanced by mobile and internet applications designed to remind patients of their treatments and control the distribution of medicine stocks.

These types of services can increase compliance with treatment and play a crucial role in improving life expectancy for patients with diseases such as tuberculosis and HIV/AIDS. Across the developing world, Deloitte estimates that extending internet access has the potential to increase life expectancy for more than 2.5 million people affected by HIV/AIDS.

How the internet unlocks universal education

The internet plays a pivotal role in extending access to educational resources and in accelerating knowledge sharing.



Access to the internet improves access to education by providing students with learning opportunities and materials online.

Deloitte estimates that by extending internet penetration another 640 million children may be able to access the internet and the wealth of information it makes available while they study.

The internet spurs access to secondary and tertiary education. Online courses offer the affordability and flexibility that many students need as in developing economies barriers to secondary and tertiary school arise not only from tuition costs, but also from the opportunity cost of attending school instead of working.

The internet also provides numerous resources for teachers, including access to professional development courses. In developing countries, higher internet penetration provides the opportunity to increase the skills of teachers in a cost-effective manner, which is particularly crucial when there is a shortage of qualified teachers. As developing countries struggle to improve the quality of their educational systems with limited budgets, the use of ICT to support teachers and students could play a major role.

The internet makes learning resources available to students and teachers; it allows learning and consultation online and can be a valuable complement to the classroom experience. The potential exists for students anywhere to have access to online educational eBooks, tests and courses. These resources can substitute traditional textbooks which may not be readily available or are prohibitively expensive in developing countries.

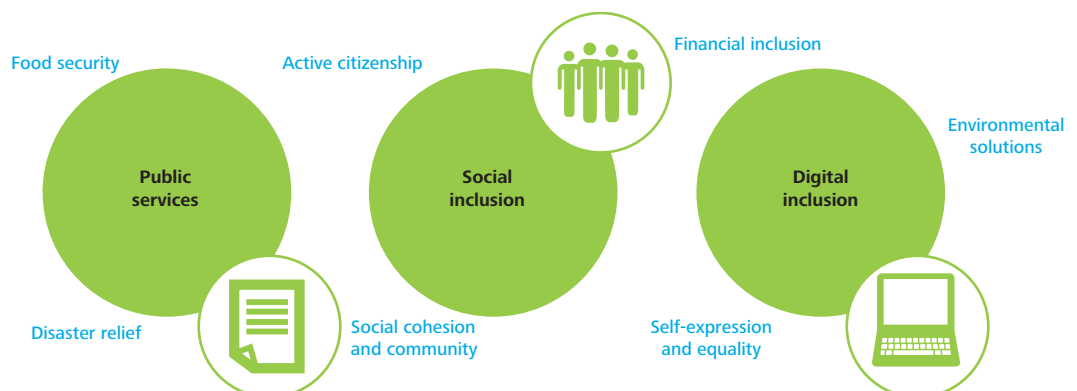
Initiatives and programmes across the developing world aimed at supporting educational efforts through ICT could also benefit from access to the knowledge base that the internet provides. Although the evidence to evaluate these efforts is still at an early stage and needs to be improved, initial results suggest that education bundled with ICT can enhance students' performance in certain educational outcomes and, when coupled with effectiveness of teaching, ICT provides a powerful complement to education. In developing countries, studies show that providing computers to improve mathematical skills has a significant impact on maths grades and children who went to schools where computer-assisted learning was provided had a better maths performance than students who went to schools where the programme was not implemented.

Extending internet access is likely to require to be complemented by other measures in order to realise wider and scalable benefits on education: combining access to the internet with targeted education policies such as improved curricula and an increase in the teacher-student ratio has the potential to significantly extend the impacts of the internet in increasing quality of education and ultimately academic proficiency, attainment levels and employment outcomes.

Improved educational outcomes can have a strong positive impact on individuals' income and health outcomes as well as on the economy. Importantly, in addition to these effects, technology can expand opportunities for students to engage in collaborative learning, with great potential for learning and circulation of ideas.

How the internet promotes public services, social cohesion and digital inclusion

ICT technologies have long been recognised for promoting and facilitating social inclusion, i.e. the participation of individuals and groups in society's political, economic and societal processes. One way in which ICT technologies expand inclusion is through effective public services that rely on ICT infrastructure and through digital inclusion, i.e. the ability of people to use technology. These three aspects are deeply intertwined, and they span dimensions as diverse as disaster relief, food security, and the environment, as well as citizenship, community cohesion, self-expression and equality.



Public authorities can enhance disaster relief efforts by promoting the spread of information online and by implementing early-warning systems. The internet also enables relief efforts through crowd-sourcing: during Typhoon Haiyan in the Philippines, victims, witnesses and aid workers used the web to generate interactive catastrophe maps through free and downloadable software, helping disseminate information and reduce the vulnerability of people affected by the disaster.

Communities can also be strengthened by connectivity, thereby promoting the inclusion of marginalised groups. In Uganda, a web-based application enables village registration agents to send birth registration details of new-borns through to connected local hospitals.

People around the world can make their voices heard through the internet, feel connected to their communities through social networks and participate more actively in local and global governance. Anyone with an internet connection is empowered to express themselves through countless opportunities. Through the Voices of Africa programme, young reporters from Zimbabwe, Malawi, Uganda and South Africa were trained to create video news using internet-enabled devices, allowing them to choose the issues they consider relevant to their communities.

Governments should recognise the importance of the internet in complementing the delivery of healthcare, education and other social services and should promote investment in the development of innovative solutions in these areas targeted to their communities.

Where do we go from here?

This paper shows that the internet is already transforming the lives of people in developing countries and has the potential to create even greater benefits if more people had access. It is clear that the internet is not a substitute for other primary necessities, but rather should be viewed as a complement that can accelerate the provision of primary services such as healthcare, education and disaster relief, while strengthening social and economic outcomes and delivering far reaching improvements in life conditions at the same time. Analogously to natural resources, the internet has a role in facilitating the development of solutions to benefit society. Viewed in this way the delivery of ambitious development targets such as those set out in the UN Millennium Development Goals, including halting the spread of deadly diseases and achieving universal education, are consistent with, and can be accelerated by widening internet access.

By allowing people and businesses to share information without barriers, expanding internet access can lead to a more fundamental advancement in the structure of economies across the world. While many economies remain dependent on agriculture and natural resources, the internet can unlock a knowledge-based economy. People and enterprises across the developing world would have greater access to information, and the ability to develop specialised expertise and adopt new business methods, also changing the balance of jobs within the economy. Internet-enabled applications allow the developing world to skip the adoption of technologies that have quickly become obsolete in developed economies and develop creative solutions tailored to their nations' needs. At the same time, increased demand in sectors such as software development combined with an increase in innovation and the emergence of new technology-led enterprises will increase demand for high-skilled labour.

The effects of extending internet access could be particularly important for rural communities. Constraints on the flow of information have limited these communities' access to wider markets and to a variety of employment opportunities. Access to mobile and internet-based applications can extend the range of business services that become available to these communities. Internet access is also valuable to rural development-oriented organisations that act as local communication conduits or intermediaries. Improvements in connectivity play an important role in overcoming the urban-rural divide and stimulating economic growth in rural areas.

Extending internet access to the majority of the population remains an ambitious target for developing countries, especially for the poorest sectors of the population and in rural and remote areas. Similarly to the growth of the mobile telecommunications sector, affordability of internet access remains the biggest barrier today, while service availability, especially in rural and remote areas, is also a significant constraint. In addition, burdensome regulatory policies often act to discourage investment in supporting telecommunications infrastructure.

Recognising the importance of the internet as an enabler of social and economic development, a coalition of stakeholders spanning different sections of society needs to coordinate efforts to make internet access a reality for today's unconnected. Governments, international and regional organisations, NGOs and the wider telecommunications and technology industry have an opportunity to partner together and make internet access available to enable the delivery of economic and social benefits.

Internet.org and Deloitte recognise that this study is just a starting point for a critical debate on economic and social development. While this paper focuses on the importance of extending internet access, it represents the beginning of a series of research papers that will discuss barriers to access as well as policies, technology innovation and advancements, business solutions and initiatives to extend internet access. We are inviting others to join the debate to advance the discussion and suggest critical policies and actions to bring more people online.

The internet allows all of the world to join the knowledge economy.

1. Expanding internet access can transform developing countries

Internet connectivity has already changed many aspects of the lives of individuals in developed economies and provided far-reaching economic and social benefits. Extending these opportunities is critical to accelerating economic and social growth in developing economies, while enabling the transition from a resource-based to a knowledge-based economy.

Of the world's 7 billion people, only 2.7 billion have access to the internet while the vast majority of the 4.3 billion that remain unconnected live in developing countries. The unconnected are typically the world's poorest and most disadvantaged populations.¹

Extending internet access means more people can share the benefits that the connected part of the world has today. Internet connectivity has already changed many aspects of the lives of individuals in developed economies, creating new ways to communicate and socialise, new business models and industries and more efficient ways for firms and workers to operate. Innovations such as social media, search engines, online marketplaces and the convergence of these platforms with nearly all existing activities have permeated society and impacted productivity, economic growth, and business creation. These services have also changed the way in which public services, healthcare, and education are provided and shared. Governments have recognised the role of internet access in enabling economic activity and social developments and have set out ambitious plans to promote investment in internet access, such as the National Broadband Plan in the US and the Digital Agenda in Europe.

In developing countries, the internet has the potential to do not just the same but more. Facebook has launched a global partnership, Internet.org, with the goal of making internet access available and affordable to all. They have commissioned this study to examine in more detail how internet access can change economies and societies in developing countries and the benefits this would generate. Based on a review of the evidence on the impacts of internet access on a number of economic and social indicators, this study illustrates how internet access combines with existing necessities to accelerate social and economic growth. It also estimates how the resulting transition to a knowledge economy would impact income levels, poverty, health and education in developing regions beyond what would happen if no action to increase internet penetration is taken.

Internet.org and Deloitte recognise that the link between internet access and economic and social growth is dynamic in nature. Internet access is linked to personal income levels, and for substantial increases in internet access to materialise, income levels relative to the cost of an internet connection will also need to grow. The internet is not a substitute for other primary necessities, but rather an enabling technology that helps people communicate across distances and cultural divides and share knowledge and information, facilitating innovations and behaviours that can prove transformational. It is therefore a complement that can accelerate the provision of primary services such as healthcare, education and disaster relief, while strengthening social and economic outcomes and delivering far-reaching improvements in life conditions at the same time.

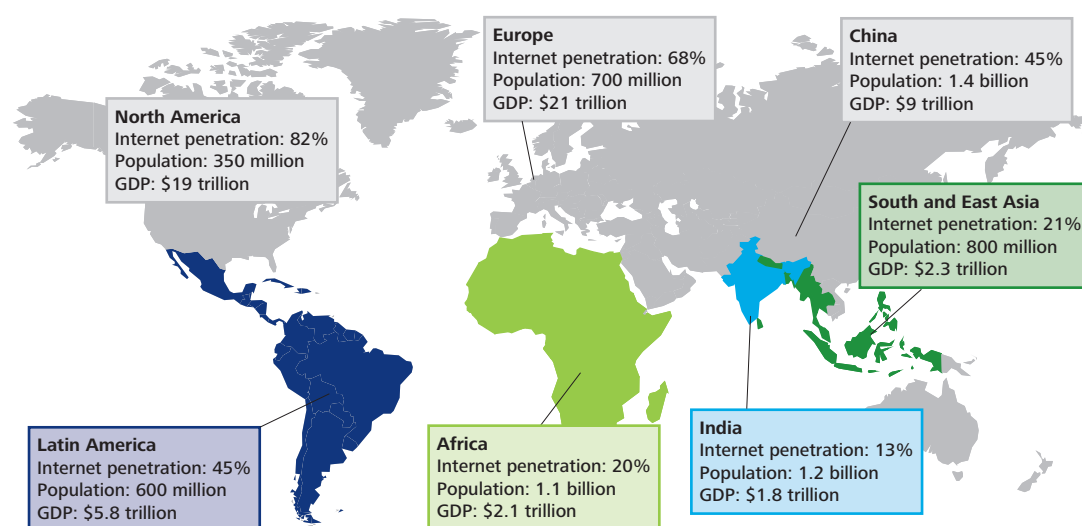
This paper is part of a series of research studies that Internet.org is going to release on internet access, discussing existing barriers as well as policies, technology innovations and advancements, business solutions and initiatives to extend internet access.

The paper initially describes the global state of internet access today by identifying how many people currently have access to the internet, their socio-economic characteristics and how many would have access to the internet if penetration levels reached those experienced in developed countries (Section 2).

It then illustrates and estimates the potential economic benefits from extending internet access, including increased income levels, creation of additional jobs, and numerous other enabling effects (Section 3); and discusses how the internet has affected healthcare, education and social inclusion (Section 4).

Section 5 concludes by discussing barriers to increasing internet access and presenting a range of actions and policy initiatives that have the potential to accelerate internet access across developing countries.

This study focuses on four regions – Africa, Latin America, South and East Asia, and India – as this is where internet penetration has more potential for growth and where affordability and accessibility remain significant barriers to internet access. Other regions, such as the Middle East and China, have not been included in the study in recognition of their unique economic position, including in reference to their ability to undertake significant infrastructure investments through public finance. The figure below illustrates the key characteristics of the regions examined in terms of internet penetration, population and GDP and compares them with other selected regions.



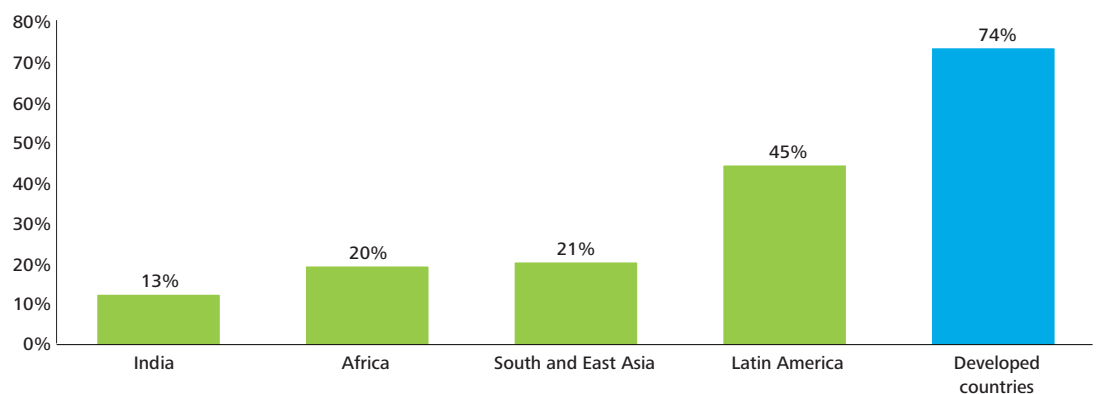
Source: Deloitte estimates based on ITU World Telecommunication database and IMF data

2. The global state of internet access today

While the internet is widely available in developed economies, today over 4 billion people remain unconnected. These are often the world's poorest and most disadvantaged populations, who could benefit the most from the economic and social inclusion that the internet promotes.

In developed economies,² internet access³ is nearly ubiquitous; internet penetration reached nearly 75% in 2013.⁴ Here, technological advancements have reduced the cost of internet access and increased the quality of connections. Consumers enjoy a choice of fixed, Wi-Fi and mobile access, and most of them are able to access high speed broadband.

Figure 1. Internet penetration worldwide, 2013

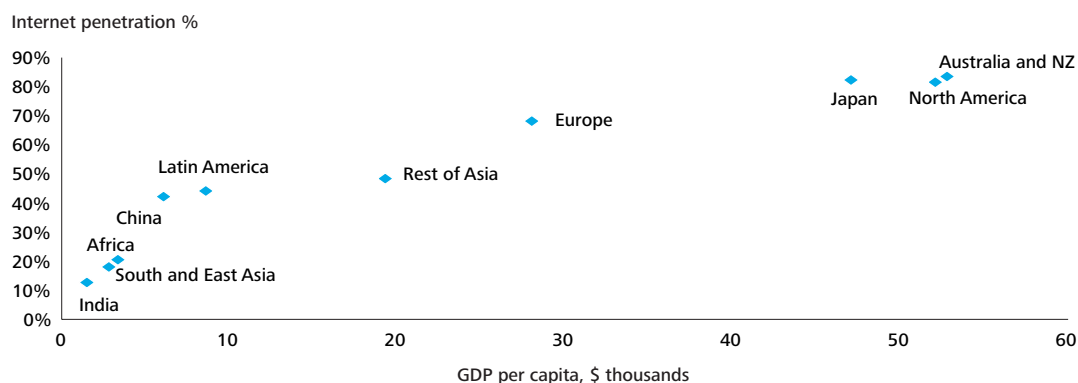


Source: Deloitte estimates based on ITU World Telecommunication database and IMF data

In contrast, in the developing countries covered by this study only 800 million out of 3.8 billion people are connected to the web. Internet penetration stood at 22% in 2013. In these regions, access to telecommunications and to the internet occurs mainly through mobile technology: on average only 3% of the population has access to a fixed internet connection.⁵ Mobile telephony has seen unprecedented growth in these countries in recent years, and now an increasing number of people living in developing markets have access to basic mobile telephones. However, the number of internet-enabled mobile connections, i.e. 3G and 4G connections, represents less than 25% of mobile connections.⁶

The world's unconnected are more likely to face challenges related to high levels of poverty and limited social inclusion. Income levels are a key barrier to internet access, and internet penetration is often the lowest in countries with the lowest GDP per capita. In India, where GDP per capita is 20 times lower than in Europe, internet penetration is 5 times lower. Similarly, internet penetration in Africa is four times lower than in North America and GDP per capita almost a 20 times lower.⁷

Figure 2. Internet access and income per capita



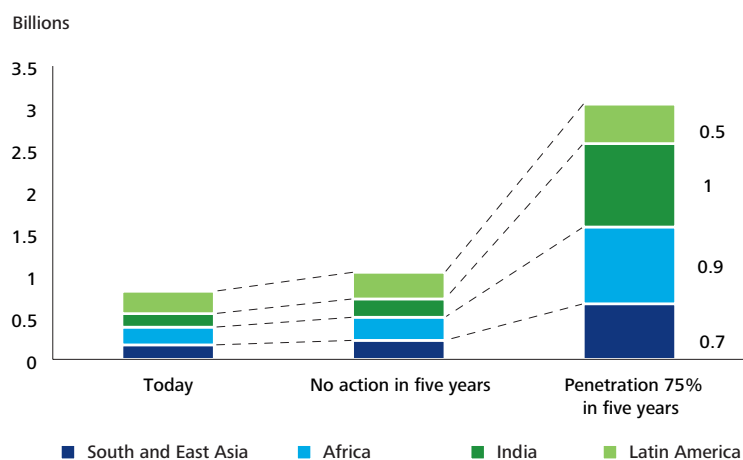
Source: ITU World Telecommunication database and IMF – 2012 figures

As a result of low income levels, the unconnected also lag behind in a number of socio-economic dimensions relating to healthcare, education and social inclusion. Furthermore, the countries for which the development gap is largest also have large rural populations, who could benefit greatly from far-reaching and affordable internet access.

What would the economy and society look like in developing countries if they reached internet access levels seen in developed economies today?

If developing countries were to catch up with levels of internet access in developed economies today, they would reach a penetration level of around 75%,⁸ more than tripling the number of internet users from 800 million to 3 billion. This means that an additional 2.2 billion people would receive internet access; of these, 700 million would be in Africa, 200 million in Latin America and 1.3 billion in the Asian regions.

Figure 3. Internet users in developing regions if penetration were to reach 75% of population



Source: ITU World Telecommunication database, IMF and Deloitte analysis



The economic and social impacts estimated in this paper are based on this aspirational scenario. This scenario is designed to highlight the existing gap in internet penetration between developed and developing economies rather than to focus on the impacts of internet access in particular countries, and is not meant to suggest that the internet experience in these countries would mirror that of developed economies.

It is important to recognise that without significant changes in the provision of internet access, either through new business models or technology advancements, these levels of penetration may remain unachieved in the short term. While international organisations such as the World Bank and the ITU do not report forecasts on internet penetration in the next years, forecasts from Cisco⁹ suggest lower growth rates in internet penetration in the next years.

The economic and social impact estimates reported in this study represent the incremental impacts of extending internet penetration beyond the levels of penetration that would be achieved should no action be taken. This 'no action' scenario is based on a review of existing economic and sector forecasts, and assumes penetration levels that correspond to an increase of nearly 30% in internet users over the next 5 years across the regions covered by this study, resulting in penetration rates of 23% in Africa, 16% in India, 26% in South and East Asia and over 50% in Latin America. As such, the results reported in this report capture the additional benefits that accelerating internet access could provide beyond the growth that is expected to occur.

The economic impacts are estimated assuming that the desired penetration level is achieved in a five year time horizon and are reported on an annual basis unless otherwise stated. In modelling these impacts, the desired growth in internet users is not constrained to be achieved through any particular technology. However, any such growth would be expected to be primarily based on an increase in mobile broadband connections, given the high take up rates of 2G technology already observed in developing countries and the lack of fixed infrastructure in these regions, particularly in rural areas.

3. The economic impacts of extending internet access

The internet offers unprecedented opportunities for economic growth in developing countries. By providing access to information, connecting people to businesses anywhere, and opening up new markets, the internet is transforming the very nature of economies and supporting economic development.

Economic conditions in developing regions remain behind developed economies. Developing economies continue to be based on agriculture, fisheries and natural resources that are often subject to climate change and environmental crises. Productivity is typically lower than in developed economies, and extreme poverty remains high, especially in rural and remote areas.

Internet access is already unlocking immense economic benefits in these regions: by empowering workers with information, internet access can kick-start economic growth and improve productivity, create jobs and lift hundreds of millions of people out of poverty. A number of mobile and internet-based services have already emerged that have transformed the way in which farmers, fishermen, small businesses and ultimately consumers benefit from increased efficiencies. Internet access is helping empower developing markets to develop and scale creative solutions that are unique to the needs of their communities.

What economic activities can the internet enable and what would the scope of this economic growth be? By using estimates on the economic impacts of the internet drawn from academic literature, and case study examples of how the internet has enabled economic activity, this section estimates the impact of extending internet penetration in the developing world to the levels seen in developed economies on income levels, job creation, poverty reduction, and on specific industry sectors.¹⁰

3.1 Internet access increases productivity across the economy

By increasing access to information the internet can increase productivity and enable markets to function more efficiently. The ability to send complex information and data via mobile phones and the internet reduces travel time and costs and increases organisational efficiency. Increases in connectivity accelerate the spread of ideas and allow users worldwide to make use of new research and technologies. Extending internet access can also increase market efficiency by removing barriers to entry, reducing transaction costs and increasing transparency.

The effects of transformative ICT technologies such as mobile telephony on productivity have been recognised in numerous studies. A study undertaken by Deloitte and the GSMA examined productivity changes in developing countries from availability of mobile telephony: productivity is a key indicator of the efficiency with which inputs such as labour and capital are used and can be interpreted as a measure of the technological dynamism of an economy. Based on this study, Deloitte estimates that if developing regions achieved internet access levels seen today in developed regions, their long run productivity could increase by about 25%. This effect is most pronounced in regions currently characterised by lower current levels of productivity or lower penetration rates. In India, long run productivity could increase by 31%, while Africa and South and East Asia may experience productivity increases of about 29% and 26%, and productivity in Latin America could increase by 13%.

Internet access can improve productivity in a variety of sectors. Mobile and internet connectivity in the agricultural sector can provide farmers with valuable information on weather conditions, disease control and new methods of maximising crop yield, and can enable livestock tracking. This can increase profits for farmers by up to 33%.¹² Across the developing world, about 40% of the labour force works in agriculture,¹³ and this number rises to almost 60% in Africa.¹⁴ These gains in productivity can benefit up to 360 million individuals, many of them small-scale subsistence farmers.¹⁵



Access to market and pricing information through the internet and mobile phones enables small-scale farmers to access markets directly instead of through costly intermediaries. These benefits are not just experienced by farmers: populations across the developing world will benefit from lower and more stable prices.

In the Kerala region of India, the use of mobile phones to track weather conditions and compare wholesale prices led to an 8% increase in profits for fishermen, along with a 4% drop in prices for consumers.¹⁶

In Brazil, fishermen now have access to 3G-enabled mobile devices equipped with customised software applications that enhance safety of navigation through real-time updates on location and weather conditions, and improve fishermen's marketing capabilities by providing them with constant updates on market prices and demand.

In urban areas, these positive effects are potentially greater than in developed economies due to the reduced quality of physical and administrative infrastructure to support the functioning of markets.

3.2 Internet access supports enterprise and innovation

SMEs in developing countries are amongst the biggest winners from access to the internet. By reducing transaction costs and the constraints of distance, the internet reduces barriers to market entry and allows SMEs to reach a broader market.

These benefits are well evidenced worldwide: SMEs with internet access in countries such as Vietnam, Mexico, Malaysia, Argentina, Turkey, Taiwan, Hungary and Morocco all experienced on average an 11% productivity gain due to web technologies.¹⁷

The internet supports the growth of SMEs in many ways, by broadening potential customer bases, reducing costs and saving time. For example, mobile and online banking make it easier to make payments to suppliers and reduce the costs associated with traditional banking. In areas of sub-Saharan Africa, where the majority of business owners employ fewer than three people,¹⁸ it avoids leaving the business unattended in order to perform a transaction at the bank.

Online and mobile banking



The M-Pesa system in Africa is a world leader in supporting mobile payments: not only does this create new jobs directly, but it can expand small businesses¹⁹ by enabling a safe way to store small amounts of money whenever needed. Online banking has the potential to develop these opportunities even more and further support economic growth.

In Cambodia, 500,000 of the country's 14 million people have bank accounts. Wing Mobile is a mobile banking system that has brought financial inclusion to an additional 260,000 people, the majority of whom make less than \$3 per day.²⁰

The internet supports innovation and leads to the emergence of new enterprises. Expansions in internet access are already driving “technology hubs” across the developing world, for example in cities such as Lagos and Bangalore. These hubs help innovators and entrepreneurs share ideas and connect with investors across the world. In turn, this leads to the emergence of new industries, increasing growth and employment. Moreover, these new industries are likely to be technology-driven, increasing the demand for skilled labour and wages.

The internet has been central for the development of cities like Bangalore in India, which now represents almost 40% of the country’s IT industry. The city has become not only an outsourcing hub for companies employing skilled technology professionals, but also the home of the research and development departments of some of the largest international and domestic IT companies, bringing great employment and growth opportunities.²¹ A number of successful start-ups have been created as a result of the positive investment and innovation climate, further extending the reach of the technology ecosystem.²²

Deloitte has undertaken a number of in-depth studies on the impact of technology innovations in developed and developing economies and the far reaching implications of these hubs for the economy. Recently, Deloitte found that London’s technology, media and telecommunication sector supports over 8% of the UK’s GDP, in addition to nurturing talent that combines creative and tech skills, driving collaborations between businesses and institutions, and enabling more funding for tech companies.²³ In developing markets, Deloitte found that the jobs created around technology and telecommunications create a significant value chain of companies and professions across each country, for example, by requiring support services in rural areas and fostering employment in remote regions.

Government-led investment initiatives can prove successful in spurring tech-driven innovations. Countries that have implemented strategic infrastructure investments to ensure robust connectivity, such as Rwanda, have benefitted from increased investment in their economy.²⁴ Public policies that supported the development of ICT in Karnataka, the Indian state where Bangalore is located, contributed to the success of the Bangalore hub.²⁵ Governments such as Colombia that have invested significantly in improving the internet infrastructure and connecting micro-businesses have seen notable improvements in a number of internet participation measures: Colombia is the sixth highest ranked country worldwide for electronic participation and the second highest ranked country in Latin America and the Caribbean for eGovernment.²⁶

A number of policy and business actions aimed at reducing administrative burdens for SMEs and at supporting investment can complement the success of mobile and internet-based applications such as banking and innovation hubs to unlock further economic benefits and support the development of local businesses. While more needs to be done in order to replicate and scale these benefits, these experiences suggest that expanding internet access has the potential to lead to fundamental advancements in the structure of economies across the developing world.

3.3 Internet access increases employment

The internet creates new jobs through numerous avenues: directly through the demand for labour from new technology-based enterprises; and indirectly through the demand from the wider ecosystem of companies that are created to support technology-based enterprises; for example, network installation and maintenance providers and providers of other skill-based services such as advertising and accounting. Importantly, the internet has the potential to create jobs that would not otherwise become available and, as seen above in the case of Bangalore, encourages the shift towards higher-skilled labour, resulting in an increase in wages and earning power. Jobs in businesses that employ the internet as primary source of trade are directly enabled by the internet, as are jobs in innovation hubs and jobs in professions that require constant access to data.

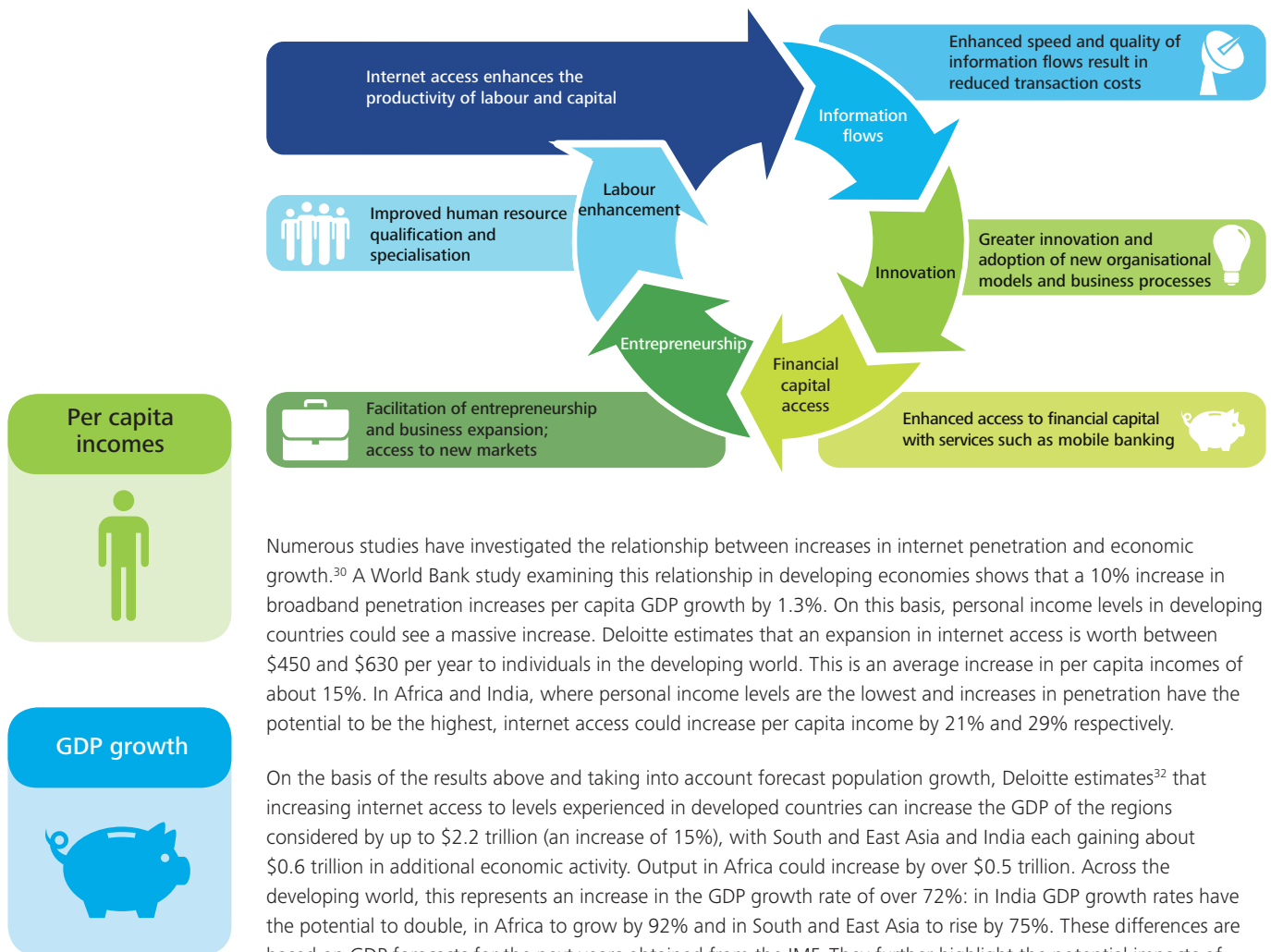
The impact of increases in internet penetration on employment have been analysed by the ITU. Based on the ITU’s analysis, Deloitte estimates²⁷ that extending internet access to levels seen in developed economies today could create 140 million jobs, an increase of 9% compared with what might have existed with current levels of internet growth. The majority of these jobs will be created in the poorest regions, where the increase in penetration would be higher. As many as 44 million jobs could be generated in Africa, and nearly 65 million in India.

Not only does internet access create additional jobs, it also enables a shift towards higher-skilled labour and an increase in the levels of responsibility and autonomy given to workers.²⁸ This creates a move towards a knowledge-based economy, as firms that invest in information technology and the associated organisational changes experience faster productivity growth.²⁹



3.4 Internet access increases economic growth

As a result of increases in productivity and innovation throughout the economy, an extension of internet access leads to additional economic growth. Growth is also driven by increases in demand in the sectors associated with internet service provision, together impacting the wider economy through increases in demand, spending and government revenues.



Numerous studies have investigated the relationship between increases in internet penetration and economic growth.³⁰ A World Bank study examining this relationship in developing economies shows that a 10% increase in broadband penetration increases per capita GDP growth by 1.3%. On this basis, personal income levels in developing countries could see a massive increase. Deloitte estimates that an expansion in internet access is worth between \$450 and \$630 per year to individuals in the developing world. This is an average increase in per capita incomes of about 15%. In Africa and India, where personal income levels are the lowest and increases in penetration have the potential to be the highest, internet access could increase per capita income by 21% and 29% respectively.

On the basis of the results above and taking into account forecast population growth, Deloitte estimates³² that increasing internet access to levels experienced in developed countries can increase the GDP of the regions considered by up to \$2.2 trillion (an increase of 15%), with South and East Asia and India each gaining about \$0.6 trillion in additional economic activity. Output in Africa could increase by over \$0.5 trillion. Across the developing world, this represents an increase in the GDP growth rate of over 72%: in India GDP growth rates have the potential to double, in Africa to grow by 92% and in South and East Asia to rise by 75%. These differences are based on GDP forecasts for the next years obtained from the IMF. They further highlight the potential impacts of internet access as a catalyst for economic growth, especially for regions, such as India, which are forecast to grow at a slower pace in the next years.

3.5 Unlocking the knowledge-based economy can reduce extreme poverty

Expanding internet access can also lead to a more fundamental advancement in the structure of economies across the developing world. Many of these economies are driven by agriculture and natural resources, and the internet can unlock a knowledge-based economy whereby information is shared without barriers: skills and knowledge, not access to resources, become key. In a knowledge-based economy, people and enterprises increasingly have the ability to develop specialised expertise and adopt new business methods. Increased demand in sectors such as software development, combined with an increase in innovation and the emergence of new technology-led enterprises, can increase the demand for high-skilled labour.

Expanded access to information, increased business and job opportunities, and ultimately higher incomes are all factors that can combine to reduce extreme poverty.

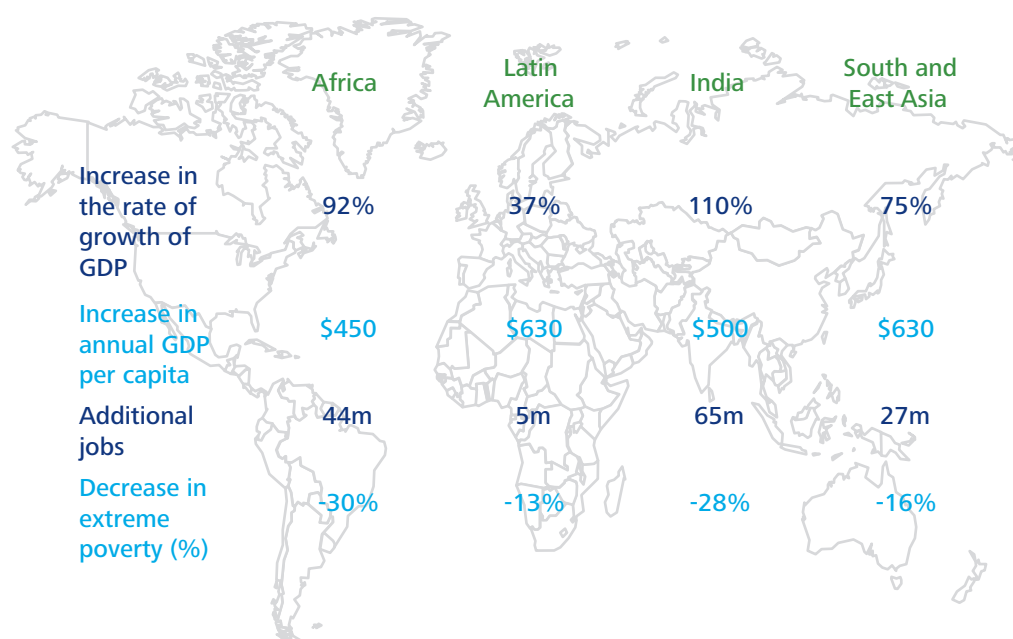
As a result of the economic growth jump-started by extended internet access, the number of people living on less than \$1.25 per day may be reduced by a third compared to current levels. This means that extending internet access has the potential to significantly contribute to the UN Millennium Development Goals of eradicating extreme poverty and hunger.

A number of studies have investigated the relationship between income increases and reductions in extreme poverty. On the basis of a study that shows how this relationship varies by region according to income distribution patterns, and on the income impacts resulting from internet access reported above, Deloitte estimates³² that about 160 million people would be lifted out of extreme poverty. The majority of this impact will be felt in Africa, where it is estimated that extreme poverty levels would be reduced by 30% and nearly 120 million would be lifted out of extreme poverty, reflecting the higher incidence of extreme poverty and the stronger response of poverty reduction to increases in GDP per capita observed in the continent today compared to the other regions. However, these effects will also be felt in somewhat more developed regions: the internet has the potential to lift 3 million out of extreme poverty in Latin America and 20 million in South and East Asia, where the extreme poverty rate could decrease by 28%.

The effects of extending internet access could be particularly important for rural communities. Beneficial impacts of technology advancements in these communities are not limited to just agriculture: constraints on the flow of information have limited these communities' access to wider markets and to a variety of employment opportunities, and access to mobile and internet-based applications can extend the range of business services that become available to these communities. Internet access is also valuable when placed at the service of rural development-oriented organisations that act as local communication conduits or intermediaries. Along with providing improved market knowledge, they can also develop locally appropriate applications and creative services, provide knowledge about successful development strategies, enable efficient regional, national and global organisational efforts, and be used as marketing tools to promote rural tourism and market the products of small secondary industries and home-based businesses. Finally, the internet enables local NGOs to gain a global presence and make better contact with potential donors and supporters through the online publication of resources and information and through the use of electronic mail.³³ Improvements in connectivity play an important role in overcoming this urban-rural divide and stimulating economic growth in these areas.



Figure 4. Summary of economic impacts of extending internet penetration by region



Source: IMF, ILO, World Bank and Deloitte analysis

4. The social impacts of extending internet access

Impacts of internet access in developing markets extend well beyond economic growth. By facilitating access to information, the internet provides wide-ranging social benefits across health, education and social inclusion. Extending internet access could lead to significant improvements in quality of life and skills contributing to social inclusion.

Social development and social inclusion remain a key challenge in many developing countries. While many of these countries have experienced some economic growth in recent years, economic, political, environmental and social crises continue to affect the lives of many populations. Over and above its economic contribution, the internet has the potential to improve the lives of those living in developing countries by providing access to an extraordinary amount of information, complementing the provision of basic services and improving health and education outcomes and social inclusion. Internet connectivity is already affecting healthcare, education and disaster relief in developing countries, in some cases through more advanced applications than those enjoyed in developed countries.

By complementing and enabling a better use of primary necessities, internet access can prove a useful accelerator in all social development objectives and targets of the UN Millennium Development Goals, aimed at encouraging development by improving social and economic conditions in the world's poorest countries. These involve dimensions as diverse as poverty and hunger, education, gender equality, child health, maternal health, HIV/AIDS, the environment and partnerships between local governments and service providers.

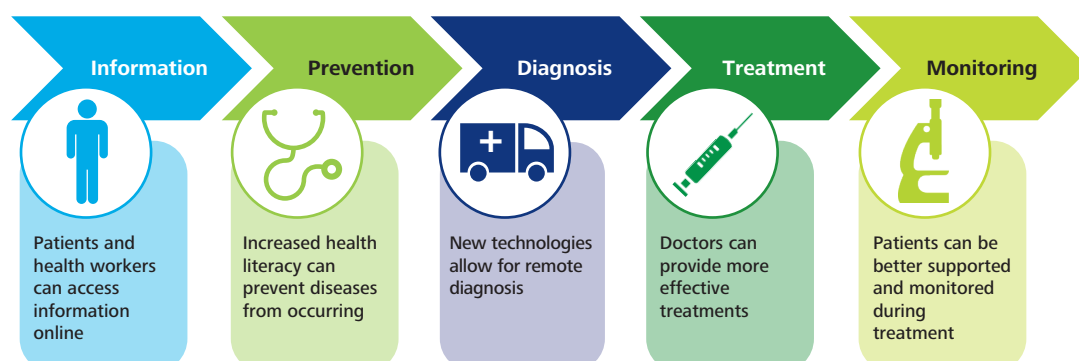
This section considers how internet penetration can impact social development in developing countries if they reached the levels seen today in developed economies.³⁴

4.1 The impacts of the internet on health

Lack of access to basic health services in developing countries remains a major social concern causing hundreds of thousands of deaths every year. More than 3.5 million children died in 2012 across India, South and East Asia, Latin America and Africa,³⁵ while the maternal mortality ratio³⁶ in developing countries was fifteen times higher than in developed countries³⁷ in 2013. The incidence of communicable diseases³⁸ is responsible for 80% of the difference in life expectancy between developed and developing countries.³⁹

A significant proportion of these deaths and diseases could be avoided if basic healthcare information and services were available. However, in developing countries a lack of financial resources and specialised personnel often combines with low levels of health literacy to increase health conditions.

Access to the internet can improve health conditions by reducing the incidence of diseases through better information for both patients and health practitioners. In addition to extending access to medical information, mobile and internet technologies have the potential to improve medical behaviours for patients and healthcare professionals by releasing doctors' time through reduced travel and increased efficiency; reminding individuals of their due treatments or medications; and providing easy access to information and enabling connectedness between patients and doctors, and between doctors in different locations. This has clear benefits for the delivery of medical services.



This impact is likely to be particularly significant in rural communities, where the traditional health infrastructure is harder to reach, by enabling information on health conditions to be shared remotely with hospitals for prompt treatment. There have already been numerous eHealth initiatives and pilot projects that have proved beneficial to local communities and could potentially generate sustainable benefits for larger populations.

4.1.1 The internet provides patients and health workers with greater knowledge

Online applications can have a direct impact on healthcare by providing information and services that would not otherwise be available to rural or marginalised communities. The internet provides both patients and health workers with immediate access to timely and relevant health information and tools.

In developed countries the internet is an important channel for health information, providing information on prevention measures and encouraging people to improve their lifestyles and medication behaviours. In addition, infection rates of communicable diseases decrease with higher awareness and health literacy in general.⁴⁰ A UK study suggests that people with low health literacy have a risk of mortality up to 57% higher than people with high health literacy. While it is recognised that this study was undertaken on a limited sample of individuals, this can provide a high level indication of the importance of health awareness. Based on these findings, providing internet access to 75% of the population has the potential to increase health literacy and, through this effect, to save nearly 2.5 million lives in developing countries.⁴¹



In particular, providing information to women and health workers can have a positive impact on child mortality rates. In India, rural villages with internet access had 14% lower child mortality rates than villages without the internet. Based on these findings, Deloitte estimates that increasing internet access in developing countries could reduce child mortality by 7% by extending information on pregnancy to a higher number of pregnant women, potentially saving 250,000 children who may otherwise have died during their first year of life.⁴²

Many mobile and internet-based applications are already improving health literacy and outcomes. One of these, **Nokia Life+ is a free web-based information service for smartphones in 18 countries that provides information related to nutrition, hygiene and prevention of common illnesses.**⁴³ Similarly, mHelp uses mobile technology to provide free services and resources such as online question answering and training for health workers. Its activity is particularly focused on tackling maternal health, child mortality and HIV, all part of the UN Millennium Development Goals.⁴⁴

4.1.3 The internet facilitates adherence to and management of treatments

Internet access benefits patients and others in the health sector by facilitating services such as the dispensation of drugs and medications.

HIV/AIDS and life expectancy



Studies have found that increasing health information and awareness of diseases has a positive effect on adherence rates to antiretroviral treatment, which is a crucial factor in increasing the life expectancy of HIV/AIDS patients.⁴⁵ Taking into account variation in adherence rates across regions, internet access may increase adherence to treatment by 22%.⁴⁶ On this basis, considering official figures on people affected by HIV/AIDS, Deloitte estimates that internet access, via its impact on awareness and adherence rates, may significantly improve life expectancy for more than 2.5 million people.⁴⁷ In Africa, extending internet access to 75% of the population may have a direct impact on the life expectancy of more than 2 million of people affected by HIV/AIDS, given the higher incidence of this disease here compared to other regions.

eHealth programmes have proven effective in combating diseases such as tuberculosis and HIV/AIDS. Building on the experiences developed through basic services such as the SMS-based SIM pill, which was successful in detecting noncompliance to treatments and achieved up to 94% full adherence,⁴⁸ internet-based applications have the potential to achieve even more.

In South Africa, iDart facilitates the management and distribution of antiretroviral treatments to HIV patients. It contributes to control drug stocks and the entire supply chain of the treatment. Since 2009, every month 300,000 HIV patients' treatments are controlled through the software.⁴⁹

4.1.4 The internet increases access to healthcare services and allows remote diagnosis

Access to the internet can improve the productivity of health resources, for instance by saving health practitioners' travel time or allowing information about patients to be sent to hospitals for analysis. Based on information on the number of healthcare workers provided by the WHO, if internet access in developing regions were extended to the level of developed economies, an additional 4 million healthcare workers could benefit from online health information and remote diagnosis.⁵⁰

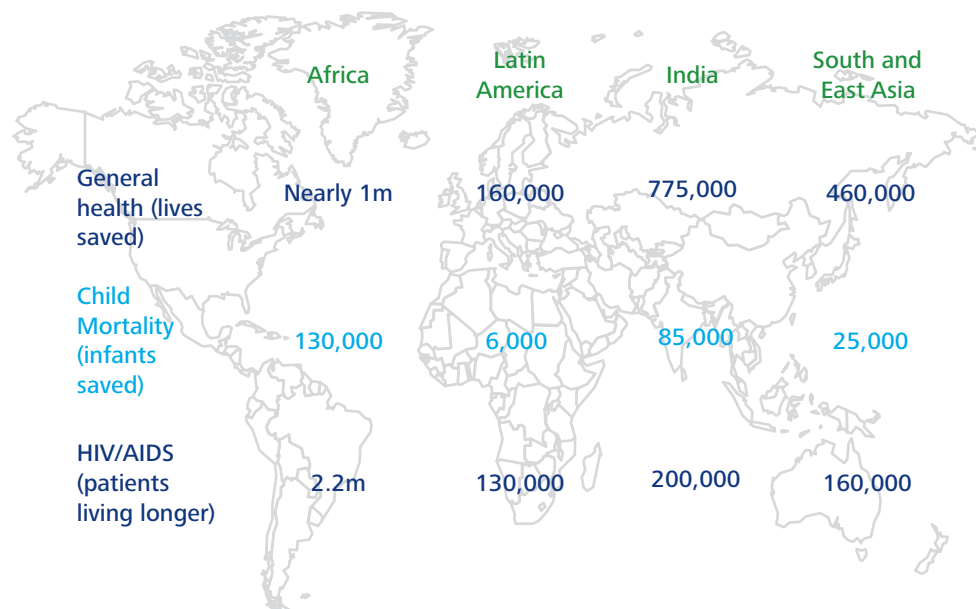
Many developing countries have limited access to microscopes and technicians. One of the consequences is that some diseases are not diagnosed in time or they are diagnosed wrongly with a negative impact on people's lives and health costs. Mobile broadband access is a powerful tool to enable people in rural areas to access new services and information that otherwise would be unavailable.⁵¹ For example, internet access enables video-conferencing to connect remote patients with trained doctors and to carry out learning sessions between practitioners.⁵²

"Trained community health workers – equipped with cell phones that allow them to get telemedical advice – can transform the rural health situation."
Joseph Jimenez, CEO, Novartis⁵³

The internet can also act as a powerful complement to basic or innovative medical equipment, to further enhance services and extend their reach.

In Uganda health workers based in Kampala can connect a microscope to a mobile phone with a camera, take pictures of microscope images and send them to a central server. Clinicians with access to the server can then make diagnosis and identify bacteria of different diseases such as malaria and tuberculosis.⁵⁴

Figure 5. Summary of health impacts of extending internet penetration by region



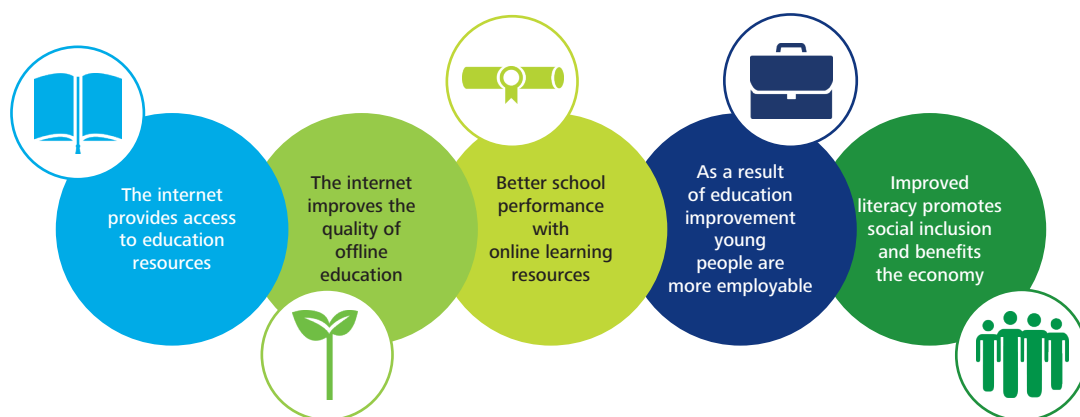
Source: WHO, World Bank, United Nations and Deloitte analysis. The impacts on the different health outcomes are not cumulative.

4.2 The impacts of internet access on education

Education is a major catalyst for human and economic development and its role is paramount in delivering sustainable socio-economic growth. Although rapid advances have been achieved in recent years, developing countries still face significant challenges in reaching universal primary school access and lag behind on many other dimensions of educational achievements. As of 2010, countries in Africa such as Niger and Mali had literacy rates as low as around 30%, while overall in Africa only 64% of the population was literate.⁵⁵ This contrasts to developed countries where this rate is typically above 95%.

While providing access to formal education for all requires investment in physical infrastructure, training of teachers, and adequate teaching resources, the internet is already proving one of the most powerful means to extend access to educational resources and improve lifelong learning and potentially outcomes, reaching even the most disadvantaged populations and in a cost-effective way.

Furthermore, as students acquire higher levels of literacy, numeracy and problem-solving skills through their engagement with the resources offered by the internet, their employability increases. Albeit the link between ICT and education outcomes requires further validation, initial evidence suggests a positive relationship between internet access and certain outcomes. Improved educational outcomes can have a strong positive impact on individuals' income and health outcomes⁵⁶ as well as on the economy.⁵⁷ Importantly, in addition to these effects, technology can expand opportunities for students to engage in collaborative learning, with great potential for learning and circulation of ideas.



"A student in a developing country can now access the library of a prestigious university anywhere in the world; an unemployed person can retrain and improve their job prospects in other fields; teachers can gain inspiration and advice from the resources and experiences of others. With each of these achievements, the online world brings about another real-world victory for education, dialogue, and better understanding between peoples."

Secretary-General of the International Telecommunication Union, Hamadoun Touré

More students online



Access to the internet has the potential to improve access to education by providing students with learning opportunities and materials online. The internet serves as a repository of knowledge that is not confined by geographical limitations and is available to anyone with internet access. The internet can also facilitate access to educational materials through means other than traditional schooling. For example, in India, the Hole in the Wall initiative provides access to computers whereby students can undertake unsupervised learning, and has been shown to have a positive impact on educational performance.⁵⁸

Based on data on children of school age from the World Bank, Deloitte estimates that extending internet access in developing regions to levels seen today in developed economies means that more than 640 million children could access the internet and the wealth of information it makes available while they study, nearly four times today's levels.⁵⁹ In Africa, up to 240 million more children could have access to the internet, and 230 million in India.

Higher education and open universities



The internet can spur access to secondary and tertiary education. While primary school enrolment rates in the developing world have risen in recent years, secondary and tertiary enrolment remains low. Secondary enrolment rates are on average around 55% and as low as 34% in Africa. Tertiary enrolment rates in Africa stand at around 10%, and are just over 20% in India and South and East Asia.⁶⁰ Both secondary and tertiary education make a significant contribution to employment prospects and income levels, but financial barriers may be a significant deterrent to enrolment in secondary schooling.⁶¹ These barriers arise not only from tuition costs, but also from the opportunity cost of attending school instead of working. Online courses can offer the affordability and flexibility that many students need. Online courses on a variety of topics are now offered by a number of institutions and leading universities, which can be accessed by anyone with an internet connection, making affordable internet access an important component of sharing the benefits of higher education.

Some universities in developing countries are also offering their own courses, such as the University of Nairobi and Open University of Tanzania, which offer both undergraduate and postgraduate courses online. Since its inception in 1994, the Open University of Tanzania has had over 80,000 enrolments.⁶²

The internet also provides numerous resources for teachers, including access to professional development courses. In developing countries, higher internet penetration provides the opportunity to increase the skills of teachers in a cost-effective manner, which is particularly crucial when there is a shortage of qualified teachers. As developing countries struggle to improve the quality of their educational systems in a cost-effective way, it is recognised that the use of ICT to support teachers and students could play a major role: evidence from Kenya and India suggest that having an additional teacher helps to improve educational performance, with students in schools with an extra contract teacher performing better than comparator schools.⁶³

The average pupil-to-teacher ratio in primary school is as high as 39 in Africa, compared to the USA where on average there is a teacher for every 14 students. While internet access alone cannot solve the problem of shortage of teachers, evidence indicates that it can support and enhance the effectiveness and quality of learning through improved teacher training.⁶⁴ For example, teacher quality has a positive impact on student achievement in reading and mathematics. High quality instruction in primary school could also substantially offset the disadvantages associated with a low socioeconomic background.⁶⁵

Teacher training programmes have used the internet and videos to demonstrate learning principles and teaching methods and encourage a creative attitude to information and learning. Programmes such as Pratham in India encourage schools to adopt ICT solutions as well as training the teachers to encourage the use of the technology.⁶⁶

The Training and Development Communication Channel used video, videoconferencing and satellite technology to provide interactive distance education for teachers in remote areas of India.⁶⁷

A major problem in developing countries is the lack of affordable learning resources. In Southern and East Africa, only 42% of 6th grade students had their own textbooks in 2007, while the acceptable level of access to textbooks was considered to be 85%.⁶⁸

Harnessing the extensive take-up of mobile services in recent years, online education initiatives have helped bridge this gap. In India, ***Attano and Samsung provided students from nursery up to post-graduation with a comprehensive collection of educational eBooks, tests and videos preloaded on smart devices or downloadable from the phone app store.***⁶⁹ Yoza Cellphone Stories creates short, interactive stories that can be downloaded on mobile phones from a website and shared on a mobile chat platform; schools that adopted Yoza stories as a reading resource experienced a fourfold increase in the number of books read over four years, strengthening literacy efforts.⁷⁰ These are some of the many examples where ICT applications in developing countries have fostered innovations and tailored solutions to meet local needs and overcome resource barriers.

Where textbooks are available only in English and not the local language, it disadvantages certain sections of the student population. For example, an evaluation of the curriculum and the relevant textbooks in Kenya has found that they benefit elite and academically stronger students.⁷¹ The internet has the potential to facilitate the availability of resources in local languages and could produce achievement gains across a wider scale.

The internet can change the way students approach learning, making it more interactive and enabling the provision of more flexible individual teaching that can be tailored to individual students and enable them to progress at their own pace. Users can access educational resources, tools and materials anytime from anywhere, using electronic technologies such as personal computers and mobile devices. ***MoMaths in South Africa is a mobile mathematics service which provides learners and teachers access to interactive mathematics learning materials using a mobile delivery platform combined with a social media application for peer-to-peer support.***⁷² Evaluation of the initiative has found a significant improvement in maths performance of the students exposed to the programme, leading to a 14% increase in maths competency.⁷³

The learning experience can be further enhanced by the opportunities provided by the internet to create and disseminate local content in the local language in developing countries. Asante Africa Foundation completed nearly 1,000 maths and science videos translated into Kiswahili for education and technology resource-starved rural schools in East Africa. Kiswahili is the national language of Kenya and Tanzania, and is spoken by over 120 million people worldwide.⁷⁴

Teacher development



Books and learning resources



Performance and outcomes



Initiatives and programmes across the developing world aimed at supporting educational efforts through ICT could also benefit from access to the knowledge base that the internet provides. Although the evidence to evaluate these efforts is still at an early stage and needs to be improved, initial results suggest that education bundled with ICT can enhance students' performance in literacy, mathematics and other educational outcomes. A study undertaken in India in 2005 indicates that providing computers to improve mathematical skills has a significant impact on maths grades. Children who went to schools where computer-assisted learning was provided had a better maths performance than students who went to schools where the programme was not implemented.⁷⁵ ICT can be also used outside of schools to improve current educational levels and tackle gender inequalities. In Pakistan where the literacy level varies widely between men and women, a mobile based programme promoted by UNESCO improved the literacy level of young and adult women. At the end of the first two phases of the project, a significant improvement was noticed in learners' literacy skills.⁷⁶

The link between ICT and education outcomes is also being investigated in developed economies. A study undertaken by the U.S. Department of Education indicates that blends of online and standard instruction are more effective than face-to-face classes. However this did not consider the differences in classroom conditions and other variables such as pedagogy.⁷⁷ A UK study also analysed the link between ICT usage in schools and pupils' grades: it found that high ICT users perform better than low ICT users, however this result requires further validation to be able to draw wider conclusions.⁷⁸

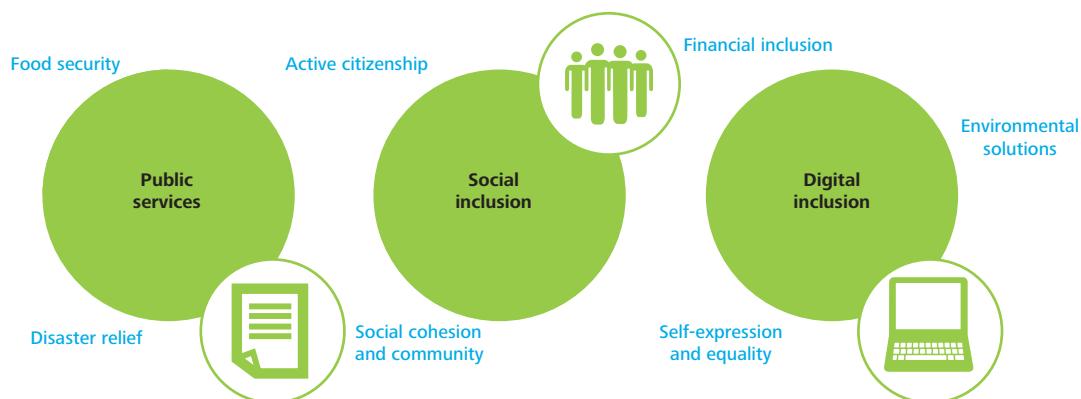
New approaches to education policy will prove crucial to ensuring that the UN Millennium Development Goals are met. A recent report revealed the goals of universal primary education and universal literacy are unlikely to be met, based on current trends, with progress having stagnated since 2004. The problem is not just one of access, but of quality: around the world, about 250 million children of primary school age are estimated to be unable to read, write or do basic mathematics, and of these, 130 million are enrolled in full-time education. Governments should promote innovative solutions to support the development of internet-based applications to complement and enhance educational efforts.

Although so far limited quantitative evidence exists on the evaluation of the impact of internet on educational performance, combining access to the internet with targeted education policies such as improved curricula and increases in teacher-student ratios has the potential to significantly extend the impacts of the internet in increasing quality of education and ultimately academic proficiency, attainment levels and employment outcomes.

4.3 The role of the internet in promoting social inclusion

The internet and its many applications have had a profound impact on the social fabric of the developed world. These often intangible benefits can have strong impacts at the personal and community level and the economic and social transformation promoted by mobile and internet access can improve a number of other social issues currently affecting developing countries.

ICT has long been recognised to promote and facilitate social inclusion,⁸⁰ i.e. the participation of individuals and groups in society's political, economic and societal processes.⁸¹ One way in which ICT expands inclusion is through effective public services that rely on ICT infrastructure and through digital inclusion, i.e. the ability of people to use technology. These three aspects are deeply intertwined, and they span dimensions as diverse as disaster relief, food security policies, environmental programmes, as well as citizenship, community cohesion, self-expression and equality. These intertwining and often intangible dimensions are captured in the figure below.



Internet access has the potential to increase efficiency in the provision of government services, especially in rural areas, reducing processing times and thus improving institutions' performance.

Internet access and mobile telephony can raise awareness of potential dangers, how to prepare for them and support organisations with the development and implementation of early-warning systems. In the event of a natural disaster, the internet allows families and friends to stay in touch through social media, allowing them to seek assistance more easily, get critical support and coordinate relief efforts. It can help find and contact the nearest relief centre, clinic, or field hospital.⁸²

The Kenyan company Ushahidi provides free and downloadable software used to generate interactive catastrophe maps of reports sent by victims, witnesses and aid workers via SMS, email and the web and was used to map the damage of the devastating Typhoon Haiyan in the Philippines.⁸³ Crisis mapping prepares people on how to help and where to find information in a crisis, and reduces vulnerability by improving information resources for people affected by disasters.

Disaster relief and food security



The internet also facilitates the spread of information on availability of food and resources across marginalised and rural communities, and improves coordination and management by local and central governments.⁸⁴

The internet allows greater participation of marginalised groups in the development process, by giving a voice to segments of the population that previously lacked access to the media and promotes civic engagements across all members of society. For example, a study in the US has found that high school students' use of the internet increases their civic engagement through the use of blogs and social media and the ability to access information on political issues.⁸⁵

In developing countries and in particular in rural areas, access to online voting and online citizen services reduces transaction costs, while businesses and entrepreneurs also benefit from access to online services like tax returns, procurement, paperless trade and customs. The internet is a key tool to help individuals understand where and how to access key public services and eGovernment solutions have resulted in significant improvements in the quality and responsiveness of the services public institutions provide to their citizens.⁸⁶

Active citizenship



Social cohesion and community



Enhanced communications promote social cohesion by reducing feelings of isolation and improving relationships; the internet creates communities of people with similar interests or problems and helps to keep relationships with friends and relatives. This is particularly relevant during natural disasters, conflicts, and epidemics. The internet can also promote access to basic community services through facilitating birth registration services.

In Uganda, the Mobile Vital Records System is using mobile technology to overcome poor communications infrastructure between rural villages and national birth registration offices by enabling village registration agents to send birth registration details of new-borns via mobile phones through to local hospitals connected to a web-based application.⁸⁷

Self-expression and equality



The internet empowers larger segments of the population, boosts autonomous and continuous learning and facilitates social interaction at all levels. Moreover the internet has created a space for expression, self-identification and mobilisation around behaviours in society, as a growing number of people use social media or other internet platforms to share their experiences and make their voices heard.⁸⁸

The Voices of Africa programme has trained young reporters from Zimbabwe, Malawi, Uganda and South Africa to create video news reports using internet-enabled devices,⁸⁹ allowing them to report on the issues they consider relevant to their communities.

Environmental solutions



The internet helps the move towards low-carbon economies by raising awareness of environmental issues through online campaigns. Additionally, innovative solutions to decrease energy consumption and provide ICT services off-grid are also being implemented in a number of developing countries, given the limited reach of national electricity grids and lack of reliable power supply.⁹⁰ This reduction can be met through, among other things, the introduction of more energy-efficient infrastructure, along with reduced carbon consumption through more efficient communication and travel.

Financial inclusion



Internet access can help address financial exclusion and improve economic and employment opportunities in rural areas. As discussed above, internet-enabled mobile terminals can bring banking – and therefore convenience, security, low costs and access to credit – within the reach of many of those who are now excluded. Micro-insurance via online accounts provides protection against financial shocks and bringing banking through affordable internet access can help promote transparency and fight corruption.

5. Inviting a debate on how to extend internet access

5.1 Internet access matters

Internet access matters in today's world. The internet has enabled developed economies to complete their transformation into knowledge-based economies where people share information without barriers, opening up opportunities for economic, business and social advancements and innovation. In developing countries, the internet is already contributing to a number of social and economic benefits and has led to innovative services being developed that have allowed developing countries to leap-frog to many state of the art technologies.

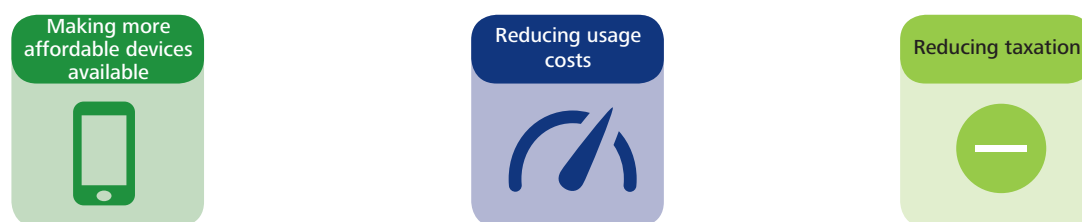
However, developing countries have still to realise their full potential. Deloitte has estimated that expanding internet access to an additional 2.2 billion people can increase GDP in developing countries by \$2.2 trillion, create 140 million new jobs, and lift 160 million people out of extreme poverty.

5.2 A number of barriers are constraining internet access

Despite increasing take-up rates in internet access in developing countries over recent years, reaching levels of internet penetration similar to those seen in developed countries remains an ambitious target for these countries.

Similar to the growth of the mobile telecommunications sector, many barriers remain to expanding internet access. Constrained affordability and service availability, especially in rural areas, are the most important and limit the expansion of access to the internet in developing countries while public policies that result in burdensome regulations further act to discourage investment.

Affordability today represents the primary barrier to accelerated internet take-up and the ITU estimates that mobile broadband remains unaffordable for nearly 3 billion people globally.⁹¹ Low income levels, often worsened by higher income inequality, combine with a high cost of owning and using an internet connection to increase the relative cost of internet access. This is further exacerbated by sector-specific taxes treating the internet as a luxury good. There are three possible ways of accelerating access by reducing the cost of an internet connection: making more affordable devices available, reducing usage costs, and reducing sector specific taxation.



Addressing the affordability challenge faced by consumers will unlock opportunities for operators to further expand coverage and invest in their networks. Service availability varies greatly in developing regions. 3G network coverage rollout has primarily focused in areas of higher income and denser populations, while newer technologies and networks that could expand internet connectivity at lower cost are far rarer.

Today, the major barriers that act to increase the costs of making the internet available include the infrastructure costs incurred by operators to deploy a network, the network costs associated with spectrum inefficiencies, and the amount of data that is required to supply basic internet services. Enhanced service availability could therefore be obtained by the combination of three key improvements: building more efficient infrastructure networks that make the signal travel further, for example by using low cost open-source hardware that can contribute to reduce the capital costs associated with network deployment; using spectrum more efficiently; and delivering data in more efficient ways e.g. through less data-heavy applications.



Importantly, barriers to access vary significantly within developing regions, and prove much higher for the poorest and those in rural and remote areas. In densely populated urban areas mobile broadband is typically available, however only those with higher income levels are likely to be able to afford it. In rural areas, the combination of high network deployment costs and lower incomes often results in lack of internet access, further exacerbating the urban/rural digital divide.

Today's levels of service affordability and availability must improve significantly to achieve universal internet access and unless the existing barriers to internet access are reduced, the economic and social benefits discussed above risk remaining unachieved.

5.3 How do we accelerate internet access?

"Of the developing world's 1.4 billion extremely poor people, 70 per cent live in rural areas. Their lives can be transformed as we connect village schools to information and knowledge on the Internet, bring telemedicine to far-flung rural health centres, provide accurate weather information to farmers and fishermen, and supply up-to-date market information to producers."

Ban Ki Moon, Secretary-General of the United Nations

To extend internet access in developing regions to levels seen in developed markets and to unlock the economic and social benefits discussed above, action is required. Without intervention, penetration in developing markets is unlikely to reach the levels seen today in developed markets.

More analysis will be required to identify rapid ways whereby governments, industry and the wider ecosystem across the economic, business, and social sectors can partner to reduce some of these constraints.

Public policy makers have the opportunity to guide national communications markets towards rapidly expanded internet access, through initiatives that focus on reducing costs and administrative barriers for operators, strengthening competitive incentives for operators to expand coverage and the services they offer, and ensuring that consumers face affordable prices. Coordinated policy efforts are effective: countries with a National Broadband Plan benefit from mobile broadband penetration some 7.4% higher than countries without plans, once the potential impact of factors like higher average income per capita, market concentration and urbanization are discounted.⁹²

The telecommunications and technology industry also has an opportunity to make a tangible difference in internet access. By shifting their business paradigms to consider the needs of customers in developing markets, the industry can promote sustainable hardware and software solutions that support open source networks, affordable phones and data efficient software.

International and regional organisations, as well NGOs operating in these regions, have an opportunity to drive the debate on how to best employ internet access to deliver life-changing healthcare and education services, and enable social cohesion.

5.4 Extending access can be achievable with coordinated action

The last decade has seen a mobile telecoms revolution in developing economies. Successful partnership between governments and operators have meant that mobile coverage has offered developing nations affordable and convenient wireless communications, and in many cases basic mobile penetration levels have exceeded levels observed in developed economies.

Internet.org and Deloitte recognise that this study is just a starting point for a critical debate on economic and social development. While this study focuses on the importance of extending internet access, it represents the beginning of a series of research papers that will discuss barriers to access as well as policy, technology innovation and advancements, and business solutions to extend access. We are inviting others to join the debate to move forward the discussion and suggest critical policies and actions to bring more people online.

Appendix A – Review of the social and economic impact of internet access

This appendix summarises and analyses evidence on the economic and social impacts triggered by the internet, based on a review of economic and academic literature and of a number of case studies. It first discusses economic impacts, and then focuses on health and education impacts.

A.1 The impact of internet access on economic growth

The impact of the internet has been extensively researched in the academic literature. The debate has often focused on the impact of the internet on economic growth and employment levels. However there is also considerable evidence documenting the more specific impacts that the internet can have on SMEs and innovation, on organisational efficiency and on the skill level of workers.

Internet access increases productivity across the economy

One way of measuring these economy-wide impacts on productivity and market efficiency is through Total Factor Productivity (TFP), which measures the efficiency with which inputs such as labour and capital are used and can be interpreted as a measure of the technological dynamism of an economy. Evidence from the United States suggests that up to two-thirds of recent increases in TFP can be attributed to improvements in ICT.⁹³ More recent research by Deloitte focusing on emerging markets has suggested that a 10% improvement in connectivity, in this case measured by mobile penetration, can increase long-run TFP by 4.2%.⁹⁴

For example, internet access in the agricultural sector can provide farmers with valuable information on weather conditions, disease control and new methods of maximising crop yield, and can enable livestock tracking. A series of studies have suggested that this can increase profits for farmers by up to 33%. There is also evidence suggesting that improved access to market and pricing information through the internet and mobile phones can help markets function more efficiently and empower small-scale farmers.⁹⁵



The internet enables fishermen in Brazil to access information on fish stocks and weather conditions

Brazil has extensively increased 3G penetration over recent years. This has impacted businesses' everyday activities. Particular examples in Brazil include Vivo's "Fishing with 3G Nets" project, which introduced 3G technology to support local fishermen's activities in the Bahia region. The project supports fishermen in their daily business by providing them with 3G-enabled mobile devices equipped with customised software applications. This enhances safety of navigation through real-time updates on location and weather conditions, and improves fishermen's marketing capabilities by providing them with constant updates on market prices and demand. It also allows them to connect directly with consumers and sell the daily catch via web-based applications.

Source: Deloitte and GSMA (2012): Brazil Mobile Observatory 2012. The initiative was developed by Qualcomm along with Telefónica/Vivo, the United States Agency for International Development USAID, ZTE, Santa Cruz Cabralia town hall through the Secretary's Office of Agriculture and Fisheries and the Instituto Ambiental Brasil Sustentavel (IABS)

Internet access supports enterprise and innovation

Extending internet access yields particular benefits for SMEs and can also support innovation and lead to the emergence of new enterprises.

The internet increases revenues and decreases transaction costs for SMEs

The internet offers potential for SMEs to grow, supporting entrepreneurship and employment in local communities.

A recent study focused on a sample of emerging countries (Vietnam, Mexico, Malaysia, Argentina, Turkey, Taiwan, Hungary and Morocco) reports that those SMEs who have access to broadband or mobile internet and who had invested in digital technology experienced on average 11% productivity gains due to web technologies. The internet impacted not only SMEs' revenues, which on average increased by 6% for those enterprises that made full use of internet access, but also the cost of selling the final products, which is reported to have decreased 4% on average.

These gains experienced by SMEs spill over to the rest of the economy. Increases in internet access are associated with greater market competitiveness, increasing efficiency and bringing benefits to consumers. In these countries, it is also reported that for each job lost due to the internet, 3.2 are created.

Source: McKinsey&Company, "Online and Upcoming: The Internet's impact on aspiring countries", 2012



The internet helps Rwanda move towards a knowledge-based economy

Rwanda focused on ICT in its plan to modernise its economy, Vision 2020, thorough a transition from an agro-based economy to a service-oriented, knowledge-based economy. A series of initiatives have been implemented: ranging from strategic infrastructure investments to ensure robust connectivity to extending the data coverage mobile network to the 96% of the population in the country. The country has also put in place several ICT literacy training initiatives and heavily invests in ICT training at schools and universities.

A prominent example is the One Laptop per Child initiative, which has distributed more than 110,000 laptops in primary schools across the countries, and the creation of an ICT innovation centre: the Knowledge Lab (kLab). This has led to substantial changes in Rwanda's internet penetration, and illustrates how an economy can make use of ICTs to transcend economic shortcomings and emerge as one of the region's ICT leaders.

Source: World Economic Forum, "Global Information Technology Report 2013: Growth and Jobs in a Hyperconnected World, The Metamorphosis to a Knowledge-Based Society: Rwanda", 2013



Internet access increases employment

By improving labour productivity and generating economic growth, expansions in internet access can also reduce unemployment. Studies have suggested that an increase in broadband penetration of 10% reduces the unemployment rate by 0.28 percentage points.⁹⁶ Wider digitalisation also creates jobs: a recent paper published by the World Economic Forum⁹⁷ shows that, on average, increasing digitalisation by 10% leads to a reduction of 1.02 percentage points in the unemployment rate.

Not only does internet access create additional jobs, it also changes the balance of jobs within the economy. There is evidence that adoption of ICT by individual firms is associated with a shift towards higher-skilled labour and an increase in the levels of responsibility and autonomy given to workers.⁹⁸ This contributes to the move towards a knowledge-based economy, as firms that invest in information technology and the associated organisational changes experience greater productivity growth in the long run.⁹⁹

Internet access increases economic growth

A variety of studies have examined the impact of internet penetration on productivity and economic growth. A recent review of studies by the ITU has estimated that a 1% increase in broadband penetration leads to an increase in annual GDP growth rates of between 0.015 to 0.13 percentage points.¹⁰⁰ Previous research from Deloitte suggests that a 10% increase in internet penetration, in the form of a switch from 2G technology to 3G technology, has a 0.15% impact on annual growth rates.¹⁰¹

Other studies have focused on the wider effects of digitalisation and increases in internet usage. For instance, the study by the WEF cited above shows that an increase in digitalisation (measured through a combination of affordability, usability, and availability metrics on internet access) of 10% leads to an increase in annual GDP growth of 0.75 percentage points, for developed and developing markets. The Deloitte paper cited above also found that doubling the mobile data use per 3G connection leads to an average increase in annual GDP growth of 0.5 percentage points, while a recent study by Ericsson¹⁰² found that doubling broadband speeds can add up to 0.3% to the annual growth rate of an economy.

Unlocking the knowledge-based economy can reduce poverty

The increases in productivity, employment and economic growth created by an expansion in internet access will raise average incomes and lift people out of poverty. The academic literature suggests that an increase in GDP growth of 1% can reduce poverty rates by between 0.3% and 1.3%.¹⁰³

A.2 The impact of internet access on health

Whilst the internet has become prevalent across various consumer industries, its impact on health is arguably in its infancy, and so is the empirical literature on its effects. Nonetheless, there have been a number of studies examining the impact of the internet and improved health literacy on a range of health and mortality indicators, and numerous eHealth initiatives and pilot projects that have proved to be very beneficial to local communities and could potentially generate sustainable benefits for larger populations.

The relationship between information and health outcomes

A review of the literature analysing the relationship between information and health outcomes reveals that in developed countries the internet is already the main channel to acquire health information, which can advise people on preventative measures and encourage people to improve their lifestyles and medication behaviours. In addition, infection rates of communicable diseases are decreased by increasing awareness and health literacy in general.¹⁰⁴ Research has demonstrated the positive impact of health literacy on mortality rates: a UK study suggests that people with low health literacy have a risk of mortality up to 57% higher than people with high health literacy.¹⁰⁵

Providing information to women and health workers can potentially have a positive impact on the child mortality rate. For example, basic knowledge can dramatically decrease the infant mortality rate and the wider impact of asphyxia; a study on traditional birth-attendant training effectiveness showed that traditional birth-attending training was associated with a decrease of 11% in birth asphyxia mortality and 8% in peri-neonatal mortality.¹⁰⁶ An empirical study undertaken in India compared the internet impact on child mortality between two villages with and without internet access. Results showed that child mortality rate decreased by 14% more in the village where the internet was provided.¹⁰⁷

The internet also plays a crucial role for communicable diseases such as HIV/AIDS. Empirical analysis estimates that increasing health literacy has a positive effect on adherence rate to antiretroviral treatment which is a crucial factor to increase life expectancy of HIV/AIDS patients.¹⁰⁸

Selection of eHealth experiences

Health literacy and training programs

Nokia Life+ is a free web-based information service for new Asha smartphones in 18 countries. It provides two separate services: Life Skills (building interpersonal skills, self-confidence, and financial literacy) and Live Healthy (nutrition, hygiene, fitness, and prevention of common illnesses).

mHelp is a programme that uses mobile technology to provide free services and resources such as online question answering and training for health workers. Its activity is particularly focused on tackling maternal health, child mortality and HIV which are part of the UN Millennium Development Goals.

mPowering Frontline Health Workers is an initiative launched by the mHealth Alliance with the aim of crowdsourcing innovative multi-media health content, creating an online library of downloadable digital health content that can be accessed by organisations in developing countries, and producing a digital dictionary to enable integration and standardised reporting across multiple mHealth applications.

Source: <http://mhealthalliance.org/our-work/initiatives/mhelp>, GSMA Mobile for Development Intelligence.



Successful treatment adherence to cure diseases

iDart is a software created to facilitate the management and the distribution of antiretroviral treatments to HIV patients. In particular, it contributes to controlling drug stocks and the entire supply chain of the treatment. The program was launched in South Africa in 2009 and every month 300,000 HIV patients' treatments are controlled through the software.

SIMpill is a medication management system that detects non-compliance in real time and, when medication is missed, uses SMS messages to remind patients and carers. With effective medication compliance, something technology can effectively support, some 90 percent of those infected with TB could be cured. In South Africa the SIMpill system has achieved a 94 percent compliance rate for a TB trial, resulting in a 92 percent cure rate.

In a study on HIV testing, Cell-Life found that text messaging can make recipients change their behaviour. Designed by Prof. de Tolly and the health and research society unit at the University of Stellenbosch, the study tested whether sending text messages that encourage people to go for HIV testing had any impact. They found that 10 motivational SMSs had a statistically significant impact on getting people to test for HIV. Across the entire sample, the average response rate was 55%.

Source: <http://www.cell-life.org/systems/dispense-idart/>; Eliza Barclay, "Text messages could hasten tuberculosis drug compliance", *The Lancet*, Volume 373, Issue 9657, Pages 15-16, 3 January 2009; and De Tolly K., Nembaware V., Benjamin P., Cell-Life, Skinner D., *Research on Health & Society*, Stellenbosch University. "Encouraging HIV testing through SMS: Can it work, and do content and dosage impact?", 2012.





Telemedicine and remote diagnosis

In India, the Pune district administration with doctoranywhere.com and Tata launched a telemedicine project to connect 88 primary healthcare centres. The aim of the project is to reduce travel time and healthcare costs for people living in rural areas. Connecting all the centres to headquarters, doctors can request advice from specialists based in main cities.

A telemedicine program by the Government of Maharashtra (India) increased the number of patients reached and diagnosed by seven times in three years. Through this project doctors created a dataset of patient details (including pathology reports, X-ray, etc.) and their medical history. A central hub containing all the information is accessible from all the consultants which can exchange their opinions about specific cases. For example, in case of an emergency patients' data is available to doctors based thousands of miles away and they can advise specific treatments. Another important aspect of telemedicine is the training that can be provided to community health workers and medical staff in general. From 2008 to 2011, 8408 patients were referred through telemedicine and 8382 specialists expressed their opinion on the referred cases. The most required services were cardiology, dermatology, pathology, ophthalmology and surgery consultation.

In Uganda, doctors use mobiles and microscopes together to provide faster diagnosis. Connecting a microscope to a mobile phone with a camera, health workers based in Kampala can take pictures of microscope images and send them to a central server. Clinicians with access to the server make diagnosis identifying bacteria of different diseases such as malaria and tuberculosis.

Source: <http://www.cddc.vt.edu/knownet/articles/pune-telemedicine.html>; Kumar et al., "Telemedicine in the State of Maharashtra: A Case Study", 2012; Tapley, et al., "Mobile digital fluorescence microscopy for diagnosis of tuberculosis", Journal of clinical microbiology, 2013.

A.3 The impact of internet access on education

Literature on the impacts of the internet on education

Access to the internet at home improves student performance

A recent paper by Badasyan and Silva found that internet access at home considerably improved test scores of 8th grade students in Brazil.¹⁰⁹ The study examined the effect of internet access at school and/or at home on the academic performance of students in urban areas in Brazil on standardised Portuguese and mathematics tests in 2007 and 2008. The study controlled for a number of variables including household assets, parental education and involvement in student activities, school infrastructure, safety, electronic equipment and libraries, teachers' academic history, experience, and pedagogical strategies. In 2009, access to the internet only at school had a small but significant positive impact on performance, although the magnitude of the impact of home access was still larger.

Similarly, Jackson et. al. found that children who used the internet more had higher scores on standardised tests of reading achievement and higher grade point averages.¹¹⁰ Interestingly, this effect was persistent and continued over the study period between December 2000 to June 2002. The study was a longitudinal field study that examined the impact on academic performance of home internet use in low income families. The ages of the participants ranged between 10 and 18 years, and the authors continuously recorded internet use and obtained multiple measures of academic performance.

The research suggests that the potential of the internet still has not been realised in its use in classrooms. While schools in developed countries are embracing the use of technology, there are potentially significantly more benefits to be gained by the opportunity to transform educational practices and pedagogy to enhance the teaching and learning experience, and outcomes.¹¹¹

Education has positive returns for the individual

As students acquire higher levels of literacy, numeracy and problem-solving skills through their engagement with the resources offered by the internet, their employability increases. Improved educational outcomes have a strong impact on both the individual as well as the economy. At a microeconomic level, there are strong positive returns to the individual in terms of higher wages and lower levels of unemployment.¹¹² There is a large body of academic literature on labour economics that reports estimates of private returns to education of between 6-10%.¹¹³

Education has positive returns for society

Many theoretical models have also demonstrated the positive impact of human capital on economic growth and on the distribution of income.¹¹⁴ Barro examined the determinants of economic growth and investment for around 100 countries over the period 1960 to 1995 and concluded that growth is positively related to average years of school attainment. Educational quality plays a crucial role in economic growth. In fact, the author found that quality of education had quantitatively a stronger impact on economic growth than duration of school participation.¹¹⁵

Similarly, Hanushek and Woessmann found a strong positive link between basic literacy skills levels as well as higher levels of cognitive skills, rather than just school attainment, individual earnings, distribution of income and economic growth.¹¹⁶

Selection of eEducation experiences

My Education in India provides access to books for students

Attano, India's first eBook store and the largest marketplace for interactive educational eBooks in the country has partnered with Samsung to launch My Education on a wide range of Samsung smart devices. The project consists of an application which is pre-loaded on the phone and also downloadable from the Mobile Application store. It caters to the needs of students across their educational lifecycle from nursery up to post-graduation by offering a comprehensive collection of interactive educational eBooks, tests, free learning videos and education news.

The eBooks available on the application include all leading publishers in India. The collection spans interactive eBooks, video books, activity eBooks, assessments and test prep to give Indian students a rounded educational experience and holistically cater to their diverse learning needs. Users can search, make revision notes, take interactive tests, highlight and bookmark important topics.

With My Education, students can also access free educational videos on various topics plus education-related news such as board results, scholarships, admission dates, and locate schools and colleges near them via an inbuilt directory.

Source: <http://www.businesswireindia.com/news/news-details/attano-powers-%E2%80%98my-education-application-samsung-tablets-smartphones/32772>





Professional teacher development through technology

Teacher training programmes in India and Bangladesh have used television programmes and videos to demonstrate pedagogical principles and teaching methods. For example, the Training and Development Communication Channel (TDCC), established in 1995, used video, videoconferencing and satellite technology to provide interactive distance education for teachers in remote areas of India. Such programmes enable teachers to watch and learn from experienced teachers in real classroom settings, and develop their teaching skills.

Similarly, the Secretary of Distance Education Department (SEED) of Brazil established the ProInfo Programme for Professional Developing in 1995, to promote computer access in public schools and facilitate relevant teacher training, using various distance education strategies. As part of this programme, the “Virtualizing” project was established which encouraged, via immersion in an e-learning environment, a culture of technology use and appropriate pedagogical strategies among teachers. The Virtualizing project, and others under the ProInfo Programme, encouraged teachers to use project-based pedagogical approaches and to have a critical and creative attitude to information and learning. Teachers were taught to use ICT in teaching and to create materials for use in classes. The ProInfo Programme also established a website for exchange of information by teachers, peer-learning, and online professional development courses; and developed software for teaching literacy via distance education.

Source: UNESCO, “Using ICT to Develop Literacy”, 2006



Bangla Innovation through Open Source provides access to information in the local language

Bangla Innovation through Open Source (BIOS), a non-profit group, was established in August 2002 with the goal of addressing the issues of accessibility and affordability of ICT in Bangladesh. Many forms of ICT are not affordable for a large proportion of the population of Bangladesh, and are not often usable as there has been little integration of the Bangla language within ICT.

BIOS has attempted to foster the development of open source technology components and has encouraged the integration of the Bengali language with ICT. BIOS also advocates for the development of ICT-based learning materials in the Bengali language, including materials such as online Bangla dictionaries, open encyclopaedias and online literature archives. When such tools are easily accessible and freely available, they can be useful for literacy education programmes.

One of the projects implemented by BIOS has focused on developing freely-available multimedia learning materials for teachers and students. These materials are created by subject matter experts and are based on sound pedagogical theory, using good software design and clear graphics, so as to enhance the usability and interactivity of the materials.

Source: UNESCO, “Using ICT to Develop Literacy”, 2006

Open universities in the developing world

The availability and demand for open online courses has expanded dramatically in the last few years. Courses on a variety of topics are offered by a number of leading universities, which can be accessed by anyone with an internet connection. Some universities in developing countries are also offering their own courses, such as the University of Nairobi and the Open University of Tanzania, which offer both undergraduate and postgraduate courses online. Since its inception in 1994, the Open University of Tanzania has had over 80,000 enrolments. The online courses offer the necessary access and flexibility that many students need to be able to enrol and successfully complete the courses.

The National Program on Technology Enhanced Learning (NPTEL) is an initiative funded by the Government of India. The website provides access to web and video-based courses in Engineering, Science and Humanities, taught by professors of these eminent universities. There are currently more than 1,000 courses being offered on the website. They have recently introduced several new courses on Polymer Chemistry, Infrastructure Finance, Money and Banking and several other subjects.

The Open University of Tanzania, "Facts and Figures 2012/13", 2013.

University World News, "Demand drives growth of open learning in East Africa", 2013.

<http://nptel.ac.in/>



Appendix B – Estimation of the impact of extending internet access

This section provides a description of the methodology employed to estimate the impacts of extending internet access on a set of social and economic indicators. Section B.1 defines the penetration scenarios used throughout the estimation and the way in which the number of internet users has been estimated for each, Section B.2 describes the methodology for the estimation of the economic outcomes presented in the report, while section B.3 covers the methodology for the estimation of the social outcomes. Section B.4 illustrates indicators of educational attainment across selected regions.

This study covers the following regions: Latin America, Africa, India and South and East Asia. A detailed list of countries included in each of the regions is provided in section B.5.

B.1 Scenario definition

This report examines the impacts on the economy and society of developing countries if they were to achieve the same level of penetration that developed countries enjoy today, compared to a scenario where no action is taken to extend internet access. In estimating these effects, it is assumed that a 75% level of penetration, which is the average penetration in the developed world in 2013, is reached in a five-year time horizon (the 75% scenario).

To assess the additional impact that this change would have on the countries of interest, it is necessary also to define a counterfactual scenario which indicates what would happen in the next five years to a number of variables if no action is taken. In the counterfactual scenario, internet users are assumed to grow in line with the IMF's forecasts on real GDP growth. This scenario is based on IMF's forecasts of GDP and population growth. This document reports the incremental impacts of the proposed increase in internet access with respect to this scenario.

B.2 Estimating the economic impacts of extending internet access

The impact of extending internet access to 75% of population in these regions are studied in relation to the following indicators:

- Long run productivity.
- Employment rate.
- GDP per capita growth.
- GDP growth.
- Extreme poverty rate.

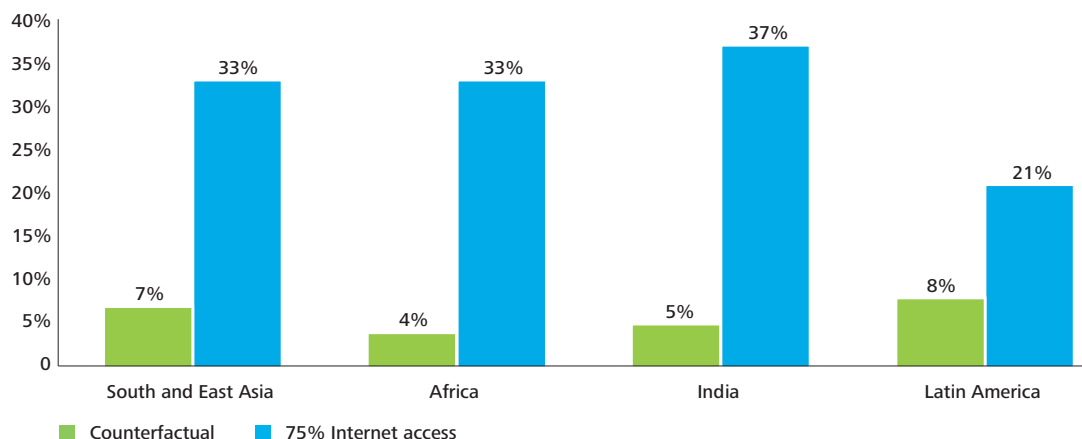
B.2.1 Estimating the impact of internet access on long run productivity

To estimate the impact of extending internet access on the countries' productivity, this report employs results from a previous work published by Deloitte and Cisco.¹¹⁷ This study estimates that a 10% increase in mobile phones penetration leads to a 4.2% increase in long run Total-Factor Productivity (TFP). Total factor productivity measures the efficiency with which inputs such as labour and capital are used and can be interpreted as a measure of the technological dynamism of an economy. Assuming that the internet has the same impact on productivity as mobile phones, this report's results can be extended to estimate the impact of increasing internet penetration on long run productivity. The study allows for a time frame of 15 years for the transformational effects to fully materialise.

In line with this approach, to assess the additional impacts of the increase in internet penetration in the long run a period of 15 years up to 2028 is considered. It is assumed that after 2018 internet penetration in both scenarios grows at the same rate for the next 10 years. This average is in line with the average penetration growth applied in the counterfactual scenario up to 2028.

The additional increase in long term productivity due to the increase in internet access is therefore estimated using the elasticity provided above. Figure 6 illustrates the additional increase in productivity by region in the two scenarios. The additional increase in productivity across all the developing regions is 25% on average.

Figure 6. Increase in long run productivity (increase in TFP) in 2028



Source: Deloitte analysis

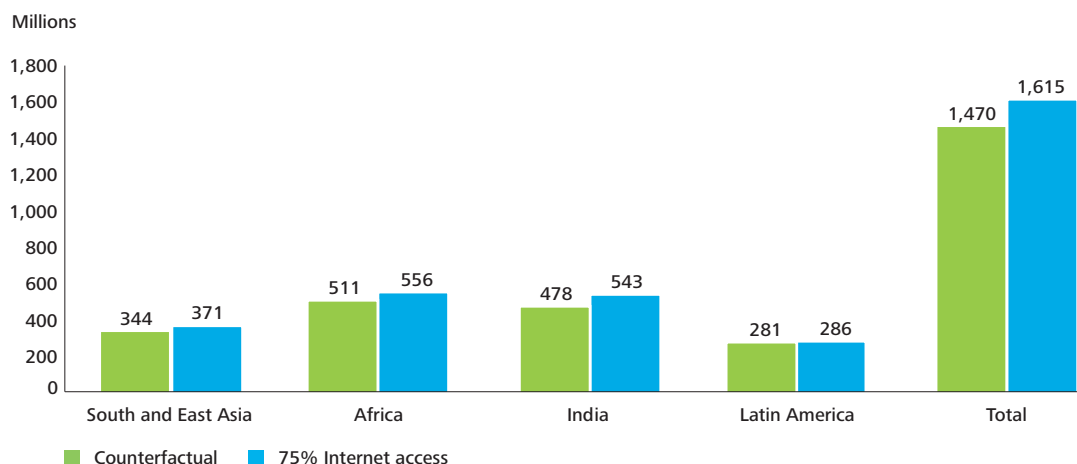
B.2.2 Estimating the impact of internet access on employment

In order to estimate the impact of an increase in internet penetration on employment, this report applies an elasticity of the employment rate with respect to internet penetration reported by ITU.¹¹⁸ This 2012 study finds that for the case of India, an increase in internet broadband penetration of 1% increases the employment rate by 0.028%. In this analysis, the estimation for India is used as a proxy for the impact of internet penetration on employment rate in all the developing regions. The ITU study did not extend the analysis to other developing regions.

The incremental impact of an increase in internet access on employment rate is obtained as follows:

- For each year, the difference in internet penetration rates between the 75% and the counterfactual scenario is estimated.
- To obtain the incremental number of employees generated by the increase in internet access, the additional increase in penetration is multiplied by the employment rate elasticity identified above. The employment rate is estimated by dividing the number of people employed (based on the latest ILO estimations) by the population.
- This incremental employment rate is added to the employment rate of the counterfactual scenario to obtain the total employment rate in the 75% scenario. The number of additional jobs is then estimated by applying this employment rate to the forecast population.
- The number of additional jobs generated by an increase in internet access is the difference between the number of people employed in the 75% scenario and the number of employees in the counterfactual scenario. Figure 7 shows the increase in employment across the regions in the two scenarios.

Figure 7. Increase in employment (number of employees) in 2018



Source: Deloitte analysis

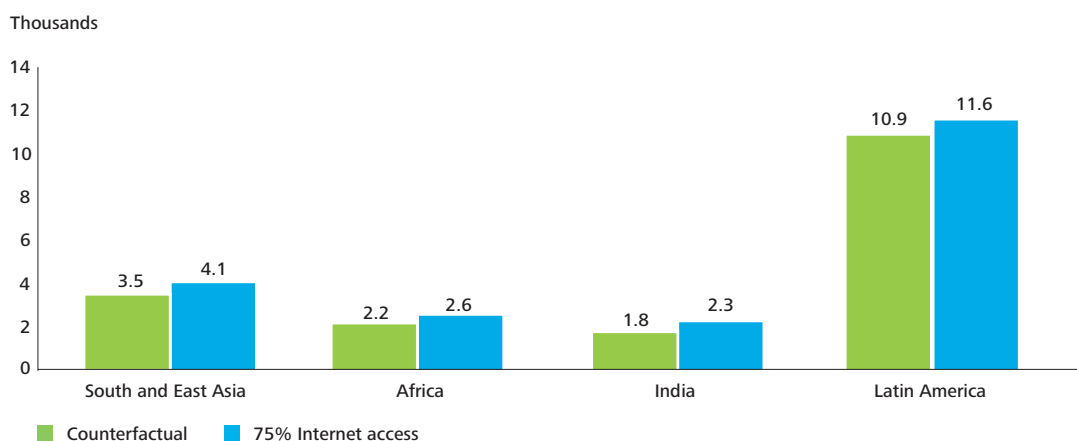
B.2.3 Estimating the impact of internet access on GDP per capita growth

To estimate the impact of internet access on annual income growth, this report employs the results of a World Bank research paper examining the impact of increases in broadband penetration on real GDP per capita growth.¹¹⁹ This study indicates that an increase of 1% in broadband penetration leads to a 0.138% increase in real GDP per capita growth. The estimation of the impact is carried out as follows:

- The number of additional internet users under the 75% scenario is estimated for the period 2013-2018.
- The number of additional internet users is used to obtain the incremental penetration rate, to which the elasticity mentioned above is applied. This allows the estimation of the incremental GDP per capita growth driven by the increase in internet access.
- The additional increase on real GDP per capita growth is added to the forecast real GDP per capita growth to obtain the effective real GDP per capita change.

The estimation of these effects is carried out annually from 2013 to 2018. Figure 8 illustrates how real GDP per capita increases across regions in the two scenarios.

Figure 8. Increase in real GDP per capita (2013 \$) in 2018



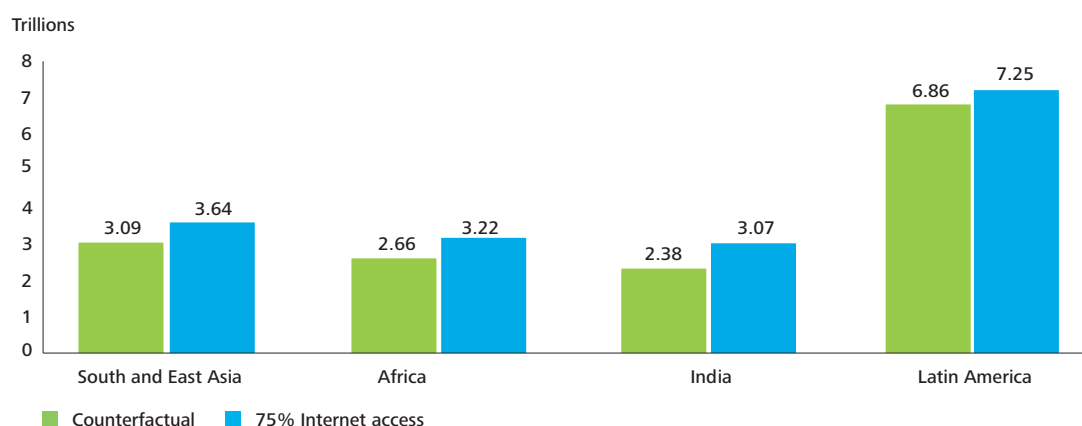
Source: Deloitte analysis

B.2.4 Estimating the impact of internet access on GDP growth

The previous section has shown that the expansion of internet access generates an additional growth in GDP per capita. Consequently, the level of GDP for each year generated as a result of extending internet access is obtained by multiplying the real GDP per capita by the forecast population.

Figure 9 illustrates the impact on GDP across regions in the two scenarios. In total, the increase in GDP levels in constant 2013 prices across regions is estimated to be \$2.2tr.

Figure 9. Real GDP increase (2013 \$tr) in 2018



Source: Deloitte analysis

B.2.5 Estimating the impact of internet access on extreme poverty reduction

The increases in productivity, employment and economic growth resulting from an expansion in internet access have the potential to raise average incomes and lift people out of poverty.

An increase in countries' income levels consequently decreases the number of people living in extreme poverty, which the UN defines as those living on less than \$1.25 per day (in purchasing power parity terms).¹²⁰ It is however important to note that the impact of GDP increases on poverty levels depends on how this additional income is distributed across the population. This distribution varies across regions and countries.

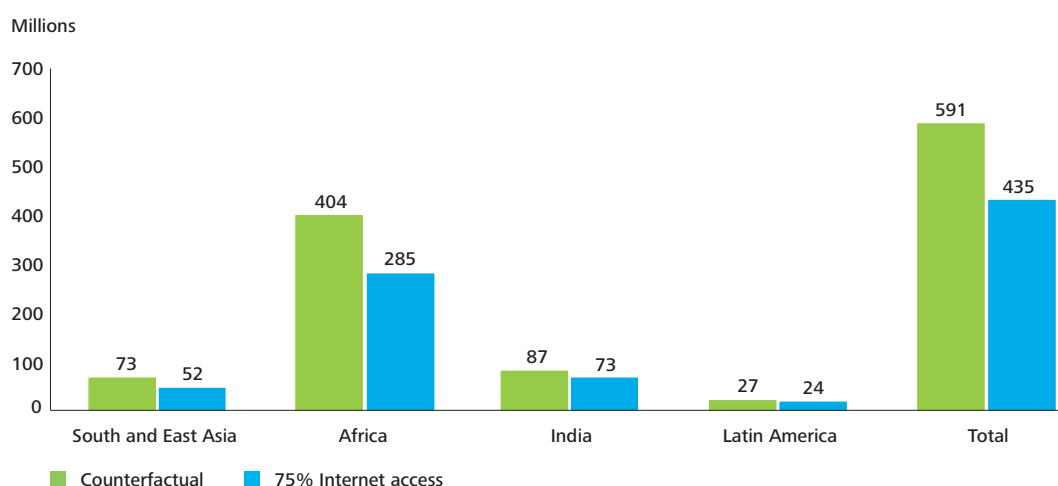
A study has been undertaken to account for these different income distributions by employing a recent estimation of income elasticities to poverty in developing countries.¹²¹ This study finds that in India and Sub-Saharan Africa a GDP per capita increase of 1% leads to a decrease in the extreme poverty rate of 0.38% and 1.08% respectively. It also provides an elasticity equal to 1.34 for a sample of other developing countries.

In the counterfactual scenario the model assumes that extreme poverty decreases in line with forecast GDP per capita growth by employing the elasticities described above. The incremental impact in the 75% scenario is obtained as follows:

- The additional impact of the increase in internet penetration on the extreme poverty rate is estimated by applying the income elasticities indicated above to the real GDP per capita reported in section 1.2.1.
- To obtain the total impact in the 75% scenario, the incremental impact is added to the poverty reduction rate in the counterfactual scenario. Population forecasts are used to estimate the total number of people living in extreme poverty in both scenarios.
- The number of people lifted out of poverty driven by the increase in internet access is obtained comparing the two scenarios.

Figure 10 illustrates the number of people living in extreme poverty in the two scenarios. Across all regions, the additional increase in GDP may lead to an additional of almost 160m people which would lift out of extreme poverty.

Figure 10. Number of people living in extreme poverty in 2018



Source: Deloitte analysis

B.3 Estimating the health impacts of extending internet access

This section describes the approach and data sources applied in the estimation of the impact of extending internet access on health outcomes. The estimation undertaken covers three health outcomes:

- General mortality rate.
- Child mortality rate.
- HIV/AIDS patients' life expectancy.

Different assumptions have been set in order to apply research and case study findings to different regions. The estimation applies the two scenarios employed by the economic model: a scenario where in 2018 the number of internet users has increased following real GDP growth rate (counterfactual) and a scenario where in 2018 75% of population have access to the internet.

All the impacts are reported showing the difference in outcomes between the two scenarios in 2018.

B.3.1 Estimating the impact of internet access on mortality rates

In order to estimate the potential health benefits delivered by the internet in developing countries, the analysis focuses on the link between health literacy and health status.

Research undertaken in the UK¹²² indicates that health literacy can affect individuals' mortality risk. This research identifies a sample of people aged above 52 with three different levels of health literacy: low, medium and high. People with low and medium health literacy are found to have higher risk mortality, by 57% and 20% respectively, compared to those with high health literacy over a 4 years period.

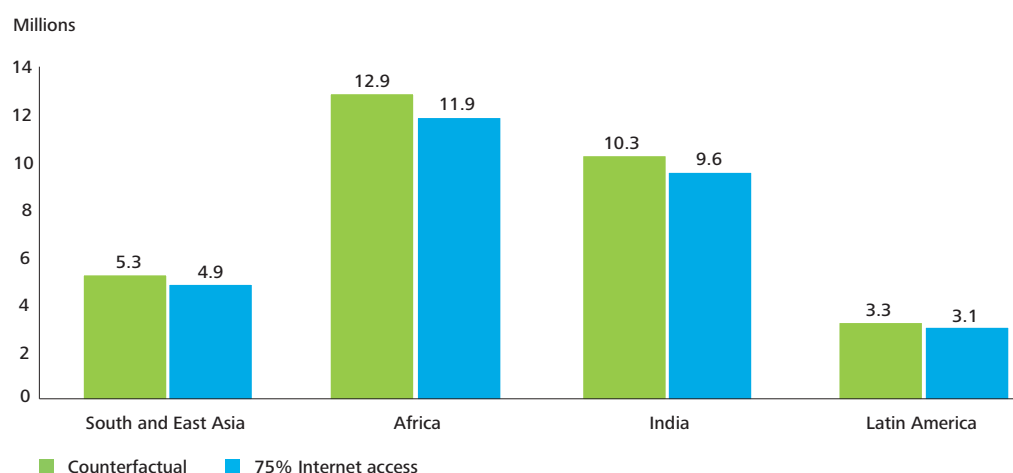
To estimate the impacts of extended internet access to the regions covered by this study, the results of this study are applied as follows:¹²³

- Literate people with access to internet may have a higher level of health literacy.
- The model estimates for each region the number of literate people with access to internet in both scenarios.

- Based on the research findings, a lower mortality rate is applied to literate and connected people. Consequently, an increase of internet penetration would lead to a decrease in total mortality.
- Comparing the number of deaths in both scenarios, the model provides an estimate of the numbers of lives that could potentially be saved as a result of internet access.

The results of this analysis are reported by region in Figure 11. This figure shows the number of deaths in 2018 in the counterfactual scenario and in the 75% scenario. In Africa, extending internet access to 75% of population would reduce number of deaths by almost 1m people. A similar trend can be seen in all the other areas: almost half million of deaths could be prevented in South and East Asia, nearly 800,000 of people in India and nearly 160,000 in Latin America.¹²⁴

Figure 11. Number of deaths in 2018¹²⁵



Source: Deloitte analysis

B.3.2 Estimating the impact of internet access on child mortality rates

The impact of extending internet access on child mortality is estimated by taking into account how information provided to women through the internet may potentially decrease the child mortality rate.

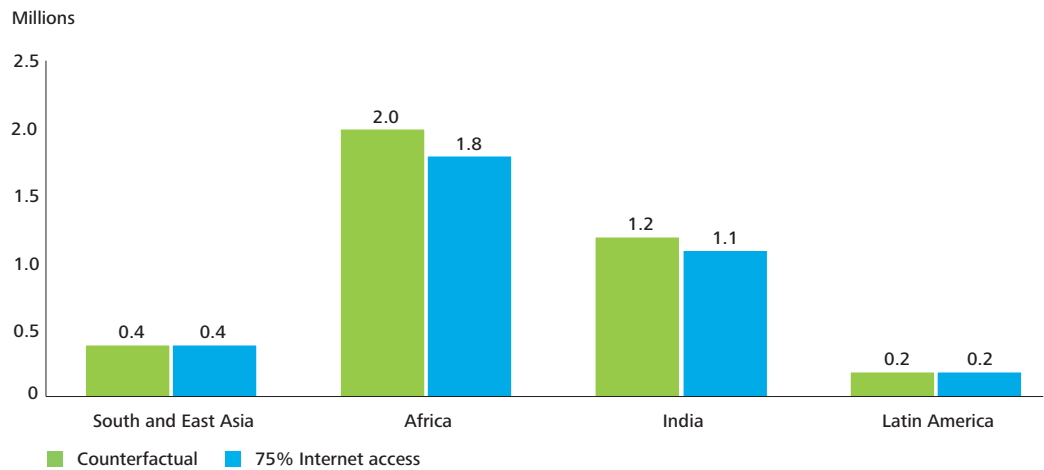
The estimation employs the results from an empirical study undertaken in India to analyse the impact of internet access on child mortality rates. The study reported child mortality rates during five years across two villages with and without internet access. The village with internet had access to internet kiosks providing specific health information to women during and after the pregnancy. Although the study shows a general decreasing trend in child mortality rate, the village with internet kiosks showed a lower child mortality rate by 14%.¹²⁶

To estimate the impacts of providing internet access on child mortality rates, this report applies the following approach:¹²⁷

- Increasing internet penetration has an impact on the number of pregnant women with access to the internet, who can now have access to information related to pre and post natal care.
- The lower mortality rate found in the study described above is applied to infants.
- This provides an estimate of number of infants saved as a result of an increase in internet access.

The results of this analysis are reported by region in Figure 12. This figure shows the number of infants' deaths in the counterfactual and in the 75% scenario. In Africa, extending internet access to 75% of population would reduce the number of infant deaths by 130,000. In South and East Asia the number of infant deaths would decrease by 25,000 while in Latin America and India this would decrease by 6,000 and by nearly 85,000 respectively.¹²⁸

Figure 12. Number of infant deaths in 2018¹²⁹



Source: Deloitte analysis

B.3.3 Estimating the impact of internet access on HIV/AIDS patients' life expectancy

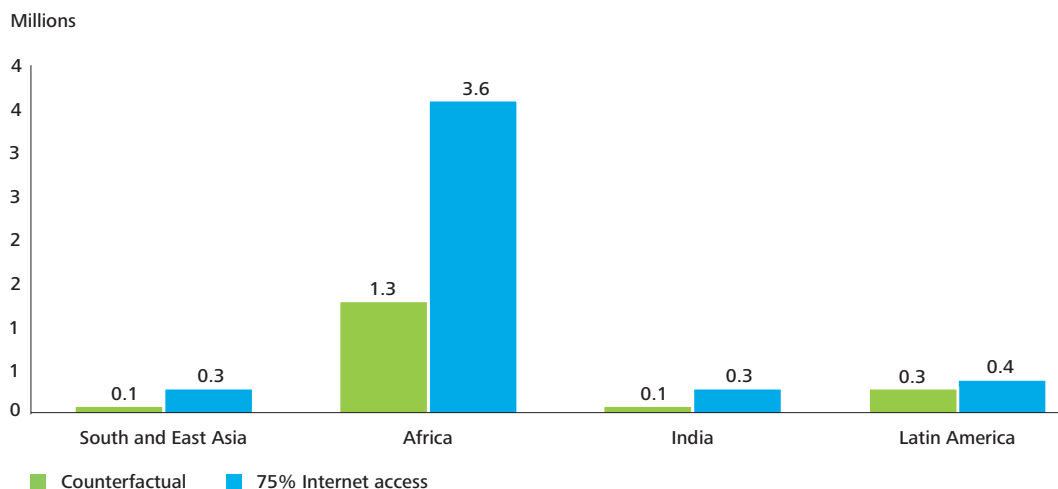
To estimate the impact of extending internet access on HIV/AIDS patients, this report focuses on the connection between adherence to treatment and health literacy. Adherence to Anti-Retroviral Treatment (ART) is a crucial factor for HIV/AIDS patients in order to improve their life quality and extend their life expectancy. A study analysing HIV patients' characteristics and behaviour found that having a higher level of health literacy improves the adherence rate to ART treatment by 22%.¹³⁰

In order to provide an estimation of the impact of extending internet access in developing regions on HIV/AIDS patients, the following approach is employed:¹³¹

- Literate people with access to the internet may have a high level of health literacy.
- It is assumed that high health literacy leads to a higher level of adherence to treatment, increasing life expectancy.
- For each region, the amount of literate HIV/AIDS patients with access to the internet receiving ART is estimated under the two scenarios.
- To estimate the incremental number of literate HIV/AIDS patients living longer generated by the increase in internet access the two scenarios are compared.

The results of this analysis are reported by region in Figure 13. This figure shows the number of literate HIV/AIDS patients receiving treatment in the two scenarios. In Africa, extending internet access to 75% of population may have a direct impact on life expectancy of more than 2m of people affected by HIV/AIDS. In South and East Asia, Latin America and India, nearly 160,000, 130,000 and almost 200,000 HIV/AIDS patients respectively may live longer.¹³²

Figure 13. Number of literate HIV/AIDS patients receiving treatment and having access to internet in 2018



Source: Deloitte analysis

B.4 Review of indicators of educational attainment

While the levels of literacy have been increasing across the world, there are still countries with low literacy rates. Literacy rates tend to be lower in rural/remote regions as demonstrated below. This can be due to factors such as lack of adequate school infrastructure or qualified teachers.

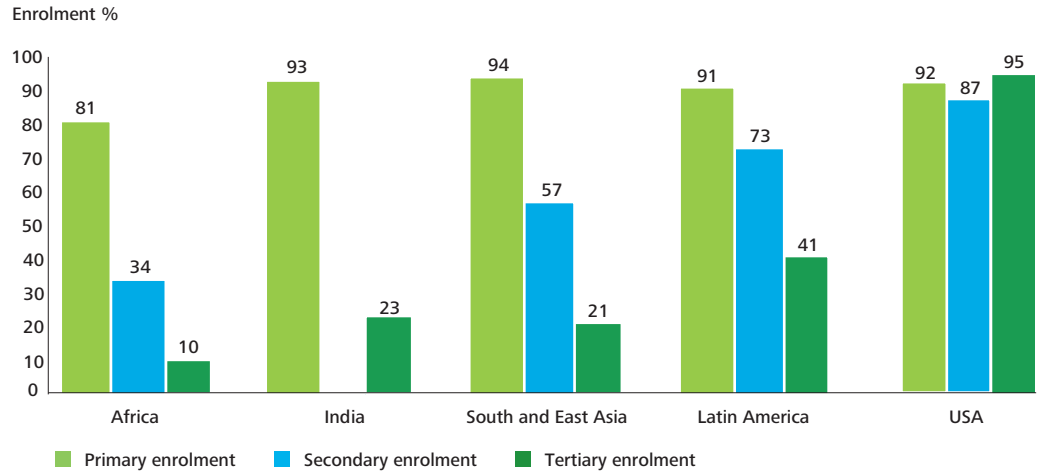
Figure 14. Disparity in literacy rates between rural and urban regions



Source: Indian Census 2011, UNESCO Institute for Statistics, "Urban and rural literacy rates"

Primary education enrolment rates are above 80% across all regions covered by the study and are high both when compared to enrolment rates at higher levels of education across the regions and compared to enrolment rates in the USA. However, the same does not hold for secondary and tertiary education, for which enrolment rates are far lower in developing countries. Secondary and tertiary enrolment rates in Africa are 34% and 10% respectively whereas in the USA these are 87% and 95% respectively.

Figure 15. The current state of education enrolment rates



Source: World Bank development indicators. The secondary enrolment rate for India is unavailable

In relation to the quality of the education, a recent UNESCO report¹³³ finds that 125m pupils around the world are unable to read a single sentence even after four years of education. A metric of the quality of education is the pupil-teacher ratio as smaller classes allow the teacher to give each individual child more attention. The average pupil-teacher ratios across all the developing countries are significantly higher than the USA with Africa and India having ratios over twice as large as that in the USA.

Figure 16. Pupil-teacher ratios



Source: World Bank data

B.5. List of countries covered by the study

Table 1. List of countries by region

Africa ¹³⁴				
Algeria	Cote d'Ivoire	Kenya	Namibia	South Sudan
Angola	D. Rep. of the Congo	Lesotho	Niger	Sudan
Benin	Djibouti	Liberia	Nigeria	Swaziland
Botswana	Egypt	Libya	Réunion	Togo
Burkina Faso	Equatorial Guinea	Madagascar	Rwanda	Tunisia
Burundi	Eritrea	Malawi	Saint Helena	Uganda
Cabo Verde	Ethiopia	Mali	Sao Tome and Principe	U.Rep. of Tanzania
Cameroon	Gabon	Mauritania	Senegal	Western Sahara
Central African Republic	Gambia	Mauritius	Seychelles	Zambia
Chad	Ghana	Mayotte	Sierra Leone	Zimbabwe
Comoros	Guinea	Morocco	Somalia	
Congo	Guinea-Bissau	Mozambique	South Africa	
Latin America ¹³⁵				
Anguilla	British Virgin Islands	El Salvador	Martinique	Saint Martin (French part)
Antigua and Barbuda	Cayman Islands	Falkland Islands (Malvinas)	Mexico	Saint Vincent and the Grenadines
Argentina	Chile	French Guiana	Montserrat	Saint-Barthélemy
Aruba	Colombia	Grenada	Nicaragua	Sint Maarten (Dutch part)
Bahamas	Costa Rica	Guadeloupe	Panama	Suriname
Barbados	Cuba	Guatemala	Paraguay	Trinidad and Tobago
Belize	Curaçao	Guyana	Peru	Turks and Caicos Islands
Bolivia (Plurinational State of)	Dominica	Haiti	Puerto Rico	United States Virgin Islands
Bonaire, Saint Eustatius and Saba	Dominican Republic	Honduras	Saint Kitts and Nevis	Uruguay
Brazil	Ecuador	Jamaica	Saint Lucia	Venezuela (Bolivarian Rep. of)
South and East Asia				
Bangladesh	Cambodia	Maldives	Philippines	Timor-Leste
Bhutan	Indonesia	Myanmar	Sri Lanka	Viet Nam
Lao People's Democratic Republic	Malaysia	Nepal	Thailand	

Source: Deloitte analysis

Endnotes

- 1 World Bank data, more details in Section 2 of this paper.
- 2 Here and in what follows, North America, Europe, Japan, Australia and New Zealand are considered to represent developed economies.
- 3 The World Bank defines internet access by the number of internet users, i.e. those individuals that have used the web in the previous year regardless of the technology employed, a convention followed by this paper. When internet access through mobile phones and devices in particular is discussed, it is clearly stated. Internet (or mobile internet) penetration is defined as the number of internet users per 100 people.
- 4 In the absence of country-level data for 2013, Deloitte has estimated internet users in 2013 based on 2012 ITU data and growth in the number of users in 2013 is based on GDP growth rates.
- 5 International Telecommunication Union World Telecommunication (ICT) Development Report and database.
- 6 GSMA Wireless Intelligence. This covers 2G, 3G and 4G connections.
- 7 ITU World Telecommunication database and IMF – 2012 figures.
- 8 The average internet penetration of developing countries in 2013 is around 75%.
- 9 <http://newsroom.cisco.com/release/1197391/>
- 10 Refer to Appendix A for a review of literature and case studies on the economic impacts of the internet and Appendix B for a detailed discussion of the methodology employed and of the results of the analysis.
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- 22 <http://thenextweb.com/asia/2013/03/04/bangalore-brings-indias-startup-ecosystem-into-the-limelight-but-how-exactly-is-it-faring/#!v7J9C>
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- 25 http://www.irmt.org/documents/building_integrity/case_studies/IRMT_Case_Study_India_Karnataka_State.pdf
- 26 http://www3.weforum.org/docs/GITR/2013/GITR_Chapter2.1_2013.pdf
- 27 See Appendix B.2.2 for more details.
- 28 Bresnahan, Brynjolfsson, Hitt, "Information Technology, Workplace Organization and the Demand for Skilled Labor: Firm-level evidence", Quarterly Journal of Economics, 2000.
- 29 Brynjolfsson and Hitt, "Computing Productivity: Firm-level evidence, Review of Economics and Statistics", 2003.
- 30 See Appendix A for a review of the literature.
- 31 See Appendix B.2.4 for more details.
- 32 See Appendix B.2.5 for more details.
- 33 <http://www.fao.org/sd/Cddirect/CDre0041.htm>

- 34 Refer to Appendix A for a full review of literature and case studies on health and education impacts of the internet and Appendix B for a detailed discussion of the methodology employed and of the results of the analysis.
- 35 World Health Organisation (WHO).
- 36 Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (WHO definition).
- 37 <http://www.un.org/millenniumgoals/maternal.shtml>
- 38 Communicable diseases, such as HIV/AIDS, malaria and tuberculosis, are those that are transmissible from one person, or animal, to another. The disease may be spread directly, via another species (vector) or via the environment. Illness will arise when the infectious agent invades the host, or sometimes as a result of toxins produced by bacteria in food (UK Gov definition).
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- 40 For example, see Pinkerton et al., "Infections Prevented by Increasing HIV Serostatus Awareness in the United States, 2001 to 2004", 2008
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- 56 Vogl, "Education and health in developing economies", NBER, 2012.
- 57 See for example Robert J. Barro, "Education and Economic Growth", Annals of Economics and Finance 14(2), pp. 301-328, 2013.
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- 59 The estimates for the number of children of school age with access to the internet is calculated by multiplying the number of mobile users in 2013 and 2018 by the percentage of the population between 0 and 14 years of age. This assumes that the number of children too young for school is a good estimate for those of school age but older than 14. The calculation is based on data from The World Bank.
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- 66 <http://www.prathamusa.org/programs/computer-aided-learning>
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- 116 Eric A. Hanushek Ludger Woessmann, "The Role of Education Quality for Economic Growth", *World Bank Policy Research Working Paper No. 4122*, 2007.
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- 120 http://www.un.org/millenniumgoals/pdf/Goal_1_fs.pdf
- 121 Ram, "Income elasticity of poverty in developing countries: updated estimates from new data", *Applied Economic Letters*, 2012.
- 122 Bostock S., *BMJ* "Association between low functional health literacy and mortality in older adults: longitudinal cohort study", 2012.

- 123 Data used in the analysis are: total population (IMF), adult literacy rate (World Bank) and mortality rate (World Bank).
- 124 Dominica and Saint Kitts and Nevis not included in the analysis, due to missing data.
- 125 A medium health literacy level is assumed across the population, therefore, it is assumed that internet impact decreases mortality rate by 20%.
- 126 "Internet kiosks help reduce infant mortality rates", Venkatesh V. and McGowan M., 2011.
- 127 Data used in the analysis are the following: number of births (UN), infant mortality rate (probability of dying between birth and age 1 per 1000 live births) (WHO). Number of births are referred to 2011 and kept constant in 2018.
- 128 Seychelles, Cote d'Ivoire, South Sudan, Sudan, Antigua and Barbuda, Dominica and Saint Kitts and Nevis not included in the analysis, due to missing data.
- 129 A more conservative impact (12%) has been used in the estimation.
- 130 Osborn et al., "Health Literacy an overlooked factor in understanding HIV health disparities", American Journal of Preventive Medicine", 2007.
- 131 Data used in the analysis are the following: HIV/AIDS patients' statistics (WHO), adult literacy rate (World Bank). HIV/AIDS patients' statistics are 2011 data and they are kept constant in 2018.
- 132 Libya not included in the analysis, due to missing data.
- 133 Education for All (EFA) Global Monitoring "Report Teaching and Learning: Achieving Quality for All", 2014.
- 134 The following countries have not been included in the analysis due to missing data issues: Mayotte, Saint Helena, Somalia, South Sudan and Western Sahara.
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