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# The Relationship between Local Content, Internet Development and Access Prices

OECD, ISOC, UNESCO

OECD

Internet Society

United Nations Educational, Scientific and Cultural Organization

**OECD DIGITAL ECONOMY PAPERS**

The OECD's Directorate for Science, Technology and Industry (STI) undertakes a wide range of activities to better understand how information and communication technologies (ICTs) contribute to sustainable economic growth, social well-being and the overall shift toward knowledge-based societies.

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The views expressed in this presentation are those of the authors and do not necessarily reflect the opinions of ISOC, the OECD or UNESCO, or their respective membership.

**TABLE OF CONTENTS**

**ACKNOWLEDGMENTS**

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## FOREWORD

In the current economic climate, with competing demands for scarce resources, policy makers are under increasing pressure to identify the priority areas and develop policy solutions that will have the highest impact. With the goal of "achieving more with less", governments need to look at ways to make the most of limited resources.

At the same time, the world is undergoing a monumental change with regard to communication, technology and access to information which offers opportunities to maximize the effects and reach of investments. The global growth of mobile networks and the expansion of the Internet are creating a new platform that can be leveraged across the economy and throughout sectors to provide better information, enhance access, catalyse change, improve social well being, and expand economic prosperity.

But Internet access and communication networks are simply tools to achieve these larger goals. For many countries, these communication "tools" are available but not exploited to their full potential. In other countries, the basic infrastructure or capacity to facilitate communication is lacking, potentially limiting the development of an economy, region, or group.

Given the potential of technology and the Internet to contribute to social, political and economic development, it is vital for policy-makers to understand their impacts. Many governments already support network development, either through direct public investment, via the modification of universal service programmes, or by implementing mutually reinforcing policy actions across government.

The OECD has undertaken an important and ambitious research agenda to understand the impact of the Internet throughout the economy in order to provide policy-makers with evidence-based and viable solutions. As a component of this work, the OECD, UNESCO and ISOC have partnered to study the relationship between the Internet, development and cultivation of local content. This report demonstrates the significant relationship between the social objective of fostering the development of local content on the one hand, and the quantity and quality of available Internet infrastructure in a country on the other hand. Furthermore, it shows how prices and capacity influence both access and use of the available contents, and how ICT availability and dissemination can increase accountability, participation, and harness development.

This work highlights the need for greater policy coherence for development and multi-sectoral approaches across the government ("whole of government") to address the multiple interacting dimensions of key issues. The extension of Internet access and thus local content to all parts of the population requires mutually reinforcing policy areas, such as investment, technology, education, and competition to create enabling environments for key inter-related sectors. In this way, policy coherence can be instrumental to generate comprehensive policy solutions and contribute to a sustainable and more inclusive development.

This work aligns with the OECD Strategy on Development and its overall mission to contribute to better policies for better lives. The Development Strategy, which has been endorsed during the Ministerial Council Meeting of May 2012, advocates a more comprehensive and inclusive approach to development in which policy coherence for development is a core element. It is an essential tool to ensure that the Organisation's contributions to development efforts are strengthened and respond to fast-changing global realities where countries at varying levels of development can contribute to global sustainable growth.

Building on the Organisation's multidisciplinary policy expertise and longstanding development experience, we strive to strengthen policy coherence for development, knowledge sharing and mutual learning as well as partnerships with other international organisations. This work is an important

contribution in that regard: the more we learn about the impacts of the Internet, the more important it becomes to foster affordable and robust access to all citizens in order to promote development and knowledge sharing.

This publication aims to provide policy-makers with insights into the history and the development of Internet and Internet access, introduces the reader to the cross-correlations between access, prices, local content, and policies and provides case studies that practitioners can draw on to develop and improve policies.

This publication is only a first step in creating better policies for better lives, and the OECD look forward to continued collaboration with our partners UNESCO and ISOC in finding ways to unleash the power of the Internet to the benefit of the entire world.

## MAIN FINDINGS AND CONCLUSIONS

Societies have a rich heritage and knowledge base that should be recognised, recorded and shared for the benefit of people throughout the world. Much of the world's content remains inaccessible even to the local population, not to mention at a broader level. There are many reasons for the existence of this "content divide".

The content that is most important to people is typically in their own language and is relevant to the communities in which they live and work. These communities may be defined by their location, culture, language, religion, ethnicity or area of interest and individuals may belong to many communities at the same time. Further, communities evolve so what is relevant will change over time. This relevant content is often referred to as "local content". The term community is used in a broad way to include not only local professional communities (public and private), but also non-professional content creators and users.

Technology can help support the recognition, creation, preservation, dissemination and utilisation of local content and there have been several important technological advancements in recent history. Technological developments such as the printing press, the phonogram, telephony, radio, television, photocopying machines, recording media, mobile phones and personal computers, among others, have greatly increased our ability to create and disseminate content.

The Internet represents another historical advancement in the development and dissemination of content. It has, first and foremost, helped empower users as content creators. The Internet has provided a platform for crowd-sourced content creation and community-developed and peer-reviewed knowledge bases such as Wikipedia. It has also allowed individuals to exercise greater choice and control over the content they consume, in contrast to the limited channels of traditional broadcasting. It plays a key role in all steps from content creation to its distribution but perhaps its largest contribution is the potential it gives to creators to disseminate their content widely and nearly instantaneously at a very low cost. This creates possibilities for information creation, sharing and dissemination, and affects the way in which societies, policies, and communities interact and develop. Furthermore, it offers opportunities to help spur growth, and building capacity, as well as to exchange knowledge.

Overall, the Internet and associated technological developments call for policy actions. Policy makers around the world in ministries of culture look for ways to promote the creation and preservation of cultural heritage, including elements that are tangible, oral and intangible. At the same time, policy makers in communication ministries focus on ways to ensure that information and communication technologies and services, such as Internet access, are available and accessible to the population. This research confirms that the goals of these two important government entities are intertwined.

This empirical research shows **there is a strong correlation between the development of network infrastructure and the growth of local content**, even after controlling for economic and demographic factors. The statistically significant relationship is evident using several different measures of local content (the number of visible top-level domains in use per country code, per capita; Wikipedia articles per language per capita; and blogs per capita) and several measures of Internet development (broadband penetration rates, autonomous systems per capita, international bandwidth per capita and routed IPv4 addresses per capita).

In addition, this research finds a significant relationship between the development of international bandwidth and the price of local Internet access. The results indicate that **more developed local Internet markets tend to report lower international prices for bandwidth** and vice versa: **markets with more intense international Internet traffic tend to report lower local prices for Internet access**. A similar relationship was detected between the degree of development of local Internet networks and the level of international prices in developing economies. In particular, countries with a more developed local market also tend to report lower prices for international Internet connections. This relationship is not visible in developed economies that tend to have much more developed Internet infrastructure.

**Policy considerations**

The empirical analysis in this paper shows a strong correlation between local content, infrastructure development and access prices, but it is not able to positively determine the direction of causality due to data constraints and complex mutual dependencies. What is most likely is that these three elements are connected and feed into each other in a virtuous circle. The inter-linkages between these different elements lead to highlight four key lines of policy considerations evolving out of this research: fostering content development, expanding connectivity and promoting Internet access competition, while at the same time taking into consideration policy interlinkages between education, communication, technology, competition, trade, R&D, and others to create mutually supportive policies.

***Fostering content development***

There are two observable trends with respect to the local content variables that were examined for this analysis. First, local content is growing very fast in volume, often at astonishingly high rates across the different measures analysed in this study. Second, its composition is changing and local content is no longer dominated by developed countries. Various measures show that developing countries are quickly becoming important sources of content and their share of global content creation is increasing. The growth of local content varies across countries and is tied to enabling factors such as the level of Internet infrastructure development.

Creating local content, recording and distributing it benefits from a specific set of skills and tools. Governments, especially ministries of education, should evaluate the level of multiple skills, such as ICT skills, knowledge and attitudes which would lead to the existence of a critical mass of competences at local level and take appropriate measures to create an enabling learning environment. Key steps include improving basic literacy (*e.g.* drafting, language, etc), critical thinking ability, as well as media, information and digital literacy skills. Policy steps to improve ICT, digital, media and information literacy should include both the formal educational system and lifelong learning. Targeted programmes aimed at certain segments of the youth and adult population can also teach necessary skills to members in a community who can then help others create, record and disseminate local content.

In addition to Internet connectivity, ICT equipment such as computers, mobile phones, cameras, scanners and audio/video recorders are important tools for digital content creators. Any trade barriers, taxes or levies that limit the development, production and importation of these devices, or increase their cost, could have a negative effect on local content creation and distribution at the local level. In some cases, ICT equipment or services are taxed heavily as they are considered luxury goods. Efforts should be made to improve policy coherence between taxation policy and ICT policy, as well as between trade policies and ICT development.

Software is an important component of digital content creation but its cost can mean that is it beyond the reach of many users. Open free online tools and materials, as well as open access to content, especially local scientific content, are an increasingly important way for users throughout the world to access

sophisticated software, tools and services that can help in all steps of content creation. The amount of interoperability among software and media will likely be an important factor for wide-spread dissemination of content.

Some of the key components of content development are the collection, localisation and preservation of content to be disseminated. Anything that helps reduce the price of recording media for content creators and distributors can help promote the recording and dissemination of local content. Some countries have chosen to impose levies on blank media (*e.g.* CDs and DVDs) as a way to help compensate artists for illegal copying of their work. These levies may benefit certain content creators receiving compensation as part of a licensing collective but the blanket nature of the levies means that many other content creators outside the collective must pay more to record and distribute their original content. Governments with these levies in place may wish to re-evaluate their effectiveness and the impact of these levies on overall content creation.

Policy makers could examine the development of domestic content hosting services and look for ways to promote the development of a local content hosting as a way to reduce international transit costs and increase the speed of content storage and delivery.

Governments collect and distribute information that is both relevant to communities and local in nature and should be role models for local content creation. Previous work such as the OECD's Council Recommendation on Public Sector Information or several other normative instruments such as UNESCO's Recommendation concerning the Promotion and Use of Multilingualism and Universal Access to Cyberspace can help provide guidance. For example, policy makers should look for ways to make more public-sector information available via new media. This will increase the amount of relevant local content available and help increase demand for Internet connectivity as a way to access this newly provided content. Examples of public data projects and platforms include the *data.gov.uk* portal in the United Kingdom, Denmark's www.borger.dk portal, Microsoft's Open Government Data Initiative, and Google's Public Data Explorer.

Governments should embrace the idea of openness where public sector data is deemed to be available for use free of charge unless specifically exempted for protection of national security interests, personal privacy, the preservation of private interests or where protected by copyright, or the application of national access legislation and rules. When public sector information is not provided free of charge, it should be priced in a way that is fair, that facilitates access and re-use, and ensures competition. Where possible, costs charged to any user should not exceed marginal costs of maintenance and distribution and in special cases extra costs for example of digitisation.

Governments should make public-sector information available to as much of the population as possible, including by using web accessibility standards and guidelines (W3C WAI) as well as universal design principles. This includes provisions for those with special needs, including the elderly, persons with disabilities, the vulnerable, or gender relevant or culturally specific and accurate provisions. Steps to introduce more inclusiveness will help promote the take-up of services and the potential for content creation and distribution.

Policy makers should take the necessary steps to foster an innovative environment for content creation. Creative ecosystems often evolve around educational institutions and areas with inexpensive connectivity.

***Expanding connectivity***

The findings of the research highlight the significant relationship between infrastructure development and local content creation. There are a number of steps policy makers can take to improve connectivity and support the development and dissemination of local content. In certain cases this may require a renewed focus on policy coherence for development to ensure that promoting the growth of a national firm in a developed country is not tied to maintaining monopoly power in another.

Mobile networks are the most prevalent Internet platform in the world, and are often the main telecommunication networks in developing countries. Efficient spectrum policy will be an important tool to help improve communications capacity and create a platform for local content development. Policy makers could re-examine their existing allocations and look for spectrum that could be available to the market, particularly as the value of certain frequency bands is growing as a result of more mobile broadband usage.

An important area for focus is international Internet connectivity. This research finds that broadband prices are lower in countries that have more international Internet connectivity, even after controlling for other demographic factors. Governments should look at existing international capacity conditions and consider ways to increase international capacity into their country. Steps that lower the costs and barriers of delivering international bandwidth are particularly important.

International bandwidth is both a mechanism for delivering local content out to the world and a means of making global knowledge available on a local level. The characteristics of local content, however, mean that much of the content that is created and distributed is domestic in nature and should be distributed locally without paying for expensive international data transit. The development of local Internet exchanges can promote the local distribution of content in a cost-effective way. Previous research shows that, when allowed to do so, market participants will self-organise efficient Internet exchange points, producing Internet bandwidth to the benefit of the economy. Governments should take necessary steps to promote the development of local Internet exchanges as a way to minimise distribution costs.

Policy makers may need to evaluate the impact of network rollouts on areas connected to new telecommunication networks and those which may be bypassed or underserved. In some cases the marginal cost of extending a backhaul connection to an additional community could be much lower than the benefit it could potentially provide. Any government investment in road construction or electrification should consider installing the infrastructure for fibre-optic networks at the same time to save on the significant digging costs. These backhaul networks can support both fixed and mobile Internet connectivity over the last kilometre.

***Promoting competition***

Policy makers should focus on improving competition because this lowers prices in markets and lower prices are correlated with more developed Internet infrastructure. The following steps focus on ways to promote competition in markets with a goal of promoting Internet growth and local content development.

Internet connectivity is expanding in almost all countries around the world. Many countries have been able to reduce the digital divide but the divide can also widen in areas with a lack of competition or those without regulatory liberalisation as well as due to existing discrepancies between rural and urban areas.

First, research has shown that liberalisation of telecommunication markets has generally led to better services and lower prices as it introduces competition into markets for the supply of Internet access and

services. The progress of effective liberalisation should continue, particularly in countries that still maintain a monopoly incumbent fixed-line provider. Competition and efficiency should be introduced into markets as a way to increase Internet adoption and help foster the creation and dissemination of locally-produced content.

Government policy should look to reduce barriers to entry in telecommunications, and the supply of Internet access in particular, as a way to promote competition. Complex licensing requirements, foreign direct investment restrictions and other barriers to entry will tend to limit competition and increase the prices that consumers and businesses pay for Internet access.

One of the key areas where governments can improve competition is via spectrum allocations. Countries with more mobile operators in a competitive market typically have lower prices than those with fewer options. Governments can help promote the rollout of multiple Internet-capable mobile networks throughout their countries.

Some governments have used telecommunication monopolies or taxes on telecommunication markets as a key source of government funding but this research highlights that there could be significant costs to that approach related to the development of local content and culture. Unnecessary taxes on telecommunication services reduce adoption, particularly if the collected revenues are not reinvested in network development. Policy makers should minimise the prices that people pay for Internet access as a way to stimulate uptake and promote the development of local content. As the Internet becomes an important foundation of the economy, further research could look at the impact of various taxation schemes surrounding telecommunications on economic growth.

Policy makers in many countries, including most OECD countries have mandated infrastructure sharing of the incumbent's telecommunication lines as a way to foster Internet competition. Infrastructure sharing can be an effective way to improve competition, either on existing networks or as a way to mutualise the cost of new network rollouts, provided it is done in a way that does not discourage network investment.

***Considering policy interlinkages***

The concept of policy coherence for development (PCD) aims to exploit positive synergies and spillovers across public policies, ministries, and actors to foster development. PCD goes well beyond minimising the adverse impact that public policies can have in developing countries; it entails the systematic application of mutually reinforcing policies and integration of development concerns across government departments to achieve development goals along with national policy objectives (OECD 2011).

Internet and local content development are closely interlinked with other public sectors such as education, infrastructure, competition, and governance. Ensuring that policies in these sectors are mutually supportive can maximise their potential for development and their positive impact.

# INTRODUCTION

The Internet benefits both developing and developed countries alike as an increasingly important communication medium and as a repository and distribution system for knowledge and culture.

This research will examine the relationship between Internet infrastructure, Internet prices and the development of local content. One of the key questions this work will examine is how policy decisions and coherence can help foster the development of content and Internet connectivity.

This project pulls together three distinct organisations, each with a different focus, to examine the relationship between the level of Internet infrastructure and the development of local content and culture. The three entities are the Internet Society (ISOC), the Organisation for Economic Co-operation and Development (OECD) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

ISOC is a non-profit organisation founded in 1992 to provide leadership in Internet-related standards, education and policy. The organisation is dedicated to ensuring the open development, evolution and use of the Internet for the benefit of people throughout the world. ISOC brings the important technical expertise to the project and knowledge surrounding Internet information and education.

The OECD is an international organisation of 34 member countries that promotes policies that will improve the economic and social well-being of people around the world. It produces economic and social data that is internationally comparable for analysis. The OECD's key contribution as an economic organisation will be on the country research and the empirical testing of the relationships.

UNESCO is a United Nations organisation with 195 member states and 8 associate members. UNESCO's mission is to contribute to the building of peace, the eradication of poverty, sustainable development and intercultural dialogue through education, the sciences, culture, communication and information. Some of the key themes of UNESCO's work in relation to communication and information are access to knowledge, free flow of information, freedom of expression, including freedom of press, and media development. In this sense, UNESCO promotes the free flow of ideas by word and image and is also tasked with maintaining, increasing and spreading knowledge.[1] This project benefits from UNESCO's lead and expertise in matters related to content, culture and expression.

## Structure of the document

Technology plays an important role in organising, recording and disseminating local content. The first section in the paper will look at information theory, knowledge-sharing and the role of the internet in the latter. The second section will examine existing tools for organising, recording and distributing information over time, including how the Internet has become an important tool for helping to create, store and distribute local content. The third section will analyse how development and competition play into access prices, the development of local content and the internet sphere of a country. Policy coherence for development and the impact of different policy areas on ICT will also be elaborated upon. The paper then concludes with a section that examines the empirical relationship between measures of local content, Internet infrastructure development and access prices. The section looks at various measures and proxies to develop an analytical framework for testing the relationship between them.

There are two annexes to the paper. The first looks at local content and the mobile phone. The mobile phone is the most common interface for Internet connectivity in many countries – both developing and

developed so one section is devoted to content that is available over mobile phone networks. It also provides examples of how local content is being used in different countries over mobile networks.

The second annex is comprised of case studies from seven different countries related to Internet infrastructure, development and local content. This section provides case studies from Brazil, China, Egypt, France, Kenya, the Republic of Korea and Senegal and offers insights into good-practices, regulations, and development issues.

## SECTION 1: KNOWLEDGE SHARING AND LOCAL CONTENT

### Information theory

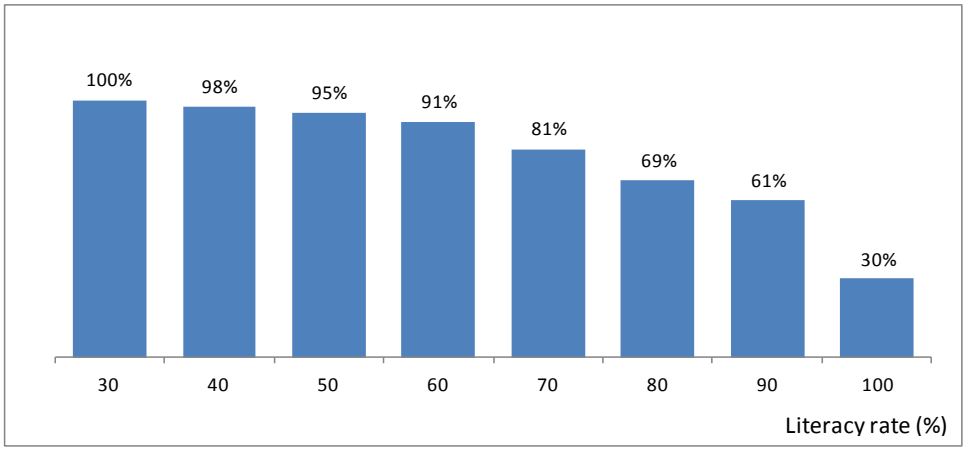
Individuals are mainly concerned with information that is relevant to them. There is a new flood of information available via information and communication technologies (ICTs) but the amount of data that is directly relevant to a given population may be relatively small. A key policy goal, therefore, is promoting the development of relevant content and ensuring that it is available to people in a format and language that applies to them. The dissemination of information among the population is often referred to as information and knowledge sharing.

Knowledge sharing plays a key role in helping respect universality, indivisibility and the interdependence of human rights, and in particular, the freedom of expression and access to information. Knowledge sharing also helps achieve the goal of an education for all, information for all and the benefits that come from a diversity of cultures and identities.

But for knowledge sharing to be effective, it needs to be relevant and accessible to all people. In many cases, there are populations and communities that do not have access to certain types of knowledge due to language, cultural, economic, disabilities, literacy or other barriers.

There may be cases where relevant information exists but not in a language that is accessible. In other cases, illiteracy poses a significant problem for transmitting knowledge. According to a recent UNESCO report, about 17% of the world's adults – 796 million people – still lack basic literacy skills. Nearly two-thirds are women (UNESCO, 2011). World Bank data on adult literacy rates in Figure 1 show that only 71% of countries have reached a literacy rate of 80% per 100 inhabitants. Only half of the population can read in 5% of countries. Some policy makers understand the importance of knowledge sharing in economic and social development and therefore look for strategies to eliminate illiteracy and ensure relevant information is available to their populations in an accessible manner.

**Figure 1. Percentage of countries attaining a certain adult literacy rate**




Note: Adult literacy rates are rounded to the nearest 10 and include the latest figures available for each country between 2000 and 2010.
*Source:* World Bank.

This idea of relevant content in the speaker's own language is called local content. The subset of information that is relevant to an individual is often closely related to knowledge within any of the communities where she or he resides. UNESCO has defined "local content" as an expression and communication of a community's locally generated, owned and adapted knowledge and experience that is relevant to the community's situation (UNESCO, 2001).

These communities are defined by their location, culture, language or area of interest. Some of the ties that bind a community are strong cultural, linguistic, religious or common-interest ties. Communities need not be confined to one geographic area as members may share the same location or may be geographically dispersed. Communities are not static or exclusive and evolve over time. Individuals may also belong to many communities at the same time. Therefore, much of the information that is relevant to an individual will depend on the different communities to which he or she belongs. As a result, policy makers are interested in better understanding the dynamics of these communities and how local knowledge and content is created, preserved, distributed and used (see Figure 2).

**Steps of knowledge sharing**

There are four key steps in the development and dissemination of local content. They are creation, preservation, dissemination and utilisation.

**Figure 2. Steps of local content/knowledge sharing**


*Source:* OECD adapted from UNESCO

***Creation***

The talent to create local content exists in all communities throughout the world. The primary challenge is harnessing the talent and knowledge and developing it into a form that can be shared and used. In many ways, creating content has become easier as technology has improved.

The whole field of graphic design and typesetting, for example, has changed with the introduction of computer hardware and software specific for the tasks. Content creators also have access to a much wider array of information and content to build upon than ever before. The development of multimedia tools such as video cameras and their significant price declines in nominal and real terms have helped increase the creation of local content, particularly by non-professional content creators - users.

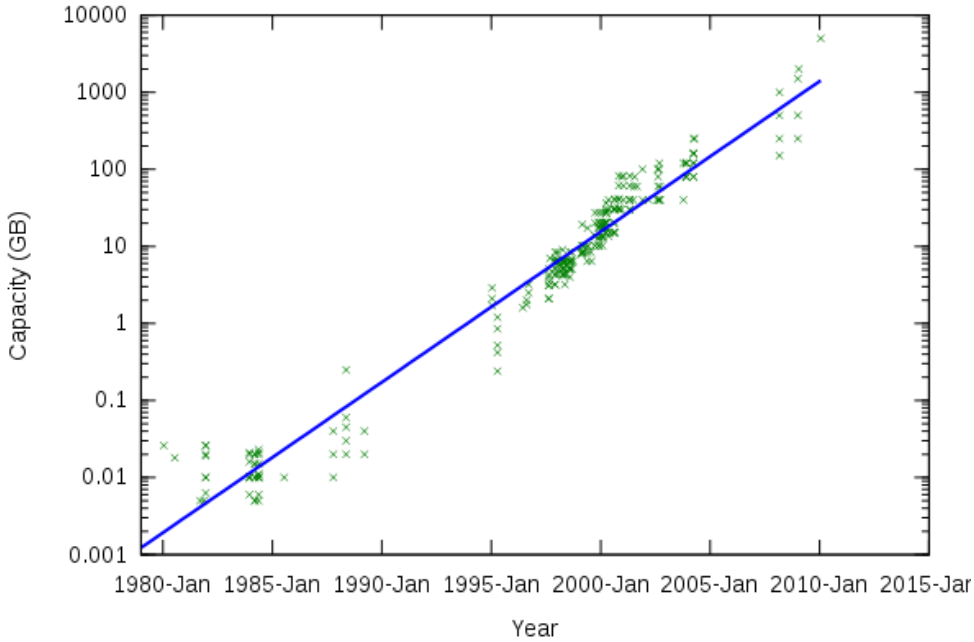
***Preservation***

Much of the content produced in the world is never recorded in a way that it can be shared or reproduced. As an example, early television broadcast signals were sent out live and rarely recorded on film until video tape recording technology emerged. The valuable content was produced but not recorded in a way that could benefit others after the original airing. Oral histories in many cultures are of particular significance yet they may be lost over time.

There is significant scope to preserve more locally produced content throughout the world. Technologies such as video cameras, audio recording equipment and hard drives have made it much more cost effective to preserve local content in a way that it can eventually be recalled and shared. The cost of

preserving information, on a per byte basis, has been decreasing rapidly. Since the development of the first disk drive in 1956, the density of information that can be recorded on a square inch of a disk (6.45 cm2) has grown from 2 thousand to over 100 billion bits in 2005, a 50 million-fold increase. This is roughly equivalent to the capacity doubling every year.[2] (See Figure 3)

**Figure 3. Exponential increase in hard disk storage capacity**




*Source:* Wikipedia, based on Kyrders Law. *http://commons.wikimedia.org/wiki/File:Hard_drive_capacity_over_time.svg#.*

### *Dissemination/distribution*

Once local content is produced and preserved it needs to be distributed in a way that can benefit as many people as possible. In the past, distribution was limited typically to the local community because of the high costs and barriers to efficient distribution. Printing books required large up-front investments that limited the types of information that could be efficiently shared via bound books. Books and many other knowledge and "content goods" were originally also characterised as being rival goods – that is that the use by one person would limit access by a second person since only one person could read a book, a magazine or a newspaper at a time.

Technological advancements have significantly changed distribution models and shifted many content and knowledge products into the category of non-rival goods – where the use by one person does not limit the use by another. Television, radio and other broadcast media opened up distribution channels to a much wider audience by introducing a one-to-many distribution model but the tools to create content and the frequencies and equipment needed to broadcast it were limited and expensive. Broadcast technologies were still limited to a relatively small geographic footprint.

The Internet arguably has had its largest impact on distribution. Information put on the Internet is immediately available to a global audience of Internet users. Certain alternative intellectual property management solutions (*e.g.* the Creative Commons licensing schemes) provide new opportunities to share content with the public.

***Utilisation***

Local knowledge and content is of limited benefit if people do not access and use the information that has been created and recorded. Technological developments have helped greatly with the creation, preservation and distribution of local content but these advancements also require equipment and skills on the part of users if they are to take advantage of them. Users who want access to local content on the Internet need some form of Internet access. In many cases, vast amounts of relevant information are available on the Internet but users may find it difficult to sift through all the information that is available and find the relevant bits. The key challenges that governments face are twofold; promoting the creation of local content and making it accessible.

## SECTION 2: EXISTING TOOLS AND THE INTERNET SUPPORTING LOCAL CONTENT

Knowledge sharing requires tools and skills to be efficient. These tools have evolved over time as local content has been created, recorded and distributed for centuries but there have been a number of key technological leaps that have had a large impact on information sharing. Figure 4 provides a breakdown of how various tools fit into the stages of local content development and knowledge sharing. Some of the tools fit under multiple headings. The list is not intended to be exhaustive but rather to show the types of tools that feed into content creation and dissemination.

**Figure 4. Examples of tools involved in various steps of knowledge sharing**

| Creation | Preservation | Dissemination | Utilisation |
|---|---|---|---|
| -Oral creation | -Paper/printing | -Oral dissemination | -Computers |
| -Pen/pencil | -Recording devices | -Paper/printing | -Mobile phones |
| -Computers | -Magnetic tape | -Photocopier | -Televisions |
| -Software | -Hard drives | -Telephony | -Radios |
| -Cameras | **-Internet (storage)** | -Broadcasting | -Education |
| -Mobile phones | | **-Internet (hosting)** | **-Internet (access)** |
| **-Internet (applications)** | | | |

*Source:* OECD

### Oral knowledge sharing

Traditional knowledge sharing has been, and in some parts of the world still is, passed on orally for next generations, from person to person in local languages. The traditional knowledge represents cultural and social values and the collective memory of a specific community.

In some cases, the oral traditional knowledge or oral local content is limited to particular social groups or is highly specialised or specific according to occupation and cultural realities. In addition, the maintenance of oral traditional knowledge in the everyday life of society is limited in some parts of the world. Communities, researchers and institutions may use information technology in order to safeguard, maintain and disseminate oral traditional knowledge. Unique expressive features, such as intonation and a much larger number of varying styles, can now be recorded as audio or video, as can interactions between performers and audiences and non-verbal story elements including gestures and mimicry. Mass media and information and communication technologies can be used to preserve and even strengthen oral traditions and expressions by broadcasting recorded performances both to their communities of origin and to a wider audience.

### Paper/printing

The development of Gutenberg's printing press and moveable type in the 15$^{th}$ century marked the beginning of the truly broad distribution of information by creating a much more efficient method for recording and disseminating information in printed form. In the 1470's, an Italian bishop explained that

three printers working for three months could produce 300 copies of a single book. For comparison, the bishop stated that it would have taken three scribes a lifetime each to complete the same number (Norman, 2005).

Despite the dramatic productivity increases, the work of Lucien Febvre and Henri-Jean Martin shows that the early print runs of books were not large quantities by today's standards. Norman (2005) cites Lucien Febvre and Henri-Jean Martin's data showing that early books had print runs of between 100 and 300 copies. In exceptional circumstances the number could be as high as 1 000. These numbers help illustrate that even though the development of the printing press was an incredible leap for the recording and dissemination of content, its reach was somewhat limited by the logistical challenges of sharing a limited amount of printed material. Over the years, printing large volumes has become much more efficient.

***Photocopier***

The printing press allowed publishers to reproduce large amounts of material in written form but it was a more recent technology, the photocopier that essentially brought the benefits of inexpensive reproduction of text and pictures to the world. Haloid introduced a new technology for "dry copying" in 1960 and within a short period of time, the technology had become so prevalent throughout the world that its name "Xerox" was used both as a noun and verb meaning, "to photocopy" (Chakravorti, 2003).

The photocopy machine has been an important tool for business but also to those wishing to spread information quickly and efficiently. In a well-known example, The Soros Foundation donated 400 photocopiers to Hungarian libraries, universities and scientific institutes as a way to foster free expression and disseminate ideas in the early 1980's[3] (Slater, 2009). The photocopier has also been a staple technology for businesses, schools, governments and others over the past 50 years. The importance of the technology is underlined as these groups continue to use them and have been slow to shift to the idea of fully digital offices.

Printing and photocopying are largely technologies for a literate population and much of the world's information has traditionally been communicated using voice.

**Communications and multimedia**

Advancements in communications and multimedia during the 19$^{th}$, 20$^{th}$ and 21$^{st}$ centuries have played a significant role improving access to communication and the dissemination of information. It is difficult to select technologies to highlight but there are still several that stand out.

***Telephony***

One of the most important recent developments in terms of information and knowledge sharing has been the development of telephony. Beginning with the invention of the telegraph and the fixed-line telephone in the mid-to-late 1800's, people were able to communicate information over long distances using their voice or encoded text. This was a marked change from using written communication for large amounts of information that needed to be transmitted long distances. Telephony helped address the issue of distance for disseminating information but it was largely limited to a one-to-one communication structure. Fixed lined telephony has grown to become one of the most important communication media and has served as a foundation for Internet connectivity in many countries.

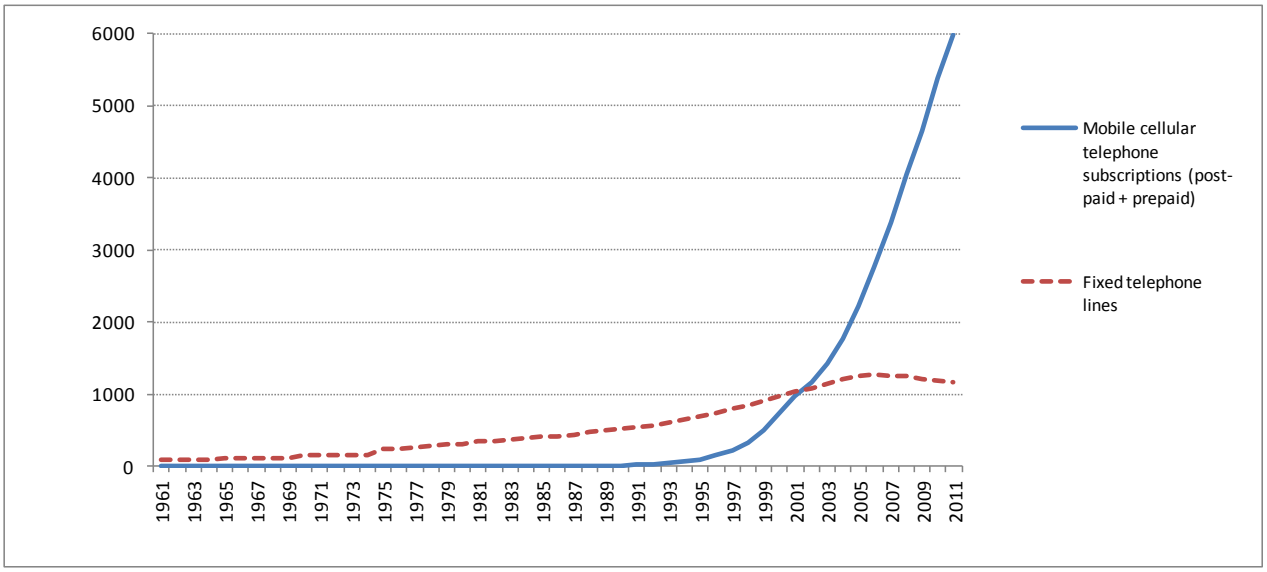
### *Wireless/mobile*

Wireless radio technology evolved through the 1800's with Hertz's measurement of electromagnetic waves and important developments in radio technology by Marconi (Luenberger, 2006). The technology evolved to become the foundation of radio/television and mobile telephony.

Mobile phones have become one of the most available communication tools in the entire world. Growing from less than 1 million subscribers in 1985, the number of mobile subscribers reached nearly 6 billion in 2011 (see Figure 5). This amazing growth and penetration throughout the world has made voice communications available to almost every community in the world.

**Figure 5. Growth of telephony as a communication tool**

Subscriptions from 1960 – 2011, in millions, worldwide




*Source:* OECD adapted from the ITU, April 2012.

### *Radio/television*

Radio and television are two of the most important media for distributing local content. The geographical reach of both radio and television are often similar to the boundaries of geographic-based communities. They are an ideal means for sending the same information to a large number of people at the same time. Both technologies require the user to have equipment to receive and decode the signals but both technologies have become nearly ubiquitous throughout the world as the price of equipment has dropped. Radio and television remain the primary source of information in some parts of the world.

The one-to-many distribution nature of television and radio also has some drawbacks. Broadcasters require spectrum to operate using free-to-air signals but there are a limited number of frequencies that can be made available in any given market. This means that although television and radio are very good at distributing information, the number of available frequencies limits the number of "voices" and plurality of content.

## Recording media

Key technological advances such as broadcast radio and television allowed people the tools to widely distribute content. It was the invention of recording media, however, that opened new possibilities for preserving large amounts of content for later use.

### *Phonogram/phonograph*

The 19th century marked a significant change in the preservation of information with the invention of the phonograph by Thomas Edison in 1877 that was capable of recording and replaying sound waves. The phonograph was fully acoustic (not electronic) until the 1920s when the introduction of electricity greatly increased the fidelity of the sound recording. At the time, the maximum recording time was limited to roughly 4.5 minutes (Randel, 2003).

### *Magnetic tape*

The phonograph ushered in the ability to record sound but it was magnetic recording tape that made it much more cost effective and versatile. Television was a key technology for broadcasting local information but the ability to efficiently record the transmission came later with the invention of videotape recorders. The first videotape recorder was developed in 1951 by engineers at Bing Crosby Laboratories. The technology was improved and marketed by two Japanese firms, Sony (Beta) and Matsushita (VHS) in the 1960s and 1970s (Carlisle, 2004).

The development of audio and video tape recorders, and their distribution to consumers changed the way people gathered and stored multimedia content. What used to be recorded on film could now be saved onto magnetic tape that could be used over and over at very low cost. Videotape became a key distribution method for commercial firms but was increasingly used by consumers in households to record events. As the price of video cameras and tape declined, the ability to produce, record and distribute video content expanded.

The invention of magnetic tape for preserving multimedia content has been a key component of content retention across the world. It provided a mechanism for content creators to record vast amounts of multimedia information for future use and distribution.

### *Hard drives*

In 1956, IBM introduced the first disk drive, its Model 350 Disk Storage Unit. Up to that point computer data was typically stored on punch cards. The early disk drive could store 100 000 characters, or roughly 100 kilobytes (Hutchinson, 2009). As mentioned earlier, the capacity of hard disks have nearly doubled every year over the past 50 years. Hard drives have been one of the key foundations of the computing revolution.

As capacities grow, so does the potential for recording local and cultural content. The prices of hard-drive storage capacity have fallen to the point that storage capacity is affordable for a large component of the world's population. In August 2011, it was possible to purchase 2 terabytes of internal disk storage for USD 70. That works out to USD 35 per terabyte or USD 0.035 per megabyte. To put that in perspective, USD 0.01 can now purchase 285 000 times as much capacity as was available on the earliest disk drive, the Model 350.

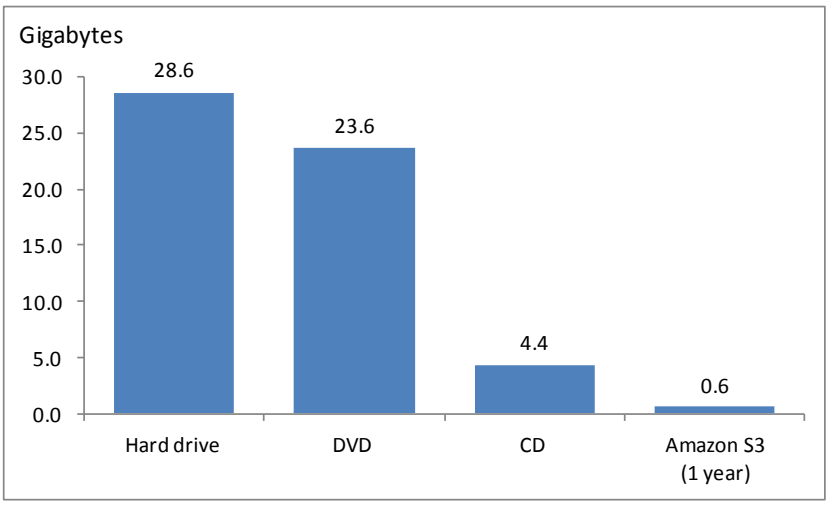
The price of storing data has fallen dramatically, not just for hard drives but for many storage media. One US dollar will now buy roughly 29 gigabytes of storage on a magnetic hard drive (see Figure 6). DVDs also provide very cost effective storage at roughly 24 gigabytes of storage for USD 1. CDs are less

cost effective but retail prices in 2011 indicate that USD 1 will still buy enough capacity to store 4.4 gigabytes of data.

Figure 6 also shows how much data can be stored for one year on Amazon's cloud storage platform (S3). One US dollar would purchase roughly 600 megabytes of storage for an entire year.

**Figure 6. Number of gigabytes of data that can be stored for USD 1**

By various recording media (hard drives, DVD, CD) and Internet storage (S3)




Notes: Hard drive storage calculations: 2 TB internal hard drive for USD 70.00
DVD price calculations: 500 DVD-R with 4.7 GB of storage each for USD 99.50
CD price calculations: 100 CD-R with 700 MB of storage each for USD 15.99
Amazon S3 pricing: Online storage for USD 0.14 per GB per month, http://aws.amazon.com/s3/pricing/

Recording media are mechanisms for preserving digital content and Table 1 highlights the affordability of media by examining how many files of various types can be saved for the equivalent of USD 1. The table is broken down into categories of audio, video, text, photos and games that represent a significant component of local content. The four different storage options that are compared are the hard drives (internal), DVDs, CDs, and online storage via Amazon's S3 platform.

There is a significant amount of content that can be stored for the equivalent of USD 1. A consumer-grade hard drive can store over 7 000 songs consisting of 4 minutes of music or nearly 70 000 photos (1 megapixel, JPG compression). That same USD 1-worth of hard drive capacity could hold 29 000 text files, each containing 250 pages of text.

The falling prices for storage capacity are also opening possibilities for sharing information with those who may not be able to read. USD 1 worth of a hard drive could hold 260 audio books, each 9 hours long. Finally, the same capacity could be used to store 952 videos of 5 minutes each.

Table 1 also compares the price of store information online using Amazon's S3 cloud service. One dollar will buy less capacity online but the difference is the content is available on a global basis. One US dollar worth of Amazon's cloud service could either store 149 songs, 198 eBooks, or 1,400 photos for one year.

Recording media has come down sufficiently in price that it is no longer a significant barrier to content creation.

**Table 1. How many files of various types can be stored for USD 1**

| | | How many files of a particular type can be saved for USD 1 of storage | | | | |
|---|---|---|---|---|---|---|
| | | **Hard drive** | **DVD** | **CD** | **Amazon S3 (1 year)** | File size (MB) |
| **Audio** | 4-minute song (iTunes) | 7 143 | 5 905 | 1 094 | 149 | 4 |
| | 9-hour audiobook (iTunes) | 260 | 215 | 40 | 5 | 110 |
| **Video** | 5-minute video (iTunes) | 952 | 787 | 146 | 20 | 30 |
| | 45 minute TV show (iTunes) | 143 | 118 | 22 | 3 | 200 |
| | 45 minute HDTV show (iTunes) | 48 | 39 | 7 | 1 | 600 |
| | 2 hour movie (iTunes) | 19 | 16 | 3 | 0.4 | 1 500 |
| | 2 hour HD movie (iTunes) | 6 | 5 | 1.0 | 0.1 | 4 500 |
| **Text** | Text file (250 pages, single spaced) | 28 571 | 23 618 | 4 378 | 595 | 1 |
| | E-Book (epub, Bookworm) | 9 524 | 7 873 | 1 459 | 198 | 3 |
| **Photos** | Photo (1 megapixel, JPG100) | 68 681 | 56 774 | 10 523 | 1 431 | 0.416 |
| | Photo (5 megapixels, JPG100) | 20 408 | 16 870 | 3 127 | 425 | 1.4 |
| | Photo (1 megapixel, RAW12) | 19 048 | 15 745 | 2 918 | 397 | 1.5 |
| | Photo (12 megapixels, JPG100) | 11 429 | 9 447 | 1 751 | 238 | 2.5 |
| | Photo (5 megapixels, RAW12) | 3 810 | 3 149 | 584 | 79 | 7.5 |
| | Photo (12 megapixels, RAW12) | 1 587 | 1 312 | 243 | 33 | 18 |
| **Games** | iPod game (iTunes) | 714 | 590 | 109 | 15 | 40 |

Notes: Hard drive storage calculations: 2 TB internal hard drive for USD 70.00
DVD price calculations: 500 DVD-R at 4.7 GB of storage each for USD 99.50
CD price calculations: 100 CD-R at 700 MB of storage each for USD 15.99
Amazon S3 pricing: 1 TB per month of storage for USD 0.14 per GB per month, http://aws.amazon.com/s3/pricing/

*Sources:* iTunes file sizes: http://support.apple.com/kb/HT1577
E-book sizes: http://blog.threepress.org/2009/11/16/how-big-is-the-average-epub-book/
Photo sizes: http://web.forret.com/tools/megapixel_aspect.asp?mp=1

## Personal computers

Computers, whether they are a personal computer or a mobile phone, are a key component of content creation and dissemination. Ever since the introduction of computers, people have been using them to create content. Computers gave people a general-purpose machine that they could use to create a nearly limitless array of media that could be transformed quickly and efficiently.

Computers quickly became an important platform for not just creating content but also for consuming it. Users could create content on a computer for distribution to other computers or they could easily export the content onto other media.

From the very early days of computers, people have been connecting them together as a way to share resources. These networks of computers could be within a business or across a campus but the goal was the same. The network allowed users to share resources and the Internet brought together these small networks and interconnected them.

## The Internet

The Internet holds a special role in content creation, similar to the role of the computer. As Figure 4 highlighted, the Internet is a general purpose technology that supports all four steps of content creation and

knowledge sharing. The importance of the Internet in each of the four outlined steps lays the theoretical foundation for the assumed relationship between the level of Internet infrastructure development and local content.

### *Step 1: The Internet supporting creation*

The Internet serves as a vast repository for information that can be used to support content collection and creation. One of the important ways in which the Internet supports content development is via tools that support collaboration. The Internet allows content creators to communicate and exchange ideas using platforms such as social networking sites, video conferencing, and instant messaging sites.

The Internet also delivers free tools for content creation that were previously provided as software for users to purchase. The high price of creative software often made it inaccessible to many users. Free open-source versions of software are now available for download over the Internet. One of the key developments, however, is that the software itself is now hosted on the Internet, requiring users to only have a very basic terminal, such as a mobile phone, to access it. Examples of free online office suites include FreeOffice online (www.thinkfree.com) and Google Docs (docs.google.com). Both online services include access to word processing software, spreadsheets and presentation software.

The Internet is also becoming a key source for creation tools in other creative areas as well. For example, music editing software is available online from sites such as JamStudio.com which provide artists the ability to create and record music without access to physical instruments (see Box 1).

**Box 1. Creating music online**

JamStudio.com is one of many websites that allow users to create music online without the need for physical instruments. Jam Studio created a database of 100 000 recordings of instruments (loops) that can be assembled and mixed together to create music. Users can select a range of instruments and create music and then record vocals over the top.


One of the benefits of sites such as Jam Studio are that they open up the possibility of music creation to those who may not have access to instruments or have the training to play.

*Source:* JamStudio.com

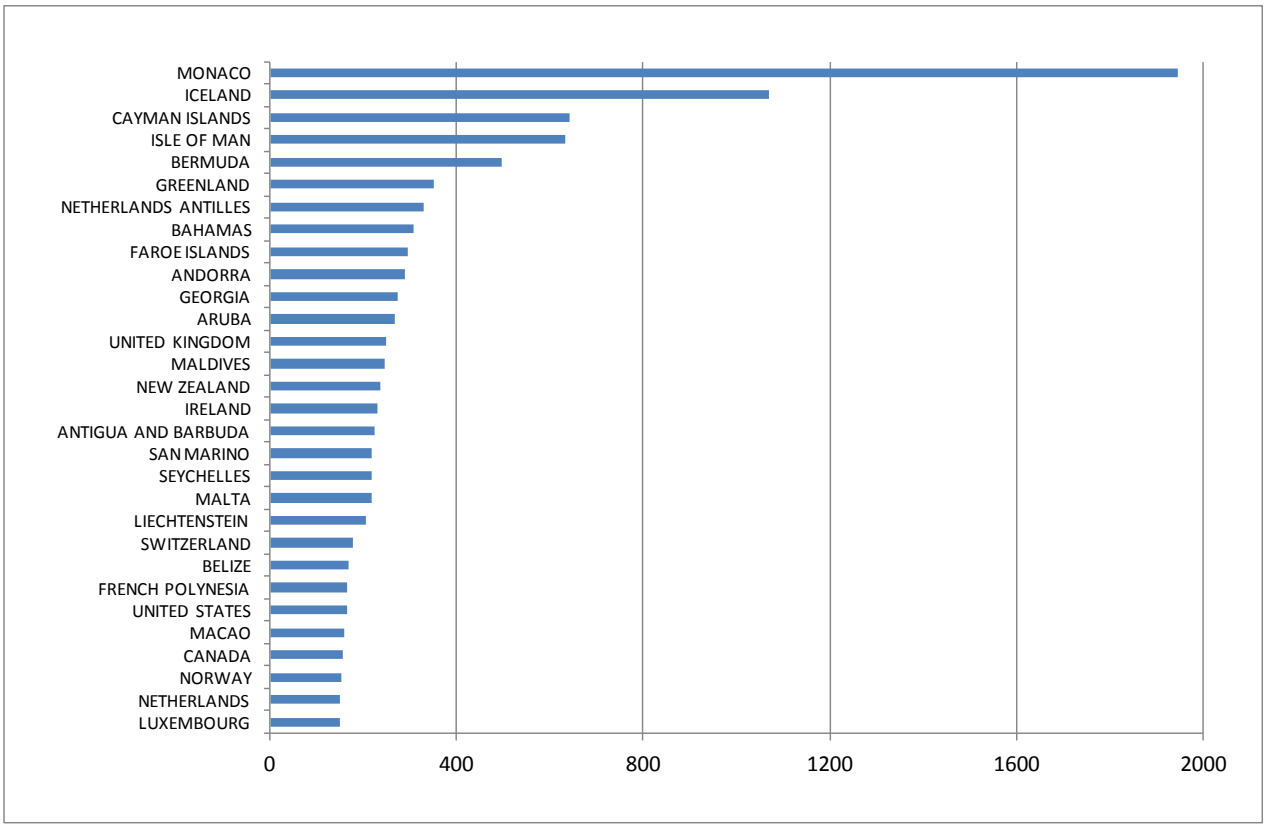
The tools for creating content and posting it on the Internet have greatly improved over time. In the past, web site creators needed to know markup-languagues such as HTML to build a simple webpage but now free tools are available as software applications that can automatically perform much more complex tasks such as setting up blogs, websites, e-commerce, fora and wikis.

### *Step 2: The Internet supporting preservation*

The Internet has become an important repository for content. For example, there are a number of services that focus on providing online storage capacity to users. Services such as Dropbox (www.dropbox.com), SugarSync (www.sugarsync.com) and SkyDrive (skydrive.live.com) provide a certain amount of online storage space for free, typically between 2 GB to 5 GB. Users can upload digital content to the sites and access the information via a range of terminals (*e.g.* phones, computers). Users that need more space can purchase it for between USD 0.10 – USD 0.20 per GB of data stored per month.[4]

The 2 GB of storage space offered on the free services is enough to hold 500 songs (4 minutes each) or 18 audio books (9 hours of audio) or 67 videos (5 minutes) or more than 600 eBooks. Often these services are marketed as online backup and sharing services meaning they assume that the user maintains a copy of another type of media such as a computer hard drive.

**Figure 7. Flickr geotagged pictures within an economy, per 1 000 inhabitants**




*Source:* Bruegge (2011)

The Internet has become one of the largest sources for photographs. An interesting example of the Internet helping preserve local content is the ability to assign geographic marker (called a geo-tag) to photographs that are posted on the Internet. Photo sharing sites such as Flickr provide storage space to users where they can upload, store and share photos. When a user uploads a photo onto the platform they can provide a geo-location marker that assigns the picture to a specific location. This creates a repository of photographs from a particular area that are available and searchable online. The number of geotagged photos per 1 000 inhabitants varies across economies but Monaco, Iceland and the Cayman islands – all popular tourist destinations – top the list (see Figure 7).

There are benefits to using these services but there are challenges for users as well. First, these online storage services require an Internet connection to access the files. If Internet connectivity goes down, users may lose access. Second, Internet business models are changing and services may come and go. Services such as Dmailer provided online storage but then closed, forcing users to find a new storage solution. Third, most of the sites offering online storage are available in English or a relatively limited number of languages. Setting up an account and installing the system would require a certain level of ability in a supported language. Finally, additional storage space is available for a fee but it may not be possible to buy additional storage if users do not have access to certain forms of payment (*e.g.* credit cards).

***Step 3: The Internet supporting dissemination/distribution***

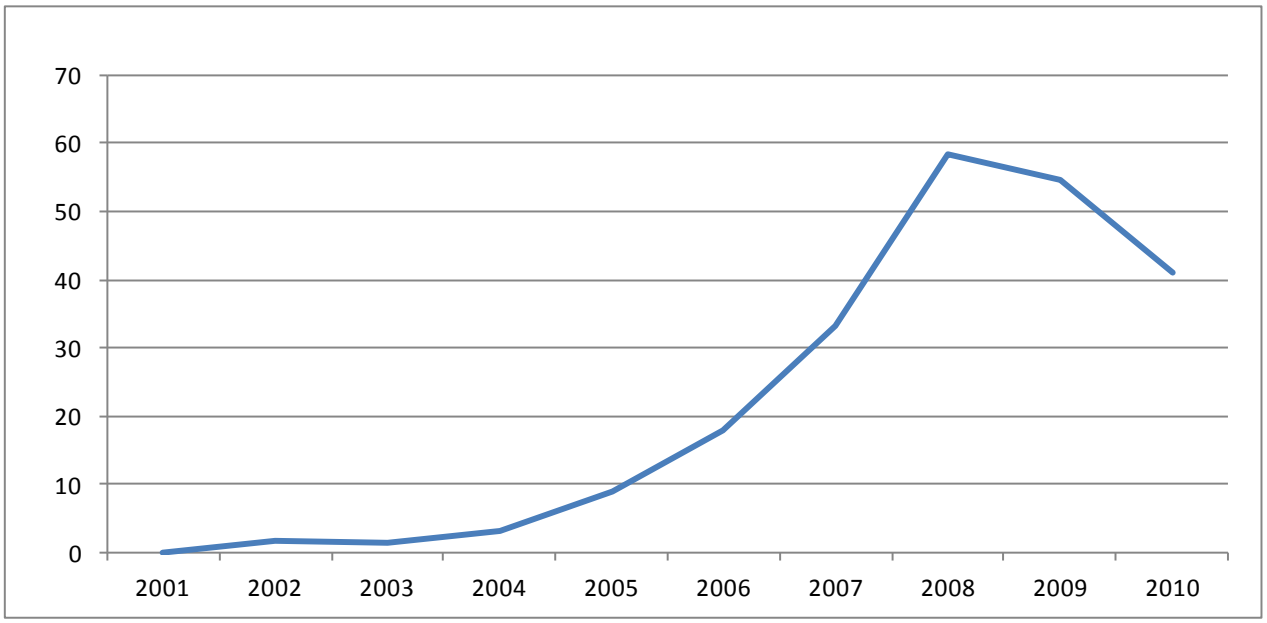
The distinction between steps two and three (preservation and dissemination) is ambiguous because services that provide storage (preservation) on the Internet also provide dissemination mechanisms. Many distribution platforms allow users to upload information for dissemination on the Internet. Examples include blogging sites such as Wordpress and Blogger, photo sites such as Flickr and Picasa, and video hosting sites such as YouTube and DailyMotion.

Ten years ago, the key way to publish information online was to create a website, which required users to have a certain skill level and to pay for online hosting via a hosting provider. The Internet model has evolved now to where the largest content hosting providers allow users to create sites and host their content on the web for free on a proprietary platform that is often supported via advertising.

One of the most basic and effective ways to publish content and distribute it on the Internet is via a blog. A blog is a web page that records content updates in descending chronological order. Blog users can easily upload text, pictures, and video onto the Internet and into a blog. Blogs are free to set up from various providers and are available in a significant amount of languages. Google's Blogger service is available in 49 languages.[5] Blogs are often thematic or follow the activities of an individual or group.

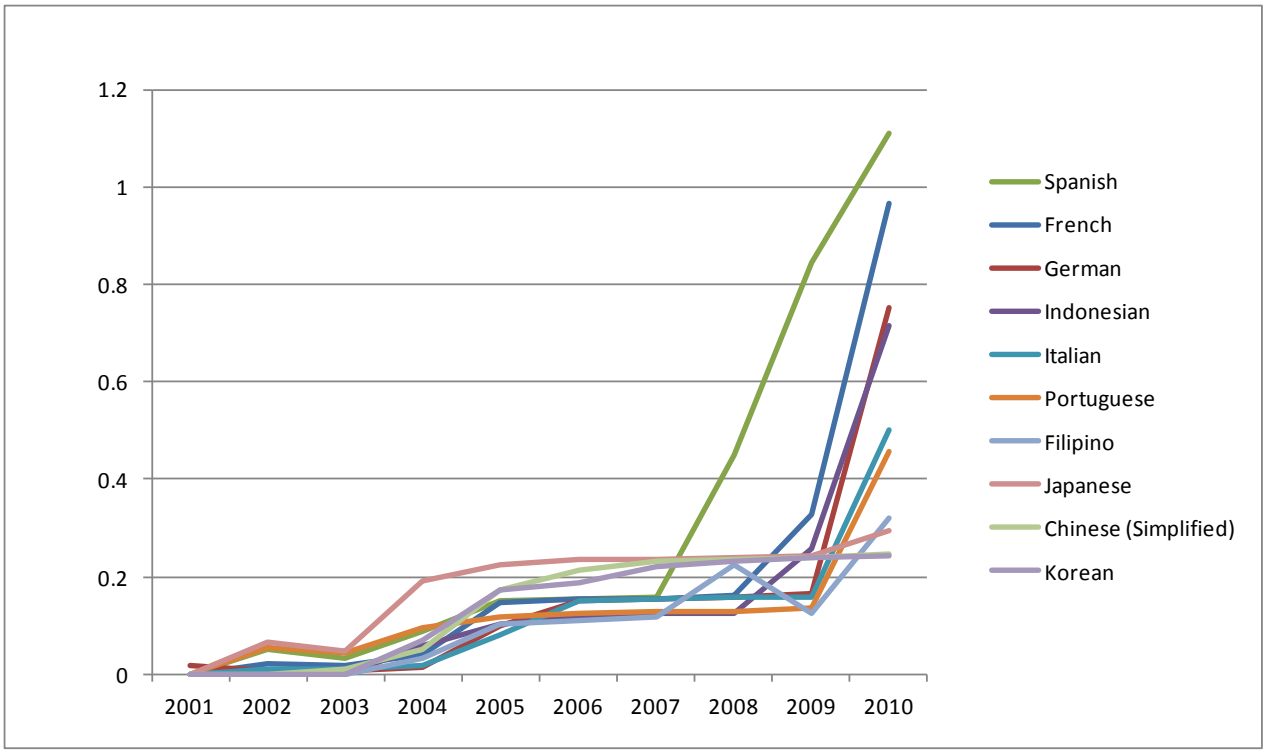
The total number of blogs indexed by Google has been decreasing since 2008 when it reached its peak (see Figure 8) but this is primarily due to a sharp decline in the number of English-language blogs in the listings. The number of blogs indexed in other languages continues to grow across different languages both for the top ten (see Figure 9) and bottom ten (see Figure 10) languages indexed.

**Figure 8. Number of blogs indexed by Google** (total by year, millions)



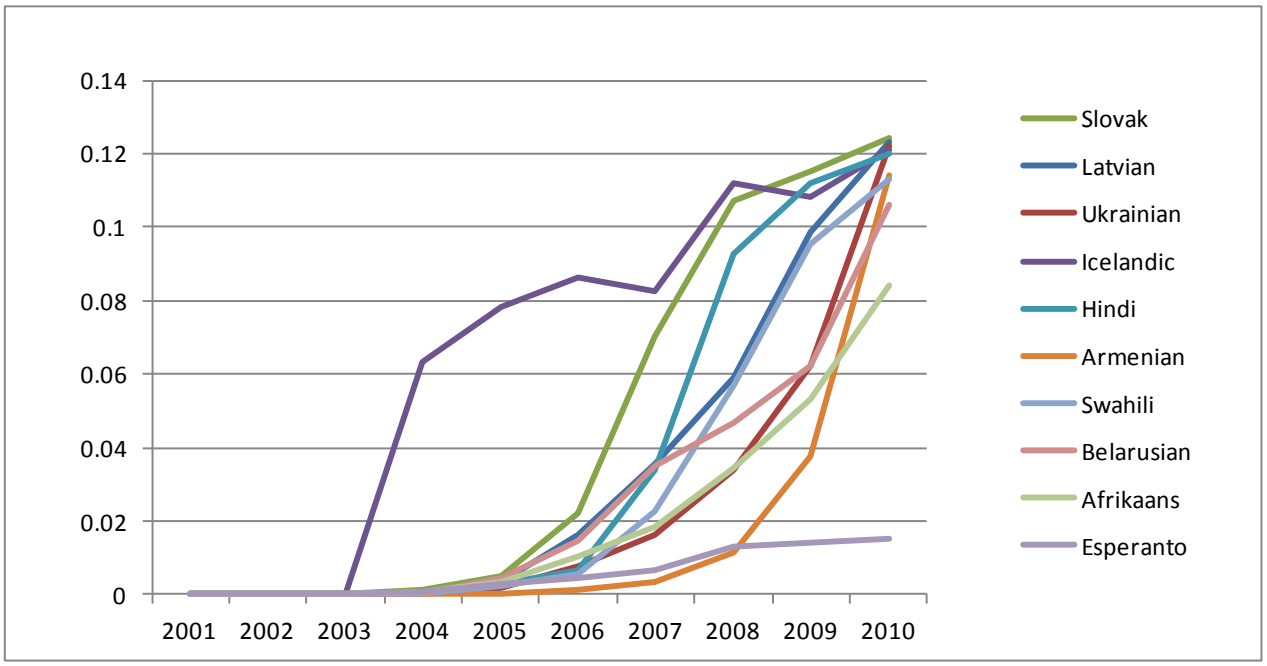

*Source:* OECD, Google

**Figure 9. Number of blogs indexed by Google** (Top 10, non-English)




*Source:* OECD, Google.

**Figure 10. Number of blogs indexed by Google (smallest 10 that are categorised by language)**




*Source:* OECD, Google.

In 2011, social networking and media-sharing sites have become one of the Internet's key repositories of digital content and one of the key ways that people publish digital content. They play a key role in helping users store and distribute localised content.

The growth of these platforms is visible in a number of statistics. The photo sharing site Flickr reached 5 billion photos uploaded to its platform in 2010.[6] Other networks are also seeing tremendous growth in photographic content. Facebook announced that users uploaded 750 million pictures over New Year's weekend in December 2010-January 2011.[7]

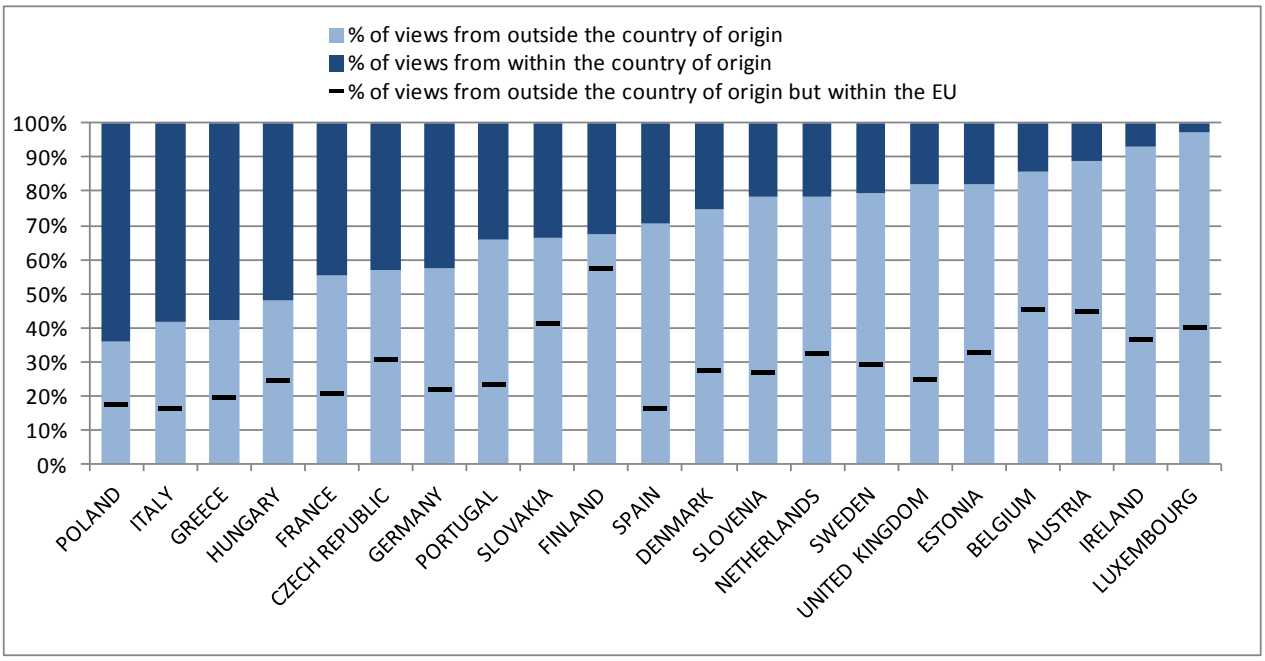
YouTube is one of the most popular video sharing sites on the Internet and in 2010 they reported that their platform hosted hundreds of millions of videos. The site also serves more than 2 billion views per day. The amount of content on the site is growing rapidly as well, with roughly 24 hours of video content added every minute.[8] YouTube data is instructive to show how video sharing sites extend the reach of local content beyond national borders.

Figure 11 looks at content uploaded to YouTube in the first half of 2011 by country of origin and then categorises the viewers of the content as domestic or international. Poland is the country in the sample with the highest percentage of domestic views of domestically-uploaded content. Roughly 64% of the views of content uploaded from Poland were watched domestically and the remaining 36% of views were from abroad. At the other end of the spectrum, 97% of the views of content uploaded from Luxembourg were from abroad. The data behind Figure 11 show that domestically uploaded content is viewed more from abroad than from home in 17 of the 22 countries in the sample, highlighting the potential for sharing domestically created content with a global audience.

**Figure 11. YouTube: National vs. international viewing of domestically uploaded content**

% of views of domestically uploaded content viewed from within and outside of the country of origin.

Selected countries in Europe, first half of 2011




*Source:* OECD, YouTube (Google).

Facebook is the largest social networking site in the world as measured by number of users, reaching roughly 750 million in 2011 and already more than 812 million in 2012. The platform hosts digital content that users upload into the site including text, photos, videos and links to web pages.

Social networks play a special role in terms of local content because they are, by their nature, defined by many of the same communities as local content. When a social networking user makes information available, they may choose to share it within a certain community or make the data public to anyone on the Internet. The scale of social networking platforms is such that now 28 of the 34 OECD countries have at least 30 Facebook users per 100 inhabitants (see Table 2). Iceland leads among OECD countries with 66 users per 100 inhabitants. Facebook also ranks in the top 10 websites in each of the countries of the OECD, and it holds a ranking in the top three websites in all but Japan. This makes social networks and media-sharing sites extremely important distribution channels within communities.

Figure 12 shows the number of Facebook subscribers per 1000 inhabitants as of July 2011.

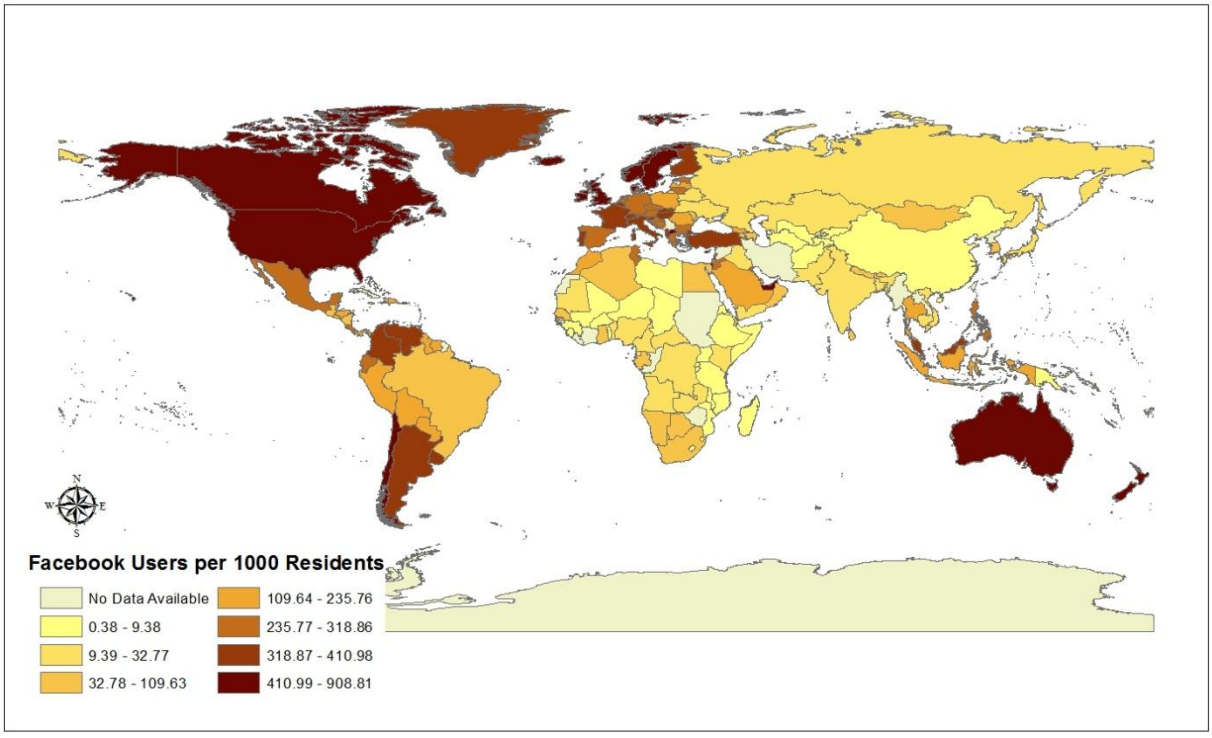
**Table 2. Facebook users per 100 inhabitants and site ranking**

Facebook users and Facebook's ranking in the top 10 websites in the country (2011)

| Country | Facebook users per 100 inhabitants | Facebook ranking in most popular sites in the country | Country | Facebook users per 100 inhabitants | Facebook ranking in most popular sites in the country |
|---|---|---|---|---|---|
| Australia | 46 | 2 | Japan | 3 | 10 |
| Austria | 30 | 2 | Korea | 7 | 3 |
| Belgium | 42 | 2 | Luxembourg | 40 | 1 |
| Canada | 53 | 2 | Mexico | 22 | 1 |
| Chile | 49 | 1 | Netherlands | 27 | 3 |
| Czech Republic | 32 | 2 | New Zealand | 46 | 2 |
| Denmark | 50 | 2 | Norway | 55 | 1 |
| Estonia | 30 | 2 | Poland | 17 | 2 |
| Finland | 37 | 2 | Portugal | 36 | 2 |
| France | 36 | 2 | Slovak Republic | 34 | 2 |
| Germany | 23 | 2 | Slovenia | 33 | 3 |
| Greece | 30 | 1 | Spain | 32 | 2 |
| Hungary | 33 | 2 | Sweden | 46 | 2 |
| Iceland | 66 | 1 | Switzerland | 34 | 2 |
| Ireland | 46 | 3 | Turkey | 38 | 1 |
| Israel | 47 | 2 | United Kingdom | 51 | 2 |
| Italy | 33 | 2 | United States | 51 | 2 |

*Source:* Facebook, Alexa

**Figure 12. Facebook subscribers per 1000 inhabitants, July 2011**




*Source:* Bruegge, (2011)

***Step 4: The Internet supporting utilisation***

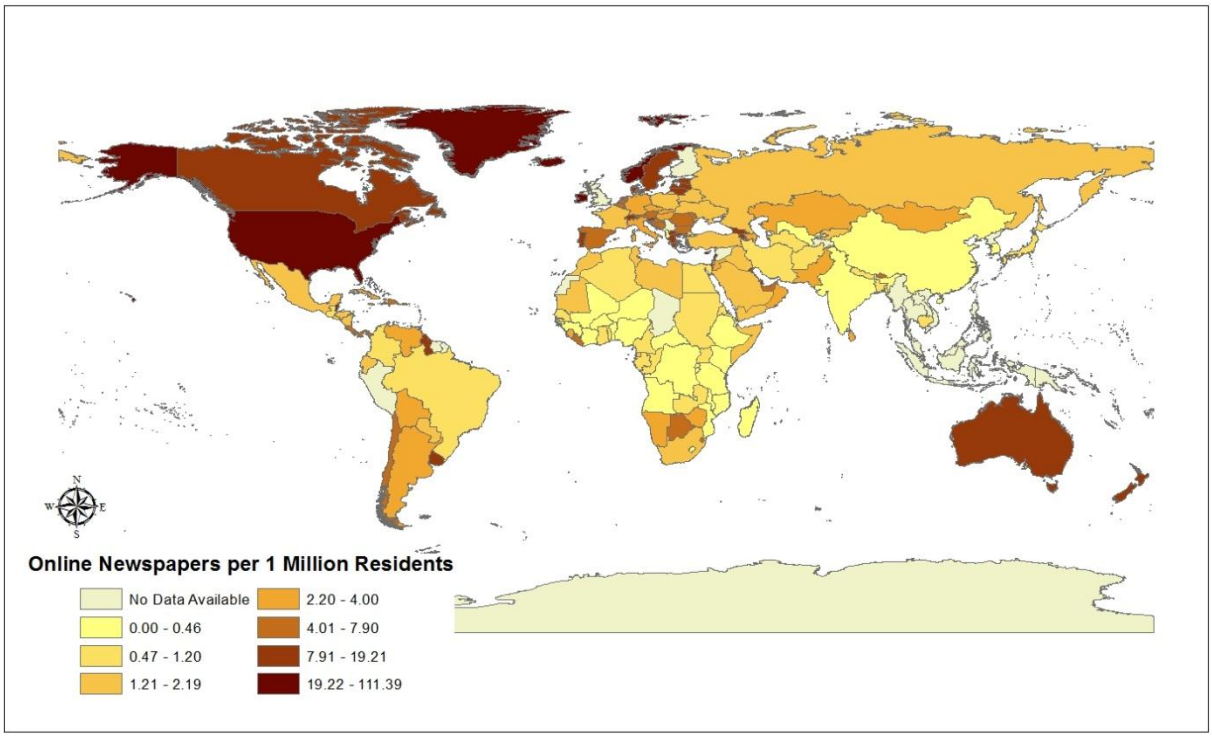
The three previous steps have looked at how the Internet supports content creation, preservation and dissemination – all on the creation side. But the Internet is also an important tool for those consuming content. It has opened up access to digital content, both locally and from across the world.

For example, the Internet has become one of the most important news platforms in the world and online newspapers, radios and television stations are a key component of local content. Thousands of newspapers, radio and television stations around the world provide some or all of their content online. As online sources of news crowd out printed news sources, online newspapers, radio and television stations become an important provider of professionally-created news.

Local newspapers are the quintessential local content providers. Not only do they cover local news and culture, but they are generally written by professional staff and provide high-quality content. Transplanting this reliable source onto the internet accurately represents an important facet of digital local content. Online newspaper, radios and television content is available on computers and mobile devices but the devices must have an Internet connection. Once the connection is available though, the possibilities for accessing news and information are vast.

The site *OnlineNewspapers.com* has categorised 14 668 online newspapers by country and the prevalence of online news sources per million inhabitants is given in Figure 13.

**Figure 13. Online newspapers per 1 million inhabitants**




*Source*: Bruegge, (2011)

Internet access also opens the world to learning tools and knowledge. Projects such as Google Books (*books.google.com*) and the Khan Academy (*www.khanacademy.com*) provide access to written

information and free online learning over the Internet to anyone with a sufficient Internet connection and capable access device (*e.g.* computer, mobile phone).

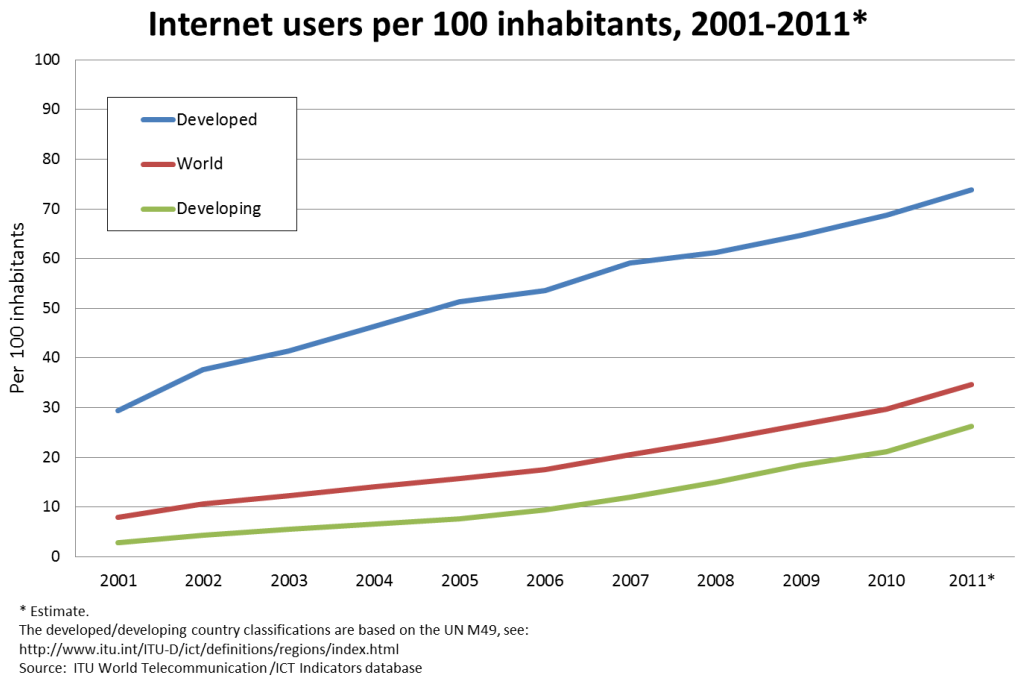
There are a number of key barriers holding back content utilisation on the Internet. First, Internet infrastructure must be available and have sufficient capacity for people to access information. Second, people also must have access to devices such as computers or mobile phones that can be used to access content on the Internet. Third, making use of content on the Internet requires a basic set of skills that must be learned. Fourth, Internet content may be available in some languages but not others. Translation sites on the Internet can provide increasingly accurate translations into other languages but the number of languages available is severely limited. Google Translate (*translate.google.com*) can translate between 64 languages. While this is an important start, it represents only small portion of 6 000 to 8 000 languages worldwide.[9]

## SECTION 3: A FOCUS ON DEVELOPMENT

The previous section highlighted how the Internet supports the creation, preservation, dissemination and utilisation of local content, but there are significant differences in the level of infrastructure development across countries and consequently on the potentially positive impacts .

Figure 14 highlights the digital divide between developed countries and the rest of the world for Internet access. Developed countries are a decade ahead of the rest of the world in terms of Internet access, reaching a penetration rate in 2011 that is comparable to where developed countries were in 2001.

**Figure 14. The growth of Internet users over time**




*Source:* ITU

This gap is of concern, not only because the Internet supports local content development, but because the Internet is increasingly viewed as an economic platform supporting activities across the entire economy.

Existing empirical studies, including on-going OECD work, suggest a positive link between increasing Internet adoption and use, and economic growth in both developing and developed economies. Lacklustre penetration rates could mean slower economic growth among countries looking to transform their economies.

Even though the aggregated effects are still preliminary, the relationship between Internet development and economic growth, as well as microeconomic evidence, suggest that governments should continue with policies that help promote Internet connectivity and encourage the take-up of services. Many of these recommendations can be found in the OECD Recommendation on Broadband Development (OECD, 2004a) and in Broadband Growth and Policies in OECD Countries (OECD, 2008).

One of the key policy questions is how the Internet can aid countries in earlier stages of development. A number of studies highlight the crucial role of the Internet in the development processes such as by improving access to health services, education, and offering new opportunities for employment for the poor. Internet access, for example, makes access to market information available at a lower cost and this can boost competitiveness and entrepreneurship, and in turn impact economic growth and social development (See Box 2).

**Box 2. ICT, the Internet and development: examples from Africa and Latin America**

A number of authors provide specific examples of the positive effects of ICTs and the Internet on economic development in Africa and Latin America.

An illustrative example is provided by Aker and Mbiti (2010), who highlight the beneficial development effects of mobile phone deployment in Sub-Saharan Africa. Another report presented jointly by Zain and Ericsson (Zain, 2010) checks the impacts of mobile phones in Sudan and claims that the mobile telecommunications sector is related to demand-side GDP growth rates. In addition the study finds that this sector accounts for over 40 000 jobs in the Sudanese economy. Furthermore, mobile phones can serve as an important instrument of knowledge and information sharing. The World Bank and the Southern Sudan Centre for Census, Statistics and Evaluation collected information on the elections in South Sudan, the economic situation, security, outlook, and other topics via mobile phones (World Bank, 2011). This contributed to accountability, helped improve the collection of data, and potentially created a better development outlook for Sudan.

An interesting study from Latin America was done by Telecom Advisory Services LLC (2009). Based on data from 24 Latin American and Caribbean countries, the study found that a rise in broadband penetration might yield a rise in GDP growth, including direct and indirect effects. Similar conclusions about the beneficial effects that ICTs and the Internet might have on economies in Latin America were also summarised in a report by the Inter-American Development Bank (IADB, 2011). The report presents the contribution of ICTs to the success of several development projects in the region.

The Internet is therefore viewed as a critical tool for development which will positively contribute to reaching the Millennium Development Goals[10] of the United Nations by the target date of 2015. The goals address specific challenges such as extreme poverty, child mortality rates, access to education, and disease epidemics and aim at building a global partnership for development (OECD, 2005b).

The Internet can serve as a means for the creation of productive networks and growth (OECD 2005a), and enhance livelihoods (OECD 2005a). It can also have an impact on poverty reduction by opening up new economic and market opportunities, and serve as a tool to fight against the spread of diseases by making information more accessible. Furthermore, the Internet can serve as a platform for stakeholders to share information and thus help build global partnerships.

OECD research on Internet access for development (OECD, 2010) stresses the need for expansion of the economic and social opportunities made possible by the Internet for users in developing economies. Liberalisation and openness have played a key part in the expansion of fixed and wireless access networks. This in turn makes access to the Internet possible, increasingly affordable and available to people with very low incomes. Internet access also leads to innovations in markets that support employment, micro-entrepreneurial and social development opportunities which have emerged as access levels have risen among low-income users (OECD, 2010).

**Infrastructure investments that can reduce costs**

Investments in infrastructure are crucial if the Internet is to facilitate community development and if local content is to be disseminated and widely used at a low price. By investing in infrastructure and access to internet, countries could overcome the ‘digital divide’ between the “North” and the “South”,

make use of the economies of scale, and transition more quickly to a middle income economy (OECD, 2004b).

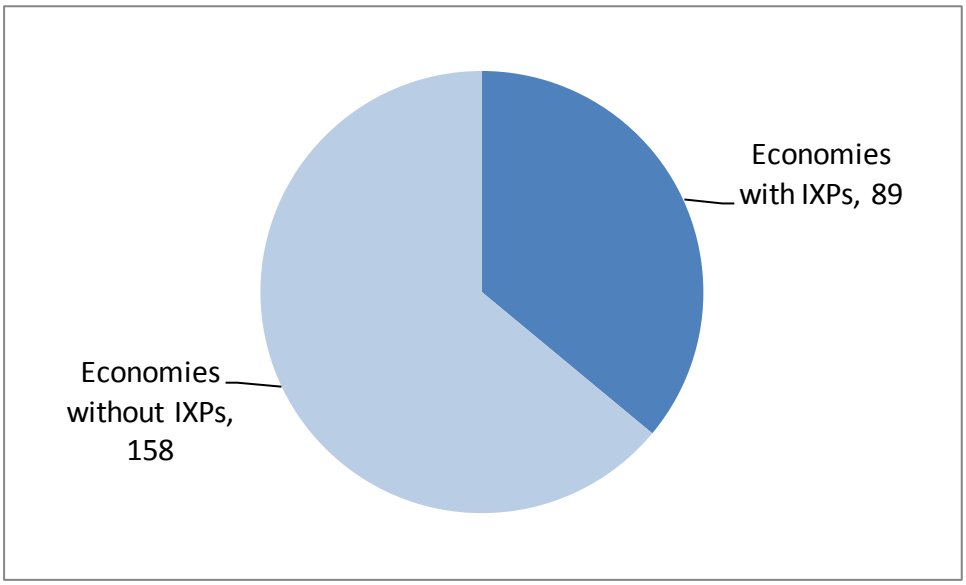
The Internet is essentially a collection of separate networks across the world interconnected at various places called Internet exchange points or IXPs. The IXP is the location where Internet traffic moves between networks based on agreements between network operators. The Internet exchange plays a key role in the Internet ecosystem because its location can determine the distance and cost of sending information from one network to another. The development of a commercialised Internet led to the development of IXPs in all OECD countries and in other locations around the world. The key benefit of having a domestic IXP is that domestic Internet traffic, such as an Internet subscriber reading a local online newspaper, would all be handled locally. This reduces the costs of the communication and increases the speed for users.

In countries without Internet exchange points, the handoffs between networks typically have to take place in a foreign country, thus increasing the cost of providing the information and introducing a delay as the Internet traffic travels out of the country on expensive international lines, is transferred across networks, and then comes back to the country of origin – again via an expensive international link. In some ways, it could be compared to forcing all domestic airline flights to have a stopover in a distant, foreign country.

The international links out of and into many developing countries are expensive because they are controlled by a monopoly provider or one with market power that can set a high price. Domestic Internet traffic, such as the sharing of local content, needs to traverse these international lines and this ultimately increases the prices for end users. Telecommunication providers in developing countries and the owners of international links are often telecommunication firms based in OECD countries, some of which retain some state ownership.[11]

Figure 15 shows that the majority of economies in the world do not have a functioning domestic IXP, meaning that domestic traffic to different networks would likely have to be routed internationally.

**Figure 15. Economies with domestic Internet exchange points** (2011)




*Source:* Packet Clearing House

**Local content and IXPs**

Local content commonly requires high amounts of bandwidth if it involves multimedia such as videos and audio files. Video and audio files are particularly important for reaching segments of the population with lower literacy levels. The larger file sizes of multimedia local content mean that content providers require more bandwidth that may need to be sent over expensive international networks if a local IXP is not available. Certainly, local firms wishing to distribute higher-bandwidth content would face much higher prices if their Internet traffic had to be exchanged internationally. This could be a barrier to firms wishing to provide local content services.

Policy makers in countries wishing to encourage the development of local content could evaluate how domestic traffic between operators is exchanged. If a domestic IXP is not available, then policy makers can consider ways to promote the development of an exchange as a way to reduce prices and improve Internet response times.

Investment in the equipment for an IXP is not sufficient to guarantee its success. Successful exchanges require a mixture of vision, technical skills, marketing ability, managerial know-how, infrastructure maintenance and an increasingly competitive domestic market for communication services.

**A focus on competition**

Competition has successfully reduced prices for communication services, improved services and helped usher in the era of new innovations in the market. An OECD report in 2006 found that the greatest cost barriers to any country connecting to global Internet was not necessarily traffic exchange relationships (which can be high) but rather monopolists in domestic markets charging high prices in the absence of competition (OECD, 2006a).

In most OECD countries, the liberalisation of markets led to dramatic and rapid decreases in prices for international connections and subsequent price declines for end users. The development of a competitive market for telecommunications should be a priority for policy makers, particularly as they strive to encourage the development of local content.

**Policy coherence for local content, Internet development and access prices**

Policy Coherence for Development (PCD) refers to mutually reinforcing policy actions across a wide range of economic, social and environmental policy areas and across countries with a view to achieving global development. PCD aims at *i)* avoiding impacts that adversely affect the development prospects of developing countries, and *ii)* exploiting the potential of positive synergies across different policy areas, such as technology, trade, competition, investment, agriculture, health, education, the environment, and development co-operation.[12]

PCD has multiple dimensions. At the international level, and in the context of an increasingly interconnected and globalised world, policies implemented by advanced and emerging economies are especially likely to have a global reach and influence the growth and development prospects of lower-income countries. But PCD has also a domestic dimension: developing country governments themselves can maximise the growth and poverty reduction impact of their own policies by assessing and effectively tackling their possible incoherencies, and by promoting synergies across inter-related sectors.

Policy coherence for development provides a tool to understand and assess the interlinkages of policy sectors, creates synergies between ministries, sectors, and actors, and helps to highlight incoherences and potential policy opportunities (OECD, 2011).

As described earlier, access to electronic communication and the wider distribution of local content offer multiple trajectories for development and have become major drivers of economic growth and social development. These include the improvement of Internet access, the development and sharing of local content, and decreasing access prices for the next several billion ICT users. Such an evolution also impacts on education and skills development, infrastructure, trade, employment, the provision of services, and technological and human development. PCD can serve as an important tool for policy-makers to maximise the potential of ICTs by helping design coherent policies across several policy sectors with a whole-of-government approach.

**PCD at the country level**

The University of Manchester (Heeks *et al.*, 2010) has analysed how far countries had strategically incorporated ICT policies in their general policy portfolio with view of improving their economic prospects and stabilising against the threats of climate change or insecurity, for example. The researchers found that the approaches were lacking in coherence in order to successfully link both development and long-term technological advancements and increase the usability of ICT (Heeks *et al.*, 2010). Supportive policies in the areas of education, competition, infrastructure, technology, or communication were not closely enough aligned to the ICT development.

A coherent ICT policy would be one which is cross-cutting in nature and of both horizontal and vertical coherence. Horizontal coherence is defined by Heeks *et al.*, (2010) as an ICT policy which does not only seek to "put in place the elements necessary for e-readiness that can make ICTs available, but also ensures there are policies that support the utilisation of ICTs and that the technology has a development impact" (Heeks *et al.*, 2010). These would be, for instance, policies on education, property rights, technology transfer, software development, and local capacity-building initiatives. Vertical coherence would ensure policy integration between the elements at each value chain stage (Heeks *et al.*, 2010) and thus provide collective responses for policies which go beyond aid and lead to a long-term development and the efficient use of the technologies.

A coherent country level policy approach needs to consider sectors that may affect the development of access, such as policies which place high tariffs on ICT equipment or taxation issues. Furthermore, money transfers (either in form of payments or banking) have been promoted in the last years, but still need to be reconciled with suitable policies to prevent money laundering or terrorism financing and facilitate these services to the rural population and the poor.

**PCD at the international level**

Industrialised countries' regulations with respect to Internet traffic exchange may also have a negative impact on the development of communications access in developing countries (OECD, 2009b: 12) and should be carefully addressed. All networks pay for their own connection to other networks in order to exchange traffic. If operators in developing countries rely as a whole, or to a significant extent, on exchanging traffic in developed countries, *i.e.* if traffic is diverted from a developing country to the provider in a developed country (*e.g.*, via an undersea cable or international gateway) and sent back, the price for the communication services increases and is then passed on to the customer in developing countries as well as resulting in poorer network performance.

Policies that promote domestic Internet exchange points (IXPs) in developing countries are therefore critical and can significantly reduce costs by avoiding the fees of international networks and encouraging service providers from developed countries to locate facilities at those IXPs. Furthermore, developed countries could support this process in form of subsidies, help with the installation costs developing countries might face, and loosen their monopolies.

**ICT for development – and development for ICT**

Collective and co-ordinated policy action can facilitate the access to ICT and the development and dissemination of local content, providing opportunities to promote economic growth, expand economic and social opportunities and exchange knowledge in both developing and developed countries. Knowledge-sharing and co-operation furthermore allows for cross fertilisation between different experiences and diverse development models, and can help to overcome the 'digital divide' between developed and developing countries. International multistakeholder partnerships and networks that bring together relevant stakeholders, provide them with platforms to share knowledge and best practices, discuss policies and build implementation-oriented partnerships, could help find viable solutions (OECD, 2009b: 20; Heeks *et al.*, 2010).

Yet, fundamental barriers remain to the successful implementation of a whole-of-government approach as these subjects are frequently far beyond the mandates of communication or technology policy makers (OECD, 2009b: 16) and depend on a close co-operation between the ministries, actors and governments.

## SECTION 4: DATA AND EMPIRICAL ANALYSES

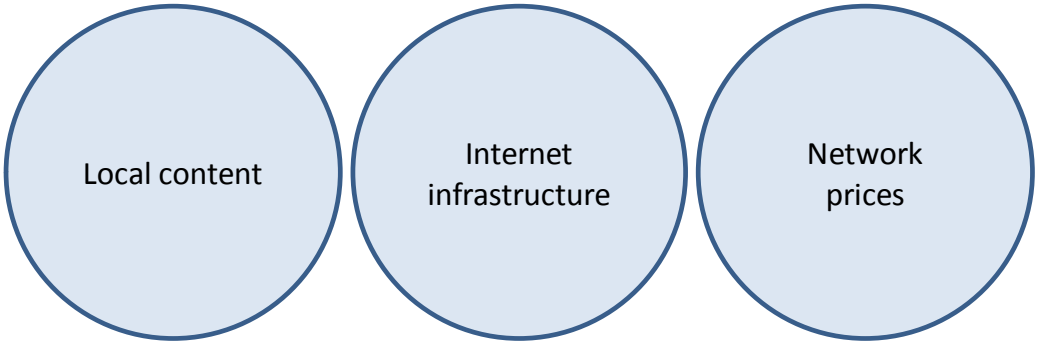
Digital technologies are a unique tool for content creation and delivery at the local level and around the world. They provide content creators access to global information and knowledge upon which they can learn, build and adapt. The Internet also has become one of the most important content delivery systems, offering creators a global platform to distribute information at a very low cost.

With these developments in mind, policy makers want a better understanding of the relationship between content creation, the development of Internet infrastructure and local access costs. In particular, there is a pressing need to understand if there is a correlation between the volume of local content production, the level of development of local Internet infrastructure and the cost of connectivity. Empirical proof of a positive correlation would help guide policy makers to make the right policy decisions.

### Introduction

This section presents a quantitative, empirical analysis of the economic relationships between local content, network development and network prices (see Figure 16) and Table 3. It begins with an outline of possible measures for each of the sectors. The analysis then uses these measures as proxies to test for relationships among the three sectors using a series of quantitative exercises.

**Figure 16. Looking for relationships among local content, Internet infrastructure and Internet prices**




*Source:* OECD

The various empirical measures that will be used in this analysis are presented in Table 3. In the absence of an established criteria or methodology for measuring on-line local content, this report selects the number of Wikipedia articles per language per capita, the number of blogs per language per capita and the number of country-code top level domains per country, per capita as references. Measures of network development include Internet subscriptions per 100 inhabitants, the number of autonomous systems per ten thousand inhabitants[13], the number of IPv4 addresses per capita[14] and international Internet usage per country per capita. Finally, two measures of network prices are introduced: the broadband monthly subscription price and the full-port price for a standard STM-1/OC-3 port (operating at 155.52 Mbit/s) for IP transit.[15]

**Table 3. Breakdown of variables**

| Local content | Internet infrastructure | Network prices |
|---|---|---|
| Number of country code top-level domains per 1 000 residents per country | Number of fixed broadband Internet subscriptions per 100 inhabitants in the country. | Fixed broadband Internet monthly subscription; USD |
| Number of Wikipedia articles per language, per capita | Number of autonomous systems in a country per one hundred thousand inhabitants. | Average full-port (STM-1/OC-3 IP transit, 155.52 Mbit/s) prices; USD |
| Number of published blogs per language, per capita | Number of Internet addresses in use in a country divided by the population | |
| | Volume of international bandwidth (megabit per second) used by country divided by the population | |

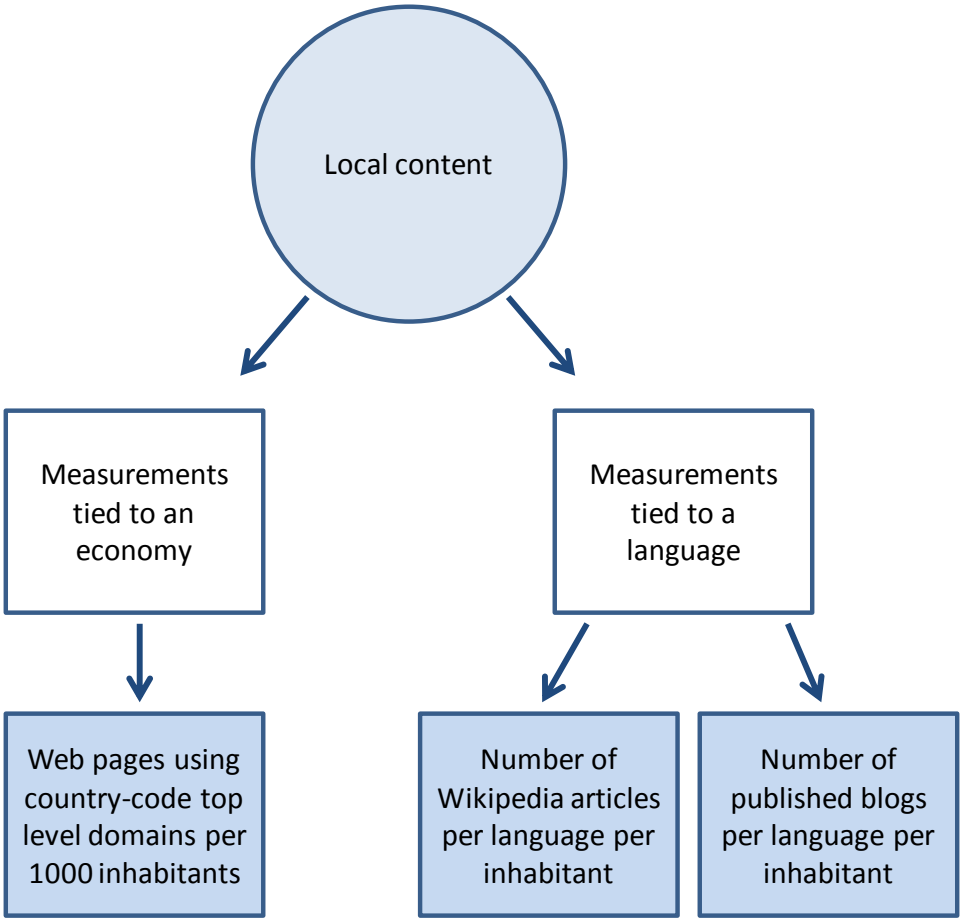
## Measures of local content

There are two observable trends with respect to local content across the various measures**.** First, local content is growing very fast in volume across the world, often at astonishingly high rates. Second, its composition is changing as developing countries and non-English speaking areas are much better represented in terms of content production than before. This analysis considered a broad range of measures for local content before settling on the three that were used in this analysis. One of the common themes across all the data sets however was that local content is growing very quickly, typically much faster than the growth of the economy as a whole.

Currently, there is no uniform definition of local content. For the purpose of this analysis this study relies on a UNESCO definition that states that local content must be *relevant and comprehensible to local users* (UNESCO, 2001). In harmony with this description, this paper considers all digital content created for an end user who speaks the same language as the author to be local content. This includes content created for people who do not live in close proximity to the creator, but thanks to the Internet, are part of a world-wide 'local' community of same-language speakers. The language criterion is primarily intended to exclude translated content. No stipulations about the author of local content are made (*i.e.* individuals, governments and businesses all qualify).

Because local content cannot be measured directly, a set of measures must be used to indirectly infer its size. To facilitate classification of local content, this research first divided potential measures into *(i)* measures which are associated with a particular country and *(ii)* measures tied to a particular language. Figure 17 provides a graphical representation of the various measures of local content that will be used.

**Figure 17. Approaches to measuring local content**




*Source:* OECD

Some local content **measurements are tied to a country** and these proxies are attributed to the country of origin. These measures focus only on the country of origin of the content and do not take into account the language of the content or the author's country of origin. Examples of these measures include the number of Internet top-level domains by country per capita, the number of online newspapers per capita, or the number of online radio stations per capita.

Restricting measures to a particular country clearly reduces the heterogeneity within the local content, especially in cases of larger countries that have rich and internally diverse local content. For example local content is offered in several languages in many countries, including local and minority languages. Another problem of this type of measures is related to the fact that some content created in a given country can be in fact designed for international audiences.

On the other hand, most cross-country data are presented at the country level, which means that they can be used together with measures of local content by country. Putting it differently, measures of local content at the country level are particularly useful for any cross-country measurement exercise that requires the intense use of other country-wide statistics.

Other local content **measurements are tied to a language** and these measures rely on the language in which the local content is offered. These measures include the number of Wikipedia articles, web pages or blogs published in a given language. The common feature of these measures is that they all rely on a common language as a classification criterion.

A potential problem related to these measures is related to the fact that numerous languages such as English, French, Spanish, Portuguese or Arabic are used in more than one country. To transform the impossibly complex and subjective problem of identifying and classifying local content into a tractable exercise, a subset of languages is proposed, in which one language is used as the first language in one country only. Consequently numerous international languages are excluded from the analysis. For the remaining languages a relationship language–country is established to assure the correspondence between the measures of local content and other statistical measures.[16]

Out of an initially broad list of possible proxies of local content, several turned out to be sufficiently large in terms of countries and years covered in order to be applied in an econometric exercise. In particular, the quantitative exercise in this chapter relies on three measures of local content: *(i)* the number of web pages using country code top-level domains per country per capita, *(ii)* number of Wikipedia articles per language per capita; and *(iii)* number of blogs per language per capita.

Table 4 summarises these measures of local content.

**Table 4. Measures of local content**

| Indicator | Description | Benefits | Drawbacks |
|---|---|---|---|
| ***Measure by country*** | | | |
| ***Web pages using ccTLDs*** | Number of web pages using country code top-level domains per 1 000 residents per country | No ambiguity in identification. Good fit for local content criteria | Narrow measure of local content due to barriers to entry |
| ***Measures by language*** | | | |
| ***Wikipedia articles*** | Number of Wikipedia articles per language* | Free and easily accessible, reflective of overall shift of the Internet community away from English language | Easy to automate creation of articles |
| ***Blogs*** | Number of blogs per language* | Free, accessible to all with Internet access | Measured imprecisely, classification of multilingual blogs is ambiguous |

Notes: * These measures should be weighted by the number of speakers of the particular language per country.

### *Web pages using top-level domains per country code, per capita (ccTLD)*

There are currently 324 ccTLDs according to the Internet Assigned Numbers Authority (IANA), the body which manages the domain names system's root zone and assigns *country code top-level domains* (ccTLDs).[17] The two-letter, top-level domains are especially designated for a particular country or territory to use to service their community.[18] Top-level domains are often used by community-oriented organisations, businesses, and even official town websites.

Although the criteria for local content permit a broad range of media to qualify, the spirit of local content is community. Whether local content be user-created, business-created, or government-created, it is intended to draw local readership and promote local language and culture. With this in mind, sites which serve and strengthen the community (*i.e.* ccTLD sites) are theoretically very good measures of local content.

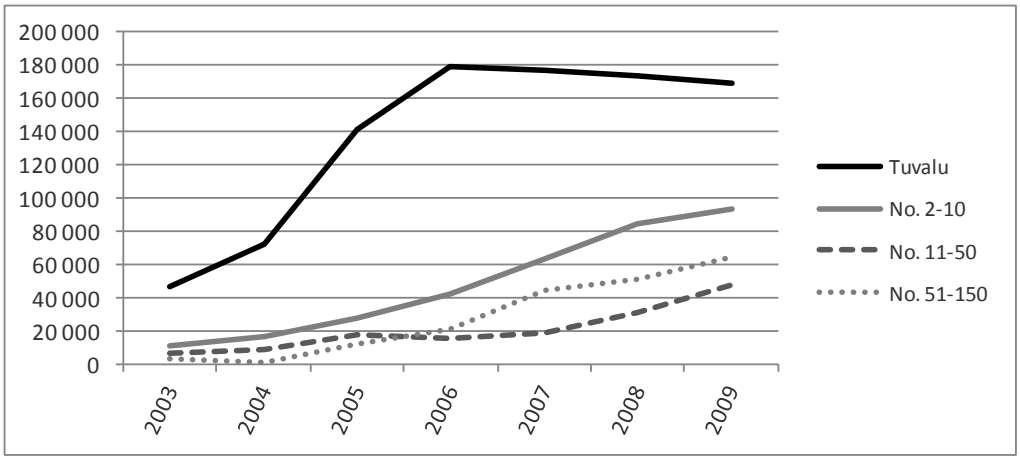
Using a Google wildcard search, it is possible to identify the number of indexed web pages with a particular *top-level domain* in 246 countries or territories from 2000-2010. The ccTLD for a particular country or territory is unambiguous to define. This eliminates a large source of measurement error in quantifying local content. The drawback of using the Google platform is that the search algorithm is proprietary, and hence the methodology is non-transparent. The algorithm seems to find more results for searches which are conducted on a more frequent basis. Additionally, searches performed months apart return very different results. For this reason, all data should be gathered at the same time.

Web sites using top-level domains are not perfect measures of local content creation. The registration process for domain names using ccTLDs is not an easy undertaking; it sometimes requires a lengthy application process and fees vary across countries. These barriers to entry may push local content providers out of the market for domain names using ccTLDs, and drive them instead to alternate channels of dissemination. Hence, using domains visible using ccTLDs as a metric for local content only captures a narrow band in the spectrum of local content. There are also a relatively limited number of cases where ccTLDs are commonly used in countries that are different than the country or territory of origin (*e.g.* .tv, .fm, .nu).

Another bias is introduced by sites which have to use a domain name with a particular ccTLD but provide translations in many different languages. Sites such as *www.rfi.fr* (an online French radio station) provide multiple language versions including *www.english.rfi.fr*; sites in translation such as this one do not meet the language requirement for local content. Nonetheless, they cannot be easily separated from legitimate local content on a large-scale basis.

The growth in *web pages using country-code top level domains* (ccTLD) has been rapid. The median growth rate over the past ten years was 40% per year in the 246 countries contained in the available dataset. At the median, the number of indexed pages per ccTLD doubles every 25 months. Average growth over the same period was an astounding 3 202 percent per year.[19] The average is distorted by small countries which increase from only a handful of sites to hundreds or even thousands in just a year. Figure 18 provides a graphical representation of the growth in the number of ccTLDs (per 1000 residents).

**Figure 18. Country Code Top-Level Domains per 1000 Inhabitants**




Notes: The outlier (Tuvalu) was not presented. Tuvalu has more ccTLDs per capita than the next 50 countries combined. This is given the popularity of Tuvalu's country code (.tv) that is being widely used abroad for denomination of television and video-related sites^.

*Source*: Google (ccTLD), World Bank (population)

***Wikipedia entries by language***

Wikipedia is a free, web-based, collaborative, multilingual encyclopaedia project supported by the non-profit Wikimedia Foundation. Its 18 million articles (over 3.6 million in English) have been written collaboratively by volunteers around the world, and almost all of its articles can be edited by anyone with access to the site. Wikipedia was launched in 2001 by Jimmy Wales and Larry Sanger and has become the largest and most popular general reference work on the Internet, ranking around seventh among all websites on Alexa with 365 million readers.

Wikipedia's user-created nature makes it a good measure for local content. In particular, the barriers to posting and editing content on Wikipedia are very low. Contributors simply need a terminal and Internet access to compose and edit articles.

The collected panel data from Wikipedia.org contains information on the 274 languages represented on the site. The data are recorded at monthly intervals from 31 January 2001. The number of languages and the monthly 10-year time series creates a very useful dataset to perform econometric analysis. Table 5 below contains summary statistics for the data.

**Table 5. Wikipedia Summary Statistics**

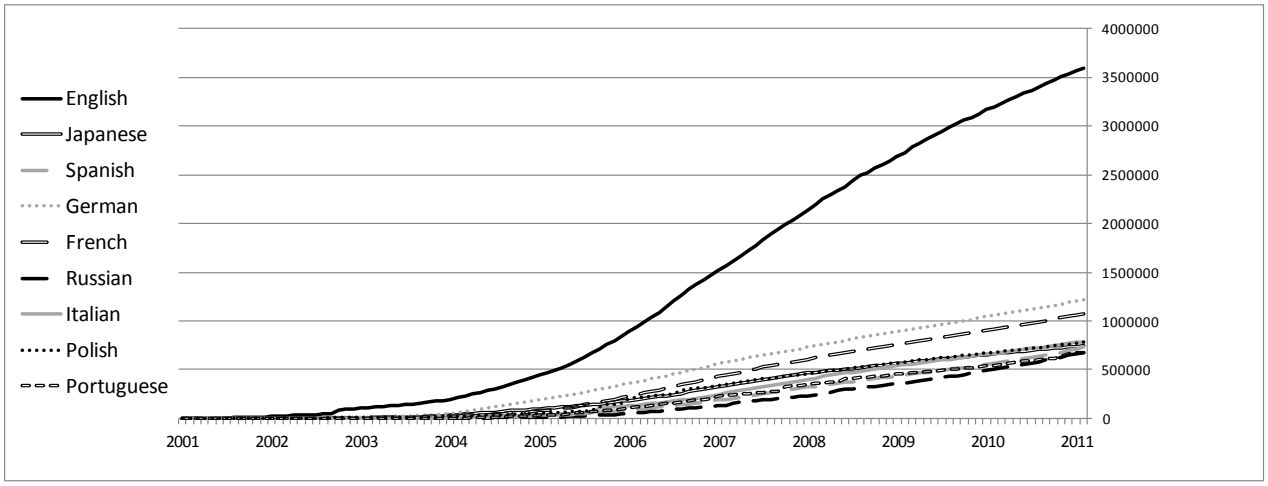
| Date | Number of languages | Total number of articles |
|---|---|---|
| Dec-11 | 275 | 17 900 000 |
| Dec-10 | 273 | 14 900 000 |
| Dec-09 | 273 | 12 300 000 |
| Dec-08 | 272 | 10 100 000 |
| Dec-07 | 267 | 7 900 000 |
| Dec-06 | 256 | 5 200 000 |
| Dec-05 | 213 | 3 000 000 |
| Dec-04 | 180 | 1 300 000 |
| Dec-03 | 103 | 392 000 |
| Dec-02 | 46 | 133 000 |
| Dec-01 | 15 | 17 000 |

*Source*: http://stats.wikimedia.org/

It is relatively easy to create Wikipedia articles using automated computer programs. While this makes constructing and updating of dynamic pages (*i.e.* pages containing frequently changing population figures) much more efficient, it also permits large-scale creation of pages with very little information. A better way to measure contribution to local content on Wikipedia might be to factor in the average length of articles or the number of contributors for each language.

Wikipedia has seen impressive growth over the previous 10 years. For example, the number of Wikipedia articles continues to climb at a rapid rate, particularly in English (see Figure 19). The median growth for all of the languages in the data is 89% per year; this translates to a doubling time of just under 13 months. Average growth statistics, especially for languages with a small number of articles might be misleading as the addition of just a few articles could potentially translate into growth of several hundred percent.

**Figure 19. Total Wikipedia articles by language**



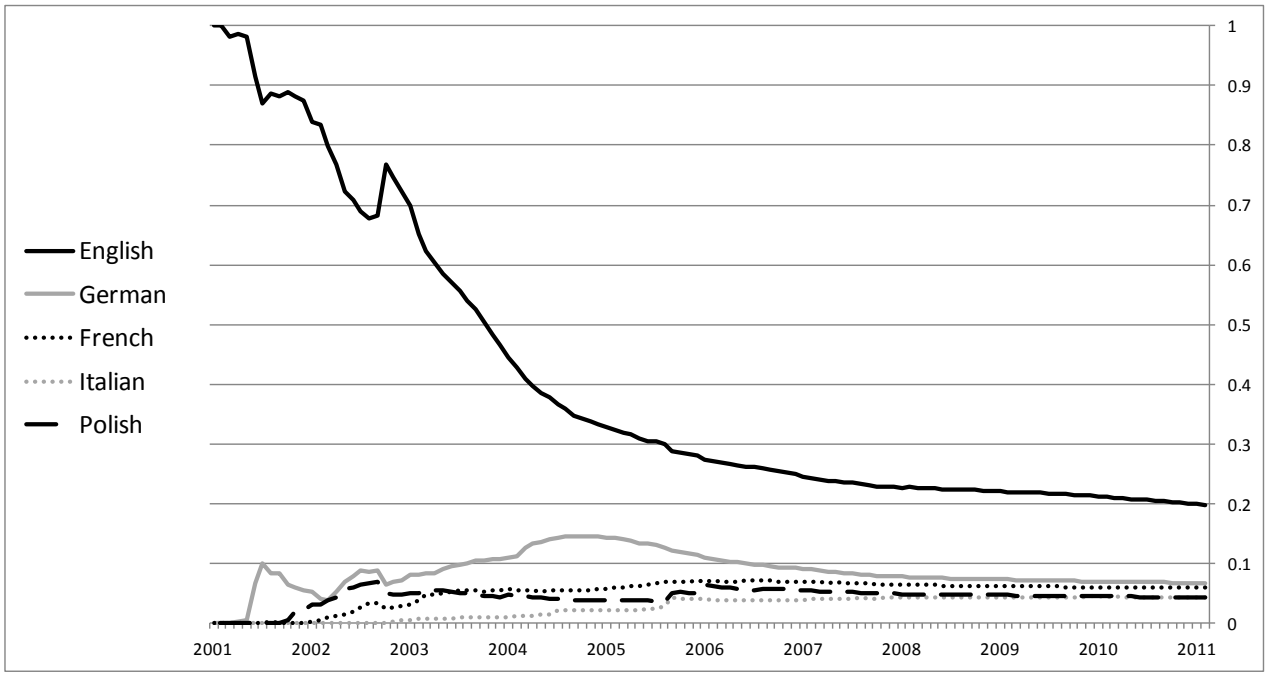

*Source*: http://stats.wikimedia.org/

Clearly, to some extent these surprisingly high rates of growth could be attributed to the time series beginning in the early days of Internet content. Nevertheless it must be highlighted that such high rates of growth are rarely seen in traditional sectors, and therefore are a clear indication of an exceptional dynamism of local content evolution.

Another trend in the area of local content is about its changing composition. In particular, after the initial domination of a small set of languages, in particular English, the share of content in English is declining, even as the amount of content in English grows (see Figure 20). Local content in minority languages appears to be growing at a dynamic pace.

Wikipedia mirrors the overall move of Internet users away from English to more local languages as Figure 20 shows. For the first few years after its inception in 2001, Wikipedia was primarily dominated by articles in English. By 2010, only about 20% of Wikipedia articles were in English, while it was estimated that 27% of internet users were English speakers.

**Figure 20. Proportion of Wikipedia Articles by Language (Top-10 Languages)**




*Source:* http://stats.wikimedia.org/

At the same time, a large amount of local content offered in languages other than primary languages has been developed. Ten years ago Wikipedia was available in about 15 language versions and these were common languages such as English, German and French. Today, Wikipedia is offered in more than 280 languages, including numerous minority languages such as Aymara, Tsonga, Kabardian or Hawaiian.

***Published blogs by language***

Although the precise definition of the term 'blog' is still disputed, loosely defined a blog is a website containing date-stamped entries in reverse-chronological order (OECD, 2007a.) Blogs serve many purposes, including sharing information (*e.g.* news blogs, political blogs, etc.), a platform for self-expression (*e.g.* personal blogs containing journal-like content), and social networking (*e.g.* interest blogs) (OECD, 2006b.)

According to the 2006 OECD Information Technology Outlook, blogs were among the most important early developments in the participative web (OECD, 2006b.) As an easily available, all-purpose platform for expression, blogs lend themselves well to the dissemination of local content. In fact, creating a blog does not require any special software and is as easy as using a word processor. Blogs are also interactive, generally permitting viewers to post comments and engage in online discussions. Because of the small readership of minority language blogs, publication of this material in other formats would be too expensive. The free and easily accessible online format of blogs makes them effective platforms for local language content.

Blogs fit the criteria for local content well but measuring them is difficult. The data on blogs was gleaned using Google searches tied to specific dates. The Google searches often return blogs which are clearly not the language of interest. This could be due to the fact that snippets of multiple languages appear in the same blog. In this case, it is difficult to know how to classify the content. Additionally,

using Google search results only allows us to sample a few of the interesting languages which we would ideally like to measure.

For the data to be unbiased, the collection needs to rely on the assumption that the Google search engine detects an equal proportion of blogs in all languages. For example, if Google is able to find 75% of blogs in French, it must also detect 75% of blogs in other languages of interest. If however, the Google algorithm is relatively more efficient in certain languages, statistical analysis of the dataset will be biased. Along similar lines, to accurately measure local content, blog use must be equally popular in the languages of interest. Previous research indicates that this might not be the case, at least in the earliest years of our dataset[20] (OECD 2006b).

Finally, blogs have two inherent biases as measures of local content. It is possible for one person to create several blogs simultaneously, thus distorting the usefulness of the metric to judge the number of different contributing voices. Additionally, not all blogs are created equal: while some blogs have over a million followers, other blogs are read only by their authors. On the production side, some blog authors post frequently (sometimes multiple times a day) while other authors write infrequently or not at all. The different degree of importance introduces the need for a subjective weighted index: in this case the simple number of blogs is counted (weight = 1), but other researchers might decide to use a more sophisticated approach which depends on blog readership. The subjectivity involved in any approach is an unavoidable drawback of blogs as a measure for local content.

The estimated number of blogs varies between sources. The discrepancy can be attributed to the fact that blog search engines use the 'number of links and the perceived relevance of blogs' to tabulate the numbers (OECD, 2006b). Survey and sampling methods have also been employed to estimate the number of blogs, but these estimates vary as well.

This analysis uses Google blog search to collect data on the number of blogs created in 46 languages from 2001-2010. Google blog search was chosen over other available search engines for (i) consistency with the search engine used for ccTLDs and websites per language, and (ii) Google search has a language option with 46 available languages.

**Measures of local Internet infrastructure development**

As the Internet becomes an ubiquitous and multidimensional technology, there is not just one way to measure "the development of Internet connectivity". Moreover, available datasets are limited in terms of the number of years covered and makes determining the causality of a relationship more difficult.

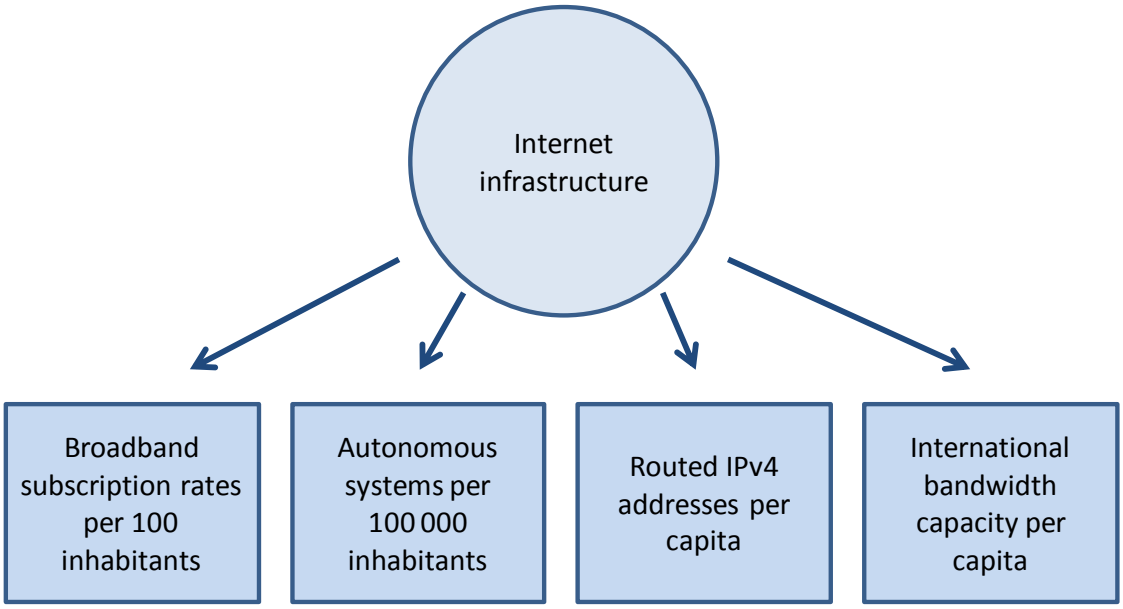
The development of the Internet can be measured at a number of levels using various proxies (OECD, 2009a). Out of a range of measures, several seem to be of a particular interest in the context of this study: *(i)* Internet subscription rates; *(ii)* the number of autonomous systems (AS) per one hundred thousand inhabitants; *(iii)* the number of routed IPv4 addresses per capita; and *(iv)* international capacity per country per capita. These measures are summarised in Figure 21 and in Table 6.

Table 6. Measures of Internet development

| Indicator | Description | Benefits | Drawbacks |
|---|---|---|---|
| ***Broadband subscriptions per 100 inhabitants*** | Number of broadband subscriptions per 100 inhabitants in the country. (1) | - Simple intuition behind the data; refers to the basic economic concept of *quantity traded on the market* | - Upper limit of growth set by the saturation level of a country<br>- Difficult to illustrate actual use of the Internet.<br>- Does not capture some alternative Internet connectivity.<br>- Refers to internal situation only, does not address trans-border network development. |
| ***Autonomous systems per 100 000 inhabitants*** | Number of autonomous systems (AS) in a country per 100 000 inhabitants.(2) | - AS data has a long time series and represents the number of separate "networks" in a country comprising the Internet.<br>- Good for understanding business connectivity and development<br>- Good to understand the degree of competition on local market | - Not intuitive<br>- Focuses on networks and infrastructure making up the Internet, rather than the number of users/devices connected.<br>- AS numbers also could potentially be used in countries other than where they were originally assigned. |
| ***IPv4 addresses per capita*** | Number of routed IPv4 Internet adresses in use in a country divided by the population (3) | - Proxies the actual intensity of use of the Internet in a given country<br>- Illustrates all the ways of connecting to the Internet (broadband, mobile, etc.) | - Not intuitive.<br>- Number of devices may be under-reported because multiple devices can share one IP address.<br>- Can be used only as long as IPv4 addresses are freely allocated among demanding parties (as long as the entire IPv4 addresses stock hasn't been deployed). |
| ***International bandwidth per capita*** | The capacity of international bandwidth (in megabits per second) into a country divided by the population (4) | - Proxies the degree of international connectivity of a given country | - Refers mainly to connectivity outside the country.<br>- Proprietary (and hence unknown) methodology behind the data collection. |

Notes: (1) source: ITU, (2) source: RIPE NCC www.ripe.net, (3) source: Geoff Huston www.potaroo.net, (4) source: Telegeography www.telegeography.com

**Figure 21. Proxies for Internet infrastructure development**




*Source:* OECD

***Broadband subscription rates***

Most of the existing literature relies on Internet or broadband subscription rates as the proxy for the development of the Internet. The broadband subscription rate is measured as the number of broadband subscriptions per 100 inhabitants. A broadband line is defined as a line (DSL, cable, fibre, or other) that offers download speeds of at least 256 kbit/s. This analysis uses broadband subscriptions as the proxy for Internet access because the data set is more reliable than general Internet subscriptions. One of the challenges with data on Internet subscriptions is that they often count inactive accounts that people may have set up for dial-up but do not use. The broadband data set is also more reliable as dial-up services are quickly disappearing around the world.

Data on broadband subscriptions are collected directly from regulators and operators. Hence, they are highly consistent and reliable. Moreover the available dataset is relatively large and the measure itself is intuitive – higher subscription rates correspond to a greater "quantity of broadband services" that are consumed in the market.

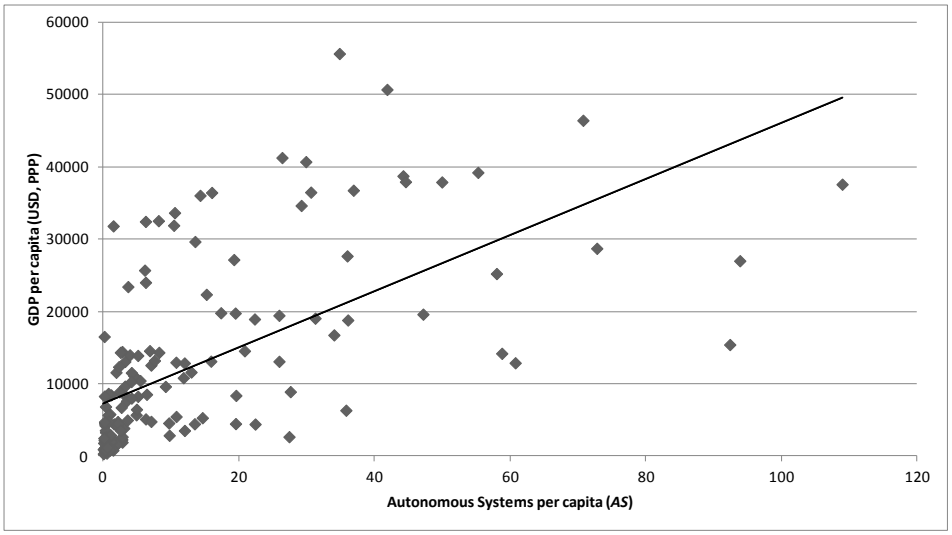
Unfortunately this proxy has also some drawbacks that limit its use as a general measure of the development of the Internet. First, by their construction, data on subscription rates are size-limited by the saturation level in a country. This means that subscription rates cannot report balanced, long run growth rates since their growth stops ultimately once all interested parties have an Internet connection. Econometrically this issue can be addressed by application of a control variable; nevertheless this is a possible limitation that should be recognised throughout the analysis. Second, *broadband penetration rates* capture the fact of being connected, rather than the actual use of the Internet. Lastly, this measure does not capture some alternative types of Internet connectivity, such as dial-up or mobile broadband access using mobile devices such as smart phones.

***Autonomous systems per 100 000 inhabitants***

An autonomous system is essentially one distinct network that interconnects with other networks to form part of the Internet. The Internet is made up of roughly 50 000 autonomous systems spread throughout the world. Groups with an autonomous system number include private firms, governments and non-profit organisations wishing to control their own IP addresses and manage their own routing. This study uses the number of routed autonomous systems in a country, divided by the population as a representation of the development of the Internet in a country. Countries with more extensive Internet development should have more companies and businesses managing their own Internet presence via an autonomous system.

Apart from these technical measures, the number of AS per capita has certain economic features that make it a potentially useful proxy of the Internet's development and use. It reflects a more profound and increased use of broadband infrastructure deployment, and greater intensity of use of broadband based services in a given country. It provides a concise measure for understanding business connectivity and development. Consequently, this is reflected in a positive correlation between the number of autonomous systems per 100 000 inhabitants and the level of GDP per capita in a given country (Figure 22).

**Figure 22. GDP per capita and number of autonomous systems per 100 000 inhabitants**




*Source:* RIPE NCC; www.ripe.net (AS) and World Bank, World Development Indicators (GDP PPP)
Trendline equation: 388,2x+7258; $R^2$=0,38. Sample of 150 observations

AS numbers have a particular focus on organisations making up the Internet and capture the number of separate networks in a country. IP addresses, on the other hand, reflect the number of end-user connections in a country. They are closely tied (and are highly correlated) but there is a nuanced difference in the two indicators. AS data reflect the number of distinct networks in a country while IP addresses are connections to these networks. The benefit of both the AS and IP address data sets is that their data cover a relatively long period of time.

There are some limitations to using autonomous system data. The number of autonomous systems per 100 000 inhabitants measures groups that have been allocated an AS number and manage their own IP addresses but there could be other explanations for why firms in one country choose to get IP addresses through a local ISP while firms in another country would rather manage their own network. Moreover, this measure by construction focuses on networks and infrastructure making up the Internet, rather than the number of users/devices connected to the Internet or the number of people using the devices.

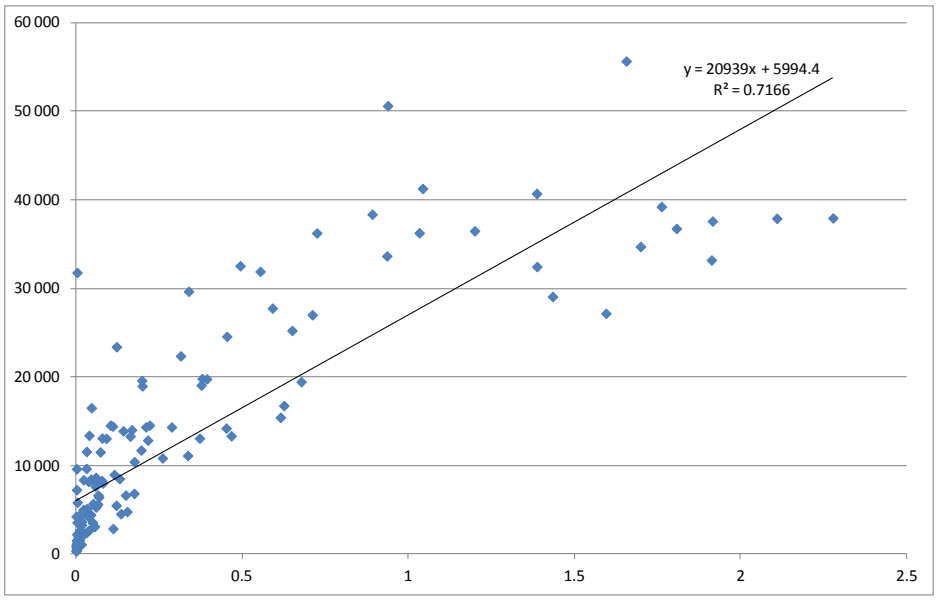
### *IPv4 addresses per capita*

An IP address is a numeric identifier for a device connected to the Internet. Networks using the TCP/IP protocol route messages based on the IP addresses of the sending and receiving party. IP addresses essentially work like a postal address, specifying an address on the Internet which can send and receive information. In general, the number of IP addresses reflects the number of computers and devices connected to the Internet. Currently most routed IP addresses are IPv4 with the next generation of numbering (IPv6) being gradually introduced around the world. The number of IPv6 addresses on the Internet has been estimated at less than 0.03% so the number of routed IPv4 addresses is still a robust representation of the number of devices attached to the Internet.[21]

Internet addressing is primarily a technical issue, but one that is influenced by economic and social factors. Increased IP infrastructure deployment and greater demand for Internet services throughout countries and societies translates into greater demand for IP addresses.

It must be highlighted that similarly to IPv4 addresses per capita, the number of autonomous systems also has certain economic meaning. Data on IP addresses to a large extent illustrates the number of separate devices connected to the Internet with their own unique IP address. Hence, it can be considered as an actual proxy of the use of the Internet by individuals and the industry. It provides a concise measure for understanding business connectivity and development. Consequently, this is reflected in a positive correlation between the number of IPv4 addresses per capita and the level of GDP per capita in a given country (Figure 23). Moreover, the number of IP addresses covers all the different ways of accessing the Internet (*i.e.* via broadband, dial-up and business leased lines).

**Figure 23. GDP per capita and number of routed IPv4 addresses per capita, 2009**




*Source:* Geoff Huston www.potaroo.net (IPv4) and World Bank, World Development Indicators (GDP PPP)
Sample of 144 observations

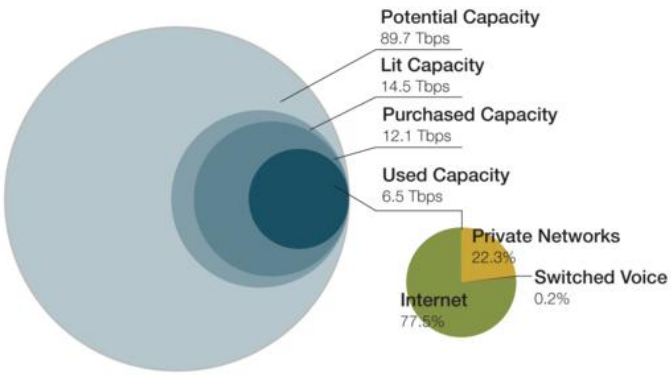
A potential problem related to the use of the number of IPv4 addresses per capita as a proxy of the Internet stems from the fact that in some instances multiple devices can share one IP address. This is possible due to a technical process called network address translation (NAT) that can be used in routers to share one IP address among a number of devices/computers. NAT is commonly used in households as a way to share one broadband connection among multiple devices but it is much less commonly deployed by ISPs to individual homes given almost all ISPs have sufficient IP addresses to accommodate their subscribers. Issues with NAT may be exacerbated because IPv4 allocations have not been uniform across countries. Large countries such as China may have fewer IPv4 addresses than individual universities (MIT) or corporations (Apple) that received allocations early in the process. These issues imply that the number of IP addresses per capita could underestimate the actual level of Internet's use and development.

***International bandwidth usage per country per capita***

The last measure of Internet network development relies on the amount of international bandwidth used in a country as collected by Telegeography ("used capacity" in Figure 24). This measure of Internet development largely refers to the international character of Internet use in a country. In particular, it presents the capacity of international Internet traffic from and to a country. For our analysis, this would be the capacity used to bring in content from abroad as well as the capacity to send locally produced content outside domestic borders.

**Figure 24. Defining international Internet bandwidth use**

Examples of different measurements



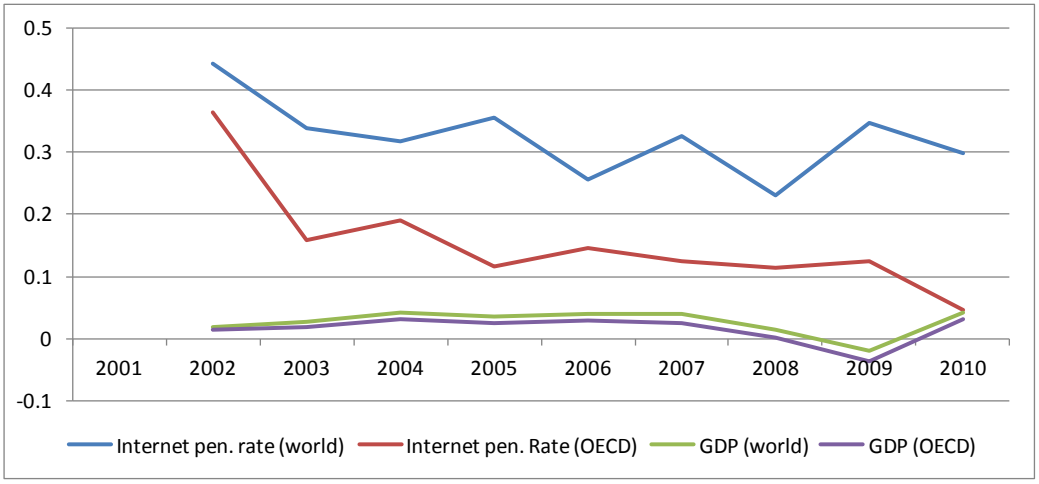

*Source:* Telegeography, Global Bandwidth Research Service

One of the drawbacks of this measure is that domestic traffic may also be routed over international lines if there is not sufficient data exchange between operators within a country. Countries without a well-functioning domestic Internet exchange will see nearly all their cross-network traffic sent outside the country, exchanged, and then re-imported using international bandwidth. The available dataset covers the period between 2002 and 2010 and is expressed in megabits per second. The data were expressed in per-capita terms to make them comparable with other economic data.

The rapid development of digital local content has been paralleled by the dynamic **development of the network**. In this case, several main trends can be distinguished. First, the Internet has been growing much faster than aggregated economic indicators. Second, developed countries in some aspects are reaching their saturation levels, whereas for numerous developing countries the network expansion processes have not yet completed.

To illustrate the dynamism of the Internet development, it is illustrative to consider the rates of growth of the internet penetration rates and to compare them with the GDP growth (Figure 25). For many years the rates of growth of the Internet was above the 10% level, which is significantly above the economic growth rates.

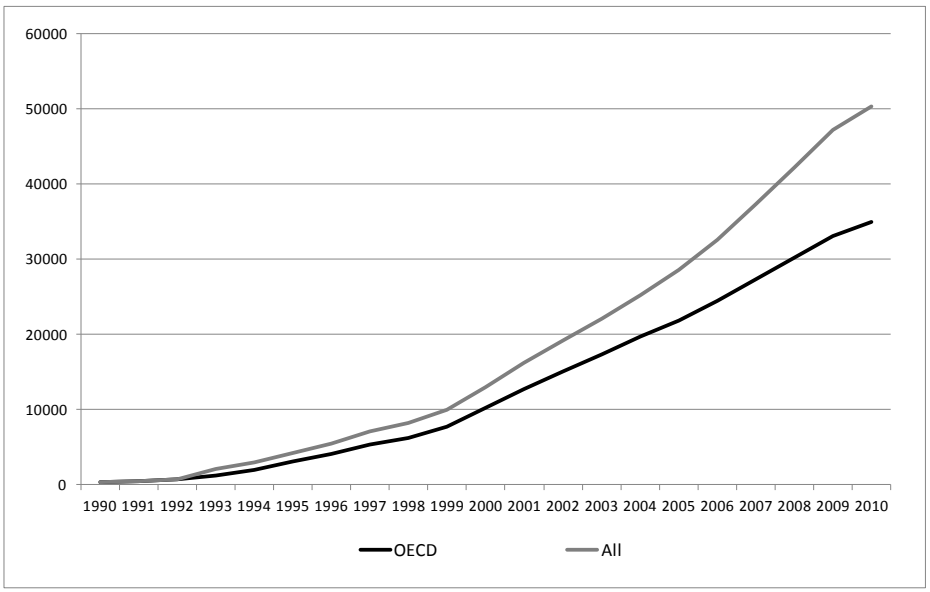
**Figure 25. Growth rates: broadband penetration rates and GDP**




*Source:* ITU (Internet Penetration rate) and World Bank (GDP growth rate)

The rapid growth of the Internet can be observed in the number of autonomous systems and IPv4 addresses. The number of autonomous systems has increased from less than 3 000 in 1997 to over 26 000 just ten years later, as Internet connectivity became increasingly important for enterprises (see Figure 26).

**Figure 26. Total number of allocated autonomous systems (AS)**



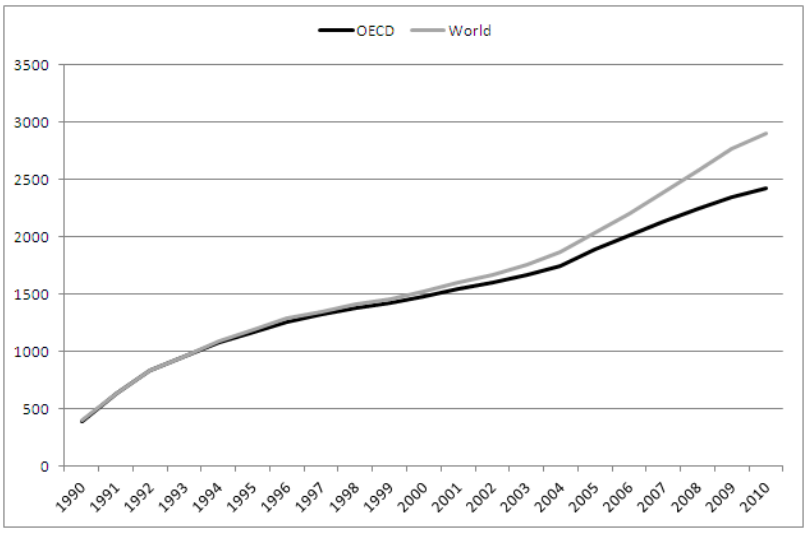

Source: RIPE NCC, www.ripe.net

The United States has the most autonomous systems in total, at 20 203 in 2010. When weighted by population, the countries with the most autonomous systems per capita are Iceland (over 10 Autonomous systems per 100 000 inhabitants), followed by Latvia, Slovenia, Switzerland and New Zealand at the end of 2010. The countries with a high number of autonomous systems per capita all have well developed Internet markets, but some countries with well developed markets have a much lower ratio (*e.g.* Japan and France). This may reflect such factors as industrial structure, and the number of ISPs and level of competition between them.

Among low and lower-middle income countries, the countries with the most autonomous systems overall are Ukraine (1 681), Indonesia (465), China (458) and India (398). Concerning the number of allocated AS per capita, the highest number in these countries was observed in Ukraine (3.6), Belize (1.7) and in Armenia (1.4).

The number of IPv4 addresses per capita has increased from less than 500 million in 1997 to almost 3 billion twenty years later as Internet connectivity has become (see Figure 27).

**Figure 27. Total number of IPv4 addresses**

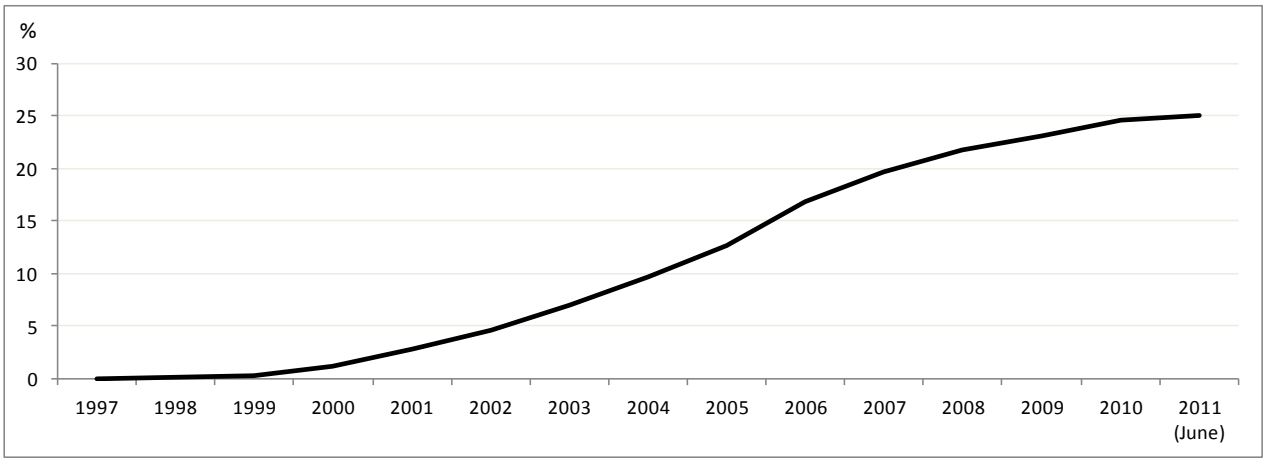



*Source:* Geoff Huston www.potaroo.net

This dynamic growth of network was observed globally, not only for the OECD countries. However, the developed countries were the first ones to observe the saturation of the market for network, and hence their growth rates were lower than global rates.

The evolution of the network subscription in OECD countries has followed a logistic distribution; there is no unlimited growth but the growth yields to the point of saturation, where every demander already has access to the Internet. Figure 28 plots the actual average fixed broadband subscription rate for OECD countries.

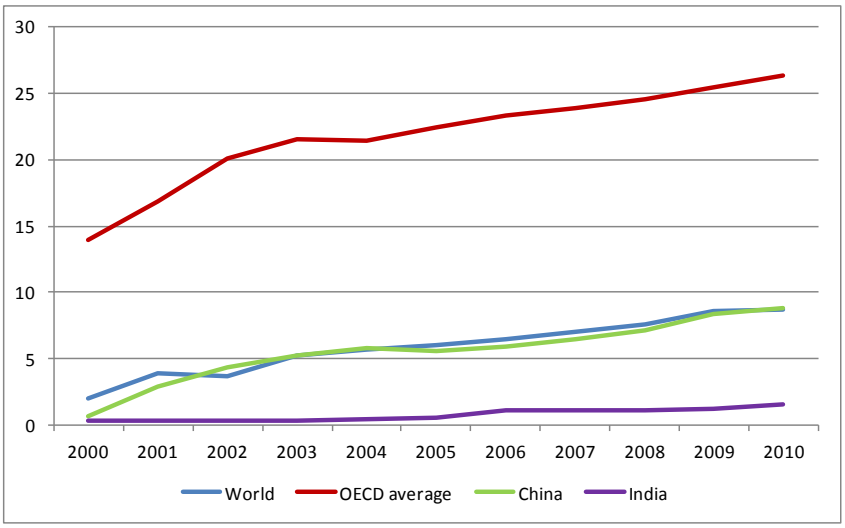
**Figure 28. Fixed broadband subscription rates (OECD Average)**




*Source:* OECD Broadband Portal

Whereas in most of the developed countries the development of the internet network seems to have reached its saturation point in at least some dimensions, for the developing countries the internet network is still in the phase of development. The take-off period in these countries begun much later and the growth rates are still much higher than in OECD countries (Figure 29).

**Figure 29. Internet subscriptions per 100 inhabitants**

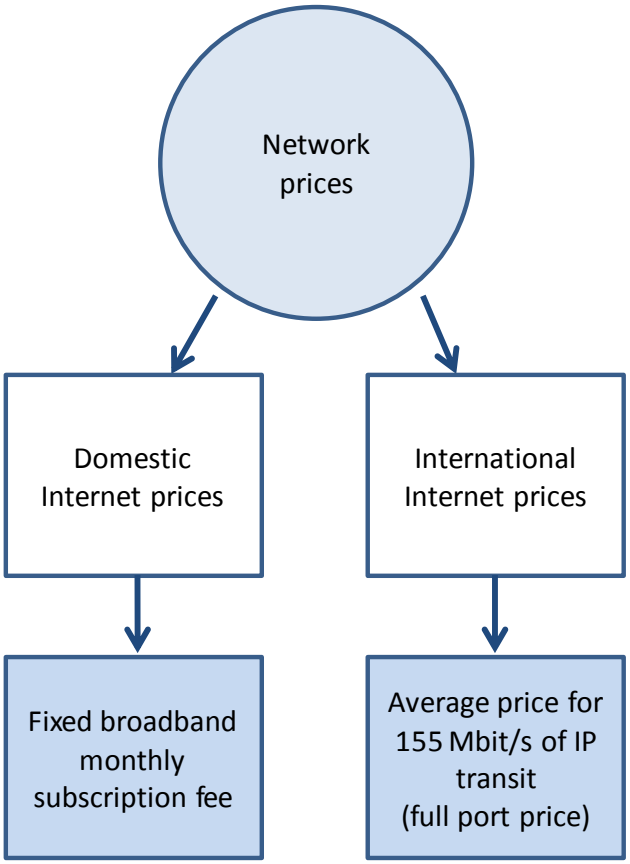



*Source:* OECD adapted from ITU

**Measures of Internet access prices**

From the economic perspective prices encapsulate the relative value of broadband for both demanders and suppliers. In this case the term Internet access price refers to the cost that a party needs to incur in order to use the Internet. Generally there are two fairly different markets for Internet services that could be distinguished with two corresponding prices: *(i)* the local market where end users acquire Internet services from service providers; and *(ii)* international markets where various providers pay for international Internet connectivity. The two prices used in this analysis correspond to these two markets (see Figure 30 and Table 7).

**Figure 30. Measuring network prices**




*Source:* OECD

**Table 7. Measures of network prices**

| Indicator | Description | Benefits | Drawbacks |
|---|---|---|---|
| ***Monthly subscription fee (broadband)*** | Fixed broadband Internet monthly subscription; USD (1) | - Large, consistent dataset<br>- Simple intuition behind the data; refers to the basic economic concept of *quantity traded on the market* | - Does not take into account connection charges<br>- Pools together individual users and business users<br>- Averages across all available offers on the market |
| ***Average price for 155 Mbit/s of IP transit*** | Average full-port (STM-1/OC-3 IPT) prices; USD (2) | - Illustrates the costs of international connectivity | - Averages across various connections |

Notes: (1) source: ITU, (2) source: Telegeography www.telegeography.com

### *Monthly subscription fee (broadband)*

The local price of the Internet refers to the cost of a monthly broadband connection. The data is collected by the ITU and is meant to be a representative offer within the country. This study uses the price of a monthly broadband subscription as a proxy for the local price of Internet access because the dataset has good coverage over time. The monthly subscription charge for fixed (wired) broadband Internet service refers to any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 kilobits per second. Where several offers are available, preference is given to the 256 kbit/s connection. The monthly price is expressed in USD and includes all additional taxes and charges.

### *International IP transit prices*

While broadband prices reflect the price that domestic consumers pay to access the Internet, IP transit prices can be considered a reflection of the cost of Internet connectivity to the rest of the world. IP transit is the price that one network would pay another to obtain access to the entire Internet with a defined amount of bandwidth. Some refer to IP transit prices as the wholesale price of Internet access. This analysis uses the full port price of a 155 Mbit/s link to the Internet from the nearest point of presence. In countries with Internet exchanges, the price is an average of the offers available on the market for 155 Mbit/s of IP transit. In countries without an Internet exchange point, the price reflects the additional cost of connectivity needed to reach the Internet exchange point where IP transit service is available.

In this specific context average full-port prices are used. Specifically, for each country all the prices across all covered international Internet connection routes were taken into consideration. Prices represent the monthly charge for an international IP transit port.[22] Prices are expressed in USD and exclude any local access charges.

## Quantitative analysis

### *Empirical analysis*

The remaining part of this section presents the Internet in a broader economic context and analyses economic dependencies between digital local content and Internet network development. Several channels of economic impact can be distinguished in this context.

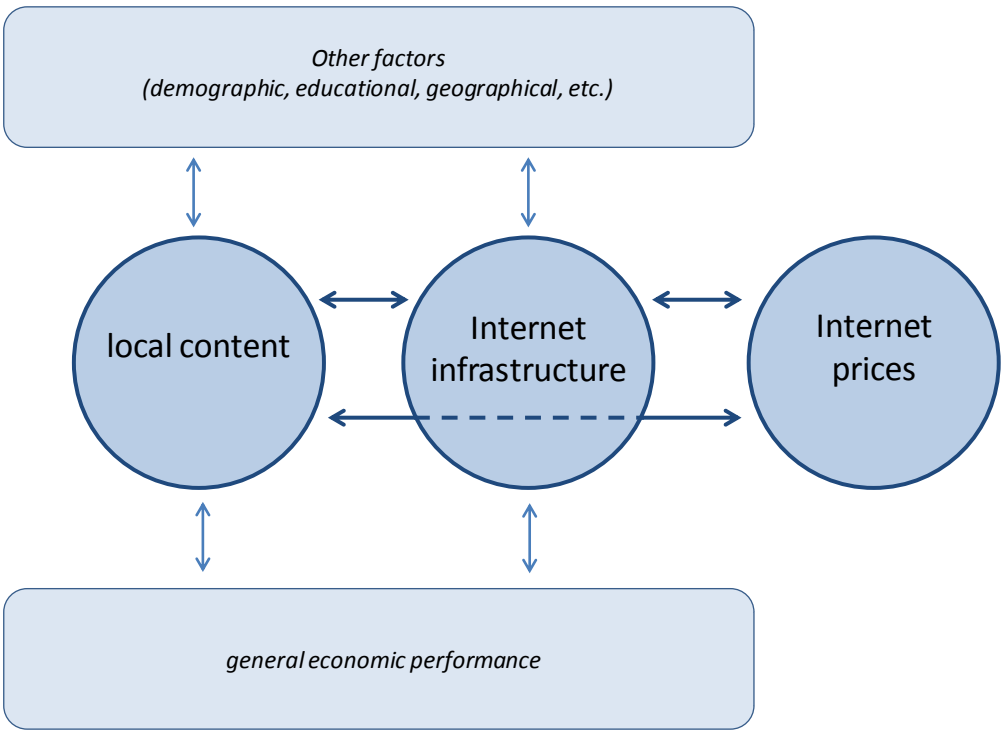
First, both digital content and the Internet both feed into the broader macro-economic ecosystem. The Internet and the wider economy are interlinked in multiple ways. Better network development improves the economic performance of firms and other market actors and hence seems to result in a higher rate of economic growth. In turn, a higher rate of growth affects the amount of investments in Internet development. This result calls for a more detailed analysis of the economic impact of the Internet.

A similarly complex, two-sided relationship can be expected in the context of network development and local content. Local content development can drive investments in Internet infrastructure, for instance through higher demand for networks as a way to access local content. Conversely, better infrastructure provides an additional incentive for local content creators to supply more local content. This suggests a two-way relationship between local content and the degree of Internet network development.

Concerning the network development, it is important to note that while being mutually dependent on local content, this phenomenon is also subject to market forces. In the context of this analysis it means that the level of network development and local content emerge endogenously in one market, implying that any econometric analysis of the issue needs to take into account endogeneity.

At the same time, Internet network development and local content are also affected by a set of demographic, gender-specific factors, institutional and geographical variables including the degree of income inequality, the percentage of young population in a society or levels of education. All these factors affect the demand for local content as well the demand for network services.

**Figure 31. Local content and network development**




*Source:* OECD

Figure 31 highlights the key relationships among the different variables in the analysis. The interdependencies between local content and Internet infrastructure are shown, as well as the interdependencies between Internet prices and infrastructure. Given these two interdependencies, one can conclude there is also **interdependency between local content and the Internet price** that is captured by the partially dashed arrow.

To reiterate, three main economic relationships can be distinguished as: *(i)* the macroeconomic impact of the Internet; *(ii)* the dependency between digital local content and network; and *(iii)* the dependency between network development and network prices.

Several studies provide empirical evidence about the **macroeconomic impact of the network**. These include Varian *et al.*, (2002), Lehr *et al.*, (2006), Crandall *et al.*, (2007), Duggal *et al.*, (2007), Bloom *et al.*, (2008), Franklin *et al.*, (2009), Koutroumpis (2009), Katz (2010), Czernich *et al.*, (2011), and Greenstein and McDevitt (2012).

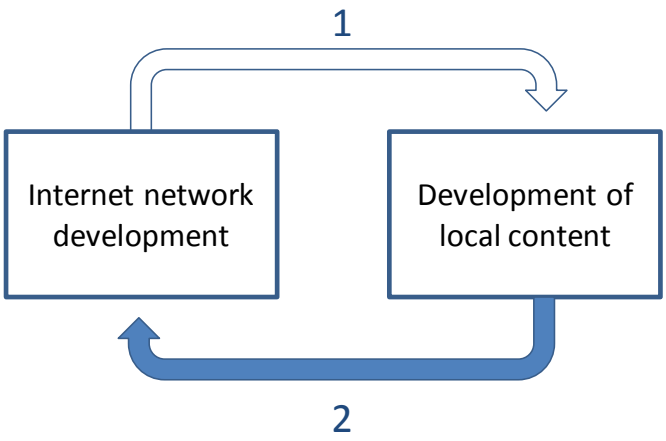
There is also a significant amount of literature looking at the relationship between ICTs and knowledge sharing, which largely corresponds to how technological and network development can affect the development of local content. Key related research includes Pelto (1973), Scarborough and Corbett (1992), Danowitz et al (1995), Grimshaw (1997), Girard (2003), Talyarkhan et al (2005), Jensen (2009), Grimshaw and Gudza (2010), Shiratuddin-Zaibon (2010), and Jansson and Tillgren (2010).

The contribution of this analysis to the existing literature focuses on the empirical examination of relationships between: *(i)* local content and network development; and *(ii)* network prices and the development of the network. It does so by introducing new proxies for Internet network development and local content that better reflect the intensity of network use and the growth of digital local content.

*Network development and local content*

With respect to the degree of **network development and local content** there are two possible theoretical mechanisms to describe the relationship (see Figure 10). First, the infrastructure improvement could enhance content development (shown as line 1 in Figure 32). Second, demand for content could be a driving force for network development (shown as line 2 in Figure 32). In addition these two forces could act simultaneously, which would result in a complex, mutually causal relationship.

**Figure 32. Potential relationships between Internet connectivity and local content development**




*Source:* OECD

The following empirical analysis will examine the relationship between network and local content development using a series of proxies for each indicator. It will also introduce several control variables that may also play a role in determining network development or local content production. These control variables include income, investment intensity, income equality (GINI), education (secondary schooling enrolment rate) and poverty levels (poverty rate).

The results of these empirical tests are provided in Table 8 below. The variables uses to proxy network development are used as the dependent variable (listed across the top of the table). The different proxies representing local content development are indicated on the left side of the matrix.

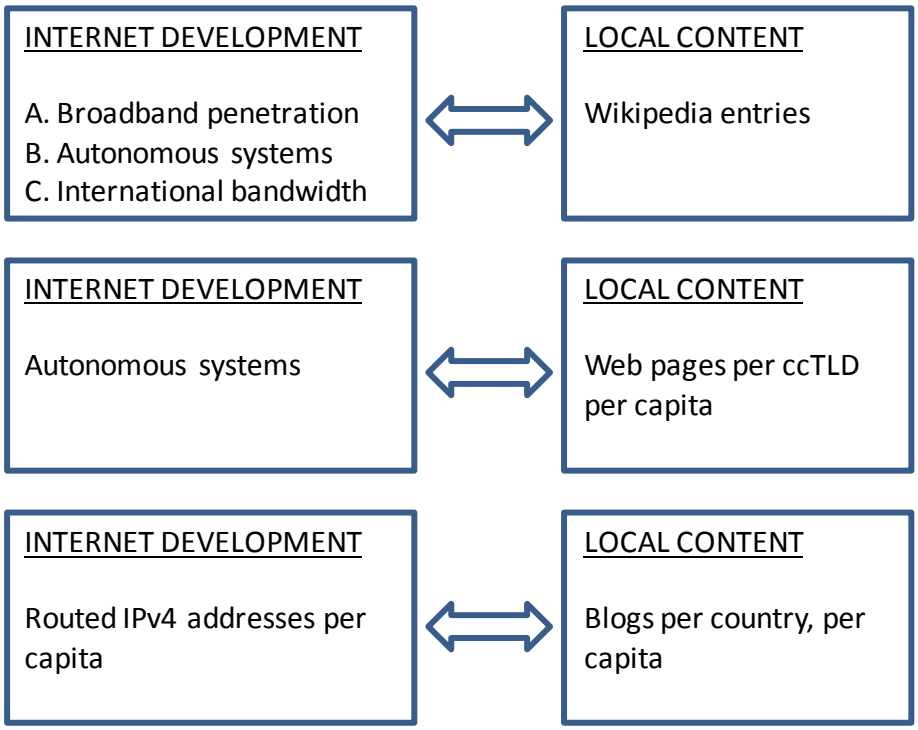
**Table 8. Local content and network development**

| | Dependant variable | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Penetration rates | | AS p.c. | | Int. bandwidth p.c. | | | IPv4 p.c. |
| **cc Top-level domains p.c.** | 20.4 | | **1.3**** | | -546 | | | |
| **Wikipedia articles p.c.** | | **190.4**** | | **.602**** | | **942**** | | |
| **Blogs p.c.** | | | | | | | **.46** | **1.3**** |
| GDP p.c. | .0005** | .0002** | $9.9 \cdot 10^{-7}$** | $10 \cdot 10^{-7}$** | .002** | .001** | $2.9 \cdot 10^{-7}$** | .00003** |
| investment intensity | .04* | .16** | .00001** | .00001** | -.2** | -.7** | | |
| *Number of observations* | *1224* | *306* | *1547* | *363* | *1181* | *322* | *44* | *140* |
| $R^2$ | *0.43* | *0.57* | *0.43* | *0.39* | *0.36* | *0.34* | *0.93* | *0.65* |
| *Notes* | | | | | | | (1) (2) (3) | (1) (2) |

Notes: Panel regression with country fixed effects (unless stated otherwise)
(1) Additional controls used in other (not presented) specifications include: percentage of young population, GINI coefficient, secondary schooling enrolment rate and poverty rate. Use of these variables did not affect the conclusions about the relationship between local content and network development.
(2) Pooled regression
(3) Results for countries with GDP per capita lower than USD 6 000.
(*) Denotes 10% significance level
(**) Denotes 5% significance level

The results of this exercise highlight that local content and the degree of Internet network development are directly related to each other (see Figure 33). This relationship has been detected using several measures for local content (ccTLDs per capita, Wikipedia articles per language per capita, blogs per capita) and several measures of Internet development (penetration rates, AS per capita, international bandwidth per capita, IPv4 per capita). The relationships in the models are still statistically significant after the introduction of economic and demographic variables.

**Figure 33. Significant relationships between local content and network development**




*Source:* OECD

Unfortunately, the data used for the proxies does not have a long enough time series to draw conclusions about the direction of the causality. In other words, we cannot make statements that one of the factors (*e.g.* local content) is driving the other *(e.g.* network development). We have, however, been able to show that Internet development and local content are indeed intertwined. What is more likely is that the two elements support each other. More local content helps encourage more Internet development, which in turn, helps promote more local content.

*Network development and local prices*

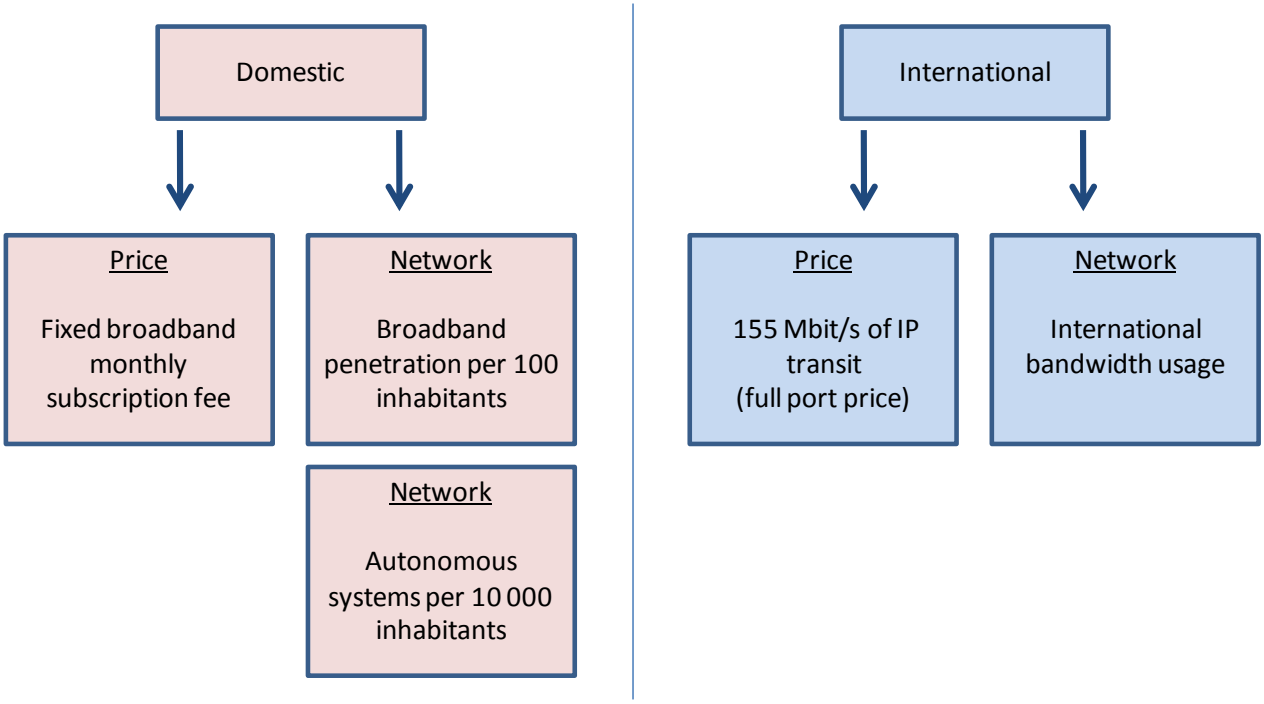
The second relationship that this research examines is between network development and local prices. Theory suggests that the inter-relatedness of network development and prices is very strong because prices for and the quality supplied of network access are determined simultaneously in the market for Internet services. Any empirical analysis must address this issue of endogeneity.

To do so, this study looks at two separate markets for the Internet services: *(i)* local markets where Internet services are supplied to the end users; and *(ii)* international markets, where Internet traffic is exchanged between different countries. Since prices and quality supplied are determined internally in a market, one way to address the endogeneity is to take an *international* price and look at its relationship with a *domestic* network development, and vice versa.

Figure 34 shows how the proxies for prices and network development can be separated into national and international components. On the domestic side, the measures of network development are the *number of AS per ten thousand inhabitants* and *broadband subscription rates*. These measures illustrate the degree of network development in a given country and are assumed to not take into consideration the international level of connectivity. Domestic pricing is given by the fixed broadband monthly fee.

**Figure 34. Breakdown of international and domestic proxies**

Proxies differentiated by their domestic vs. international nature




*Source:* OECD

International measures include *international bandwidth usage per capita* for network development. This refers purely to the cross-country traffic and is assumed to not take into account local network development. International pricing is represented by the *price of IP transit*.

If we assume that both markets are distinct, the price and development measures can be mixed for the analysis. It is very important to keep in mind though that even though domestic and international segments are different, there is some crossover as the prices for Internet bandwidth will feed into ISP costs domestically to some degree.

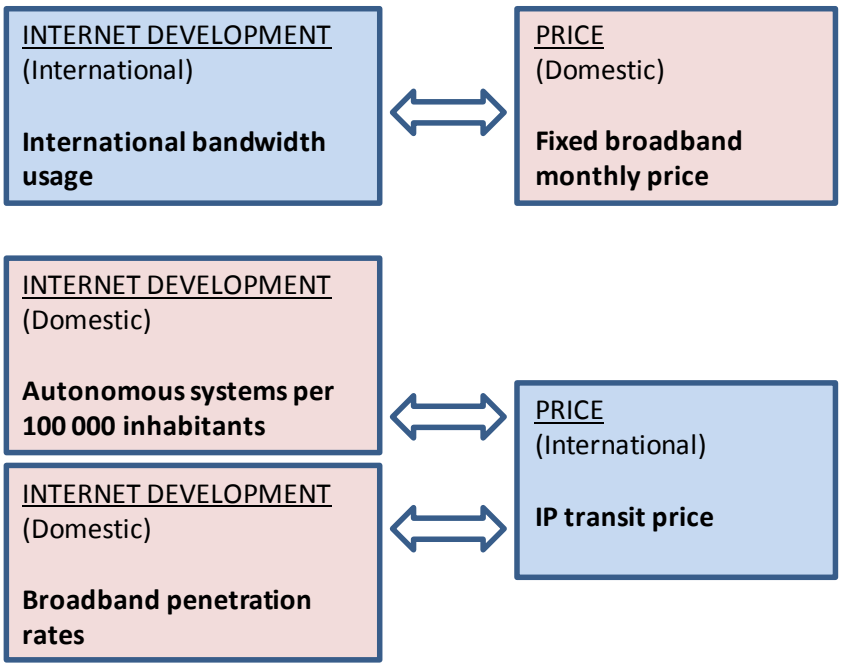
The results of these empirical tests are provided in Table 9 below. The variables uses to proxy prices (domestic and international) are used as the dependent variable and are listed across the top of the table. The different proxies representing network development (domestic and international) are indicated on the left side of the matrix. Additional economic and social variables are included to control for investment intensity in the country including the age of the population, income inequality, education levels and the poverty rate.

**Table 9. Network development and network prices**

| | Dependant variable | | | | |
|---|---|---|---|---|---|
| | Fixed broadband price (Domestic) | IP transit price (International) | | | |
| **International bandwidth p.c. (International)** | **-127.4*** | | | | |
| **Autonomous systems p.c. (Domestic)** | | **-1158*** | **-7381**** | | |
| **Broadband penetration rates (Domestic)** | | | | -1.16 | **-14.3**** |
| Investment intensity | .102** | -.0033** | .0047* | -2.7* | 8.1* |
| *Number of observations* | *35* | *160* | *29* | *134* | *26* |
| *$R^2$* | *0.35* | *0.36* | *0.32* | *0.38* | *0.36* |
| *Notes* | (1) | (1) | (1) (2) | (1) | (1)(2) |

Notes: Panel regression with fixed effects
(1) Additional controls used in other specifications included: percentage of young population, GINI coefficient, secondary schooling enrolment rate, poverty rate. Use of these variables did not affect the conclusions about the relationship between network development and network prices.
(2) Results for countries with GDP per capita lower than USD 6000.
(*) Denotes 10% significance level
(**) Denotes 5% significance level

**Figure 35. Relationships among network development and network price proxies**




*Source:* OECD

The results indicate that more international bandwidth leading into a country is associated with lower monthly subscription prices for fixed broadband (Figure 35). This is a particularly interesting result as it highlights that countries with low international bandwidth have the highest subscription charges that are likely the result of a lack of competition or a very nascent market structure.

Countries with developed local networks, as measured by autonomous systems and broadband penetration rates, are also characterised by lower international IP transit prices. This confirms a relationship that has long been assumed. The relationship between IP transit prices and domestic network development is evident in developing countries. The relationship does not hold for developed countries. This provides information to policy makers in developing countries that domestic network development and improved international connectivity could feed into each other in a positive way.

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## ANNEX 1: MOBILE LOCAL CONTENT AND INFRASTRUCTURE

From a global perspective, the most accessible ICTs are mobile phones. This makes them a key platform for the creation and dissemination of content. In 2009, the number of mobile cellular subscriptions in the world had reached 4.7 billion, an increase of 16% from the previous year. The overall number of world Internet users was 1.9 billion or 27.1 users per 100 inhabitants. Mobile phone subscribers outnumbered Internet users by a factor of 2.5 to 1 in 2009, underscoring the importance of mobile in any discussions of local content.

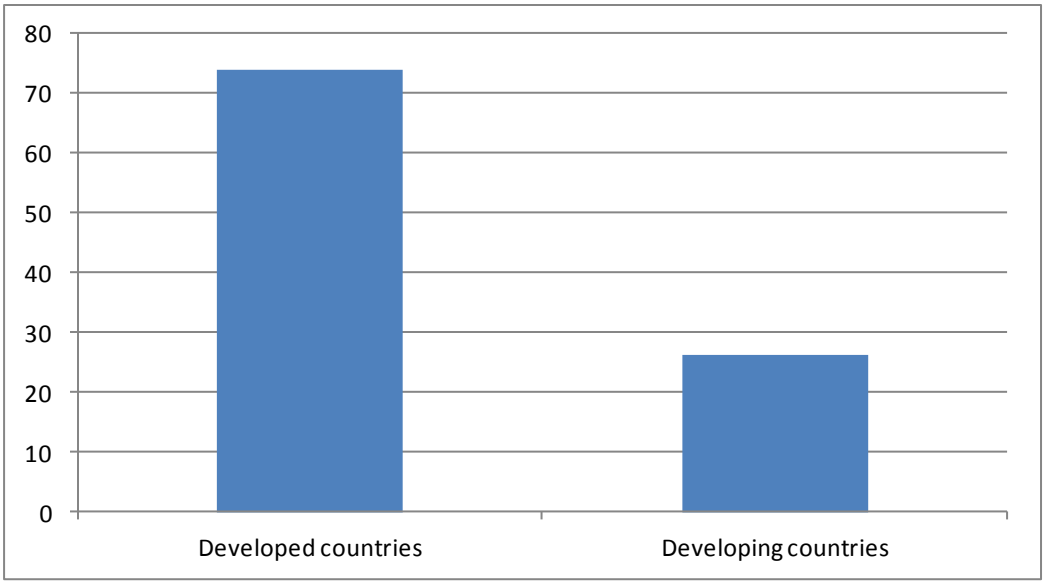
The mobile platform will remain vital for content creation (via camera phones, audio recording capabilities and applications) and distribution (via Internet access over the mobile network). Mobile "smart phones" are rapidly becoming important tools for content creation in developed and developing countries alike. The mobile platform, while important everywhere, is particularly important in countries that lack of a reliable, wired network infrastructure. In this respect, mobile connectivity has the great potential to bring people online and eventually improve quality of life, productivity, social coherence, and promote cultural preservation all over the world.

The objective of this section is to analyse how mobile infrastructure and mobile content have been used and developed in different countries. This section pays a particular attention to locality, such as local network infrastructure and local content creation, since the local involvement would have a direct and strong impact on economic, social and cultural development.

Overall, the number of Internet users has been growing on a global basis for a decade but the growth has been uneven, leading to a digital divide between developed and developing countries. The gap in access can be seen in Figure 36 where the penetration rate in developed countries is estimated to be almost three times the rate in developing countries in 2011. This gap is much more pronounced when it is restricted to fixed broadband access, although the gap is beginning to close. Developed countries had a penetration rate of 25.7% in developed countries but the rate was only 4.8% in developing countries in 2011.

**Figure 36. Internet access: A digital divide**

Internet users per 100 inhabitants, 2011

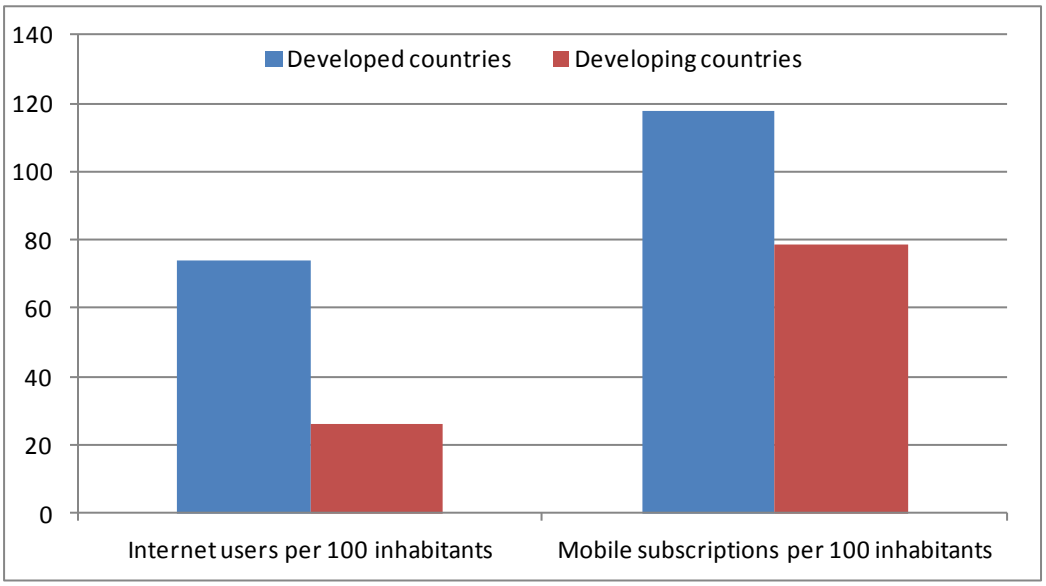



*Source:* OECD, ITU World Telecommunication Indicators Database, April 2012.

But mobile networks are becoming an equalising factor across the world in terms of access to communications. As Figure 37 shows, a gap remained in mobile but it is less pronounced than the gap we find between Internet use in developed and developing countries.

**Figure 37. Penetration: Mobile and Internet divides between developed and developing countries**

2011



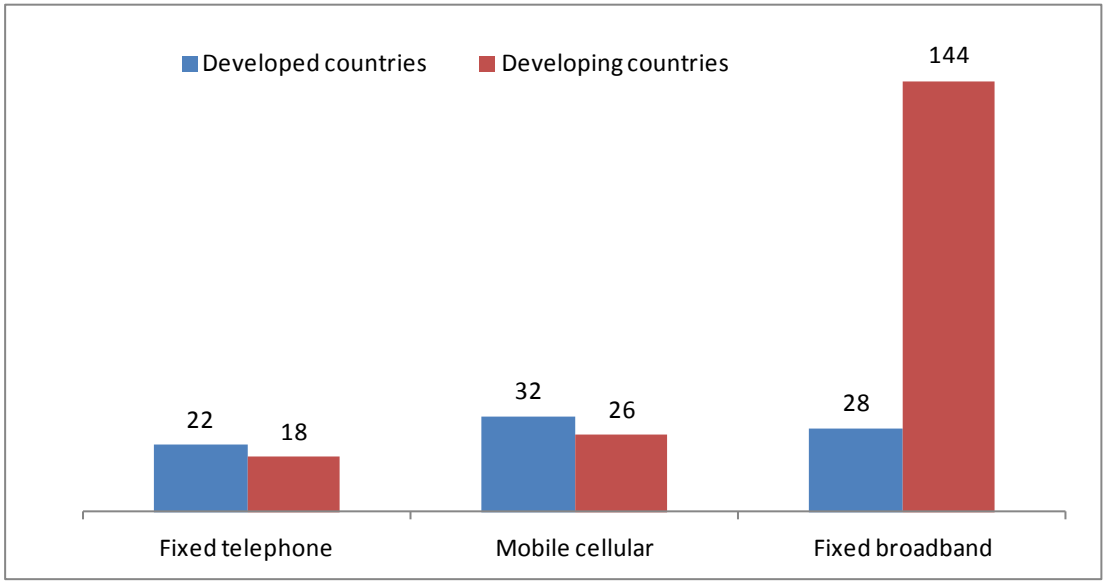

*Source:* OECD, ITU World Telecommunication Indicators Database, April 2012.

Even when wired networks are available, the prices of Internet access and the devices used to connect are beyond the reach of many in society. High prices for Internet service can be a barrier to takeup and also to the development of local content and the local ICT industry.

One way to examine this is to compare the price differences for services based on purchasing power parities (PPP). These PPP adjusted prices take into account the prices of other goods and services in the country. Interestingly, the prices of fixed telephone and mobile cellular services in developed and in developing countries are relatively similar in terms of PPPs. This means that the prices of fixed and mobile telephony are roughly comparable across most countries relative to the prices of other goods and services in each country. That changes though with Internet access. In 2010, the ITU reported that the average monthly price for broadband services was USD 28 per month in developed countries but much higher at USD 144 per month in developing countries (see Figure 38). Penetration rates also tend to be negatively correlated with local access prices. The good news is that while prices are still high in developing countries relative to the rest of the world, they are falling over time.

**Figure 38. Price differentials for communication services**

Average prices for a monthly subscription, by technology, in USD PPP, 2010




*Source:* ITU Measuring the Information Society, 2011

There are a number of challenges to improving mobile adoption in developing countries and these barriers will also affect the development of local content. Some countries have a workforce comprised largely of workers with irregular cash flows that do not lend themselves well to traditional monthly subscription models. Another significant challenge in many countries is insufficient access to a stable electricity supply. Users often charge their phone battery away from where they live, often at the homes of acquaintances or at charging stations where they have to pay a fee for the service. Many users turn the mobile off as a way to reduce battery usage when they are not making calls.

If governments want to encourage the use of mobile phones for local content creation and distribution then any efforts to reduce barriers to adoption could be seen as positive developments for local content as well. There are many initiatives around the world to promote the adoption of mobile, many of them led by mobile operators and equipment manufacturers. For example, Motorola launched a project of building solar energy kiosks in Uganda that offered free solar-powered mobile phone recharge services. Other

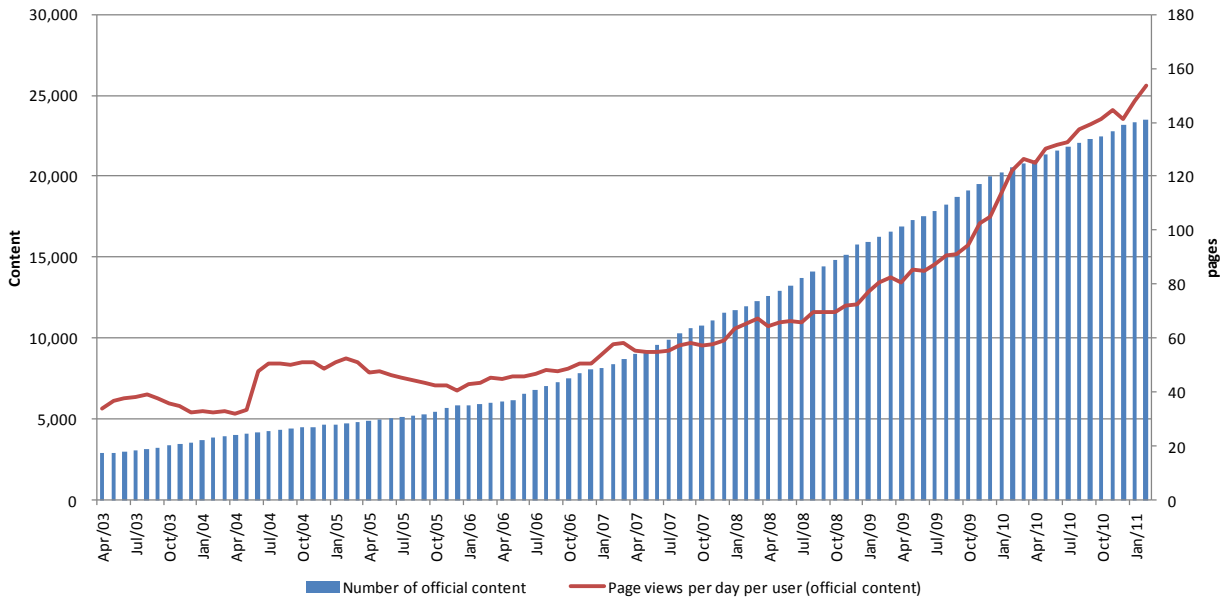
device manufacturers have introduced solar powered mobile handsets and solar charging equipment to the market. The challenges in the market have also led to innovative uses of mobiles such as village phones and shared handsets.

**Mobile content markets**

Ten years ago, Japan was one of the leading countries in mobile Internet development. Mobile operator NTT Docomo introduced its "i-mode" service in 1999 and it was seen as a revolutionary new model for localised content delivery at the time. The service was somewhat limited as it provided access only to content which the operator had approved. Creators would submit their content for approval and then the mobile operator received a percentage of the revenues for its role as an intermediary in the transaction.

One of the drawbacks of the approach was that the operator NTT Docomo became the entity that decided which content was available on the network. This is referred to as a “walled garden” business model since users are limited to the content and services within the walls of the network provider. Nonetheless, i-mode and other rival services that followed in Japan led to a broad take-up of mobile services and content. This large user base then attracted more localised content. The walled garden approach came under pressure around 2007 when full-Internet browsing became common on mobile phones and operators faced increasing pressure to offer more open access to content. However, i-mode services have continued to grow over time with both the amount of content available and the number of pages viewed per user (see Figure 39).

**Figure 39. Number of official content sites (NTT i-mode service) and daily page views per user**




*Source:* NTT docomo

One of the recent trends with mobile content is that companies offer services where the price of connectivity is included in the device. This means that customers do not have a direct relationship with a network provider such as via a monthly subscription or pre-paid card. Examples can be found in services such as e-book readers (*e.g.* Amazon Kindle) and GPS devices (*e.g.* Tomtom Live Services). These developments are important because it is the content provider itself that subsidises the network access cost as part of their content services.

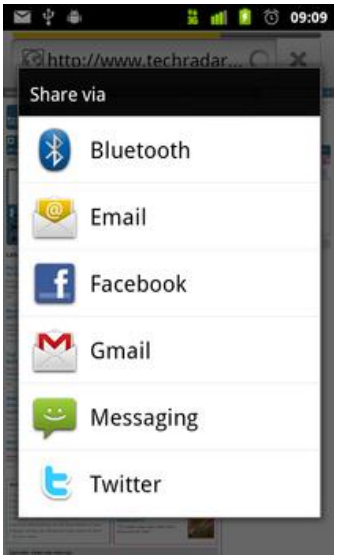
In the past several years, data services on mobile networks have become much closer to their wired counterparts – allowing relatively unfettered access to Internet-based content. There are some services that are commonly limited on mobile data networks but by and large, the networks can be used in similar ways. Mobile Internet subscribers often pay a monthly fee for a certain amount of data that they are allowed to transfer in a given month. Prepaid data plans are common in some countries.

Handsets themselves have evolved over the previous 10 years and are now much better equipped to create content – often running sophisticated operating systems that were available only on computers before – and featuring content tools such as quality cameras. These "smartphones" have become common in developed countries and are increasingly now used in developing countries. The use of smartphones has helped promote the use of mobile broadband for content delivery.

Mobile handsets themselves have evolved to become much easier to use to create and distribute content. Popular mobile operating systems allow users to take content on their mobile phone and share it easily with others using social media, e-mail or SMS (see Figure 40).

**Figure 40. Sharing content over the Internet using a mobile**

Screenshot of the Android operating system offering different methods for sharing content




*Source:* http://freesoftwa.blogspot.com/2010/12/review-google-nexus-s.html

One key transformation of the mobile market was the introduction of digital content through online stores directly to mobile devices. The largest digital media store is Apple's iTunes store which was developed to support its consumer electronics such as the iPod and iPhone. These online outlets sell digital content in the form of audio, video, electronic books and mobile applications (often called "apps"). The growth of these stores has been phenomenal. iTunes opened in July 2008 with just 500 applications available for purchase but just three years later there were nearly 450 000 applications.[23] By January 2011, Apple's iTunes store had delivered 10 billion application downloads.[24]

The phenomenal growth of these content delivery platforms has also helped create a global market for locally produced content and applications by reducing the barriers to entry for application development. In July 2011, there were just over 100 000 active application developers on the iOS platform – working out to an average of roughly 4 applications per developer.[25] The high number of developers shows that small companies or individuals are able to develop and sell their mobile apps to all over the world. This expands business opportunities to many SMEs and individuals who may never have those business chances in the mobile application value chain.

In spite of rapid development of online application markets, challenges still remain in many parts of the world to open these stores to all users. One of the key challenges is that many online application markets require an account with a verified payment method to download any applications or content. This can be a significant barrier in some countries where access to credit is difficult. Apple’s iTunes store has started allowing users to create an account without a credit card so as to get free applications.

**Examples of mobile content development**

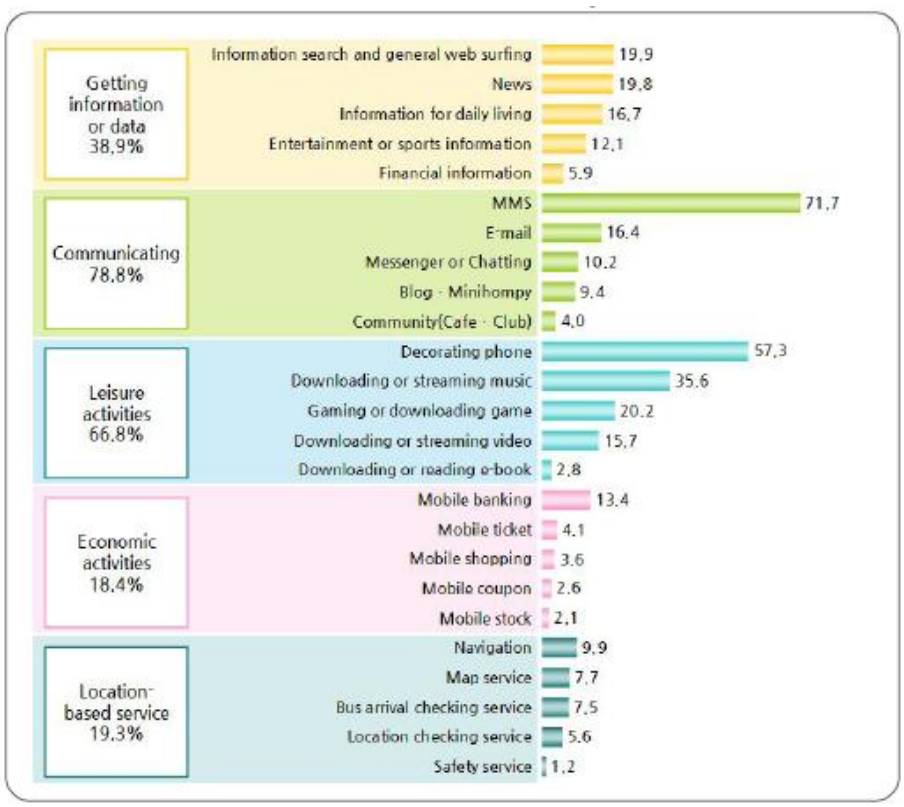
This section will examine specific examples from different countries around the world relating to mobile Internet usage.

***Republic of Korea***

Republic of Korea is one of the most advanced mobile countries in the OECD area. In 2009, the number of cellular mobile subscriptions reached 48 million, which corresponds to a penetration rate of 98.4 subscriptions per 100 inhabitants. The number of subscriptions with access to broadband data services is relatively high, at 40 million, or a penetration rate of 83.6 per 100 inhabitants.

A survey of how Koreans use the mobile phones found that 78.8% of mobile phone Internet users use it for communication purposes (*e.g.* MMS, e-mail), 38.9% use it for getting information (*e.g.* news, web search) and 18.4% use it for economic activities (*e.g.* mobile banking).

**Figure 41. Purpose of using mobile phone internet (%) – mobile phone internet users**




*Source:* Survey on the wireless Internet usage (2010)

### *Japan*

Japan has been one of the world's leading mobile countries for more than a decade. The number of cellular mobile subscriptions was 116 million in 2009, corresponding to a penetration rate of 91.3%. The Japanese advanced mobile market is reflected in the high take-up of mobile broadband services with 109 million subscriptions or 85.8% of the all mobile users.

The most popular mobile content usage in Japan is social networking sites (21.6%), followed by blogs (17.8%), downloading music (8.4%) and microblogging (*e.g.* Twitter) (7.7%) in terms of time that users spend online per week.[26] The mobile content market in 2009 was estimated around USD 6.1 billion, with an increase of 14% from the previous year.

Japan's experience of the Great East Japan Earthquake in March 2011 demonstrated an important role of ICTs during the severe disaster. Japan had a disaster prevention system that could warn people of approaching earthquakes and tsunamis via mobile and broadcasting networks. This system greatly helped to contain the destruction of an already devastating situation.

One of the key lessons learned from the experience is the significant role of mobiles and local content for sharing information in the disaster. In particular, online social media served as a way to share information and communicate with others in real time (*e.g.* for contacting missing friends and relatives, finding access to emergency food and water supplies). The importance of relevant data and mobile connectivity was highlighted by data from the web browser company Opera.

The Opera Mini browser is a web browser specifically for mobile phones that scales down content to speed its delivery over mobile networks. Data collected by the company through the browser showed the impressive growth of Twitter in March in terms of its user base (with an increase of 62.4% from the previous month) as well as growth in page views (with an increase of 83.7%). News sites also had the impressive increase of access in a few days after the earthquake when traditional communication channels were not working. Figure 42 below shows the shift in mobile content using the Opera Mini browser in the days surrounding the earthquake.

**Figure 42. Opera Mini mobile browsing through the Great East Japan Earthquake**

| | 10 MARCH: The day before the earthquake and tsunami is a **normal browsing day.** | 11 MARCH: **The earthquake strikes**, followed by a devastating tsunami. Twitter jumps up on the mobile browsing list, along with meteorological sites. | 12 MARCH: Browsing to **news sites increases** by a significant degree. | 13 MARCH: **The power crisis emerge.** TEPCO starts rolling black-outs and nuclear crisis escalates. | 14 MARCH: Browsing to **shopping sites is down**, compared to other sites in the top ten list. | 15 MARCH: Browsing for **news remains high** |
|---|---|---|---|---|---|---|
| 1 | google.com | google.com | google.com | google.com | google.com | google.com |
| 2 | yahoo.co.jp | yahoo.co.jp | yahoo.co.jp | yahoo.co.jp | yahoo.co.jp | yahoo.co.jp |
| 3 | mixi.jp | mixi.jp | mixi.jp | mixi.jp | mixi.jp | mixi.jp |
| 4 | livedoor.jp | livedoor.jp | livedoor.jp | **tepco.co.jp** ↑384% Owner/operator of the Fukushima plants | livedoor.jp | livedoor.jp |
| 5 | amazon.co.jp | **twitter.com** ↑59%* Social microblogging website | wikipedia.org | livedoor.jp | ameblo.jp | twitter.com |
| 6 | ameblo.jp | ameblo.jp | twitter.com | wikipedia.org | twitter.com | wikipedia.org |
| 7 | wikipedia.org | amazon.co.jp | ameblo.jp | twitter.com | wikipedia.org | ameblo.jp |
| 8 | twitter.com | **tenki.jp** ↑1927% Japanese weather site | amazon.co.jp | ameblo.jp | tepco.co.jp | amazon.co.jp |
| 9 | youtube.com | **jma.go.jp** ↑1685% Japanese government weather site | **asahi.com** ↑39% Japanese newspaper | amazon.co.jp | asahi.com | asahi.com |
| 10 | my.opera.com | wikipedia.org | youtube.com | **nikkei.com** ↑46% Japanese economic newspaper | amazon.co.jp | **nhk.or.jp** ↑1% Japanese national broadcaster |

* *Growth from previous day*

*Source:* State of the Mobile Web, March 2011 (http://media.opera.com/media/smw/2011/pdf/smw032011.pdf)

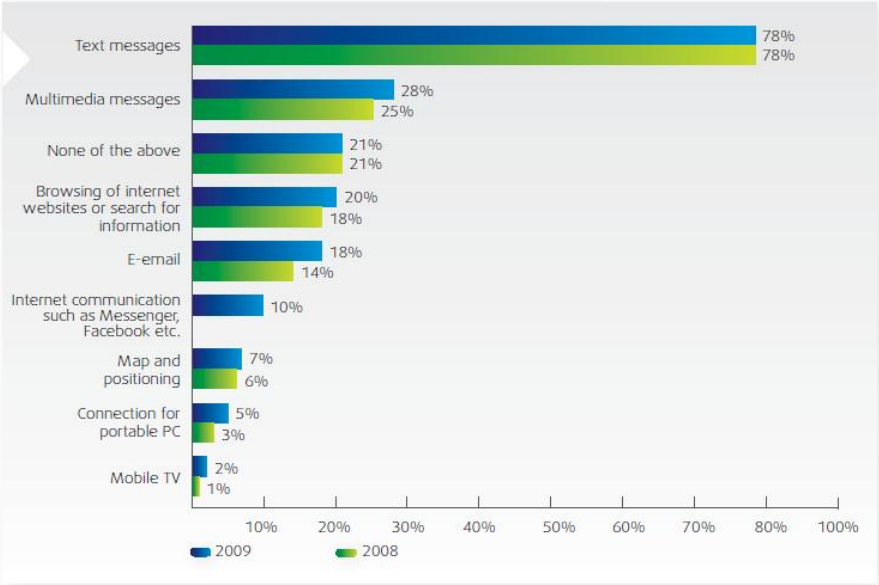
### *Finland*

The number of cellular mobile subscriptions in Finland in 2009 reached 7.7 million, with a penetration rate of 144.2%. There were nearly 1 million mobile broadband subscriptions the same year and the number had nearly doubled from the year before.

The Finnish Communication Regulatory Authority (FICORA) provides information on how people use mobile services in Finland. In 2010, FICORA found that mobile accounted for more than half of all broadband subscriptions in the country. The number of mobile broadband subscriptions reached 1.6 million, which was nearly a doubling from the year before.

According to FICORA's Communications Markets in Finland 2009, the frequently used mobile data services were SMS (78%), followed by MMS (28%), Internet websites (20%), e-mail (18%), and SNS (10%).

**Figure 43. Use of mobile services in Finland (2008-2009)**




*Source:* Communications Markets in Finland 2009 (FICORA)

The Helsinki University of Technology published research statistics for the most accessed websites based on the traffic measurements in Finnish operators' networks in May 2009 (see Table 10)[27] The most accessed mobile websites were news and communications, and they correspond to the popular (regular) Internet websites. In the list, many of the popular websites have Finnish domain names (.fi) and they are usually provided in Finnish.

**Table 10. Most accessed sites with mobile in Finland (2009)**

| Mobile browsing | Mobile browsing on mobile-optimized sites | Regular websites |
|---|---|---|
| Ilta-sanomat (www.iltasanomat.fi) | nokia.mobi | Ilta-Sanomat (www.iltasanomat.fi) |
| Kauppalehti (www.kauppalehti.fi) | m.facebook.com | MTV3 (www.mtv3.fi) |
| MTV3 (www.mtv3.fi) | m.hs.fi | Suomi24.fi (www.suomi24.fi) |
| Suomi24 (www.suomi24.fi) | yle.mobi | YLE (yle.fi) |
| IRC-galleria (irc-galleria.net) | m.youtube.com | Helsingin Sanomat (www.hs.fi) |
| Facebook (www.facebook.com) | foreca.mobi | MSN/Windows Live Messenger (explore.live.com) |
| Helsingin Sanomat (www.hs.fi) | wap.jamba | MSN.fi (fi.msn.com) |
| Flickr (www.flickr.com) | m.volvooceanrace.com | Windows Live Hotmail (www.hotmail.com) |
| Ilmatieteenlaitos (ilmatieteenlaitos.fi) | wap.sp.fi | IRC-Galleria (irc-galleria.net) |
| Wikimedia (www.wikimedia.org) | ovi.mobi | NettiX (www.nettix.fi) |
| Blogger (www.blogger.com) | wap.aftonbladet.se | Eniro.fi (www.eniro.fi) |
| | m.espn.go.com | Telkku.com (www.telkku.com) |
| | m.ebay.com | Plaza (plaza.fi) |
| | m.note.nokia.com | Kauppalehti.fi (www.kauppalehti.fi) |
| | wap.eniro.fi | Huuto.net (www.huuto.net) |
| | wap.veikkaus.fi | Taloussanomat (www.taloussanomat.fi) |
| | 020202.mobi | Etuovi.com (www.etuovi.com) |
| | wap.weatherproof.fi | Oikotie.fi (www.oikotie.fi) |
| | | Kaksplus (kaksplus.fi) |
| | | Ilta-Sanomat (www.iltasanomat.fi) |

*Source:* 'Mobile content services market in Finland 2009-2014'(IDEAN).

### *Egypt*

The number of cellular mobile subscriptions in Egypt at the end of 2010 was 71 million, which was equivalent to a penetration rate of 90.4%.[28] The annual growth rate of mobile subscription from the previous year was 28%. Mobile Internet subscriptions reached 7.8 million and indicated nearly a doubling from the year before.

According to the Ministry of Communications and Information Technology, 21% of mobile subscribers used their mobile for SMS, 1.9% for entertainment activities, 1.4% for MMS, but only 0.5% used it for Internet access in 2010.[29] The ministry did another survey on mobile data services during the same year. Survey results revealed that 73% of mobile data service subscribers were actually using the mobile data services, and most of them were young males (*i.e.* 18-34 years old) with monthly expenditures of around USD 80-250. The most popular activity for mobile data services was to get information and news (57.2% of the users), followed by e-mails (22.8%). A majority of users accessed the services at home (42%) or in transit (35%). Another 55.3% indicated that they spend more than 120 minutes per week on mobile data services.[30]

The Egyptian government has taken steps to improve the amount of Arabic content. The country's ICT strategy in 2010 looked to promote capacity building and to promote local digital content production. The National Telecommunication Institute (NTI) provides training to new university graduates and professional engineers. In 2010, the number of trainees who received the training courses was around 1 800, and of these, 10% trained in the area of web application development.[31] One of the important initiatives as part of the project is digitizing material from the National Library and Archives of Egypt, books from Egyptian publishers, material from the National Theatre and media from news agencies.

Kenana Online (www.kenanaonline.com) is a community-based portal whose aim is to empower Egyptian citizens in rural and urban areas to improve their standards of living through ICTs. Initially, the portal provided local relevant knowledge and information to help individuals in the community improve

their lives. Content on the portal is assembled from local communities and includes information from NGOs, research institutions and local companies. The portal was so successful that its scope was extended to include a series of community portals for SMEs (www.ayadina.net); livestock production and agriculture (www.aradina.net); and a specific youth portal (www.yomgedid.com). All these portals are provided in Arabic.

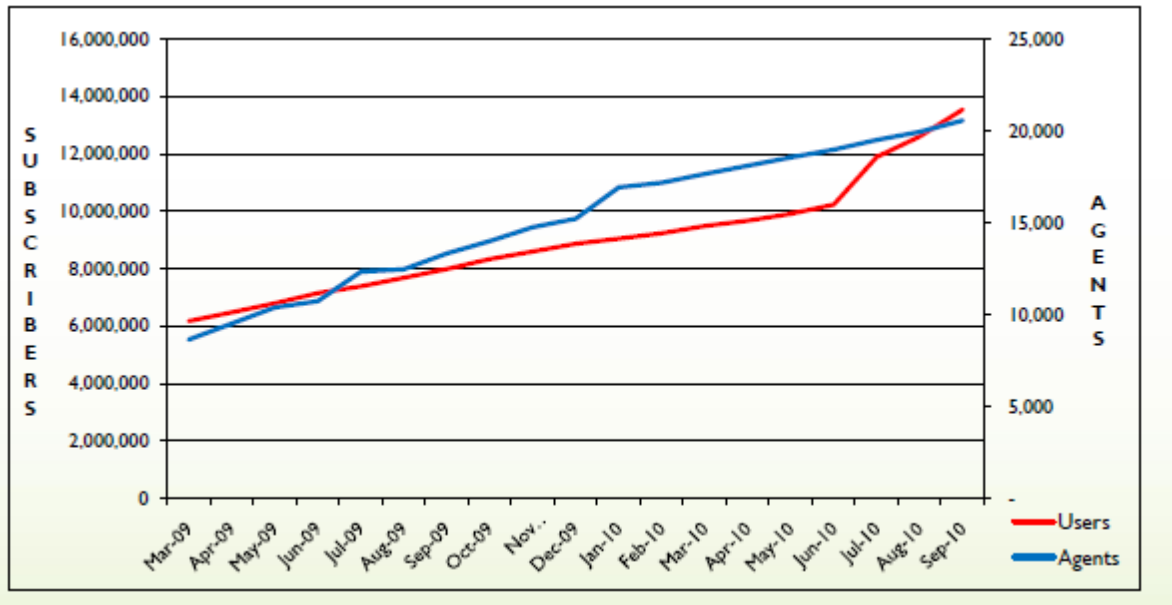
***Kenya***

The number of cellular mobile subscriptions of Kenya in December 2010 was 25 million, a 12% increase from September 2010. The mobile penetration rate is 63.2%. The fast growth of mobile subscriptions can be explained among other factors by the recent, significant tariff declines (e.g. 31.9% reduction on prepaid tariffs and 36.6% on postpaid tariffs over the quarter). In Kenya, prepaid services have dominated the mobile market, as in most other African countries.

Mobile is the key access point in the country for Internet content. The most frequent daily online activity via mobile phone was social network services (51%), followed by e-mail (39%), getting information about news, sport and weather (27%).[32]

M-PESA is the most well-known example of mobile applications developed in Kenya. It originally started as a money transfer service which allows mobile users to send money across the country with mobile phones. Now, the services have expanded to enable users to withdraw money, buy airtime, or pay for groceries, utility bills, or school fees. Safaricom and Equity Bank launched M-KESHO (kesho is the Swahili word for tomorrow), which provides microsavings, microinsurance and microcredit services through mobile phones. As of September 2010, there were 13.5 million M-PESA users and they represented 81% of Safaricom customers.

**Figure 44. M-PESA subscribers/agents - Safaricom**




*Source:* Safaricom (www.safaricom.co.ke/fileadmin/Investor_Relations/Documents/HY-2011_RESULTS_ANNOUNCEMENT.pdf)

As Kenyan local examples such as M-PESA and government e-services show, the country's digital content industry has vast potential to be a major contributor to economic growth through employment

creation, capital investment and export earnings as well as becoming a vehicle for cultural preservation. In 2010, the government launched a USD 4 million grant to promote the development of local digital content and software applications. The grant goes to those who develop private sector content (USD 1.5 million) and those who work to develop a government portal (USD 2.5 million). There were a total of 501 applications vying for 15 projects that would be funded. The list of awarded projects is provided in Table 11 below.

**Table 11. Awarded project of local digital content project in Kenya**

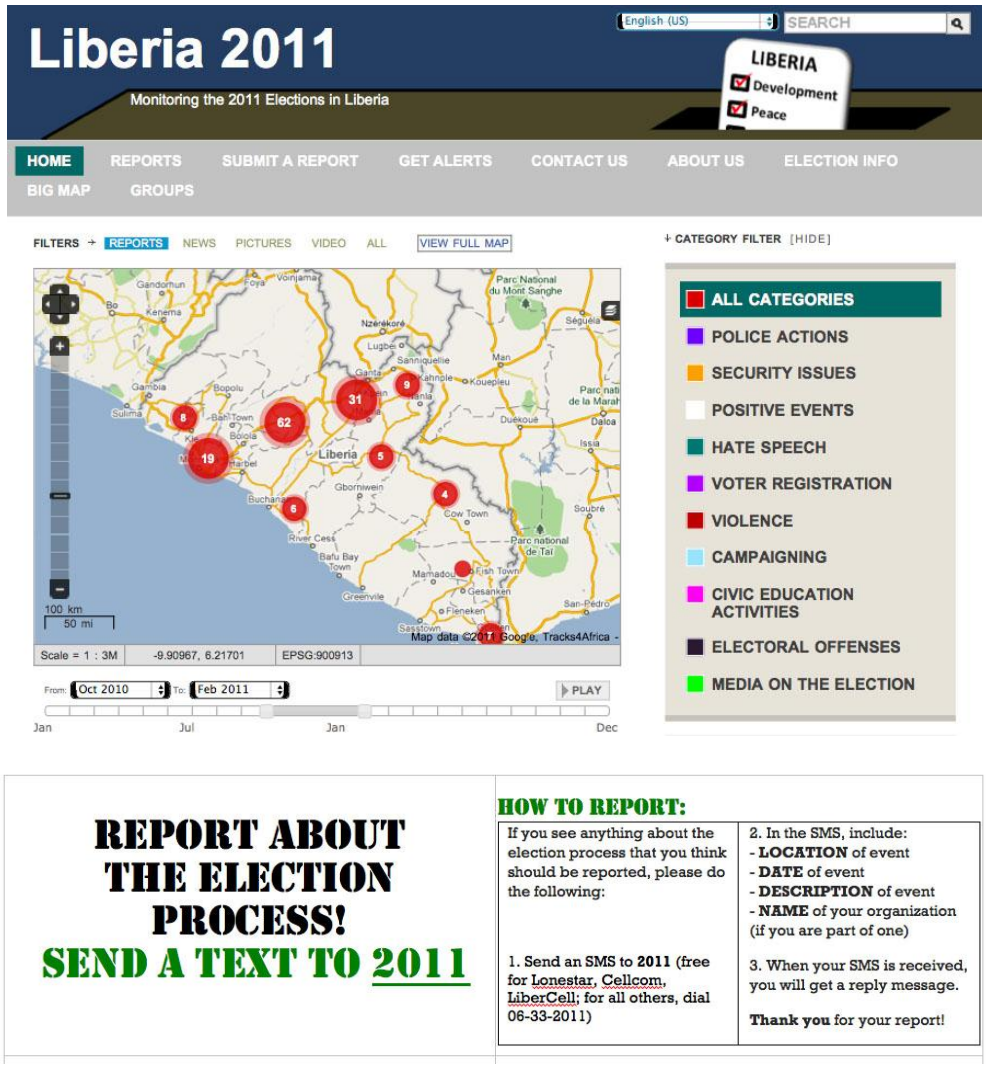
| Category | Project title | Project overview |
|---|---|---|
| Private Sector (enterprise)<br><br>(7 winners of 256 enterprise applicants and 1 winner of 133 individual applicants) | Farmer mobile banking and mobile e-services transaction platform | To provide a mobile and web based solution for credit unions and farmers to access financial services. |
| | Development and implementation of mobile learning in Kenya | To offer low cost, short courses to the ordinary citizen. |
| | Mobile phone applications to promote events, business and social networking in Kenya | To expand already popular weekly events-listing magazine to the mobile phone by combining location based technology, social media and interactive features to provide relevant information. |
| | Jumuika mobile advertising and marketing | A subscription and permission based mobile application to run targeted digital campaigns. The demographic and psychographic data it collects will allow brand managers to better understand the Kenyan market. |
| | Project Afya: AskaDoc.co.ke | To offer medical advice to millions of Kenyans by developing a web and mobile based platform. |
| | Makutano junction and development of digital content for TV series | To develop a series of the popular TV shows in East Africa region into digital content on mobiles and the web. |
| | JAMOBI - Empowering the Jua Kali sector through mobile software | To develop mobile based tools to help small scale traders manage supply chains, record sales and develop budgets that will help them better understand their cash flow and grow their businesses. |
| | Mobile phone utilities for the blind and visually impaired | To redevelop and take to market a mobile phone application for the blind and visually impaired which allows them to use voice prompts to access mobile phone features. The application will first be developed in Swahili. |
| Government Portal<br><br>(7 winners of 112 applicants) | HIV and AIDS in the workplace e-Learning course | To assist implementation of HIV and AIDS training among civil servants |
| | Lost and found project | To assist Kenyans in finding their lost official documents such as national ID cards |
| | EDUWEB: Education institution listing and interactive mapping portal | To create a comprehensive list and interactive map of all education institutions in Kenya |
| | Kenya online museum | Multimedia documentation of Kenya's rich history |
| | eMazingera software application | Crowd sourcing application for documenting and collecting information on environmental degradation and abuse using the Ushahidi platform |
| | Teacher's portal | Linking Kenyan teachers with their employers |
| | IVR tax filling solution | A multilingual platform for Kenyans to file tax returns based on Interactive Voice Response (IVR) technology |

*Source: www.gmeltdown.com/2010/09/local-content-grants-government.html, www.ict.go.ke/index.php/entertainment/248-winners*

Ushahidi (the Swahili word for "testimony") is a web platform that was initially developed by Kenyan journalists after the presidential election in 2008 to share live information on incidents of violence and peace efforts throughout the country on a website. Ushahidi allows people to report violence via SMS, e-mail or Twitter and have it shown on Google maps. The concept is called "crowd-sourcing" and it outsources tasks that were traditionally performed by employees or contractors to an undefined large group of people or community.

This application, originating in Kenya is free and open source software, allowing it to be further developed. The platform was used soon after the Haiti earthquake in 2010, to gather information from news reports and SMS texts sent by individuals about the most acute needs on rescue, food, water, security among others, and placed them on a map so they would be available to rescue and relief teams. The Ushahidi platform was also used after the Chile earthquake (Feb 2010), the US Gulf oil spill (Apr 2010), the Australia black Saturday bushfire (Feb 2009), the New Zealand earthquake (Feb 2011), and the Japanese earthquake (March 2011). For election monitoring, Ushahidi is used to monitor election irregularities including fraud, vote tampering, illegal campaigning, and removal of observers in countries such as India, Lebanon, Mexico, Sudan, the Philippines, Ethiopia, Brazil, United Republic of Tanzania, and Nigeria among others. An example of the web interface is given in Figure 45 below.

**Figure 45. Liberia 2011 - tracking the country's presidential election (above) and the card handed to local field reporters to explain what and how they report (below)**



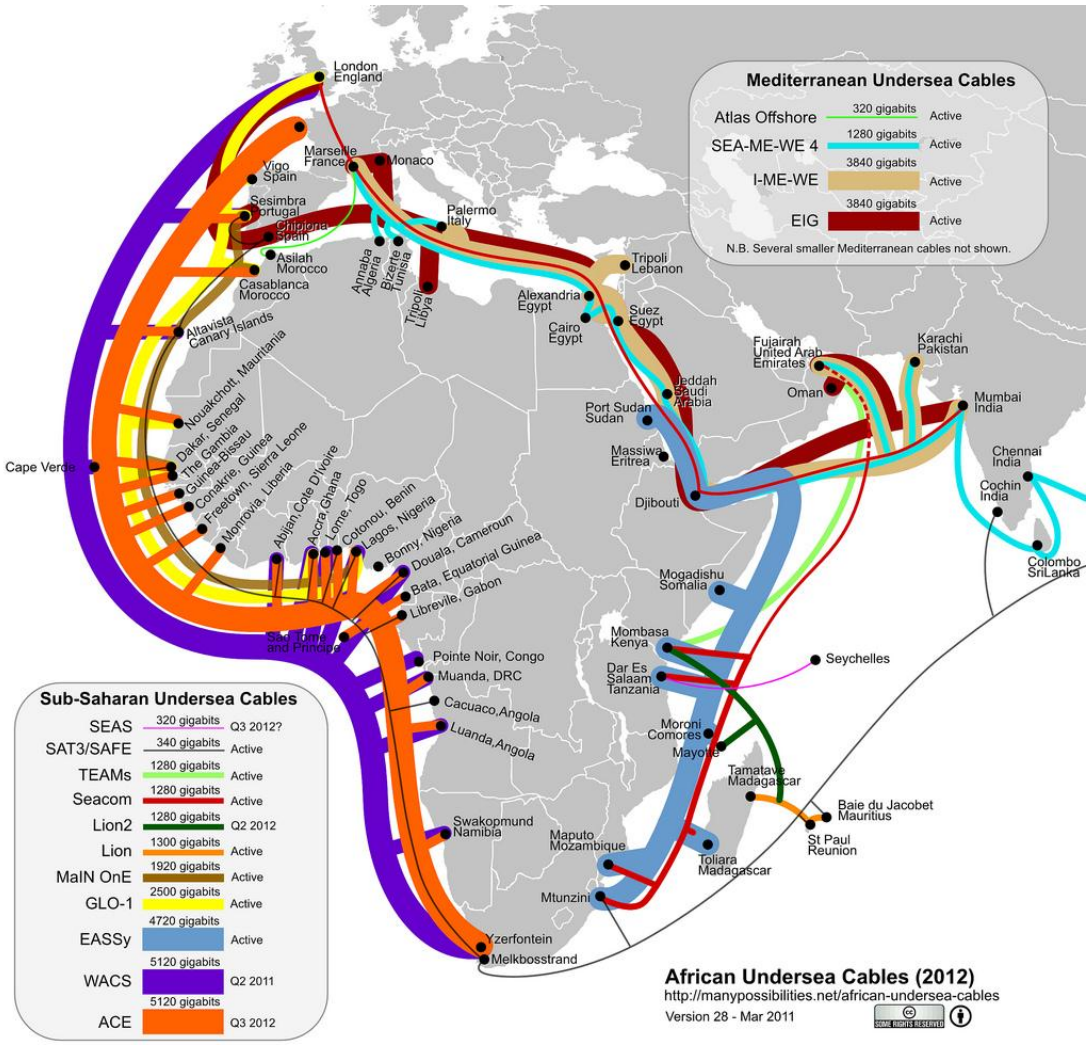

*Source:* http://blog.ushahidi.com/index.php/2011/02/14/gearing-up-for-liberias-presidential-election/

### *Uganda*

In the context of policy development, the Ugandan government has set up a rural communications development fund that is funded by 1% of the gross annual revenues of each telecommunication operator in order to facilitate and promote access to basic communication services for all. The funding helps support building wireless base stations, Internet points-of-presence, or Internet cafes.

Like many east African countries, Uganda had long suffered from the lack of effective backbone infrastructure, and relied on expensive satellite connections until 2009 when international submarine fibre cables landed on the African east coast. Seacom, TEAMS, EASSy are the three major East African undersea fibre optic cable system projects that reached Uganda. Uganda is now connected via a national fibre backbone extending to its boarders, and the arrival of the undersea cable systems expanded the capacity of international bandwidth and led to the data market growth in Uganda (see Figure 46).

**Figure 46. African undersea cables**




*Source:* http://manypossibilities.net/african-undersea-cables/

In Uganda, as in many other African countries, almost all mobile subscribers use the prepaid services. Network traffic was dominated by voice due to successful promotions which allow unlimited on-net calling for a certain period for a flat fee. Most subscriptions were GSM-based, and it was 2008 when the first commercial 3G services launched. The number of mobile broadband subscriptions was still very small with 360 000 corresponding to a penetration rate of 1.1% in 2009. Yet the increasing competition in data services forced mobile operators to expand and introduce innovative new services. For instance, MTN Uganda started offering free browsing of text-only Facebook Zero page to Internet-enabled phone customers.[33]

In Uganda, the majority of mobile users who live in rural areas are not connected to the national electrical grids. This means that they need to find a solution to charge their mobile batteries. People often walk several kilometres to charge their mobile handsets at charging stations that often open at market or at other trading places. Others connect dozens of handsets to a car battery by a wire. Uganda Telecom launched solar powered handset as another solution in September 2009.

Ugandan's benefit from a mobile content project called "Application Laboratory (AppLab)" that is led by the Grameen Foundation to promote innovation in the provision of services and information by using mobile phones and other ICTs and to alleviate poverty in the developing world, including in Uganda, Ghana, and Indonesia in different projects. The AppLab develops mobile phone applications and services which allow people to access important information including health, agriculture and education.

**Box 3. Google SMS - AppLab Uganda projects**

The AppLab Initiative was launched in Uganda in June 2009 under a partnership between the Grameen Foundation, Google and MTN Uganda (the largest mobile operator in Uganda). AppLab seeks to understand the needs of locals and develops mobile applications by creating self-sustaining business models and processes so as to promote social and economic empowerment for the poor, those who lack reliable access to important information in their daily life. The service called "Google SMS", launched in June 2009.

As an example, there is a application called "Tips" that provides users local health advice and answers to frequent questions, such as those involving HIV/AIDS, sexually transmitted infections, family planning methods and maternal health best practices. Also for those who have, or think they may have, contracted an illness, the directories of health facilities help them find local clinics, types of services offered, and so on. The service also provides local agriculture advice on market prices of products, management of pests, disease information for crops and animals, and bulletin board system that connects suppliers with buyers. These applications are provided through SMS-based databases and voice technologies. The AppLab also prints the marketing materials in the local language (Luganda) so that local people can learn how to use the services.

"AppLab Question Box (AQB)" is another local content initiative which is a local language hotline service and brings the Internet and expert advice to people who may never see a computer, never visit agricultural specialist or never read in English. When villagers ask a question via "intermediary workers" who are recruited in the community, equipped with mobile phones and connected to AQB (local-language telephone operators), an AQB operator searches websites or local database for the answer in English and calls back with the answer, translated back into the local language. Intermediary workers then provide the answers to the community. The questions asked most frequently between April and September in 2009 were; crop problems related to pests, nutrients and diseases (42%), crop production techniques (15%), agricultural product prices (12%), health problems related to animal husbandry (17%), enterprise development for animal husbandry (6%), and others (8%). The results of frequently asked questions helps further develop mobile applications which will be the most useful for villagers.

### *Brazil*

In 2010, the number of mobile subscriptions in Brazil was 202.9 million (16.7% increase from 2009), with penetration rate of 105%.[34] It should be noted that mobile penetration rates in Brazil vary depending

on the geographic area - high in Brasilia (147%) and Sao Paulo (132%) and low in other parts of the country (*e.g.* Amazonas with 23.5%).

Four mobile operators compete in the Brazilian mobile market: Vivo (Telefonica, with 30% market share in 2010); Claro (America Movil, 25%); TIM (Telecom Italia Mobil, 25%); and Oi (Telemar, 19%). Prepaid subscriptions accounted for 82.3% of the total mobile subscriptions. The total number of high-speed Internet access lines was 21.7 million in 2010 and of these, 8.7 million (40%) were mobile Internet connections.

**Table 11. Overview of top social networking sites in Brazil**

| Top Social Networking Sites in Brazil by Unique Visitors<br>August 2010<br>Total Brazil Internet Audience*, Age 15+ - Home & Work Locations<br>Source: comScore Media Metrix | | | | |
|---|---|---|---|---|
| | Total Unique Visitors (000) | Average Minutes per Visitor | Average Pages per Visitor | Average Visits per Visitor |
| **Total Internet Persons: 15+** | **37,527** | **1,561.0** | **2,109** | **58.0** |
| **Social Networking** | **36,059** | **252.6** | **585** | **32.4** |
| Orkut | 29,411 | 275.8 | 657 | 35.8 |
| Windows Live Profile | 12,529 | 5.5 | 12 | 3.7 |
| Facebook.com | 8,887 | 29.3 | 55 | 6.6 |
| Twitter.com | 8,621 | 31.8 | 44 | 7.5 |
| Formspring.me | 3,638 | 34.8 | 57 | 9.0 |
| Sonico.com | 1,711 | 10.0 | 15 | 2.9 |
| Ning.com | 1,570 | 6.4 | 10 | 2.4 |
| LinkedIn.com | 1,471 | 10.7 | 26 | 2.6 |
| Multiply.com | 1,349 | 3.6 | 5 | 1.6 |
| Vostu.com | 1,130 | 2.2 | 2 | 1.7 |

** Excludes traffic from public computers such as Internet cafes or access from mobile phones or PDAs.*

Source: ComScore
*www.comscore.com/Press_Events/Press_Releases/2010/10/Orkut_Continues_to_Lead_Brazil_s_Social_Networking_Market_Facebook_Audience_Grows_Fivefold*

"Orkut" is a social networking site and one of the most visited in Brazil. As of May 2011, 50.6% of Orkut's users were from Brazil, followed by India with 20.4% and United States with 17.8%.[35] Although this data does not separate out mobile from fixed Internet access, the service has a mobile dedicated site. Orkut in Brazil is well competing with other globally recognised SNS rivals such as Facebook. One source found that Orkut reached about 36 million unique visitors in September 2010, while Windows Live, the second largest SNS in Brazil, had 12.5 million visitors per month and Facebook, the third largest had 9 million monthly visitors.[36]

## ANNEX 2: CASE STUDIES

### Kenya

#### *Socio-economic context*

Kenya is the economic hub of Eastern Africa, although there is still room for improvement. The country has maintained high growth rates in the range of 2% to 7% in the last decade despite the 2007 food and oil crises and the 2008 financial crisis.[37] These positive results are due to Kenya's reliance on agricultural commodities characterised by highly resilient international prices and to the increasing exchange of commodities and manufactured goods through the East African Community (EAC) common market. In addition, Kenya benefits from hosting one of the most vibrant private-sector communities in Africa. Despite this positive setting, Kenya needs to diversify its economy and limit the vulnerability to climate hazards. Kenya also needs to strengthen further civil participation to limit its vulnerability to another political shock as it faces 2012 elections. In this case study we discuss how the development of local content on the Internet can make a positive contribution on both fronts.

There is a pressing demand for public service delivery in a country with half of the population living below the poverty line and an annual population growth of 1 million. The country is considered off-track when it comes to eradicating extreme poverty by 2015 - Millennium Development Goal (MDG) 1 - with the percentage of population below the poverty line at 46.9% in 2008/09. A large bulk of the population lives with USD 160 per month which only covers subsistence expenditures. The population also suffers from a lack of social mobility. With around a quarter of the population under the age of 15 and half of the population under the age of 25, policies to tackle youth unemployment should be at the heart of the government's agenda to unlock poverty. To address the issue of youth unemployment and lack of skills, the government has formulated the National Youth Policy and established the National Youth Council.[38]

The Kenyan government has succeeded in delivering primary and secondary education to the bulk of the population, but quality is insufficient and tertiary education remains unaffordable. The country is very likely to achieve universal primary education by 2015 - MDG 2. The adult literacy rate is 87% and the gross enrolment ratio is 113% in primary education and 59% in secondary education. To improve access to education, the government has invested in free primary education since 2003 and in free tuition in secondary schools since 2008. Education consumes approximately one-third of the national budget and is mostly related to recurrent costs such as staff salaries.[39] Quality remains nevertheless a challenge in terms of the number of teachers per student. Moreover, public funding is unable to respond to demand for tertiary education. As an alternative, the government tolerates high tuition fees in public schools and provides incentives, such as tax exemptions, for the private sector to deliver higher education. Tertiary education therefore remains affordable only for high income households. Kenya also had a low number of PhD students attaining a degree over the past decade. The main reasons that explain this outcome are the low number of supervisors, limited funding, migration of researchers to the private sector and limited capacity to translate research into development outcomes.

Kenya has an extremely rich ethnic and linguistic diversity although there is unequal representation in government. There are 42 ethnic groups and 42 associated languages. The national languages are English and Kiswahili. The government is seeking to strengthen the use of Kiswahili across the government to enable the entire population to access information related to public service delivery and state functioning. Indeed, Kiswahili is the only language that is spoken nationwide. In terms of government representation, according to the first ethnic audit of the civil service conducted by the National Cohesion and Integration Commission (NCIC), members of the Kikuyu, Kalenjin, Luhya, Kamba and Luo communities occupy 70%

of jobs in the civil service. The audit reveals that the Kikuyu constitute the largest single dominant ethnic group in all ministries and departments, with the exception of the Office of the Prime Minister dominated by the Luo and the police and prison departments dominated by the Kalenjin. The 20 smaller communities have less than 1% of their population in the civil service. This includes Teso (0.9%), Samburu (0.6%), Pokomo (0.6%), Kuria (0.5%), and Mbeere (0.5%) among others. Unequal political representation can nurture a belligerent political stance as in the course of the 2007 elections.

***Internet infrastructure***

Despite Kenya's access to undersea cables and the competition in national backbones, these developments have not yet led to an expansion in the number of users which would in turn encourage local content on the Internet. Undersea fibre optic cables connected Kenya to the world in 2009 enabling the country to bypass satellite infrastructure. The combination of access to international cables and the presence of three competing undersea operators has resulted in a substantial reduction in wholesale prices, going down from about USD 3 000 per megabyte (MB) per month in early 2009 with satellite to between USD 200 and USD 500 in mid-2011 with the new cables.[40] [41] In addition, Telkom Kenya and Kenya Data Network operate on a similar scale, ensuring competitiveness in national backbones.[42] Telkom Kenya operates a USD 60 million backbone funded by the state. As a private wholesale infrastructure provider, the Kenya Data Network is a pioneer in Africa. It owns an international gateway licence and sells capacity to Internet Service Providers (ISPs). Retail consumers are yet to benefit fully from these changes however since ISPs still charge high rates. In the course of 2009-10, monthly wholesale prices shrank by over 80% for an E1 international leased circuit, while monthly retail prices decreased by around 50% for 512 Mbit/s.[43]

Internet Exchange Points (IXPs), root and top-level domain name servers set the conditions for the development of local content on the Internet. By hosting these three structures within its borders, Kenya can maintain autonomy and internal connectivity during periods when international cables are damaged, also benefiting from lower latency and bypassing transit fees on international links when traffic is local. There have been two industry-based IXPs in Nairobi since 2001 and in Mombasa since 2010, both managed by the Telecommunications Service Provider Association of Kenya (TESPOK) under a not-for-profit arrangement. With 0.4 Gbps in domestic bandwidth production, the IXP in Nairobi was able to register almost 700% growth in five years. National licensed operators, ISPs and large organisations such as the Kenya Education Network (KENET) and government are all present in IXPs. The sector has not reported discriminatory behaviour in the use of IXPs or the root servers which they host. This efficient exchange of local traffic should open opportunities for the creation of local content and the hosting of services. Growth in the number of international interconnections and in the number of autonomous systems (AS) attests to the rising of the ISP community.[44]

The creation of IXPs and ccTLDs in Kenya has not been easy and continues to face challenges. In terms of IXPs, it was challenging to convince the different actors of the benefits of exchanging traffic locally since operators were for some time engaged in intense wholesale price competition. Secondly, Telkom Kenya, the fixed-line incumbent, feared losing a significant portion of its international leased line revenues and contested the creation of an IXP. As a result, the IXP in Nairobi shut down for around one year and the regulator opted to issue a licence for the operation of the exchange point – the only such case worldwide to our knowledge.[45] Domain names using the country's top-level domain (.ke) are expensive. Initial prices ranged between USD 6 to 24 per year but eventually were as high as USD 57 per year. This is higher than many other top level domain registrations. In addition, some businesses, particularly small and medium-sized entreprises (SMEs), do not perceive .ke as providing a strategic advantage. They consider the country domain as not being relevant or recognised relative to international domains such as .com. This partly relates to the low perception of quality and trust that local users attribute to Kenyan businesses.

Even though Kenya's mobile market is relatively competitive for voice, access to the Internet is still unaffordable and with limited coverage. We can observe the dynamism of voice services through the suppression of roaming charges and the reduction in interconnection rates. By 2006, Kenya, Tanzania and Uganda were the first countries in the world to suppress roaming charges amongst users of the Celtel network. This event forced other providers in the region such as Safaricom, MTN, UTL and Vodacom to adopt similar strategies.[46] In terms of interconnection, Kenya has been the first country in sub-Saharan Africa to apply EU recommendations of 2009 by enforcing cost-based termination rate caps based on long run incremental costs (LRIC). In turn, Kenya has the lowest termination rates in sub-Saharan Africa, USD 2.7 cents.[47] The reduction in termination rates in August 2010, led to an immediate reduction in retail prices allowing smaller operators to compete with dominant operators.[48] [49] Despite this progress on voice services, Internet uptake remains low due to the recent issues concerning access to undersea cables, limited relevant content and low PC ownership.[50] Internet access is also expensive. The average monthly cost of Internet access at a speed of 128 kbps via ISPs is around USD 77 which is almost half the monthly income for a low-income household.[51] With mobile phones, prepaid Internet access for a month can cost USD 11 with an investment of USD 44 for the modem.[52]

**The radio is the main source of local content, especially in rural areas, although mobile Internet should progress gradually.** Above 80% of households have access to radio.[53] [54] There are 98 radio stations, mostly community based. In comparison, broadband through mobile phones is only available to 7.3% of the population. It is important to note that access to fixed lines is even lower. Less than 0.1% of the population is subscribed to fixed broadband at a speed of 256 kbps. Besides being expensive and slow, mobile data services offer limited content relevant to the local population. This situation should improve in the mid-term. Since telecommunications operators find there is less business opportunity for voice services, they are moving onto the provision of local content. Telkom Kenya Limited is already providing services such as Internet hosting, VoIP and other multimedia services.[55]

***Internet content***

**Kenya is at the forefront of innovation in local content on the Internet as attested by the adaptation of global solutions.** In terms of the customisation of global solutions, *Whive.com* aggregates social media tools such as Facebook, Twitter, SMS and mobile applications and makes them available in local languages such as Kiswahili and Sheng.[56] *Uzanunua.com* is an adapted version of eBay.[57] It enables Kenyans to buy and sell goods online through local systems such as m-pesa, zap and yu cash. It already has 13 000 members and an annual growth rate of 200%. Similarly to Google, Websimba's Eat Out website and Eat Out Mobile site allow consumers to search for local restaurants using criteria such as location, type of cuisine and budget.[58] The Horizon HK_V2 Platform is a locally developed web-based customer relationship management (CRM) solution such as *SalesForce.com* that allows the integration of a soft phone to make outbound calls and updates data in real-time.

The internationalisation of local Kenyan initiatives also illustrates their innovative capacity in the development of local content on the Internet. Kenyan applications are adopted by other countries. Ushahidi is a non-profit technology company that specialises in developing free and open source software for crowdsourcing, visualisation and interactive mapping.[59] The company started as an *ad hoc* group of technologists and bloggers that developed software in a few days to gather more and better information about post-election violence in Kenya in January 2008. The populations in Chile, Haiti, Russia and Japan have also benefitted from this solution in the aftermath of natural disasters, as well as Liberia before, during, and after the elections thanks to an election monitoring crowd-sourcing. Another initiative, SasaHivi Media Ltd is bringing technology (media and Internet) together with Kenyan culture (design, content creation and publishing).[60] It is an East-African pioneer in offering outsourcing services with the majority of external clients located in Europe. Mobikash Afrika Limited is an independent Kenyan services provider that has offered mobile commerce and banking solutions across all networks since 2009.[61]

Mobikash Afrika Limited is establishing the application in South Africa and expects to expand to other countries in the Common Market for Eastern and Southern Africa (COMESA) region.

**The government is strongly supporting the development of local content on the Internet in visual effects and broadcasting.** In January 2011, the Ministry of Information and Communications established a Creative Content Task Force to promote the visual effects sector. Kenya has the know-how and potential to grow in this sector but lacks industry cohesion. The task force will also strive to provide synergies in sub-sectors including broadcasting, film, music, digital media, visual effects, fine arts, events, gaming, education, heritage and culture and publishing. In terms of broadcasting, Tinga Tinga Tales provide an example of the potential of the Kenyan market in this sector. It is a children's series based on African folk tales that was commissioned by the BBC for its CBeebies channel and by Disney Channel for its Disney Junior block.[62]

The government is also strongly supporting the development of local content on the Internet through e-government services, particularly in rural areas where the bulk of the population lives. The universal service fund which remained non-operational for some years, should now serve to develop 'digital villages' in rural areas. Internet infrastructure and as well as electricity are indeed largely absent in rural areas. The government expects these villages to foster entrepreneurship and local content by developing e-govermment services that are translated into local languages. The government would therefore serve as an anchor for rural demand.

The government is adopting an integrated approach to education where Internet content seeks to compensate quality gaps in primary education and the low researcher base at university level. Virtual Essence Ltd has developed the MsingiPACK 2011 E-learning and E-revision Solution to provide a supplement to upper primary classes fully based on local content. This solution enables access to past programme papers of Kenya's Certificate of Primary Education as well as a new syllabus based on the New Constitution in Kenya. The Pack is available via fixed devices and mobile phones. This solution is in line with the government's willingness to develop local content for education and entertainment for primary and secondary scholars and for the working class. Mainly educated high-income people are accessing the Internet, however. Among low-income households, education and skills remain the major factors influencing the usage of Internet in Kenya.[63] Concerning higher education, the Kenyan Education Network (KENET) is connecting university and research institutions within Kenya as well as linking to other National Research Education Networks (NRENs) in Europe. This network accounts for 70 institutions and 220 000 students in Kenya and seeks to act as a catalyst for local content.

**The radio community and population are generating content on the Internet that strongly complements traditional media**. The radio community offers interactive features when they move to the Internet, ahead of Internet bloggers. Community radios such as Guetto and Koch are opening Facebook pages and blogging. Larger radios such as Citizen have online websites. In terms of written media, the population in Kenya trusts more individual communications through Facebook or SMSs. Among low-income people, those in secondary school or aged 15 to 34 are the most active in using Internet both for chats and for social and professional networking.[64] In addition, people between the ages of 25 and 34 use more Internet features than other age groups adding e-learning and e-commerce sites to chats and social networking. The population often perceives the written media as not benefitting from freedom of expression. For example, the journalist Francis Nyaruri was murdered in January 2009 after writing for the newspaper Weekly Citizen a series of articles about corruption and malpractice by local officials and police in Nyanza province. In this context, the media community expressed significant reservations about the concept of statutory regulation of media ethics and standards in the 2010 Media Bill.

**Internet is still about communication channels that push external content into local communities.** Internet content is still predominantly in English and of Western origin. Inclusion of

Kenya's 42 languages would not be sustainable beyond the mid to long-term. Training to acquire skills to produce content in local languages, even in the official language Kiswahili, is very expensive. In terms of local content, Daily Nation is the only Kenyan site among the top ten sites most visited in the country by June 2011.[65] Population of every age range use non-Kenyan social networking sites such as Facebook, MySpace, Twitter and Classmates and professional networking sites such as LinkedIn and Probook.[66] Some global solutions are trying to adapt to the local market. Google and Microsoft created the site Tafiti in Kiswahili but without success.

***Other strengths***

The government seeks to increase and diversify sources by promoting employment in the development of local content on the Internet. The government is providing incentives to local content providers through reduced licence fees, loans for the development of local content, access to technical assistance and training as well as awards for best content providers. Moreover, the government is creating the Multimedia University (MUU) corridor in an effort to leapfrog the economy into the information and knowledge age. The MUU is a 15 km by 50 km government area that hosts projects on e-government services, telemedicine, a smart school, a multipurpose smart card system, a research and development cluster and e-business development. This initiative plays a pivotal role in the ICT initiatives encompassed in the 2030 Vision of Kenya. It is based on Malaysia's MUU.

Civil society's systematic contribution to government decisions in the ICT sector through the Internet alleviates the lack of multi-ethnic representation at government. KICTANet is a major success story in terms of public consultation processes. It is an e-mail list for a multi-stakeholder network on ICTs in Kenya that provided the means for a vast consultation dialogue on ICT policy in 2005 before the release of the 2006 ICT Strategy. This was a result of UN support to multi-stakeholder approaches in the 2005 World Summit on Information Society (WSIS). It was also a result of the 2003-06 donor-funded project, Catalysing Access to ICTs in Africa (CATIA), that sought to set a multi-stakeholder framework for ICT policies.[67] Following KICTANet pioneering experience, the government systematically consults civil society in every regulatory decision in the ICT sector. Given this premise, the government seeks to foster the development of social networks to increase civil society participation in non-ICT sector discussions and to reduce state corruption in line with the country's current priorities. In mid-2011, the government engaged in policy discussions to find innovative solutions to integrate social networks into mobile communications.

***Other challenges***

Competition between ICT firms in the EAC common market is hampered by the existence of country-specific licencing regimes.[68] Tanzania has a converged licensing regime for telecommunications, Internet and broadcasting. Rwanda and Burundi issue basic telecommunications licences. In Uganda, the government places its emphasis on infrastructure licencing to open infrastructure to competition. Since 2008 Kenya is shifting to a technology-neutral licencing framework that does not distinguish between fixed and wireless. Countries therefore apply different criteria to enable the operation of firms. As a result, in Kenya it is not possible to access an IXP without a national licence. Alternatively, the KCC is considering direct peering between IXPs in EAC countries.

Spectrum allocation challenges the proliferation of innovative wireless content since it can impede market entry. Kenya does not have an institution for advocacy in spectrum allocation and the discussion on the price of spectrum is closed to the public. Spectrum fees are set by the regulator and not determined by the market. Third-generation mobile licences set at USD 25 million gave Safaricom monopoly over these products in 2007. After complaints by three mobile operators, CCK reduced the initial fee for access to

additional broadband spectrum to USD 10 million.[69] In addition, the method of spectrum allocation on a 'first come first served' basis has created shortages in spectrum. For example, there is insufficient spectrum to roll out WiMAX. The KCC envisages auctions or beauty contests to allocate spectrum and is also committing to release spectrum for use by government in 2.3 to 2.7 GHz and in 400 and 800 MHz.[70] More bandwidth will become available as a result of the migration to digital broadcasting in 2012.

**Kenya has yet not developed regulation for Internet content, video on demand and cyber-security.** In terms of content regulation, the 2010 Bill of the Independent Communications Commission of Kenya aims to establish an independent broadcast regulator to replace the KCC. But as of 2011, Internet broadcasting is not subject to any regulation. In contrast, traditional broadcasting has an obligation of 30% of local content which is often unmet due to the absence of content. In terms of regulation of user-content generation on the Internet, the government seeks to learn from international experiences. The emergence of user sites inciting to violence during the 2007 Kenyan elections drew the attention of authorities. The government took no action since the sites were hosted outside the country and Kenyan authorities had no jurisdiction. In terms of cyber-security, the KCC envisages to address spam since it is a growing concern at all levels of society, including government's regular functioning.

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## Arab Republic of Egypt

### *Socio-economic context*

Egypt is an economically diversified middle-income country whose main sources of growth are oil, natural gas, tourism, agriculture, agro-industry, construction and textile manufacturing. The population engaged in a large-scale uprising in 2011 that was transformed very soon into a major popular revolution. As a result, after a 30 year rule as Egypt's President, Hosni Mubarak stepped down in 2011. In the short run, the transition government faces the challenge of addressing the population's demands while preserving fiscal stability and returning to pre-revolution growth rates.[72] In the medium term, the choices made through the referendum convened in March 2011, as well as the elections that were held in the end of 2011 and in June 2012, will shape Egypt's future.

Since 1995 the Egyptian economy has been progressing with gross domestic product (GDP) growth rates fluctuating between 3% and 7%. This growth however, has not benefitted the population as a whole, with poverty rates increasing from 16.7% in 1999/2000 to 21.6% in 2008/2009 (OECD, 2011a). Poverty is worse in rural areas where more than half of the population lives and the Upper Egypt region is the most affected with poverty reaching 43.7% of the population.[73] Egypt is the second most populous country in Africa after Nigeria. As such, it benefits from economies of scale but is also subject to pressures in public service delivery. For instance, the annual amount of water available per person will be halved by 2026 under the current fertility rate of three children per woman (Adamson *et al.*, 2000).

Net primary and gross secondary enrolment rates are relatively large at 93.5% and 79.3%, respectively (OECD, 2011a). Egypt is therefore on track to attain the second Millennium Development Goal (MDG) on universal primary education in 2015. Illiteracy remains a challenge among the adult population reaching 30% in 2007 and rising to 42% for women.

Egypt has a fairly homogenous population and Arabic is spoken nationwide. The Egyptians are fairly homogeneous people of Hamitic origin. They are often known as both Arabs and descendents of ancient Egyptians, with Arab influences being stronger in the north. There is a small Nubian population in the south, bordering with northern Sudan that accounts for about 0.2% of the population. There are also some Berber nomads in the eastern and western deserts and in the Sinai that account for 0.4% of the population.

### *Internet infrastructure*

Egypt is the largest Internet market in Africa and the previous government looked to reinforce this position by introducing policies to deploy fibre to the home. Egypt has three submarine fibre cables connecting the country to the world, FLAG, SEA-ME-WE 3 and SEA-ME-WE 4. After a blackout in 2008, other projects are in the pipeline to improve the resilience of international connections. In terms of national copper lines, Telecom Egypt has a monopoly in the fixed-line telephone sector and leases parts of its network to other Internet service providers (ISPs). With this infrastructure, over 1 million households have access to fixed broadband through Asymmetric Digital Subscriber Lines (ADSL). The International Telecommunications Union (ITU) estimates that 24.2% of the population are Internet users. The past government looked to further reinforce the position of Egypt as a leader in the digital economy and is studying which are the most appropriate business models to deploy fibre to the home.

Egypt is a regional pioneer in building Internet Exchange Points (IXPs) although improvements could be made. Egypt was the first country in the Arab League to create an IXP in 2004 (OECD, 2011b). This was combined with the flourishing of a dynamic ISP market. To illustrate, in 2010 autonomous system numbers (ASNs) that identify uniquely a network on the Internet reached 60 and international connections

attained 232. These numbers likely underestimate the number of networks in Egypt as many multinational corporations that are present in Egypt have their own ASNs registered in other countries.

The IXPs do not have effective architectures to avoid blackouts, however. Indeed, in reaction to online activism, on 27 January the past government easily blocked access to Egyptian Internet addresses by intervening in the country's IXPs. Since one building hosts all IXP switches, the system is vulnerable. The Egyptian authorities are studying how to reorganise the IXPs such that switches are located in several contiguous buildings to increase the system's resilience to external shocks in a similar structure to those of Brazil.

Egypt is a regional pioneer in the creation of root and top-domain name servers as well as in the introduction of an Internet domain name in Arabic, though there could still be some improvement. By hosting name servers, IXPs and root servers, Egypt fosters the development of local content. Indeed, Egypt can maintain autonomy when there are outages in international connections and benefit from lower latency and bypass transit fees on international links when traffic is local. Egypt was also among the first countries of the African continent to build root and top-domain name servers. In addition, the Ministry of Communications and Information Technology (MCIT) fostered the introduction of Arabic script to the domain name system and launched in June 2010 the first Arabic Internet domain name, .misr, which is the Arabic word for Egypt. Despite this positive evolution, the price for registering domain names is still high at around USD 98 compared to roughly USD 10 for .com or .net. The total number of registered domain names is also fairly low at 8 253.

Egypt has relatively affordable fixed and mobile broadband services. The MCIT aims at guaranteeing affordable access to the Internet for all Egyptian citizens through a large set of measures. For instance, since 2002 a state-sponsored programme allows manufacturers to provide personal computers at affordable prices to schools and households, also offering discounts on 512 kbps ADSL subscriptions for three years.[74] The project's goal is to provide personal computers to 25% of households. In addition, in 2004 the government launched a Broadband Access Initiative which has increased the number of broadband connections ten times in four years and has brought 24 Mbps ADSL2+ to residential households. As a result of these policies, it costs about USD 7 for a monthly subscription to 256 kbps which is about 6% of an average salary. Since disposable income is sometimes lower, 63.4% of ADSL connections are shared with neighbours to reduce costs. Otherwise, more than a quarter of Egyptian Internet users connect at Internet cafés. In terms of mobile broadband, the price goes from USD 8.30 for 500 MB of traffic per month to USD 24.90 for unlimited downloading. The previous government's liberalisation measures opened up the mobile broadband market to three operators (Vodafone, Etisalat, Mobinil) which has created a competitive ecosystem.

Television and radio are the main sources of local content in rural areas since fixed and mobile broadband are concentrated in urban areas. According to the ITU, more than 96% of households had access to television and 78% to radio in 2009. In comparison, broadband through mobile phones is only available to 8% of the population. Access to fixed broadband is even lower. About 1.3% of the population has subscribed to fixed broadband at a speed of at least 256 kbps. These numbers lag well behind narrowband figures where mobile penetration is 41.4% and fixed-line penetration is 12.4%. In addition, Internet connections are largely concentrated in urban areas. About 50% of Internet users are in Greater Cairo, followed by the Nile Delta region (20.8%), Upper Egypt (13%), Alexandria and Matrouh governorates (10.2%), and finally the Sinai, Red Sea and Suez Canal regions representing only 5.9% (IDSC, 2010).

***Internet content***

The previous government prioritised the development of Internet content to improve the quality of education, address illiteracy and enable access to Arabic sites. There are several initiatives to improve the

quality of education. For instance, the Egyptian Educational Initiative is a public-private partnership between Egypt and the World Economic Forum (in 2007) to reform Egypt's educational system. The project has developed digital content to address low educational quality.

Another initiative, Smarts Schools, is putting in place applications to build library databases at schools and the Technical Schools Development Project provides applications for teachers and students at industrial schools to strengthen technical education and vocational training.[75] More than 200 000 young graduates were trained through the MCIT Digital Literacy Program and more than 300 000 citizens (government employees and students) have obtained the ICDL certification.

There is also an Illiteracy Eradication Initiative that produces Internet content for teaching Arabic letters and words and elementary mathematics.[76] The past government also created a specialised portal, the Memory of the Arab World, to contribute to Arabic content on the Internet but also to promote the Arab heritage and civilization.[77] To illustrate the relevance of Arabic content in Egypt, when the Arabic version of Facebook was launched in March of 2009 the number of users jumped from 822 560 to 3 581 460 in two years.

Several government initiatives have targeted the quality and reach of public service delivery with programmes for e-government and e-health services. The e-government initiative seeks to integrate the Internet into the delivery of public services and to modernise the way citizens interact with government. To illustrate, the MCIT, the Ministry of Water Resources and Irrigation and the Ministry of Justice have been working on a national land registration system. This programme enables more efficient settling of ownership disputes and protects state and citizens' rights.

Another example is the government portal, *egypt.gov.eg*, which improves efficiency and speed in service delivery in areas such as document extractions, management of access to and usage of public utilities and interaction with courts, real estate and notarization offices.[78]

In terms of e-health, the past government and the Ministry of Health established programmes to deliver better health services and provide medical education and insurance to remote or underserved areas. For instance, the National Network for Citizen Health develops information systems and databases for quality health treatment and to guarantee the delivery of targeted subsidies.[79]

The previous government initiated the process of digitalising the National Archives of Egypt (NAE), though there is still a need of additional funds as well as innovative models to pursue this transformation. The NAE is one of the oldest archives in the world, founded in 1828 in Cairo. Its importance lies in having about 55 000 of the most significant collections of manuscripts in the world in the Arabic, Turkish and Persian languages. The Center for Documentation of Cultural and Natural Heritage (CULTNAT) in partnership with the MCIT and Egyptian IT companies are digitalising documents in the national archives. The project employs 4 000 graduates who have received specialised training. The population can already search and access over 25 million out of the 90 million documents through the NAE intranet, nationalarchives.gov.eg. High-resolution digital images of 130 000 valuable documents are also made available to preserve the physical condition of national archives by reducing the need for physical access. In addition, the CULTNAT and the NAE have completed the digitalisation of 10 000 maps and 3 500 papyri. The future government still needs to allocate substantial funds to continue the project, as well as to find innovative procedures to facilitate digitalisation such as the audio transfer of content and solid business model to encourage large scale digitization among publishers.

Other work is ongoing to digitalise of Egypt's rich heritage in areas such as archaeology, architecture, arts and geography. The Eternal Egypt portal is a collaboration between CULTNAT, the Supreme Council for Antiquities and IBM Corporation that presents the Pharaonic and Islamic treasures of Egypt.[80] The Archaeological Map of Egypt employs multimedia with Geographic Information System (GIS) technologies to produce documentation and management tools for the Egyptian archaeological sites.[81] CULTNAT's Architectural Heritage programme also uses GIS technologies to document the 19th and early 20th century architectural heritage of Egypt including extensive photographic documentation.[82] The CULTNAT is also digitalising Egypt's presidential palaces and in particular, the interior possessions. Regarding art documentation, CULTNAT is developing a programme that digitalises the rich Arabic music, Egyptian Musical Theatre, printed materials of Egyptian movies and Egyptian caricatures. Furthermore, the Egyptian Geographic Society Archives published their database with maps, atlases and images.

Finally, the Egypt Memory Online Shop is the first of its kind in the Middle East.[83] The portal launched with IBM offers an e-commerce model for cultural heritage that provides users with a variety of cultural products like books, CDs, atlases and high resolution images as well as CULTNAT publications.

Traditional media are increasingly using Internet tools. The MCIT online media programme supported the transformation of newspapers from printed newspapers to online media using the Internet. In addition the programme supported the digitization of old newspapers such as Al-Ahram which is one of the oldest newspapers in Egypt. In terms of printed newspapers and magazines, over 40% provide their audience with an Internet version of their content, amounting to a total of 63 newspapers and magazines with Internet services. Out of these 63, only 17 have Internet sites that provide a readers' comments service, 12 of which belong to independent newspapers. Regarding television, 30 out of the 51 government and private-sector television channels broadcasting through the satellite NILESAT have Internet sites but only three offer Internet live broadcasting. Concerning radio, 33 radio stations representing 91.7% of the stations broadcasting on the NILESAT, have an Internet site. The radio stations broadcast transmissions live through the Internet.

Bloggers complement traditional media and share information through social networks such as Facebook, Twitter and YouTube. Most Egyptian bloggers are young men in their 20s, while a quarter are women. Over three-quarters of bloggers write only in Arabic. Some 20% write in both Arabic and English and nearly 10% write in English only. In addition, the number of Egyptian blogs were above 160 000, which represents more than 30% of total Arabic-language blogs (IDSC, 2010).

***Other strengths***

The previous government placed a strong emphasis on promoting employment in the Internet economy. Public and private institutions provided Internet training to improve skills, including the National Telecommunications Institute, the E-learning Competence Center, the Information Technology Institute, the Software Engineering and Competence Center and the Information Technology Industry Development Agency. Over 140 000 graduates have already followed a basic skills programme, 27 000 have followed a specialised training programme and 2 500 have followed a continuous training aimed at developing the service industry on business process outsourcing (BPO) and knowledge process offshoring (KPO) (United Nations, 2007). Indeed, the government developed an export-oriented strategy for IT-enabled services combined with the promotion of foreign direct investment and IT investment.[84]

Community Development Portals (supported by the ICT Trust Fund) aim to empower Egyptian citizens in rural and urban areas to improve their standards of living through the utilization of state-of-the-art ICTs. The project was first launched in 2004 under the name of Kenana Online and is a community-based portal that provides people with the necessary locally relevant knowledge and information that helps them pursue better lives both on the personal and professional levels. The portal was a significant success, both in terms of scope and popularity, and a number of Kenana Online specialised portals have been spun off. These include the Small and Medium Enterprises portal which provides information on starting a small business; the livestock production portal which provides information about agricultural and animal matters such as agricultural machinery or the breeding behaviour of various species; the Arab family portal, which deals with family planning, basic health and disease, drug addiction, dieting and exercise; and finally the youth portal which aims to empower young people and enhance their participation in public life in order to contribute to their active citizenship. In an attempt to best meet local needs, the portals' content is derived from local communities including NGOs, research institutions and local companies.[85]

Following the 2011 turmoil, the transition government is strongly increasing its presence on social networks to raise public involvement and transparency in the decision making process. Before the 2011 revolution, Egypt's Prime Minister communicated through the Ministry of Information which was in charge of media and communication in the country. The websites of the Ministry of Information were not interactive. The Ministry was abolished in February 2011, some days after Hosni Mubarak stepped down. In order to adapt to the new context in Egypt, the transition government has greatly strengthened its communication strategy through the usage of social media, encouraged by the new cabinet and ICT

professionals at the MCIT. The Supreme Council of the Armed Forces, which temporarily rules the country, has been the first to utilise social media through a Facebook page which the population considers a main source of information and dialogue.[86] In mid-2011, the website already had more than one million followers. The Cabinet of Ministers and the Prime Minister have also created accounts on Facebook and Twitter to make announcements to the public.[87] A large proportion of the population with access to Internet in Egypt reads these websites and many people make online comments but the transition government is not yet fully exploiting this interactivity.

Internet adoption is increasing in the aftermath of the 2011 revolution but also thanks to past government policies to increase local content. The 2011 revolution resulted in an unprecedented rise in the use of Internet to access real-time, uncensored, user-generated content on the evolution of the uprising. To illustrate, Egypt gained 632 120 new Facebook users in January-February 2011. On 1 February 2011 alone, the day the past government turned the Internet back on, Egypt gained 100 000 new Facebook users. Egypt was leading African countries with over 7 million Facebook users in mid-2011. Moreover, Twitter adoption grew ten-fold in January 2011 and tweets also grew ten-fold to over 1-million between 24 and 30 January despite the closure of major ISPs.

Much of the draw to Internet access has been the availability of local content, much of it created through initiatives of the previous government. For instance, it launched the Community Development Portal programme in 2004 with a community-based portal, Kenana Online with local information to improve personal and professional lives.[88] Other Community Development portals have followed to enrich the Arabic content on the Internet with specialized knowledge in development various field, through active community participation and locally relevant information. There is a Small and Medium Enterprises (SMEs) portal at ayadina.net, a livestock production portal at aradina.net, an Arab family portal at byotna.net, an Arab Internet youth safety portal at amanak.org and a youth portal at yomgedid.com.[89]

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## Senegal

### *Socio-economic context*

**Senegal's favourable economic outlook is severely constrained by power shortages**. Despite the 2008 food and oil crises and the 2008 financial turmoil, since 2005 gross domestic product (GDP) growth rates have fluctuated between 5% and 7%.[91] The major sources of economic growth are the manufacturing of chemical products mainly linked to agriculture, the construction sector exports of construction materials and telecommunications services. Large public investments in infrastructure such as the 2010-15 Road Infrastructure Programme, the Dakar-Diamniadio toll motorway and the Blaise Diagne International Airport explain the weight of construction in the economy.[92] The telecommunications sector accounted for 10% of GDP in 2008, strongly supported by mobile services and has created 1 800 direct jobs and 30 000 indirect jobs.[93] Despite this positive outlook, persistent energy shortages hamper the production process of chemicals and construction materials and the proliferation of telecommunications services. While blackouts are common across West Africa, their frequency and length in Senegal in 2010-11 are blocking productive and commercial activities. The government's 2011-15 Emergency Plan, Takkal, seeks to permanently resolve the electricity problem.

**Impoverishment in rural areas leads to the high migration of young people to urban areas and foreign countries.** Over 80% of poor households live in rural areas. The number of poor households peaks in the province of Casamance which has for a long time been prone to sporadic outbreaks of separatist violence. As a result of rural poverty, young people migrate to urban slum peripheries where employment opportunities are mainly in the informal sector. Indeed, almost half of the population in Senegal lives in urban areas. Young people also leave the country. There are around 2 million migrants, despite the relatively small national population of 12.5 million. At their peak in 2008, there were USD 925 million in remittances, equivalent to 14% of GDP and to more than twice the level of foreign aid. Inefficiencies in the agricultural sector and rising food and oil prices will continue to encourage youth's migration from rural areas. This migration pattern has a large impact on the country as 44% of the population are under the age of 15.

The large diversity and oral nature of local languages partly explain the population's weak participation in the educational system and the very high illiteracy rate. There are about 20 ethnic groups of varied size in Senegal. The most prominent groups are Wolofs (35%), Peulhs (20%), Sérères (17%) and Diolas (10%).[94] Despite hosting 43 local languages, Senegal has just one official language, French. Only about 20% of the population speaks French, however. The most common local languages are Wolof, Pulaard, Serer and Mandinka. While there is no nation-wide language, Wolof is the first or second language for around 80% of the population. These factors are partly responsible for weak participation in the educational system which is in French and also explain the extremely high illiteracy rates in Senegal,

reaching 41.9% of the population. The government's information on public policies and services in French thus remains inaccessible to half of the population.

The population's weak participation in the educational system and inadequate technical training contribute to the very high unemployment rate. Young people stop studying very early, most at the level of primary education. Although the gross primary school admission rate has reached 117.5%, the completion rate is somewhere over 60%.[95] Schooling rates drop to 30% in secondary education and 8% in tertiary education. The few people that continue secondary and tertiary education belong to high-income segments and typically occupy management positions or migrate to foreign countries once they have finished their studies. In addition, there is no technical training for those who leave school at an early stage. In consequence, there is a lack of human resources for technical positions. This structure is partly responsible for the high unemployment across all ages in the country.

***Internet infrastructure***

**Senegal is a communication hub in West Africa, thanks to the strong historical support of the government.** Since the fifth Economic and Social Development Plan (1977-81), the government has considered the telecommunications as a priority sector to foster economic growth and reduce poverty. As a result, Senegal has historically benefitted from international access through the analogue undersea cables Antinea, Fraternity and Atlantis-1 and the digital cables Atlantis-2 and SAT-3/WASC.[96] The new fibre optic cables, Glo 1, ACE and MaIN OnE, further consolidate Dakar as a major communications hub in Africa, along with Accra, Lagos, Cape Town, Mombasa, Djibuti and Cairo.[97] With this infrastructure, Senegal has for a long time delivered international connectivity to neighbouring countries such as Mali, The Gambia, Guinea Bissau and Mauritania. Senegal remains undoubtedly ahead of surrounding countries. For instance, Senegal used twice as much international bandwidth as its five neighbouring countries together in 2011. Senegal also has the highest broadband penetration rate in West Africa. Fixed and mobile broadband penetration attain 0.4% and 7.2% of the population, respectively, with usage attaining around 15% of the population.

**The monopolistic position of the fixed-line incumbent, Sonatel, has hampered the development of the Internet.** For the *Agence de Régulation des Télécommunications et des Postes* (ARTP), Sonatel holds a dominant position in all the market segments, historically setting high pricing on the bandwidth of the undersea cables.[98] It has also historically dominated the fixed-line segment and Sonatel and Millicom together dominated the mobile segment until the second national operator, Expresso, arrived in 2009. Interconnection remained an unsolved issue up to 2009 when the dominant operators, Sonatel and Millicom, submitted catalogues for the first time for ARTP's approval. The ARTP does not however have the technical tools to regulate anti-competitive pricing.[99] All Internet Service Providers (ISPs) reach users through Sonatel's fixed-line network and since Sonatel leases lines at very high rates, there are only two major ISPs, Sonatel Mutimedia and ARC Informatique.[100] By 2008, there were 2 068 leased lines at, for example, USD 1 172 access rate and USD 889 monthly rate for 256kbps.[101]

**Nigerian Globacom challenges Sonatel's monopolistic position over broadband services.** Sonatel's dominant position over international prices may change in the short term.[102] In June 2011, the government of Senegal granted Globacom a licence to deliver mobile, data and Internet services. The licence also allows Globacom to land its submarine cable, Glo 1, in Senegal and to carry traffic for major operators, the government and wholesale customers. This arrival to the market is already putting pressure on competitors to expand their offer and decrease retail prices. Millicom, for example, seeks to offer new services such as mobile Internet, TV and video-on-demand. Overall, Globacom is consolidating its presence in West Africa and challenging France Telecom's position in francophone African countries. Indeed, the government of Senegal partly privatised Sonatel in 1997 in favour of France Telecom. Globacom already has licences in Nigeria, Ghana, Benin Republic and Côte d'Ivoire.

The absence of Internet Exchange Points (IXPs) and root servers together with the weak usage of top domains penalise local traffic exchange. Even though the government and operators have been discussing the creation of an IXP since 2007, there has been no progress on implementation. Some actors suggest that there is lack of awareness on the benefits of an IXP within both the private and public sectors. In consequence, the country does not benefit from lower latency or from bypassing transit fees on international links when traffic exchanged between service providers is local. In addition, there are no root servers in the country to route national Internet traffic when there are disruptions to undersea cables. In terms of the country domain, local usage is limited. The diaspora has requested about two out of three country domains. Internet actors perceive .sn as expensive at a user rate of around USD 99 compared to less than 10 USD for .com or .net domain names. There is also a lack of vulgarisation and promotion of the country domain and absence of sufficient data centres to host content locally.

**In major urban areas, while fixed broadband is increasingly affordable, mobile broadband remains expensive.** The high cost of fixed Internet has fallen rapidly from USD 3.25-2.15 to USD 0.65-0.43 an hour.[103] Sonatel, for example, offers 20 hours of Internet access through a 512 kbps Khéweul ADSL connection for USD 22 monthly charges plus an equivalent tariff for the initial connection. An increasing number of people are accessing Internet from the home thanks to these falling retail prices. Despite having one of the cheapest rates in Africa, fixed broadband services remain relatively unaffordable, taking up to a quarter of an average monthly salary.[104] Joint Internet and television subscriptions would even take up more than half of an average monthly salary. Hence, even though broadband television and triple play offer is advanced compared to other African countries, prices are high with respect to purchasing power. However, overall penetration still continues to increase as neighbours commonly share a Wi-Fi connection. Eight out of ten Internet users continue nevertheless to access the web through cybercafés or at work. Internet usage is strongly concentrated in Dakar (35.1%), compared to other cities (16.4%) and rural areas (5.5%). The education level and working status are the major factors that determine Internet access.[105] Recently deployed mobile broadband is more expensive than fixed broadband. For instance, Sonatel offers prepaid mobile Internet for USD 1.1/hour or USD 66/month. Availability of a USB key to access Internet from a computer would add another USD 66.

In rural areas, radio is the main source of local content since Internet infrastructure is limited and expensive and Internet content is predominantly in French. The use of radio is pervasive across Senegal, with 84.2% household penetration.[106] Internet penetration remained until recently very concentrated in the high-income population and commercial actors living in large urban areas, mostly in Dakar which counts for about a quarter of the urban population. Even in terms of fixed-line, public telephone access points are only available in 1 000 villages out of the 14 206.[107] According to Research ICT Africa analyses, there seems to be no demand for broadband services in rural areas but this might reflect limited connectivity and lack of adapted solutions. Mobile phones combined with video would be a very interesting alternative to radio in rural areas due to the very high illiteracy rates and the fact that local languages are transmitted orally.

***Internet content***

The media is the principal source of local content on the Internet, strongly boosted by the local young population and by the diaspora. News in Senegal are widely accessible to the population through the Internet on very diverse matters ranging from economy, culture, politics, sports to society. The list of news sites is very long and Dakar even hosts a regional news site for West Africa, ouestaf.com. [108] Most include videos such as politicosn.com, xibar.net, sen24heures.com, apanews.net and nettali.net. Online audio is less common and yet well-known sites such as seneweb.com, sunuker.com and walf.sn offer these services. News websites in Senegal are interactive and local youth and diaspora are particularly active in exploiting this feature. To illustrate, the journalist Basile Niane was in the top 20 best bloggers according to the Mondoblog competition at Radio France International (RFI) in 2011. In contrast, the population use the

government's online platforms to extract official information but not to interact with the state. Press freedom in Senegal is amongst the most respected in Africa and online press benefits from the same level of freedom as traditional media.

The internationalisation of local Senegalese initiatives puts forward the existence of a population pool with skills for the development of local content on the Internet. Since 2002 the Senegalese company, Manobi, uses mobile phone technology to help small-scale farmers in Senegal play a more active role in the product value chain.[109] The model is extending to South Africa, where farmers from the Limpopo province are directly linked to purchasers from restaurants and lodges in the Kruger Park, situated within a radius of 20km. They no longer have to travel to Pretoria or Johannesburg to sell their perishables at low prices. Manobi also has activities in Mali, Burkina Faso, Niger and Benin. Gainde 2000 is another example of a Senegalese company that is internationalising its activities. Since 2002 the company has developed computer solutions to improve trade and transport efficiency through a single-window solution. The single window allows traders to collect all the documents required before submitting their declaration to customs in 0.5 days compared to four days prior to the installation of the system.[110] Kenya has implemented this single window and Burkina Faso is in process of implementation by 2011.

The government of Senegal and donors are both strongly supporting Internet infrastructure as compared to fostering local content on the Internet. From a regulatory perspective, the ARTP has mainly focused on infrastructure until recently. From a policy perspective, in 2010 the government created a new Ministry of Connectivity that seeks to foster the development of local content on the Internet. The Ministry however, did not have clear terms of reference by mid-2011.[111] In terms of Internet content, the private sector is not adequately organised to plan and implement initiatives since, beyond major telecommunications operators, there are only very small-scale actors.[112] Regarding donors, they are supporting projects to provide equipment for schools. For instance, Senegal is the pilot country of the Sankoré project supported by France, which seeks to provide equipment to primary and secondary schools in Africa in line with the Millennium Development Goals. In addition, Senegalese programmers are developing the Sankoré software for the region. Another initiative, the Seneclic project, delivered 2 500 computers to schools thanks to a grant from Axa Assurances.[113] USAID is also providing equipment for schools in Dakar.[114]

The government Internet site is successfully delivering public administration services in major urban centres, though it has still to develop health and education infrastructure and content. In 2006, China provided a USD 120 million loan to Senegal to build a government fiber optic backbone to connect the public administration and to deliver official documents to the population. South Korea also contributes USD 75 million to this network by financing the cabling of 665 administrative buildings. The project is already being implemented with 700 km of installed fibre. The *Agence de l'Informatique de l'Etat* (ADIE) has successfully created an online platform accessible though this network for the population to access reliable administrative information. Regarding health, two hospitals are being connected through the extra-capacity in the network but additional funding is necessary to allow other hospitals and schools to benefit from this capacity. The Ministry of Health has a vast project to digitalise health records but it has not yet reached the planning stage on a national scale.[115] In addition, in 2011 the President requested a Presidential Council to consider the available possibilities to deliver telemedicine services in rural areas. In terms of education, the government is studying the possibility of using the Universal Service Fund (USF) to extend both Internet and energy to rural schools. During 2010 alone, the government collected USD 14.9 million from a 3% levy on operators' turnover but the amount has still not been used (Calandro *et al.*, 2010).

**Internet is about communication channels that push external content into local communities.** Internet content is in French. The only large-scale mechanism to finance content on the Internet is the *Fonds francophone des inforoutes* available since 1997 to foster the creation of content in French. In addition, Qwerty keyboards are not the most appropriate for the transmission of local languages. Microsoft

was a pioneer in introducing Wolof in computer software, in particular in Windows, but consumers rarely use this system. Google is producing applications to translate content into local languages. Since 2009, the company is also raising awareness among the population so that they contribute to the generation of local content though without much success. There are no major local actors producing content in local languages although there are some sites fostering local culture.[116] In terms of Senegalese content, seneweb.com and facedakar.com are the only Senegalese sites among the top ten sites most visited in the country as at June 2011.[117] Samaxarit.com is the first Senegalese social networking site built with open source software. The young population are nevertheless very active users of non-Senegalais social networking sites such as Facebook and search engines such as Google although Senegalese presence on social networking sites is very recent, with almost no users before 2008.

**The government is slowly progressing in the digitalisation of cultural heritage despite some caveats.** There are two projects on the digitalisation of heritage with open source software thanks to French and EU support: the digital library of the University Cheikh Anta Diop of Dakar and the digital library of the *Institut Fondamental d'Afrique Noire* (IFAN).[118] The digital library of the University Cheikh Anta Diop has digitalised at least 500 master and PhD theses since 2002. The next step will be to digitalise rare books accessible at the university's library. IFAN has digitalised 260 multimedia documents and 50 texts. With its 62 640 monographies, among other documents, the Institute still has a long way to go. In terms of other programmes, despite the richness of the National Archives of Senegal which goes back to 1816, the government has not yet found an external partner to fund their digitalisation. The two ongoing projects of the University Cheikh Anta Diop and IFAN are also lacking resources and equipment, including a data centre, to continue their efforts.

***Other strengths***

**The skills of the population offer a large potential for the development of local content on the Internet.** Indeed, Senegal is underexploiting the skills of the pool of students educated not only on software and but also on a broad range of disciplines necessary to generate content on the Internet. There are some remarkable examples of the capacities of the population. For instance, researchers at the *Ecole supérieure polytechnique de Dakar* (ESP) are developing software tools to improve local governance. They have developed a land management tool to formalise land attribution. They have also created an open source application to manage budgets at local level and the *Ministère de Décentralisation et des Collectivités Locales* wants to implement this latter solution for all local communities. Lastly, researchers at the ESP have created a health card that contains all the history of a patient with past illness, treatments and general background information such as the blood group. After winning the Imagine Cup, the ESP represented Francophone Africa in the world completion organised by Microsoft in 2011. In addition, students at the Université Cheikh Anta Diop in Dakar have developed Soukeyna, an application for mobiles which enables pregnant women to send SMS to arrange meetings at the hospital and ensure follow-up. The government's initiative to launch the first incubator for companies in the ICT sector in 2011, should encourage these solutions.

During political protests in 2011, the population generated content on the Internet in order to follow events and organise gatherings. On 23 June, the population strikes contributed to derail the electoral reform that would allow the election of the president with 25% of the votes in the first round and would also propose a dual ticket with a vice-president. Communications through Twitter under tags such as ticketwade, kebutu and TouchePasMaConstitution enabled the population to follow events around Dakar and to organise demonstrations outside the Central Police Station. Many people celebrated the success of protests in blogs and tweets.[119] Notice nevertheless that unlike the North African outbreaks, in Senegal the scaling up of events through the Internet has its limits as only 15% of the population have access to social networks.

### *Other challenges*

**The government has not yet regulated Internet content or implemented policies on cybersecurity.** In terms of content on the Internet, there is no regulation and the government has not yet attributed Internet content regulation to any institution. In 2011, the ARTP regulates telecommunications and the *Conseil National de la Régulation de l'Audiovisuel* (CNRA) is in charge of regulating multimedia through traditional channels. There is a multiplicity of actors and overlapping of responsibilities in the ICT sector between the different Ministries, the ADIE, the ARTP and the CNRA.[120] This results in the absence of a consolidated action plan in the sector and does not facilitate fast and consistent regulatory measures. Regarding cybersecurity, there is a legal framework both for cybercriminality (law n. 2008-11 25/01/2008) and cyberprivacy (law n. 2008-12 25/01/2008) but there is no implementation as yet.[121] The government has recently created a National Council on Security that should, among other tasks, co-ordinate security services although it is still not functional. In the meantime, there is a growing number of online scams, blackmails and extortions. Individuals often from Nigeria and Liberia, make victims believe they come from countries at war such as Liberia, Sierra Leone, and Congo where they would need to find their property against 20% in commissions. With this procedure, in 2004 Nigerians in Dakar obtained USD 77 000 from an American citizen. In 2007, Nigerians in Senegal plundered the bank accounts of victims in Europe and the United States through the Internet using stolen credit cards with the help of software. Both cases are waiting to be judged. In 2000, a Senegalese owner of a cybercafe in Dakar was arrested and sentenced for having falsely offered via Internet large quantities of gold to a wealthy businessman from the United Arab Emirates.

**The digitalisation of content is hampered by the lack of respect of intellectual property rights**. It is common to find copied information under a new author name in Senegal. People do not consider that there is infringement of property rights when using information produced by a third party without quoting and with no changes with respect to the original text. This issue is one of the major reasons that impedes large scale digitalisation of culture in Senegal. For instance, despite the progress of the digital library of the University Cheikh Anta Diop, authors are often reluctant to place their theses because they lose control of the use of the text through the Internet. They often prefer to publish in internationally recognised journals which offer restricted access.

**Lack of local language content on mobile broadband makes tackling poverty and migration in rural areas difficult**. The principal economic actors in rural areas are women. The production of local content for these women in order to improve agriculture activities would be useful to reduce the prevalence of poverty and migration. Women in rural areas, however, hold the highest illiteracy rates in the country. Recent government efforts to teach local languages in some pilot schools were not successful, partly because support material is missing. Unless content is produced in local languages via an audio support, efforts to deliver content to women will be in vain. Mobile phones would be the most adequate tool for oral transmission in rural areas. For instance, clickinfoado.sn is a Senegalese the platform that offers audio information in Wolof on family planning.

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## China

### *Socio-economic context*

In three decades of profound political and economic transformation, China has become the second-largest economy in purchasing power parity terms and has lifted 400 million people out of poverty. China has the world's second largest manufacturing sector and is the world's largest exporter of goods (OECD, 2010). Growth has relied substantially on high rates of investment, despite recent policies to boost domestic consumption. Impressive saving rates, attaining up to 45% of gross domestic product (GDP) have enabled large-scale capital accumulation.

China has made great strides in improving its educational system and in raising literacy rates, though there are persistent regional disparities. Since the formation of the People's Republic of China in 1949, the country has strongly improved the basic level of education of its population. Net primary enrolment rate stands at 99.7%, gross enrolment rate of lower secondary education is 100.1%. Literacy rates have risen to attain 94.2% of the population.[123] Between 2000 and 2010, the number of universities and institutions of higher education increased from 1 041 to 2 723.[124] Enrolment rates have also soared in the last two decades to reach 31 million.[125] Overall, tertiary education is based on merit and is highly competitive.[126] There are also over 230 000 students studying abroad, many of whom are returning to China because of the opportunities and official incentives. Despite this positive outlook, there are regional disparities. The proportion of illiterate and semi-literate people in 2007 was lowest in Beijing at 2.75%, but was as high as 39.6% in Tibet and above 10% in five other provinces.[127]

There is income inequality within urban areas but also between urban and rural regions. For instance, the average annual urban household income in 2007 was USD 1 812, three times more than that of an average rural household (EUI, 2009). There are also regional inequalities between coastal areas, where industrial reform started in the 1990s, and inland regions in western and central provinces. In view of these imbalances, the government is shifting towards more redistributive policies across the country. There is greater public spending on education to foster entrepreneurship and productivity. There is also more spending on pensions and health, though welfare services will remain underdeveloped. In addition, over time the government has eased the restrictions that limit labour mobility in the inland and western regions (OECD, 2010).

The national language in China is Mandarin Chinese which was traditionally spoken in the north. There are also regional languages such as Daur, Kalmyk-Oirat, Lu, Peripheral Mongolian, Central Tibetan, Uyghur and Xibe.

### *Internet infrastructure*

Thanks to macroeconomic conditions, government policies and user demand, there are more Chinese online as the entire population in Europe. There are 513 million Internet users in China or 38.8% of the population (CNNIC, 2012), which is more than the European population of 475 million. In addition, half of

all Asian Internet users are Chinese even though the Chinese account for only 35% of the entire Asian population. In terms of broadband, the Internet reaches 392 million users or 28.6% of the population (CNNIC, 2012). These positive numbers have been attained firstly with strong macroeconomic conditions that have enabled the development of Internet infrastructure, network technology and product applications. Secondly, the government has been an early mover on fixed Internet access. In the early 2000s, the government invested in the creation of a national fibre optic network, an "eight horizontal eight vertical" backbone structure. Moreover, the government issued third-generation licences for mobile communications in 2009 and has been testing the TD-LTE (Time-Division Long-Term Evolution) Network in six pilot cities since early 2010. TD-LTE-Advanced, as developed by China Mobile, was accepted as one of the 4G International Standards at the ITU Radiocommunication Assembly meeting in January 2012.[128] In addition, in 2010 the State Council decided to speed up the integration of telecommunications networks, cable networks and the Internet. Thirdly, since 2010, social networking has attracted many users to the Internet. In addition, following the 2008 global crisis, traditional enterprises have accelerated their presence in the Internet to negotiate, co-operate and trade.

Hong Kong, China is outperforming the Chinese mainland in the development of Internet exchange Points (IXPs) and root servers. By hosting IXPs, root servers and top-domain names, China fosters the development of local content. Indeed, China can maintain autonomy when there are outages in international connections and benefit from lower latency and bypass transit fees on international links when traffic is local. The Hong Kong Internet Exchange is one of the primary locations for Asian peering (OECD, 2011). With a volume of domestic bandwidth of 143 Gbit/s and 98 service providers, the Hong Kong Internet Exchange has occupied a leading position in the Asian region for a long time. The Hong Kong IXP has managed to provide bandwidth efficiently thanks to the development of an integrated approach where all components of the network, from international connections to the local loop, were regularly strengthened. The IXP in mainland China is outperformed by Hong Kong's IXP since it has only attained a domestic bandwidth production of 2Gb and is accessed just by 11 service providers.[129] In terms of root servers, Hong Kong, China has four while China, with a much greater population, has three. China has already over three million top-level domain registrations with fairly low prices at about USD 12. The proportion of .cn in all domain names in China is however, decreasing from 80% to 64% while .com is progressing from 16% to 29% (CNNIC, 2010).

Despite already having about one third of the population connected to the web, fixed and mobile Internet access remains relatively expensive. 73.4% of Chinese Internet users are used by desktop computers to access the Internet, while 69.3% use mobile phones (CNNIC, 2012). The numbers on mobile penetration are particularly high taking into account that third generation mobile networks started to be operational in October 2009. Despite having relatively low tariffs to access the Internet compared to other countries, the rates still remain high in relative terms to purchasing power. Fixed broadband costs about USD 18 per month for a 256 kbit/s connection. This figure can amount to about 10% of an average salary in China. There are often offers that enable users to access lower tariffs. For instance, it is possible to connect 10 hours per month to the Internet for about USD 1.50. In terms of the mobile Internet, the prices vary widely according to the volume of downloading ranging from USD 0.80 to USD 45.00. Indeed, the population can also access the Internet with 30 MB of downloading for USD 0.80 and an additional USD 1.62 per extra MB. Regarding regional differences, prices to access the Internet under the same conditions can vary from USD 13 per month in Ningbo in eastern China's Zhejiang province to USD 30 per month in Beijing. Taking into account the fact that 58.2% of Chinese Internet users are under the age of 30 and 31% are students (CNNIC, 2012), the cost of Internet can have a strong impact on Internet usage. This demographic breakdown of Internet users in China is significantly different from that of Western countries. For example, in France the percentage of Internet users aged 15 to 34 is less than 35% and only 12% are students (Synthesio, 2011).

The television is the main source of local content in rural areas, where lack of infrastructure and skills are the two major impediments to accessing the Internet. A key challenge in China is the existence of 'dual structures' related to regional disparities between urban and rural areas. The most important information channel in rural areas is the television. Indeed, 79.3% of rural inhabitants who do not access the Internet choose the television to obtain information regularly (CNNIC, 2012). In contrast, only 20.7% of the rural population had access to the Internet by 2011. Out of a rural population of 657 million, 136 million access the Internet, which accounts for 26.5% of the total internet users. In urban areas, the number of Internet users is 377 million people. This gap between urban and rural areas is related to weak Internet infrastructure in the latter. The lack of knowledge of computer and Internet technologies explains weak personal computer usage in rural areas. According to a national survey conducted in 2011, 57.8% rural inhabitants listed "do not know how to use computer and Internet" as the reason for not using the Internet. An annual net income of an average rural household of USD 1 102 only suffices for a low-end computer.[130] As a result, over half of the rural Internet population access the web through Internet cafés. On the other hand, the mobile Internet is particularly used among China's rural population. Indeed, 70% of rural web users use their telephone to access the Internet, while the figure is 10 points lower in urban areas (Synthesia, 2011). The Internet gap between urban and rural areas is also related to the lack of adequate skills in rural regions. With regard to rural Internet users, 84.3% are under the age of 30 and 84.4% have high school education. In urban areas, skills are not so fundamental for Internet usage. To illustrate, 66.3% of urban Internet users are under the age of 30 and 47.4% have high school education (CNNIC, 2010).

***Internet content***

Internet entertainment content continues to develop rapidly in China through music, games and video despite intellectual property disputes and video regulation. The usage of instant messaging on the Internet ranks first among all Internet applications, with 80.9% of Internet users accessing this service in 2011, followed by search engines (79.4%), online music (75.2%) and news (71.5%) (CNNIC, 2012). Over 63% of Internet users access games and video. Because of the large number of game users, the game industry is segmenting its offers according to local demand and is also evolving from a focus on quantity to the quality of content. This market is attracting local and foreign game developers. For instance, in 2009, 35 imported online games obtained approval for release in China. Imported games have accounted for 38.8% of China's USD 4 billion online gaming industry. This market has suffered though from intellectual property disputes, for instance, with foreign game producers. In terms of Internet video, regulation to control content resulted in a severe disruption of the market. The 2008 law called "Provisions on the Management of Internet Audio and Video Programming Services" aimed to create self-policed, local-language content for the Chinese Internet. The broadcast media regulator, SARFT, and the Ministry of Industry and Information Technology (MIIT), issued video regulations that require video service providers to obtain a broadcast production licence and an Internet news information services licence that some consider difficult to obtain. The SARFT issued a notice in 2009 detailing 21 content categories that video providers should edit or delete.[131] As a result, the government shut down 25 video sharing portals and warned 32 other sites, among which was Tudou.com – the largest video sharing portal, for hosting improper material.

**Commercial content on e-commerce and e-payments are rising by about 30%, far beyond other applications.** Even though commercial content has for long been developed in the Internet market in China, the 2008 global crisis accelerated companies' adoption of these services. About 30% of Internet users were accessing commercial content in 2010 (CNIC, 2010). Large content providers such as sina.com.cn, netease.net and sohu.com deliver e-commerce services. To illustrate the weight of these companies, Fortune ranked Sohu as the world's 3rd and 12th fastest-growing company in 2009 and 2010, respectively.[132] E-commerce services are so widespread that even small and medium enterprises (SMEs) are using them extensively. In particular, alibaba.com from the Alibaba group is the world largest online business to business trading platform for SMEs. E-commerce continues its expansion and there are a few

key trends appearing. First, mobile platforms are starting to deliver e-commerce. Second, businesses are paying more attention to consumer experience and safety guarantees. Third, there is an increasing trend on self-constructing logistics or providing logistics through co-operation. Online payments have risen rapidly with the increase in e-commerce services. Public facilities providers, such as electricity and water companies are also increasingly enabling online payment for their services. Moreover, online payments between enterprises are also rising.

The Internet in China is experiencing an evolution from entertainment and commercial content to media and social networking content. Search engines and web news are the second and fourth most utilised services on the Internet in China with 79.4% and 71.5% of the Internet users accessing them (CNNIC, 2012). The Internet has become one of the main means for people to access media which is challenging the press and television. In addition, with the widening of the age range of people accessing the Internet, Internet media is experiencing an evolution from a focus on quantity to quality production. In terms of search engines, since 2009 they have entered a period of rapid development with the arrival of a large set of online applications for e-commerce and social networking. Baidou.com has about 79.89% of the market share in search engines, followed by sogou.com with 6.7%, Google.com.hk with 4.95 % and then by other minor search sites such as soso.com, youdao.com and bing.com.[133] More than half of Internet users are contributing to blogs and social networks. By the end of 2011, there were 319 million blogs in China. Chinese Internet users have on average three social networking profiles. The size of social networking content in China is, of course, linked to the vast number of Internet users and 25% of all social networking users worldwide are Chinese (Synthesio, 2011). There are Chinese social networking sites such as Renren for students with 170 million registered users, Kaixin001 for young employees with 95 million registered users, Qzone mainly targeting and 51 for rural populations with 700 000 peak simultaneous users[134]. By the end of December 2011, the number of weibo (microblog) users hit 250 million with a growth rate of 296% from the end of 2010. Its utilization ratio also increased to 48.7% from 13.8% in 2010 (CNNIC, 2012). Furthermore, the Chinese population is increasingly using the so-called “human flesh search engines” to raise online personal accountability, though there may be some privacy caveats.

**Government has invested heavily in e-government infrastructures, yet the development of contents and use has not matched up.** The government spent about USD 100 billion on the Internet government strategy between 2001 and 2005. The number of government Internet sites exceeded 10 000 in that period, with portals at 32 provincial governments, 74 ministries and 333 municipal governments. The Ministry of Commerce is an exception, topping the list of ministerial websites. This Ministry has developed more than 4 000 websites and prioritises the Internet as the first source for information release. Moreover, about 10% of government websites publish their budget reports, increasing transparency. For instance, Guangzhou was the first local government to publish the fiscal budget of its 114 departments. It must be highlighted that this situation seems to improve partially, thanks to the Weibo’s boom and to the the fact that more and more governmental bodies are on Weibo and not just relying on website to reach out to citizens. However, performance and use of government websites are uneven and lagging behind infrastructure development. Indeed, there is a lack of common standards which has led to the creation of information islands. In addition, information often remains unused. Citizens only use 75% of government Internet sites, and fewer than 50% of users have ever accessed information on government sites. As a consequence, China has slipped seven places in the 2010 United Nations E-Government rankings.

**Internet content related to education and health seeks to complement traditional education and health services**. E-education has a positive outlook since China has always placed education as a priority. For example, the government has set the goal to provide training for over 10 million teachers across the country in five years through the National Teacher Training Programme. In terms of health, China started to pay more attention to the construction of a regional and national health information network following the outbreak of the severe acute respiratory syndrome (SARS) epidemic in 2003. In 2009, China published policy documents focusing on establishing a unified electronic health record and national health

information data dictionary. There are some limitations to the deployment of e-education and e-health services, however. Most importantly, insufficient Internet infrastructure and penetration of personal computers hinder the potential of these services to reach the rural, remote and ethnic minority areas.

**Filtering of Internet content.** Since 1998, China engaged in technical filtering of Internet content. The government's Internet control usually focuses on Chinese language content and on China's political and religious specific issues, although pornography is also an issue. While many countries employ China's filtering techniques such as domain name system redirection and Internet Protocol blocking, China appears to be the only country to use the Transmission Control Protocol (TCP) reset technique. With this technique the government can filter content by keyword whether the content is hosted in China or abroad. To bypass Chinese filtering policies, some sites such as Google, Facebook, Twitter and Youtube have decided to be hosted outside Mainland China. However, the content of these sites may be either blocked or slowed down if the sites fail to comply with Chinese restrictions. The government has also blocked other sites using TCP resets such as the Chinese-language Wikipedia, BBC News and Wikileaks in certain periods during the 2008 Olympic Games.[135] These policies in turn foster local content. For instance, Facebook is very popular worldwide, but less than 1% of the Chinese population use it. As a substitution, a Chinese equivalent has been developed: Renren, which is, however, with its 170 million users[136] far behind the worldwide user base of Facebook at over 800 million active users. In China, eight of the ten most visited sites in the Internet were Chinese in mid-2011.[137]

**Domestic Internet services development based on business models of global success**, i.e., the development of Chinese equivalences of global business models for the local Chinese market by a Chinese company, has become a successful tool of internet development and the spread of local content. With its 120 million registered users, Sina Weibo is a very active Chinese microblogging site.[138] Tencent also has a microblogging platform called QQ microblogging with 100 million active members. Chinese microblogging platforms have 250 million users,[139] which is more than the 200 million Twitter users worldwide. There are intellectual property caveats in this strategy, however. For example, in 2000, Israeli's ICQ launched a law suit against the Chinese - but US-hosted - OICQ to have them comply with US legislation because the Internet domain name was hosted in the United States. OICQ changed its name to QQ.

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## Brazil

### *Socio-economic context*

**Adequate fiscal and monetary policies have enabled Brazil to develop a diversified economy.** Brazil is increasingly becoming a service-oriented economy, but is also one of the world's largest agricultural producers and has a diversified industrial base. The services sector ranges from unskilled and low-value-added services to highly remunerated professional and financial services.[140] With its vast natural resources, Brazil is one of the world's largest producers and exporters of raw and processed minerals.[141] Moreover, the country's industry is the largest and most diversified in Latin America ranging from heavy engineering to consumer goods.[142] However, local currency appreciation and Asian competition are challenging local manufacturing. As a result, the government of Brazil has launched the 2011-14 "Bigger Brazil Plan" where a total of USD 322 billion has been allocated to financing the productive sector, of which USD 160 billion is earmarked for knowledge-intensive industries.

The resumption of economic growth coupled with anti-poverty programmes has significantly reduced poverty and inequality, though income distribution remains skewed. The greater macroeconomic stability in President Lula's 2003-06 administration resulted in improved labour conditions and higher real earnings with weaker inflation. These factors have contributed to the fall in the population below the poverty line to less than one-quarter in 2007. Income distribution has also improved since the 1990s thanks to targeted social programmes aimed at the poorest families under the umbrella of *Bolsa Família*. Indeed, the Gini coefficient fell by 0.7% annually from 2001-07.[143] Yet, income distribution remains skewed. This is particularly challenging since income is still the most powerful determinant of differences in education and health service delivery in Brazil.[144] The income effect is being countered by the decline in the population growth rate which is alleviating the government's pressure to deliver public services. The large concentration of the population in urban areas, where 86% of Brazilians live, is also easing the delivery of public services.[145]

While illiteracy has fallen substantially, the poor quality of primary and secondary education is one of the country's main weaknesses. Illiteracy among the population aged 15 and over has fallen dramatically over the past 20 years from 25% in 1980 to 10% in 2007.[146] Primary and secondary gross enrolment rates at 120% and 90%, respectively, attest the attainment of nearly full coverage at national level. Despite these positive outcomes, the performance of students remains low when compared to other countries through standardised international tests such as the Programme for International Student Assessment (PISA).[147] This reflects the dichotomy of the Brazilian system whereby primary and secondary education levels are poorly funded and overcrowded while public universities are excellent. Indeed, spending per student on tertiary education is about 30% higher than on primary education in OECD countries, but about seven times higher in Brazil.[148] As a result, wealthy families send their children to private schools to improve their chances to access a university education.

Even though the Portuguese language is one of the strongest elements of national unity, the country has rich ethnic diversity and strong regional disparities. In spite of the fact that Brazil is the fifth largest country in the world and the sixth most populous, the Portuguese language is spoken nationwide. The only

exceptions are some members of Amerindian groups and some immigrants. The principal families of Indian languages are Tupí, Arawak, Carib and Gê. In terms of ethnic plurality, Brazil has experienced large degrees of cultural assimilation. Brazil's population is very diverse, comprising many ethnic groups that trace their origins back to four sources: Amerindians, Europeans, Africans and Asians. A large percentage of the population is of combined origin since interracial breeding has been common. For instance, according to the 2000 census 39% of the population are of mixed race, 54% are of European origin, 6% are black and fewer than 1% are indigenous. In addition, Brazil's population is unevenly distributed across the country. The wealthy southeast is densely populated while northern states and the interior of the dry northeast are sparsely inhabited and underdeveloped. European and Asian descendants live mostly in the south. In the northeast, people of African and mixed-race descent predominate on the coast, whereas in the semi-arid country land there is a predominance of white and Amerindian-European people. The majority of Amerindians live in Indian reservations in the north and centre-western part of the country.

***Internet infrastructure***

**Brazil has the fifth largest contingent of Internet users, yet the government seeks to increase broadband infrastructure.** With its 1.3 Mbps in international bandwidth usage and its 75 million Internet users, Brazil is surpassing all other Latin American countries. In contrast, only 38 million people or 20% of the population have access to broadband Internet.[149] The main reason is the lack of sufficient broadband infrastructure. Only about half of Brazilian municipalities are covered by broadband services through cable modem or Asymmetric Digital Subscriber Line (ADSL). There is indeed weak competition in these services, often confined to urban areas with the sole coexistence of one of the incumbents and a small entrant. Even in terms of Internet Service Providers (ISPs), there are more than 1 000 but only five large companies hold 50% of the market share in terms of Internet users.[150] The absence of a common licence for the delivery of voice, Internet and broadcasting is also hindering broadband expansion.[151] To alleviate weak broadband penetration and wholesale competition, the government created the National Plan for Broadband in 2010 whereby Telebras backbone should reach more than 80% of the 5 565 municipalities by 2014.[152] The plan has not yet been approved due to lack of funds.

Brazil benefits from favourable conditions for the development of local content in the Internet as a leader in Latin America in both Internet exchange points (IXPs) and root servers and in Lusophone countries in top domains. The country has experienced impressive growth in IXPs in recent years. Between 2006 and 2010 alone, IXPs grew from four to 19, way ahead of other countries in the Latin American region such as Peru hosting two IXPs and Colombia, Chile and Argentina hosting just one IXP.[153] In addition, Brazil has the largest IXP in the region with 54.6G of bandwidth and 106 participants in São Paulo's *Ponto de Troca de Tráfego Metro*. Brazil's IXPs are the result of the long-term programme *Comitê Gestor da Internet no Brasil (CGI)* to create new IXPs to foster economic development.[154] Brazil is also at the forefront in the creation of root servers hosting five by 2011, ahead of other countries in the region such as Argentina and Chile which host two servers.[155] The number of top domain names has also been increasing since their creation in 1996, though growth has been particularly strong since 2003 reaching over 2.5 million. Almost half of the domain names are concentrated in São Paulo.[156] The top domain name .br is the most common Portuguese language Internet suffix, surpassing all other Portuguese-speaking countries' top domain names as well as .com Portuguese sites.[157] By hosting IXPs, root servers and domain names, Brazil fosters the development of local content. Indeed, Brazil can maintain autonomy when there are outages in international connections and benefit from lower latency and bypass transit fees on international links when traffic is local.

**Given Brazil's income inequalities, fixed and mobile broadband are still unaffordable for the bulk of the population**. The average price for fixed broadband access at the low rate of 128kbps stands at USD 30. In contrast, in Chile, for twice the speed, the price is USD 34 and in Argentina, for four times the speed, the price is USD 27.[158] Even in localities with higher income and infrastructure, the price of fixed

broadband is a major deterrent to access the Internet. For instance, according to *Centro de Estudos sobre as Tecnologias da Informação e da Comunicação* (CETIC), 50% of people surveyed in urban areas who have a computer but no connection, highlight the fact that they lack resources to pay the access. Indeed, the price of fixed broadband is high with respect to purchasing power. Low-speed broadband services would amount to 8.7% of the minimum wage of USD 341 per month set for the year 2011. Regarding mobile broadband, 66% of users with access do not use these services because of their high pricing.[159] According to Frost & Sullivan, Brazil has the highest rates in mobile broadband in Latin America. Indeed, prices can range from USD 40 for 250MB download to USD 50 for 1GB download. Even though there is a large number of mobile broadband operators under the CDMA family, there is weak price competition as in the case of voice services. Brazil has the largest mobile voice tariffs in Latin America and the Caribbean with a USD 45 low-usage basket.[160]

The radio is the main source of local content in underdeveloped and rural areas since the Internet is scarcely available and expensive, thereby exacerbating social and regional disparities. The radio continues to be the first source of local content in underdeveloped and rural areas with 85% of households having access in 2009. Brazil has about 250 million radio receivers and 8 204 radio stations of which 3 865 are community radios. In contrast, fixed broadband is scarce in those areas.[161] For instance, Brazil's economic hub, São Paulo, has 42% of national broadband connections while the whole of the northeast region has only 6%. Even though mobile broadband is also concentrating in major urban centres, its high growth rates and low deployment costs could result in some penetration into rural areas. The rate of penetration of mobile broadband at 14.3% is already much larger than fixed broadband at 5.9%. This mobile rate is the highest in Latin America. Moreover, mobile broadband is the only Internet experience for 52% of the population and is likely to be prevalent in rural areas. Mobile broadband could also offer comparative advantages to radio. Community radios are subject to restrictive legislation where authorisations might take years. Furthermore, radios can only operate within a range restricted to a radius of 1 km. This is not adapted to a scattered population such as the dozens of small communities of 50-100 families along the Tapajós River in the Amazon that are several kilometres apart from each other.[162]

***Internet content***

In the last decade, the country has experienced the "Brazil Internet Phenomenon", a massive increase in Internet use mostly reflected through social networks. The "Brazil Internet Phenomenon" was first reported in 2003 when the photography blogging website, Fotolog.com, showed that Brazilians had quickly exceeded the combined number of users of all the other countries in the world. In 2008, Brazil also became the country with the highest number of MSN Messenger users, above 30 million people.[163] Google's social networking portal, Orkut, witnessed a spectacular boom in users from Brazil, surpassing the number of registers on Orkut from any other country in the world.[164] Twitter grew 13 times between 2009 and 2010 alone in Latin America mainly driven by Brazil, while worldwide it increased five times. In addition, Brazilian Internet users have become leading players of many online video games such as the popular *Tibia*. According to a IBOPE/Net Ratings study, Brazil had already overtaken the United States in terms of time spent surfing the Internet in 2004.[165] Within Latin America, Brazilians spend the most time on the Internet with an average of 26.4 hours per month in 2010.

Brazilians access the Internet mainly to communicate and to search for information and services through applications that are often hosted abroad. By 2009, more than 85% of Brazilian users were accessing the Internet regularly to communicate placing them top of the league of social networking users globally.[166] Orkut is the most popular social network, followed by Windows Live Profile, Facebook.com and Twitter.com.[167] Other social networks that are used to a lesser extent are Formspring.me, Sonico.com, Ning.com, LinkedIn.com, Multiply.com and Vostu.com. Among all these sites, only Sonico.com has its headquarters in Latin America (Argentina). In communication, the activity of sending instant messages expanded to reach 70% of Internet users in 2009 from 61% of users in 2008. Instant messaging in email

and social networks has contributed to the rise in popularity of the Internet.[168] The two most popular sites for online instant messaging applications are Twitter and eBuddy, both with their headquarters outside Latin America. In terms of information search, sites related to fun and entertainment receive the most attention, accounting for 60% of users. Searches on goods and services are increasing, with the number of users rising from 50% in 2008 to 60% in 2009.[169] Searches on health-related services also increased to attain 39% of users in 2009. This is related to certain 2009 events such as the tropical fever in the Amazon and the H1N1 flu virus across Brazil. The Ministry of Health contributed to online information on these diseases.[170] Some new trends on information searches are related to the rise in access to virtual encyclopedia websites and free online dictionaries which 33% and 26% of the population use, respectively.

Brazilians also access the Internet for leisure activities such as games, films and music, with only some game applications being hosted in the country. Games occupy a central position on Internet usage in Brazil. Experts believe that the advent of online multi-player gaming has much to do with the skyrocketing rate of Brazilians who use the Internet on a regular basis to access this service. Some local game companies have been successful such as Atrativa with multiplayer games on pool and pocker and Mentez with *Segredos do Mar* and *Vida nas Pasarelas*. The number of people accessing the Internet to watch films or videos has increased from 49% in 2008 to 53% in 2009. The increase in the number of children aged 10 to 15 accessing these services, explains this positive evolution. Interestingly, even among those excluded from the economically active population such as students, housewives and pensioners, there is also a positive trend in the use of the Internet to access multimedia. Indeed, the profile of the population accessing films and videos has no relation to income and employment status. The two most popular sites for online film applications are IMDb (Amazon) and Rotten Tomatoes (Warner Bros) and for online music applications are Grooveshark (Escape Media Group Inc.) and SoundCloud, all having their headquarters outside Latin America.

Brazil is leading in e-commerce in the Latin American and the Caribbean region and the more so with fiscal incentives on electronic and software products to counter the 2008 global crisis and to raise competitiveness within the 2011-14 'Bigger Brazil Plan'. The government of Brazil is fostering e-commerce exchanges thanks to the reductions on the taxes of industrialised products.[171] As a result, Brazil continues to reinforce its position in this sector within the region. Brazil makes up 34% of the Internet population in Latin America and the Caribbean, but 61% of the regional e-commerce revenue in 2009. Retailer preferences differ across countries. While in Brazil 95% of e-commerce sales were spent on Latin American and the Caribbean sites, in Mexico this percentage falls to 65% and in Puerto Rico to 5%.[172] In Brazil, 52% of Internet users search online for prices of goods and services and 19% actually make purchases. Almost half of the users that make purchases online choose electronic equipment, followed by books, magazines and newspapers. Hence, Internet users buy online high value-added goods and services. The leading e-commerce site by far is MercadoLivre, Brazil's version of eBay, followed by CorreiosNet Shopping. Despite the positive progression of e-commerce, it still remains associated with the richest segments of the population and also with those who benefit from financial independence. The low rate of banking inclusion, security and privacy concerns as well as lack of trust constitute major barriers for further expansion of e-commerce among the population.

The expansion of online local media is partly due to the fact that the population has historically tended to trust media outlets rather than government information. People in Brazil join those in Nigeria, Indonesia, India and Russia in having more trust in their media than in their governments.[173] In Brazil, national or regional newspapers are the first sources of news. Indeed, Brazil has a vibrant and pluralistic press with several hundred newspapers. Both newspapers and television have used the Internet to diffuse their content, including films and videos.[174] Some well-known examples of online news sites are Globo News at g1.globo.com/globo-news/globo.com, Brazil Online at noticias.bol.uol.com.br and Jornal do Dia at jornaldodia.com.br. In terms of Internet news, Brazil was a pioneer in hosting an online debate between three potential candidates of the Brazilian government in 2010.[175] The event organised by the UOL portal

and Folha.com provided a rich and pluralistic experience for Brazilian democracy through online debates on social networks. This is shown by the fact that the tag of Twitter that was following the event, was in first place in global lists of the most discussed topics. Blogs have also grown although only 20% of Brazilian people trust them against 45% that distrust them. Some well known blogs containing news are Brazzil at brazzil.ning.com/profiles/blog/list, Diário di Rio de Janeiro at diariodorio.com and Blog do Tas at blogdotas.terra.com.br. Bloggers often reproduce the content of journalists. Since the legal framework has not been updated, it is still an open question as to how Brazil will protect journalism enterprises while not imposing limitations on access to information.[176]

**The government has made strong efforts to achieve the democratisation of public administration.** The government of Brazil is at the origin of some best practices on e-administration that sought to increase efficiency as well as expand usage of services. For instance, the Ministry of Planning, Organisation and Management has developed a main page on government services and information at brasil.gov.br that provides access to the Brazilian government by subject or department offering 800 online services. Another best practice is that of the Federal Tax Authority portal, ReceitaNet, at receita.fazenda.gov.br that enables online submission of tax returns and tax payments. The electronic tender system, e-Tender, at comprasnet.gov.br reflects the intentions of private and corporate citizens for online procurement. In addition, Brazil was the first country in the world to have fully electronic elections in 2000 when 115 million people voted in 406 000 electronic voting points.

The government has also made strong efforts to deliver online public services such as education and health in order to minimise social disparities. Regarding education, Brazil seeks to enhance teachers' ability to make use of information and communication technologies in education to reduce the digital divide in the country and to increase the quality of primary and secondary education. Since 2009, UNESCO and local partners have launched the international project, "ITC Competency Framework for Teachers", to provide guidelines on how to improve teachers' capacities in teaching practices through the use of new technologies. Moreover, the Ministry of Education intends to extend access to computers in all schools, including those in rural areas. In terms of e-health, Brazil has developed national unique identifiers whereby 116 million individuals and 153 903 healthcare providers are uniquely identified. The government has also developed initiatives to deliver services in rural areas. For example, BHTelessaúde has enabled both online and offline consultations in 76 primary health units in the southeast of the country. Telecardio identifies and gives diagnosis of Acute Coronory Syndrom in 82 villages in Minas Gerais covering a population of 400 942 inhabitants.

**Brazil is progressing with the digitalisation of its rich cultural heritage.** The government launched the Brazilian Digital Library at bn.br/bndigital in 2006 to preserve and facilitate access to the Brazilian memory and cultural heritage. The National Library digital collection is in the public domain, consequently without problems of copyright. The Brazilian Digital Library has over 18 000 scanned items corresponding to about 1 million images. In addition to this project, the National Library of Brazil is participating in the World Digital Library (WDL) project. The US Library of Congress launched the WDL initiative to create a world library with contents relating to the history and culture of peoples and countries around the world. Moreover, the National Library is managing a virtual network, the Brazilian Digital Memory. The Brazilian Digital Memory aims at disseminating digital information and contents of the institutions that participate in the network.[177]

***Other strengths***

Business enterprises prefer the Internet as their main channel for the attainment of public services, while individuals still prefer to access them physically owing to inadequate content and processes, fear of data misuse and lack of e-skills. According to a 2010 survey on the use of ICTs in Brazil, 79% of businesses used at least one public service through the Internet during the past 12 months.[178] In contrast,

60% of individuals have a preference for face-to-face services.[179] Individuals' weak usage of the Internet to access public services is related to several factors. Firstly, the absence of certain services through the Internet, particularly on health such as the fixing of appointments. Secondly, the weak interactivity of Internet public services. A quarter of the individuals surveyed argued that their requests were never answered and that they did not even receive any confirmation that their demand was being processed. In addition, while 90% of individuals use the Internet to access information on public services, only 60% conclude transactions since the latter are often not possible. Thirdly, almost 40% of the individuals who use the Internet to access public services claim that a strong hurdle to increased usage is related to the fear that there will be misuse of personal data. Lastly, almost 50% of those individuals who do not use the Internet to access public services argue that a major obstacle is that they do not have sufficient skills to manipulate computers.[180]

***Other challenges***

The government is addressing spectrum shortages for the proliferation of mobile broadband content, though spectrum is still not allocated to operators. The decision of the telecommunications regulatory agency, *Agência Nacional de Telecomunicações* (ANATEL), to refarm spectrum in the 2.6GHz band will foster competition and create opportunities for operators to enjoy economies-of-scale from fourth generation products such as Long Term Evolution (LTE) and WiMAX networks. Mobile operators, however, have recently made a USD 2.8 billion investment in third generation spectrum auctions and are deploying and expanding this network. In addition, mobile operators have on-going third generation coverage commitments until 2015. Even if there are new spectrum auctions for fourth generation products, wireless broadband offers will probably not appear on the market before 2015/16.

The government of Brazil is working on a proposal to provide a legislative framework for Internet content through a collaborative approach in public policy. Brazil lacks a specific legal framework regarding the Internet. In order to create one, the Ministry of Justice has created a collaborative process whereby during a period of 45 days anyone could suggest what this legal framework should encompass. In the Ministry's first public online debate from 29 October to 17 December 2010, 1 500 daily visits and a total of 800 comments were recorded for this initiative focusing on freedom of speech, protection of privacy and network security. Despite this positive setting, the Ministry's first draft of proposal was subject to a "Mega No" online campaign. The initial draft included the controversial Article 20, which called for the removal of content deemed offensive or criminal after only one warning by the government without requiring a judge's approval. In addition, Article 22 made it mandatory for all Internet providers to keep their customers' information in a database for three years in case the user was involved in a police investigation. The law could also hamper the free flow of information on sexuality and sexual health online.[181] As a result, the Ministry of Justice is still reviewing the proposal in 2011.

Even if Internet service providers and judges are intervening to remove online content where necessary, Brazil is in fourth position worldwide for unauthorised file sharing through peer-to-peer networks.[182] Despite the lack of specific legislation on Internet content, online service providers can remove any content on their own initiative if it violates their terms of service or for any other legitimate reason. It is also worth noting that some Brazilian laws may require that Internet intermediaries take down specific illegal content as soon as they are made aware of its existence, as is the case with child pornography. An important step forward was Orkut's removal in 2010 of virtual communities engaged in piracy. In the last half of 2010 alone, Orkut removed more than 1 million links to pirate material. In recent years, Orkut has been the biggest source of illegal music files in Brazil through communities that posted links to cyber-lockers such as RapidShare and Megaupload where pirate material is stored. Peer-to-peer networks such as BitTorrent for audiovisual and Ares for music are also popular in Brazil. However, service providers have not been active in controlling pirate content through this distribution channel. In 2010, the Entertainment Software Association (ESA) detected 9.2 million connections participating in

unauthorised peer-to-peer file sharing through service providers in Brazil. Music and film industries report that Internet piracy remains a constraint for the development of a legitimate online sector. In terms of games, the absence of enforceable remedies against game copies has enabled a flourishing market for pirate games. As many as 95% of game consoles in use in Brazil have been modified to enable the use of pirate games.[183]

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## France

### *Socio-economic context*

With its strong regulatory and social protection heritage, France plays a particularly important role in European and international debates. As one of the founding nations of European economic and political integration, France is a key player on the European stage. The government advocates for higher capital levels, but with appropriate supervisory arrangements and sufficient time to allow systems to adapt without excessive economic costs.[185] France presided over both the G20 and the G8 in 2011. The priorities that the French Presidency put forward in the G20 agenda were, among others, strengthening financial regulation, supporting employment and strengthening the social dimension of globalisation. For the G8, France recommended avoiding duplication of the G20 agenda, and prioritised new common challenges such as the Internet, innovation, green growth, sustainable economies and nuclear safety.

France needs to increase its competitiveness and address structural unemployment in order to sustain generous public services and prevent the erosion in purchasing power. The world market share of French exports has been declining and few new French products are gaining market share.[186] In order to address the decreasing competitiveness, the government is fostering synergies between public and private research, developing competitiveness clusters more effectively, reducing tax expenditures for businesses and eliminating administrative barriers to small and medium enterprise (SME) growth.[187] Moreover, there is a shortfall of about 1.5 million jobs for workers under 25 and over 55 years of age.[188] France provides access to training and job-search support but high unemployment benefits and barriers to lay-offs are not conducive to job creation.

**The government is taking measures to make sure that education is affordable to all with homogeneous quality.** According to the OECD's Programme for International Student Assessment (PISA) 2009 results, students in secondary education in France occupy 22$^{nd}$ place out of 65 for reading and mathematics skills and 27$^{th}$ place for science skills.[189] The results also show that nearly 20% of students in France face learning difficulties, compared to 15% in 2000. In addition, results suggested that inequality is growing steadily in education and the social background is hence a strong predictor of educational achievement.[190] Admission to primary and secondary public schools depends on the residence location, which in turn shapes the possibilities of students to be admitted to prestigious tertiary education centres. France has a dual tertiary educational system. The *Grandes Écoles* make a competitive selection of students and offer very good prospects in the labour market. Universities in contrast admit all the students that apply which can reduce quality due to uneven levels of pre-tertiary education. The government seeks to boost education quality by softening the assignment of students to schools close to their residence, by granting greater autonomy to *Grandes Écoles* and universities and by increasing spending on higher education.

**There are many regional differences in France, though the population has abandoned most associated dialects.** Major ethnic groups are Alsatian, Basque**,** Bretons, Corsican, Flanders, Gypsies, Jews, Normans, Provence and Pyrenees. There are many people from the country's past colonies in Africa, as well as European citizens from Portugal, Italy and Spain, who arrived in France after the end of World War

II due to the economic conditions in their home countries. The only official language is French which the population speaks nationwide. There are numerous regional languages such as Basque, Breton and Corsican which represent a rich linguistic heritage.

***Internet infrastructure***

**France has a competitive fixed broadband market that offers nationwide coverage and relatively affordable access.**[191] The country broadband coverage is of 98.5% with the Asymmetric Digital Subscriber Line (ADSL).[192] According to the *Autorité de Régulation de Communications Électroniques et des Postes* (ARCEP), household subscription to fixed broadband reached 63% in 2009. Since the ADSL network belongs to France Telecom, ARCEP considers this operator as dominant in this market and has imposed an obligation of local loop unbundling (LLU).[193] France Telecom applies non discriminatory, transparent and cost-oriented pricing to third parties that want to deliver services to users through its access network. About 30% of France Telecom lines are unbundled. In turn, intense competition between Internet service providers in urban areas explains the low pricing at USD 42.9 per month for ADSL services up to 28 Mbps. These subscriptions often include free Voice over IP (VoIP) telephone communications to fixed lines as well as digital television. In rural areas, local authorities or *collectivités locales* have fostered the deployment of fixed broadband. There are nevertheless three types of digital divide: age, income and education.[194] According to the National Institute of Statistics and Economic Studies (INSEE), over 99% of the population aged 15-29 have used the Internet. In contrast, 90% of those aged over 75 have never accessed Internet. For 30% of people who are not subscribed to the Internet, the price of the equipment and subscription is the main reason. About 60% of people without a school diploma have never used the Internet.

High-speed fixed broadband deployment will progress slowly as fixed broadband is widely accessible and there is weak demand for higher speeds. In France, there are four million households with access to cable and one million with access to fibre. France is therefore lagging behind in the deployment of fibre networks. To address this low deployment, the government has imposed the symmetric regulation of high-speed broadband networks, that is, the same regulation applies to all operators. According to this regulation, operators should provide non discriminatory and transparent prices to third parties that want to use the fibre access network. This is less restrictive than the European Union regulation on the matter since the latter also requests operators to offer cost-based pricing. By having soft regulation, the government seeks to foster infrastructure competition in this emerging market. Free, SFR and France Telecom, have already announced their interest to deploy fibre networks in major urban areas. Free and France Telecom signed an agreement in 2011 to co-finance the deployment of fibre optic to 5 million households in around 60 zones of medium density. For areas with very low density, the government is investing USD 2.8 billion to support open networks in regions and departments. The government expects *collectivités locales* to play a similar proactive role in rural areas as with ADSL deployment. Fibre deployment to the home is nevertheless going to be slow at an estimated cost of USD 35.9 billion. In addition, there is weak demand for higher speeds than those attained with ADSL. Only 10% of households with access to fibre have subscribed to these services. The government aims at having 50% fibre coverage by 2017 and 100% by 2025.

France has adequate infrastructure for the development of local content on the Internet, such as root and top domain nameservers, though there are inefficiencies in Internet exchange points (IXPs). France has seven root servers and over 2 million top-level domain registrations. The *Institut National de Recherche en Informatique et en Automatique* (INRIA) administered ccTLDs until 1998. By that date, top-level domains needed a flexible management structure which a research institute could not host and the *Association Française pour le Nommage Internet en Coopération* (AFNIC) started administering ccTLDs from that date onwards. In terms of IXPs, there are 15 with a total domestic bandwidth production of 43.8 G. Despite

this positive number, 11 out of the 15 IXPs are located in Paris. This is inefficient since each time a service provider connects to an additional IXP, the costs rise accordingly.

**Mobile broadband is not accessible nationwide and prices are relatively high.** There are four operators that offer third-generation mobile broadband services: Orange, SFR, Bouygues Telecom, and Free. By the end of 2009, Orange covered 87% of the population, SFR 81% and Bouygues 80%.[195] Orange and SFR attained rates below their obligations as Orange must reach 98% of the population by end 2011 and SFR 99.3% by end 2013. The government issued a fourth third-generation licence in 2010 and only Free answered the call for tender. Free must cover 90% of the population by 2018. The penetration of third-generation mobile services is 37.7% compared to second-generation services with 61.4%. Users perceive mobile broadband prices as relatively affordable. Internet access without time or limitations ranges from USD 56 to 70 for monthly subscriptions, about 5-6% of the net minimum salary. The arrival of higher speed Long Term Evolution (LTE) networks in 2012 should contribute to improving the user experience.

***Internet content***

**Despite France's "cultural exception" to promote domestic content, external content is abundant.** France introduced the cultural exception in the General Agreement on Tariffs and Trade (GATT) negotiations in 1993. The underlying idea is that commercial exchanges can undermine cultural goods and services if these are not protected. The first debate on the cultural exception in GATT negotiations was related to audiovisual products. France could maintain both tariffs and quotas to protect its cultural market from other countries' products, most notably American production. As a result of these policies, in 2005 only 65% of films in France were American, compared to 90% in other European markets. The 'cultural exception' explains most of the protectionist measures that the French government has adopted concerning locally developed Internet content. Despite this support, orange.fr, leboncoin.fr and free.fr were the only three French websites among the top ten most visited sites in France in June 2011.

**The government of France identifies Internet content as a competitiveness cluster that fosters economic growth.** The government of France has taken many steps to raise the relevance of Internet content. In 2008, the government created a specific Ministry on the Digital Economy attached to the Ministry of Economy, Industry and Employment. The French presidency of the G8 placed Internet on the agenda of the G8 Summit for the first time. The heads of state and governments of the G8 discussed in 2011 the evolution of the Internet and its impact on both economic growth and changes in societies. Consultancy research commissioned by the French government claimed that the Internet economy accounted for a quarter of GDP growth in France in 2010. It also led to the creation of 700 000 direct jobs in 15 years.[196] In reaction to the 2008 global crisis, the government created a USD 50 billion programme in 2009, the *Grand Emprunt*, to create competitive sectors. Within this programme, the government allocated USD 3.5 billion for the development and usage of Internet content. The government has been actively supporting digital content since Plan France Numérique 2008.

**The government is supporting the digitalisation of national heritage, particularly cinema.** The *Bibliothèque National de France* (BNF) digitalised some of its collections between 2007-2011 with a USD 10 million budget but would need an additional budget of USD 215 million to complete the project. Consequently, the BNF launched a call for tender in 2011 to co-operate with private actors for the digitalisation of, among others, ancient books from 1470-1700 and the French press from 1780-1940. In addition, following a strong historic support of cinema, the government is financing the digitalisation of 10 000 films with a USD 143 million budget. The *Centre National du Cinéma* (CNC) will digitalise the first 2 500 films thanks to the *Gran Emprunt*. This first round will involve the digitalisation of films after 1929. The CNC is also putting in place a complementary project to digitalise and repair cultural heritage related to silent movies and short films.

There are local Internet sites for gaming, e-commerce and multimedia that have been very successful domestically but have struggled to grow internationally while consolidating telecommunications operators' positions. French companies such as Vivendi Games and Ubisoft are leaders in online games. The game industry in France is worth USD 4.3 billion with 430 companies and 10 000 direct jobs.[197] Serious games are an increasingly important market and are used to capture the attention of students more effectively. For instance, Ludiville is a serious game that French company KTM Advance has developed for BTS Bank.[198] The game deals with the management of a virtual bank where the player is a counselor on housing credits. KTM advance have also developed Blosson Flowers for MEA-I ONG, in which the player has the responsibility of managing a small flower business.[199] In terms of e-commerce, France has a dynamic sector with sites such as rueducommerce.com (online book market), seloger.com (online housing market), priceminister.com (first- and second-hand market) and vente-privee.com (discount market of top brands). Dailymotion.com and deezer.com offer videos and music online. Innovative solutions for mobile phones and smartphones are not so numerous. With some exceptions such as Ubisoft, local solutions are weakly internationalised and often merge or are bought out. Vente-privee.com has merged with American Express to enter the US market. Rueducommerce merged with Decitre. Japanese Rakuten bought priceminister.com. Different reactions to advertising, the presence of local actors and US competition often limit internationalisation. Furthermore, network operators increasingly buy some of these start-ups and hence enlarge their offers and consolidate their positions. For instance, Orange recently bought Dailymotion and Deezer.

The 1981 Lang law that sets a unique price for paper books was extended since mid-2011 to e-books to foster diversity by protecting editors and authors from distributors. According to the Lang law, the publisher decides a price for its book and booksellers in France are not allowed to sell the book with a discount above 5% of the fixed price. Supporters of the law say it protects small booksellers from big stores' competition. They claim the law also creates diversity since it enables editors to cross-subsidise publications with a smaller audience.[200] The new e-book law also allows editors to control user prices. In addition, editors should equitably remunerate authors. In contrast with the Lang law, the e-book law applies to distributors such as Amazon, Google and Apple in France but also in other countries. This e-book law may be against European Union (EU) legislation since the European Commission (EC) avoids all *ex-ante* regulation in emerging markets. Indeed, e-books only represent 1% of the editorial market in France.

The four-layer administrative complexity in France leads to unco-ordinated investments and weak vertical integration in the delivery of digital public services. France's main administrative layers are the state, 26 regions, 99 departments and 36 851 communes. There are however, other institutions such as the *Etablissements Publiques de Coopération Intercommunale* (EPCIs) with specific competences, for example, on water, electricity or transport, that work in parallel to these core layers. In addition, the central administration also has some territorial access points, for example, on social security and subsidies. This flows the policy of de-concentration of public services. This administrative structure has nevertheless resulted in some unco-ordinated investments in digital public access points. The region or department would usually finance digital access points in groups of communes during a limited amount of time. The groups of communes would then need to assume these costs. However, since each administrative layer can manage its budget to install digital access points, redundant investments are possible. In addition, there is weak vertical integration in the delivery of digital services with some bottom-up exceptions such as that of the tourism sector. About 4 000 *Syndicats d'Initiative* have substantial information on local heritage and cultural activities. The information is updated at departmental and regional levels and aggregated at national level. Moreover, tourism physical access points complement digital ones in reply to consumers' requests.

***Other strengths***

The government has a very active role in Internet content regulation through the Hadopi law with regard to supporting the creation of local content. France has historically provided strong support for the production of local multimedia (cinema, music) and against piracy. The government is extending this tradition from terrestrial wireless, cable and satellite platforms to the Internet. Television companies and later telecommunications operators have contributed to financing local production of multimedia in France. The government proposed the Hadopi law as a means to set new economic models that enable the existence of small local producers. Following Hadopi, the government delivers labels to those sites that respect local creation. Internet users should end up using these services once they attain a critical mass. In reaction to these policies, French Deezer is evolving from offering free services online to requesting user fees.

The government has a very active role in Internet content regulation through the Hadopi law with regard to penalising illegal downloading of films, music and other proprietary sources. The Internet community has strongly criticised Hadopi because it blocks Internet access of users who download illegal content. Some have suggested that this is against United Nations recommendations on universal access to cyberspace.[201] The European Parliament voted to add to a telecoms reform bill that any agency must first obtain permission from French courts before disconnecting violators.[202] By 2011, only 10 individuals have been pursued in justice out of the 18 million initially identified by service providers. The government engaged in a USD 4.3 million advertising plan in 2011 to raise awareness among the population on the positive aspects of the law to protect intellectual property.

**The government can filter Internet websites with child pornography, racial violence, terrorism and unregistered gambling.** Filtering in France is relatively marginal since most illegal content is controlled through regulatory measures. The government maintains that filtering would not protect France's cultural heritage since individuals can bypass this action easily and cheaply. In addition, only a judge can make the decision to block a website and filtering is limited to national boundaries. For instance, in 2000 a French judge ruled that Yahoo had to prevent French users from accessing websites fostering racial hate. Although Yahoo complied with this request on its French website, yahoo.fr, it could not apply this action to its US site due to the prevailing US regulation.[203] The government participates in several regulatory platforms to foster international co-operation on cross-country regulation.[204] On the other hand, in 2011 the government approved the Loppsi 2 law through which the state can request Internet service providers block access to child pornography. The Loppsi 2 law also empowers the government to control websites with racial violence and terrorism content. Moreover, since the 16th century the government has maintained a monopoly of lottery and sports gambling. Offshore Internet gambling companies have been challenging this monopoly since the government could only close websites hosted in France. In 2010, the government approved online gambling in compliance with EU regulation but in 2011, online gambling in French-based companies is shrinking, due to the high taxation of these services. The government tracks and closes gambling sites of unregistered companies based in France.

France has prudent policies on data privacy that prevent targeted advertising and illegal use of personal information as well as protect intellectual property rights. According to French legislation, the user must explicitly accept the collection of personal information on the Internet by third parties. The *Commission Nationale de l'Informatique et des Libertés* (CNIL) ensures that data privacy law is applied to the collection, storage and use of personal data. This entity revealed that Google's Street View car with cameras recorded Wi-Fi data for Google Street View relating to passwords, login details and e-mail exchanges without users' permission. The CNIL also claimed that Google collects personal data through smartphones connecting to the geolocation service Latitude without users' knowledge. The CNIL fined Google in France for USD 143 000. Moreover, Loppsi 2 law also protects Internet users, in particular punishing the crime of identity theft with two years of imprisonment and a USD 28 000 fine. In terms of

intellectual property, three editors, Gallimard, Flammarion et Albin Michel have demanded USD 14 million from Google for the digitalisation of 10 000 books. Google stopped the programme to digitalise past media articles in 2011 since it was claimed to be infringing on intellectual property rights.

Since 2011, the Conseil National Numérique (CNN) seeks to promote dialogue between the government and Internet actors, though the creative industry, civil society and consumers are not part of this initiative. The objective of this institution is to initiate a participative discussion with the Internet sector in order to avoid past failures in the management of some Internet matters such as Hadopi users' restrictions. The participants are mainly representatives of telecommunications operators such as Orange, Bouygues Telecom and SFR, software editors such as Syntec Numérique and Avanquest Software and content providers such as Deezer, Pages Jaunes, meetic.fr, melty.fr and aufeminin.com. The government has not included creative industries, civil society and consumers in the CNN.

Internet regulation of television and video-on-demand (VOD) seeks to foster content production in the French language but can also result in the migration of companies to other countries. The *Conseil Supérieur de l'Audiovisuel* (CSA) applies the same regulation to television and video on demand (VoD) independently of the network (terrestrial wireless, cable, satellite and Internet). In terms of television services, editors based in France must respect both European Union (EU) and French regulation. The EU seeks to foster EU production companies as a source of economic development. Companies based in the EU must dedicate 10% of their emission time to EU productions or must use 10% of their budget to support EU productions. France supports editors that promote the French language. All companies based in France must dedicate between 5-20% of their turnover, depending on their size, to finance Francophone multimedia and cinema productions. In terms of VoD, regulation by the CSA only began in March 2009 since these services did not before have sufficient economic weight. VoD companies start contributing to finance Francophone production when they reach an annual turnover of more than USD 14 million since it is an emerging market compared to television.[205] These demanding regulations for Internet television and VoD can provide incentives for companies to migrate to other EU countries. Large pan-European companies such as Euronews are nevertheless based in France.[206]

***Other challenges***

**The French government makes the claim that content providers may need to pay more to finance Internet infrastructure.**[207] Members of the *Union pour un Mouvement Populaire* (UMP) and the *Parti Socialist* (PS) are analysing Internet revenue flows and will present a proposal for a law to Parliament in September 2011. The Parliament had approved a tax on Internet advertising, known as 'google tax', in December 2010 but the Government suspended the tax soon after due to the opposition of French Internet actors. Indeed, instead of taxing large foreign corporations, the 'google tax' applied solely to French websites. The actors commercialising and consuming online music commenced discussions in mid-2011 on how to achieve a more balanced online revenue sharing as well.

Spectrum allocation in fourth-generation mobile services seeks to avoid third-generation high pricing in order to foster deployment. The government has launched a call for tender for mobile broadband Internet via LTE technology. The government is auctioning two frequency bands: 800 MHz which allows larger coverage and 2 600 GHz which enables higher capacity. The government will attribute the frequencies in early 2012 thanks to a beauty contest and a one-tour auction. For the most attractive frequency that requires less capital investment, 800 MHz, the government has set a USD 3.5 billion ceiling. This ceiling is close to the USD 3.8 billion final auction price for the same frequency band in Germany. With this ceiling the government seeks to avoid the third-generation frequency overpricing experience that led to underinvestment. In 2013-15, the government expects the selected operators to deploy fourth-generation networks.

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## Republic of Korea

### *Socio-economic context*

**Sixty years of successful economic transformation have placed Korea among the world's leading economies.** The country has evolved from a post-war economy to one of the world's fastest growing economies in 1960-90 and it remained one of the fastest growing developed countries in the 2000s. Korea's Gross Domestic Product (GDP) has evolved from just above that of Burkina Faso in 1960 to ranking 12th in the world in 2009. The country made the transition from aid recipient to aid provider in November 2009 when it became the 24th member of the OECD's Development Assistance Committee.[209]

This transition, unprecedented in the history of the OECD, was possible with the adoption of a government-led export oriented strategy based on shipbuilding, automobile manufacturing and construction and, since the 1990s, high technology. Due to this strategy, Korea became the seventh largest exporter in 2010. With this export performance and a large fiscal stimulus, the country has also achieved one of the strongest recoveries among OECD countries in the aftermath of 2008 global crisis. In addition, Korea is strongly placing its footprint on the international agenda. It has been a member of the OECD since 1996 and hosted the fifth G20 summit in 2010.

Korea's main challenge is to maintain its technological leadership and competitiveness despite having the most rapidly ageing population in the OECD area over the next 40 years. Korea, China and Japan account for 25% of global GDP. While Korea differentiates from its neighbours thanks to a high technology but middle labour cost market, competition remains fierce in the Northeast Asian market. Korea's culture of exceptionally long working hours partly explains its economic transformation. Strong labour competition however, results on very low fertility rates. Women aged between 15 and 49 have just 1.1 babies on average, the lowest rate in OECD countries.[210] This moves Korea from being the third youngest country in 2007 to the second oldest in just 40 years.[211] In addition, in 2005 more than 45% of people aged over 65 already had incomes below the OECD poverty threshold which is defined as half of median household income. This is the highest old-age poverty rate among OECD countries and well above three times the OECD average.[212] With this outlook, the government seeks to put forward policies that foster labour productivity to sustain economic growth and social cohesion in the medium term. Despite long working hours, productivity per hour worked in Korea is only half of that in the more advanced OECD countries.[213]

The sustainability of fierce labour competition thanks to inflated tertiary education will depend on the balance between higher female participation in the labour market and lower birth rates. Consistent with developed economies, primary and secondary gross enrolment and literacy rates reach over 97% of the population. Surprisingly though, tertiary gross enrolment rates also reach 98% of the population. Due to this high participation in tertiary education, many students attend private institutions at high fees, around USD 10 000 per year or study overseas. Koreans represent the third largest group of foreign students in the United States and the largest in China.[214] As a result, 58% of the population aged 25-34 has attained tertiary education compared with only 11% for those aged 55-64. This five-fold increase over a 30-year period has put Korea among the top four OECD countries in terms of tertiary attainment among the younger population.[215] In the short term, this leads to very fierce competition and to a weak female participation on the labour market. In fact, only half of Korean women with a university level education are in employment.[216] The income gap between men and women is the worst in the OECD area at almost 40%.[217] In the medium term however, very low birth rates will attenuate competition for jobs. The government seeks to tackle low labour productivity but also low labour force participation among women.

**Korea is one of the most homogeneous countries in the world, both ethnically and linguistically.** The country had a population made up almost entirely of Koreans with a strong ethnic identity. Recently though, since the Korean manufacturing industry is lacking labour force with the inflated tertiary education, the government introduced the 'industrial trainee' programme. This programme relieves this labour shortage by legally inviting less educated people with relatively low wage from Southeast Asia - Pakistani, Bangladeshi, Vietnamese, Mongol and Chinese - leading to many social problems. The Republic of Korea was established in 1948 and spent its first four decades under authoritarian rule. In 1987, after a massive protest the government enacted a democratic constitution that is still in place. All Koreans speak the Korean language, whose relationship to other languages is disputed. It may be related to Japanese or languages of the Altaic group, but it also contains many Chinese words. The Korean language was based on the Chinese alphabet until 1444 when King Sejong encouraged the creation of a simpler Korean alphabet to raise literacy rates.

### *Internet infrastructure*

**Korea is a world leader in fixed broadband infrastructure.** Korea ranks first on the number of fibre-to-the-home (FTTH) subscribers (15.1% of population), on the number of households with broadband access (94.3% of households) and on download speeds (22.6Mbps).[218] In urban areas there are typically three providers, in rural areas at least one. Even rural areas are massively connected to fixed broadband with 99.8% coverage by 2008. In addition, 10 submarine fibre optic cables are present in eight different regions in Korea.

Korea's success in fixed broadband infrastructure is due to the government's strategy, the synergy between public and private sectors, the country's geography and the population's early adoption culture. The government has set consistent policies on broadband since the Framework Law on Information Society in 1995. In addition, in early 2000s the Korean government selected IT industry as a new growth engine, investing heavily in its infrastructure as well as nurturing the IT venture firms. It led broadband investment to generate demand by providing e-government services, free Internet in all schools and electronic authentication to stimulate e-business. In addition, 10 million people have received Internet education. Moreover, the public sector has a strong influence over the private sector's behavior, which it has combined with policies to enable multi-provider competition. A new entrant, Hanaro Telecom, introduced ADSL for the first time in Korea in 1998 and the government privatised Korea Telecom in 2002. Another reason for Korea's success is related to the country's geography. Korea's population is concentrated to around 30% of the land and in addition, 82% of the population lives in urban areas, mainly in high residential buildings. Lastly, the population is highly literate and has an early adoption culture.

There is an increasing integration of services in the Korean market due to recent mergers. Currently in Korea there are 126 Internet Service Providers (ISPs) exchanging traffic locally at four Internet Exchange Points (IXPs). The Korean Internet market is very dynamic with 2 906 international connections, a domestic bandwidth production of 142 Gb and 52 ISPs connected at the largest IXP.[219] In addition, the country has three root servers and 1 million top domain registrations. Recent mergers are however, decreasing competition pressure. The market has recently consolidated with three operators, KT, SKT and LG Uplus, providing voice, mobile, Internet and IPTV services. Since 2000, the Korean Communications Commission (KCC) is annually monitoring the degree of competition in the market and as such will verify the impact of these mergers.

While fixed broadband is accessible and affordable countrywide, mobile broadband prices are high and mobile high-speed broadband still has low coverage. Monthly subscription for fixed broadband starts with around USD 35, while mobile broadband with USD 56.[220] Considering that the average income per household is approximately USD 2 800, the population argues that mobile broadband is expensive. SKT, KT and LG Uplus offer mobile broadband access to over 100% of the population. However, the government considers mobile broadband should offer very high speeds at around 20Mbps and operators are starting to deploy high-speed mobile broadband. KT has been the first company worldwide to complete its nation-wide WiBro network in March, 2011, covering 85% of the population. Both SKT and LG Uplus started commercial Long Term Evolution (LTE) services in July 2011.

### *Internet content*

**Korea was a very early developer of Internet content, though export of its solutions has been weak.** Because of the country's early deployment of broadband infrastructure, Korea has been a pioneer in the development of Internet content. Since the 1990s, Internet portals such as Naver, Daum and Nate have consolidated their position on the Korean market and since the mid-1990s, the social networking site, Cyworld, has connected people in Korea. In June 2011, these four websites were among the top 10 most visited links on the Internet in Korea. However, as an early content developer, Korea has missed a window

of opportunity to expand Internet applications to international markets, mainly because the content is in Korean. There is, nevertheless, some expansion of Internet content to Japan and China, particularly games. The impact of the expansion in China is mitigated because of cultural differences but above all, because the Chinese have copycat Korean games.

**External content is only now entering the country and remains a secondary source.** External applications such as Google, Facebook and Youtube have recently reached the Korean market. In 2011, Facebook and Twitter have already attained over 3.5 million and 3.2 million Korean users, respectively. Most users had never heard about these services before the arrival of smartphones in 2009. These external applications are also among the top 10 most visited websites in Korea although they are outperformed by local solutions due to the variety of content available in the Korean language. Another reason for the use of local content is related to the fact that the Korean population have historically remained inward looking. This is the result of a series of events including the Joesun dynasty last King's policy on closing frontiers in the 19th century, the Japanese invasion in the first half of the 20th century and the Shin To Bu Ri civil society movement in the 70s and 80s to prioritise Korean goods and services. The population tends to prefer Naver and Cyworld to Google and Facebook in the same way they prefer the fast food restaurant Lotteria to McDonalds. The increase in the use of Google, Facebook and Twitter is strongly related to large numbers of Korean emigrants.

Local content on the Internet is very rich, covering games in particular, but also user created content (UCC), e-mails, blogs, news, music and e-learning.[221] Games represent the largest online market in Korea, at USD 6.1 billion by 2009 and with a 30% annual growth rate despite the global crisis. UCC has developed in line with the technological progress in digital cameras and mobile Internet. By 2009, the most visited video site was TVPot, a UCC service of the Internet portal Daum, followed by Pandora, Youtube and Mgoon. E-mail has been the main service leading the growth of Internet portals such as Daum and Naver since 2000, only recently stagnating with the arrival of microblogs and social networking services. The blogs that are most used are those of Naver, followed by Daum, Tstory, Egloos and Yahoo. In addition to Twitter, there are some local microblogs such as me2DAY, yoZM, Conecting and Playtalk. Me2DAY already attained 1 million subscribers by 2008. Regarding news, according to the '2009 Survey on the Internet usage' 97% of Internet users aged six and over get their news from the television, but 76.4% also get it through the Internet. Online music sales increased between 2007 and 2008 by 23% to attain USD 0.5 billion. The E-learning industry total volume increased between 2007 and 2008 by 11.8% to USD 1.9 billion.

**Korea ranks first among 192 countries on e-government development and e-participation in the 2010 UN E-government survey.** The government offers very varied services online such as health and welfare information, administrative information, online civil petition, food and drug information and tax reporting. The government has also put in place a one-stop e-trade platform that allows paperless processing in trade. The length of customs processing has shortened from 23 days in 1993 to 2.9 days in 2009. Korea's e-procurement system is also an example of best practice. It allows businesses to check procurement processing such as registration, bidding, contracting and payment verification. The turnover on the e-procurement website exceeded USD 79 billion in 2009.[222]

The government has long pushed the country to become a hardware leader, and it has recently promoted applications on the Internet. The government of Korea is seeking to increase the diversification of its economy and to support service sector development. Indeed, Korea is a leader in semiconductors, display panels and mobile handsets. Korea's services sector is, however, relatively small accounting in 2008 for 60% and 67% of total value-added and employment, respectively. These are the second-lowest shares in the OECD area. There is a large growth potential in services though, since productivity is just 58% of that in Korea's manufacturing sector. In its new growth strategy in 2009, the government identified

five service sectors as new growth engines, and also identified contents and software within heath care, education, green financing and tourism.[223]

**The oligopoly over fixed Internet explains in part the weak development of innovative applications.** Web portal actors determined what the population was accessing on the Internet when desktop computers were the primary device used to access the Internet. During this period, service providers such as Naver, Daum and Nate obtained large advertising profits based on their dominance. Indeed, the three web portals together controlled over 90% of the market. They kept users in their closed systems where many services were available such as shopping, games, news, blogs and search engines, preventing small companies from entering the market. Service providers were not active on innovation and did not take large risks. Big corporations performed well on standardised production but this rigid framework was not adequate to foster innovation. Samsung, for example, created an incubator but the culture of the organisation soon revealed as inadequate for innovative creation. As a consequence, the staff working at the incubator left Samsung and started a venture company, NHN, which created Naver's search engine.

With the exception of games, e-commerce and e-banking, the proliferation of innovative applications on the Internet has been recent and largely thanks to the arrival of smartphones in 2009. The arrival of the iPhone in 2009 made it possible for creators to be in direct contact with users though applications such as App store. Newly introduced social networking sites represent a distribution channel for small venture companies. This is resulting in a paradigm shift from hardware to software competition on the Korean market. The market is no longer confined to service providers but subject to competition among applications developers including platform providers, content providers and device manufacturers. Above all, the new context allows the emergence of start-ups with innovative ideas. For instance, Ahiku offers a live broadcasting service through Twitter. Blayer enables underground musicians to promote their songs directly to audiences. South Korea's start-ups follow a similar pattern to the IT venture boom 10 years ago. Many initiatives are flourishing in the expectation that the market will grow extensively. With the rapid expansion of smartphones to 4-6 million by end 2010, the development of innovative local applications should continue to flourish.[224]

***Other strengths***

Korea is the top-performing country in digital literacy by a significant margin in the OECD's Programme for International Assessment (PISA) survey of 70 countries.[225] In order to test students' digital reading performance, the survey tests how they evaluate information on the Internet, assess its credibility and navigate web pages. In Korea, Internet usage rate for the population aged three and over is 77.2%.[226] Even at the age of 60 and over, 20.1% of the population use the Internet. The Internet usage rate for people aged 50 and over broke the 50% mark for the first time in 2009. For the population aged between 10 and 30, the rate of usage is above 98%. Male Internet usage accounts for 82.4% while female usage for 71.9%. Eight out ten people aged three or above use the Internet to get information, for leisure activities such as music and games and for communication through e-mail and messenger. Internet users aged three and over spend on average 13.9 hours per week online.

**The government of Korea has adopted an active role in protecting intellectual property rights on the Internet.** In 2009, the National Assembly adopted an approach to control copyright infringement on file sharing and on downloading movie content.[227] The amendment to Article 133 of the Copyright Law dealing with the 'collection, abandonment and deletion of illegal reproductions' authorises the Minister of Culture, Sports and Tourism to close sites that refuse to comply after more than three warnings to remove content.[228] The Minister can also close the accounts of users uploading this content. The Minister can take these punitive measures regardless of whether or not the copyright holder has made a request. The positive evolution of Internet music sales is thanks to the policy framework promoting legal distribution.

**The government seeks to suppress anonymity on the Internet to prevent abusive behaviour, though there are some privacy caveats**. Since 2003, the government has requested co-operation from the major Internet portals to develop real-name systems for their users. In 2005, the government implemented a rule that requires users who create an account with an e-mail or online chat service to provide their name, address, profession and identification number. In addition, in 2007, the government required users to register their real names and resident identification numbers before posting comments or uploading video or audio clips on the Internet.[229] The government implemented these policies in reaction to the suicide of four celebrities in 2007 and 2008 following rumours spread by the Korean Internet community. By 2007, the police had already reported 10 000 cases of online defamation. There are, however, some privacy concerns on such policies. For instance, since 2004 election laws require individuals posting comments on the Internet in support of, or in opposition to, a candidate to disclose their real names. As a result of these policies, Google disabled the features on YouTube for uploading videos and comments in the Korean language alleging lack of freedom of expression.[230]

**The government is also penalising defamation on the Internet to avoid abusive behaviour.** In 2008, the Minister of Justice introduced the crime of 'cyber defamation' to punish those who openly insult others through the Internet with up to two years' imprisonment or a USD 9 400 fine. Internet portals that fail to temporarily block online postings containing defamatory information are subject to a fine of up to USD 28 300 or can be forced to shut down. If there is a leak of personal information, the Internet portal must inform the victim and report the matter to the Korean Communications Commission.[231]

**Internet content contributes to shaping the political landscape in Korea**. For instance, Internet communications played a prominent role in 2008 protests against the resumption of imports of American beef after a five-year ban. Debates online were very intense with daily page-view counts jumping from 40 to 200 million on the Agora forum, one of the largest Internet debate bulletin boards in South Korea. The Korean Confederation of Trade Unions and the Korean Teachers' and Educational Workers Union led protests lasting 100 days against the President's administration. Protests were coupled with Internet action through the uploading of protest videos, posting of messages on protest meetings and arrests, and online debate. As a result of the combined action, the President's cabinet resigned.

***Other challenges***

The government exercises extensive content regulation as well as filtering of North Korean politically sensitive information and of socially harmful content. OpenNet Initiative 2007-08 tests show that Korea filters political and social content, specifically North Korean propaganda and information promoting the reunification of North and South Korea, as well as gambling.[232] The filtering is not very extensive since the Korean government has a very active approach on content regulation by ordering Internet hosting providers to revise their content directly. Indeed, the Korean Communications Standards Commission (KCSC) can decide upon harmful information for youth under the Juvenile Protection Act and can recommend action against Internet sites containing pornography, gambling services, violence and anti-social information, as well as support for communism and for North Korea.[233] The KSCS can block and close sites, delete messages and suspend user identifications.

**The government also carries out substantial content regulation on information related to elections on the Internet.** The National Electoral Commission (NEC) monitors and censors domestic Internet to maintain the country's ban on public advocacy of candidates prior to elections. The NEC has already removed over 100 000 election articles, comments and blogs from the Internet, and over 65 000 movies for video-sharing on the Internet.[234] The NEC began censoring the Internet in the 2000s, partly in reaction to the significant role it played in the 2002 presidential election. The NEC has two divisions on Internet regulation and censorship: the Internet Election News Deliberation Commission (IENDC),

handling news websites and the Cyber Censorship Team (CCT), monitoring personal blogs, videos and message board comments.

Due to the government's control over Internet content, some of the population tend to trust the information on social networks more than that of large web portals. Minerva is the Internet username of an individual who wrote about the Korean economy and the economic policies of the Korean government on the Agora forum between March 2008 and January 2009. Among the most famous predictions Minerva made were the collapse of Lehman Brothers and its potential consequences and the sharp decline of the South Korean currency value against the US dollar at specified times. The government arrested Minerva in 2009 for spreading false rumours on the Internet and some foreign bloggers express concerns that the government's handling of Minerva suggests a demise of freedom of speech in Korea.

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2 “Kryder’s Law”, Scientific American Magazine, August 2005 at: http://www.scientificamerican.com/article.cfm?id=kryders-law.

3 “George Soros”, Salon.com, http://dir.salon.com/story/people/bc/2001/03/27/soros/index.html.

4 Dropbox pricing is: 2GB free, 50 GB for USD 9.99/month, 100 GB for 19.99/month. SugarSync pricing is 30 GB/month for USD 4.99, 60 GB for USD 9.99, 100 GB for 14.99/month and 250 GB for USD 24.99/month) . Prices were valid as of 22 August 2011.

5 Blogger language selection page at: http://www.blogger.com/language.g

6 "5 billionth photo uploaded to Flickr", CNN, 20 September 2010, at: http://articles.cnn.com/2010-09-20/tech/flickr.5.billion_1_photo-sharing-site-flickr-facebook?_s=PM:TECH

7 "Facebook Users Uploaded A Record 750 Million Photos Over New Year's

8 YouTube 5 year facts and figures from Google press at: https://sites.google.com/a/pressatgoogle.com/youtube5year/home/5-year-metrics.

9 http://www.unesco.org/culture/languages-atlas/index.php

10 *www.un.org/millenniumgoals/*

11 As an example, Orange’s ownership structure was 26.93% by the French State in conjunction with the Fonds Stratégique d'Investissement in December 2010. *www.orange.com/en_EN/finance/stock/shareholder-structure/*.

12 OECD Council at Ministerial Level, Final Communiqué, 16 May 2002, OECD Action for a Shared Development Agenda, URL: *www.oecd.org/document/46/0,2340,en_2649_33721_2088942_1_1_1_1,00.html* (Last Access: 03 May 2012).

13 An autonomous system is essentially one distinct network that interconnects with other networks to form part of the Internet.

14 An IPv4 address is a numeric identifier for a single device connected to the Internet. Nowadays, apart from IPv4 addresses, IPv6 addresses tend to be introduced as a new way of device identification. The share of IPv6 addresses is still marginal.

15 *Broadband monthly subscription price* primarily refers to domestic price of network access, whereas *full-port price for an STM-1/OC3 connection for IP transit* captures the price of international Internet traffic from and to a given economy.

16 The following languages and corresponding countries are included: Albanian - Albania, Azerbaijani - Azerbaijan, Bahasa Indonesia - Indonesia, Bahasa Malaysia - Malaysia, Bosnian - Bosnia and Herzegovina, Bulgarian - Bulgaria, Byelorussian - Byelorussia, Croatian - Croatia, Czech - Czech Republic, Danish - Denmark, Dutch - The Netherlands, Estonian - Estonia, Farsi - Iran, Finnish - Finland, Georgian - Georgia, Greek - Greece, Hebrew - Israel, Hindi - India, Hungarian - Hungary, Icelandic - Iceland, Italian - Italy, Japanese - Japan, Korean - Korea, Latvian - Latvia, Lithuanian - Lithuania, Luxembourgian - Luxembourg, Macedonian - The Former Yugoslav Republic of Macedonia, Norwegian - Norway, Filipino - Philippines, Polish - Poland, Romanian - Romania, Russian - Russia, Serbian - Serbia, Slovak - Slovak Republic, Swedish - Sweden, Thai - Thailand, Turkish - Turkey, Ukrainian - Ukraine.

17 *www.iana.org/domains/root/db#*

18 *www.iana.org/domains/root/cctld/*

19 An illustrative analysis of use of domain names which support non-Latin scripts and multilingualism can be found in EURid (2012.)

20 This study indicated that blogs were disproportionately used by Japanese and Koreans, relative to the number of speakers of these languages. A 2010 Technorati report on the state of the blogosphere indicates that 49% of bloggers are located in the United States (relative to 25% of internet users). Thus while blogs overestimate Japanese and Korean local content in 2006, they underestimate it in 2010.

21 http://asert.arbornetworks.com/2011/06/world-ipv6-day-final-look-and-wagons-ho/

22 Full-port STM-1/OC-3; 155 Mbps.

23 App store metrics are from http://148apps.biz/app-store-metrics/?mpage=appcount on 18 August 2011.

24 "TechBytes: Apple Announces 10 Billionth iTunes Download", ABC News, 24 January 2011, at: http://abcnews.go.com/Technology/techbytes-10-billion-apps-downloaded-itunes-store-firefoxs/story?id=12745967.

25 App store metrics are from http://148apps.biz/app-store-metrics/, retrieved on 18 August 2011.

26 *www.yhmf.jp/pdf/activity/adstudies/vol_34_01_06.pdf*

27 This research was carried out at an operator internet APN, and does not include most of the browsing at WAP sites.

28 *www.egyptictindicators.gov.eg/en/pages/Publications/PublicationsDoc/ICTBriefJan2011_en.pdf*

29 *www.new.egyptictindicators.gov.eg/en/Indicators/_layouts/viewer.aspx?id=720*

30 *www.new.egyptictindicators.gov.eg/en/Publications/PublicationsDoc/mobile%20data%20service%202010%20(2).pdf*

31 Ministry of Communications and Information Technology of Egypt, 'Information and Communications Technology Indicators Bulletin' (September 2010) *www.mcit.gov.eg/Upcont/Documents/Indicators_Q3_2010.pdf*

32 TNS Research International (2010) "Digital Life 2010" *www.ict.go.ke/images/Digital%20Life%20KE-%20ICT%20report.pdf*

33 *www.bizcommunity.com/Article/220/16/48106.html*

34 *www.anatel.gov.br/Portal/exibirPortalNoticias.do?acao=carregaNoticia&codigo=21875*

35 *www.orkut.com/MembersAll*

36 *www.readwriteweb.com/archives/brazil_facebook_is_growing_fast_but_orkut_still_far_ahead.php*

37 OECD (2011).

38 OECD (2011).

39 UNESCO (2010).

40 Balancing Act (2011).

41 Note that there is still scope for wholesale price reductions since Seacom undersea cable is selling Mbps/month capacity for USD 40/50 (commercial purposes) and for USD 10 (research related, *e.g.*, National Research Education Networks (NRENs)).

42 Calandro and Moyo (2011).

43 Africa Next Investment Research (2010).

44 The main Internet service operators are the Kenya Data Network, Jamii Telkom, UUNET, AccessKenya, Wananchi online, Communication Solutions and AfricaOnline. Although the CCK has issued 127 licenses to Internet Service Providers (ISPs), only 50 are operational (Adeya *et al.*, 2010).

45 Jensen (2007).

46 Gillwald and Mureithi (2010).

47 Note that the Kenyan government limited the reduction of the cost termination rate following the complains of the dominant operator, Safaricom.

48 Stork (2011).

49 The Communications Commission of Kenya (CCK) has announced that it will monitor broadband interconnection as well.

50 Adeya *et al.* (2010).

51 Mitullah *et al.* (2011).

52 Adeya *et al.* (2010).

53 In comparison to radio, almost 50% of the population have access to television.

54 Ly and Stork (2011).

55 Nyaga (2011).

56 *www.whive.com/home.php*.

57 *www.uzanunua.com/*.

58 *www.eatout.co.ke/*.

59 *www.ushahidi.com/*.

60 *www.sasahivi.com/*.

61 *www.mobikash.com/index.php?inhalt=home*.

62 *www.tingatingatales.com/*.

63 Mitullah (2011).

64 Mitullah (2011).

65 *http://nacion.co.ke*.

66 Mitullah (2011).

67 Malila (2011).

68 Nyaga (2011).

69 Calandro and Moyo (2011).

70 Jagun and Mureithi (2011).

71 The data is available at wirelessintelligence.com.

72 The interim government has increased food subsidies, frozen the plan to phase out energy subsidies and upgraded the status of temporary government workers who have been in their posts for more than three years to permanent workers (OECD, 2011).

73 As a consequence of these large poverty rates, the government is unlikely to meet the national target of reducing poverty to 15% given the slowdown in economic growth with the global crisis and the national transition.

74 The MCIT had already launched in 2002 the Free Internet Initiative to offer subscription-free Internet services via dial-up.

75 See more detailed information at mcit.gov.eg/ProjectDetails.aspx?ProjID=2&Cat=1&SubCat=1.

76 15 governorates received a training of trainers programme. CDs are available at no charge as well.

77 See the Memory of the Arab World portal at: http://memoryarabworld.net.

78 Information on the full set of e-government initiatives is accessible at: http://mcit.gov.eg/Content.aspx?Cat=1&SubCat=4.

79 Information on the full set of e-government initiatives is accessible at: http://mcit.gov.eg/Content.aspx?Cat=1&SubCat=2#National Network for Citizen Health .

80 See the Eternal Egypt portal at http://eternalegypt.org.

81 The information is available at: http://egyptmemory.com.

82 The information is available at: http://egyptmemory.com/webapp/wcs/stores/servlet/CategoryDisplay?langId=-1&storeId=10001&catalogId=10001&categoryId=11004&top=Y&breadcrumbPage=TopCat&mainnav=Y.

83 The portal is available at: http://egyptmemory.com/webapp/wcs/stores/servlet/EMHomeView?langId=-1&storeId=10001&catalogId=10001.

84 For more information, see: http://mcit.gov.eg/Content.aspx?Cat=9.

85 For more information, see: http://yomgedid.kenanaonline.com/

86 See the Facebook page at: http://facebook.com/Egyptian.Armed.Forces?sk=app_4949752878.

87 See the Cabinet of Ministers Facebook website at: http://facebook.com/pages/Cabinet-of-Egypt/137801596242178 and Prime Minister Facebook website at: http://facebook.com/pages/Prime-Minister-of-Egypt/134901579877799.

88 The Kenana Online site is available at http://kenanaonline.com.

89 The SMEs portal builds capacity for SMEs to leverage ICT, facilitating nongovernmental organisations (NGOs) to act as business centres in different sectors and establishing links between local SMEs and the global business community. The livestock production portal enriches online Arabic content dealing with the various issues pertaining to farming, land and livestock. The Arab Internet safety portal has been created with a wealth of material on child safety issues for parents, educators, teens and children and has benefitted from the support of legislators and law enforcement entities.

90 The data is available at *http://wirelessintelligence.com*.

91 OECD (2011).

92 OECD (2011).

93 Badji Ndiaye (2010).

94 Akoh (2008).

95 OECD (2011).

96 Antinea connected Dakar with Casablanca in 1977, Fraternity connected Dakar with Abidjan in 1978. Atlantis-1 and Atlantis-2 connected Senegal with Europe and Latin America in 1982 and 2002, respectively. SAT3/WASC connected Senegal with Europe, Asia and other eight countries in Africa in 2002 (Akoh, 2008).

97 Recuero Virto (2010).

98 Ly (2010).

99 Calandro *et al.* (2010).

100 Note there is no local loop unbundling since there are only around 300 000 subscribers in Sonatel's fixed-line network.

101 Ly (2010).

102 There is an open conflict between Global Voice and Sonatel over the management of incoming communications in Senegal. Global Voice proposes that the government in Senegal manage these communications in exchange for taxing international traffic.

103 APC (2011).

104 Fall (2011).

105 Badji Ndiaye (2010).

106 Ly and Stork (2011).

107 Ly (2010).

108 Some examples of sites with a diverse range of news are: leral.net, sunuker.com, lepeuple-sn.com, sununews.com, lagazette.sn, bitimrew.net, lesoleil.sn, pressafrik.com, ferloo.com and loffice.sn. Some sites dealing with sports are: yekini.com, senesport.info/site, dakarfoot.com. Dakarmatin.com offers news on economy.

109 African Economic Outlook (2009).

110 UNNExt (2010).

111 The government already created other Ministries in the past such as the Ministry of Pedagogy, Ministry of Good Governance and Ministry of Competitiveness with unclear terms of reference and short existence.

112 CRES (2010b).

113 www.seneclic.sn/

114 *http://senegal.usaid.gov/fr/node/283.*

115 The West African Health Organisation has also recently announced a plan to digitalise health records.

116 See : blog-pulaagu.com/?p=209 (pulaagu blog), pulaagu.com/index.php?option=com_content&task=view&id=23&Itemid=44 (pulaagu origin), ndefleng.net (sérère culture), laculturesserere.blogspot.com/2007/10/apprendre-la-langue-serere.html (sérère blog), senegalaisement.com/senegal/ethnies.html (ethnic groups in Senegal).

117 nacion.co.ke.

118 Sow (2009).

119 Global Voices (2011).

120 CRES (2010b).

121 CRES (2010a).

122 The data is available at *http://wirelessintelligence.com*.

123 According to the 2010 Educational Statistics Yearbook of China, illiteracy rate among population aged 15 and above is 7.1%

124 Source: 2010 Educational Statistics Yearbook of China.

125 Source: 2010 Educational Statistics Yearbook of China.

126 There are also alternative arrangements (*e.g.* privately run universities, China radio and TV universities, part-time colleges) through which youth and adults can pursue higher education and upgrade their qualifications.

127 Source: 2010 Educational Statistics Yearbook of China.

128 Ministry of Industry and Information Technology (MIIT) of China *www.miit.gov.cn/n11293472/n11293832/n11293907/n11368223/14442585.html* and International Telecommunication Union (ITU) *www.itu.int/net/pressoffice/press_releases/2012/02.aspx*

129 This context is related to the fact that there is a monopoly in the international gateway in China Mainland.

130 National Bureau of Statistics of China, "National Economy Maintained Steady and Fast Development in the Year of 2011" *www.stats.gov.cn/was40/gjtjj_en_detail.jsp?searchword=income&channelid=9528&record=2*

131 These content categories include distortions of Chinese culture and history, disparaging depictions of revolutionary leaders, heroes, police, army or judiciary; depictions of torture, mocking depictions of catastrophe, including major natural disasters, excessively frightening images and sound effects and sexually suggestive or provocative content that leads to sexual thoughts.

132 Netease has a market value of USD 0.7 billion. Sina has over 100 million registered users.

133 CNZZ, Web Analytics in China, December 2011, *http://engine.data.cnzz.com/*

134 *http://techrice.com/2011/03/08/chinas-top-15-social-networks/*

135 OpenNet Initiative (2009).

136 *http://royal.pingdom.com/2012/01/17/internet-2011-in-numbers/*

137 These sites are: baidu.com, qq.com, sina.com.cn, taobao.com, 163.com, sohu.com, youhu.com, soso.com.

138 *http://techrice.com/2011/03/08/chinas-top-15-social-networks/*

139 CNNIC (2012)

140 OECD (2009b).

141 Brazil's mineral deposits include iron ore, bauxite, manganese, copper, tin, uranium and gold. In addition, recent discoveries of large offshore fields are boosting its oil and gas reserves.

142 EUI (2008).

143 OECD (2009b).

144 OECD (2009).

145 To illustrate, fourteen cities have a population of over 1 million.

146 EUI (2008).

147 OECD (2009b).

148 OECD (2009b).

149 CGI (2010b).

150 Information from the Brazilian Association of Internet Service Providers (ABRANET).

151 Low traffic capacity and quality are also important bottlenecks for broadband services. The Universities of Oxford and Oviedo concluded in 2008 that Brazil occupied the 38th position among 42 countries in the quality of broadband (CGPID, 2010).

152 APC (2010).

153 See *https://prefix.pch.net/applications/ixpdir/index.php?show_active_only=1&sort=country&order=asc*.

154 OECD (2011).

155 See *http://root-servers.org*.

156 See *http://cetic.br/dominios/estados.htm#sao-paulo*.

157 As of August 2011, Google showed 1 230 000 000 pages for site: .br, 164 000 000 for site: .pt (Portugal) and 2 860 000 for site: .ao (Angola). Portuguese pages in the .com domain were 1 080 000 000.

158 Information from the Brazilian Association of Internet Service Providers (ABRANET).

159 Steinhauser (2011).

160 Galperin (2009).

161 IPEA (2010).

162 APC (2010).

163 MSN Messenger is an instant messaging programme that is very popular among teenagers in Brazil.

164 Orkut is an Internet site where Brazilians keep in touch with their friends and co-workers, as well as meeting for singles and networking for business opportunities. Orkut is much more popular than Facebook. While 89.6% of users have an account in Orkut, only 57.6% have one in Facebook.

165 Residential users in the country spending an average of 13 hours 43 minutes per month in the Internet, compared to 13 hours and 21 minutes in the United States. See *http://telegeography.com/products/commsupdate/articles/2004/05/25/brazilians-spend-the-most-time-on-the-internet*.

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167 Comscore (2010).

168 CGI (2010a).

169 CGI (2010a).

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171 CGI (2010a).

172 Comscore (2009).

173 GlobeScan (2006).

174 CGI (2010a).

175 Colussi Ribeiro (2011).

176 IPEA (2010).

177 See *http://bn.br/redememoria*.

178 Face-to-face service occurred with 22% of enterprises, and telephone usage reached 11%.

179 CGI (2010b).

180 Despite these drawbacks, there should be growth in the individuals accessing public services through the Internet. Indeed, still 43% of the interviewed individuals are not aware of the e-government tools.

181 APC (2011).

182 IIPA (2011).

183 IIPA (2011).

184 The data is available at wirelessintelligence.com.

185 IMF (2011).

186 IMF (2011).

187 OECD (2011).

188 OECD (2011).

189 OECD (2010).

190 There are two years of educational distance between autochthones and first-generation immigrants. A distance of one year still remains between autochthones and second-generation immigrants.

191 France used a very large international bandwidth of 8 000 Gbps at the competitive international tariffs of USD 14 per Mb/month in 2011.

192 Satellite networks cover 100% of the territory, complementing ADSL in very low density areas.

193 ADSL accounts for 93% of fixed broadband subscriptions.

194 UMP (2011).

195 ARCEP (2009), before the market entry of Free.

196 McKinsey (2011).

197 UMP (2011).

198 For information on Ludiville, see *http://ktm-advance.com/viewProject_fr.php?id=117*.

199 For information on Blosson Flowers, see *http://ktm-advance.com/viewProject_fr.php?id=108*.

200 For instance, Hamaria Editions collection of poems.

201 UNESCO (2003).

202 OpenNet Initiative (2010).

203 OpenNet Initiative (2010).

204 Some of these platforms are the *Réseau Francophone de Régulation des Télécommunications* (FRATEL), the *Réseau des Instances de Régulation Méditerranéenne* (RIRM) and the European Platform of Regulatory Authorities (EPRA).

205 VOD does not contribute very much to production financing since companies have relatively small annual budgets of around USD 70 000.

206 *www.euronews.net/*.

207 Curien and Winston (2010).

208 The data is available at *www.wirelessintelligence.com*.

209 Jo (2011).

210 OECD (2007).

211 OECD (2009a).

212 OECD (2009a).

213 OECD (2010).

214 Jo (2011).

215 OECD (2008).

216 OECD (2007).

217 OECD (2007).

218 Jo (2011).

219 See *http://prefix.pch.net/applications/ixpdir/index.php?show_active_only=1&sort=country&order=asc*.

220 OECD (2011).

221 KCC and KISA (2010).

[222] KCC and KISA (2010).

[223] OECD (2010).

[224] KCC and KISA (2010).

[225] OECD (2009b).

[226] KCC and KISA (2010).

[227] IP World (2009).

[228] OpenNet Initiative (2010).

[229] Xinhua News Agency (2008).

[230] *http://kr.youtube.com*.

[231] OpenNet Initiative (2010).

[232] OpenNet Initiative (2010).

[233] Reporters without borders (2004).

[234] Hai-in (2007).

[235] The data is available at *http://wirelessintelligence.com*.