International Telecommunication Union

Measuring the Information Society

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Foreword

It is my pleasure to present to you the 2010 edition of *Measuring the Information Society*, which features the latest *ICT Development Index (IDI)* and *ICT Price Basket* – two benchmarking tools to monitor information society developments worldwide. This new edition of the report highlights key trends at the global, regional and national levels, showcasing top performers and identifying the main drivers of change. The report also examines the evolution of the digital divide between 2002 and 2008 and discusses price developments over the last year.

The report shows that despite the recent economic downturn, the use of ICT services, such as mobile phones and the Internet, has continued to grow worldwide. All 159 countries included in the IDI have improved their scores during the past year confirming the ongoing diffusion of ICTs and the overall transition to a global information society. The top-ranking economies continue to be primarily high-income countries from the developed world but a number of developing countries have shown strong improvements in their IDI scores and rankings between 2007 and 2008. There are large inter- and intra-regional disparities in IDI performance, especially in the Americas and Asia and the Pacific regions, reflecting the income differences in those regions. The IDI results show that although the digital divide is still significant, it is slightly shrinking, especially between those countries with very high ICT levels and those with lower levels. Moreover, high IDI growth in some developing countries illustrates that countries with low ICT levels can catch up relatively quickly, provided their ICT sectors receive adequate policy attention.

High costs of ICT services are often a major barrier to ICT uptake, in particular in low-income economies. The ICT Price Basket, which combines the price of fixed telephony, mobile cellular and fixed broadband Internet services into one measure, allows policy makers to compare the cost of ICT services across countries. It also provides a starting point for looking into ways of lowering prices – for example, by introducing or strengthening competition, by reviewing specific tariff policies and by evaluating operators' revenues and efficiency. I am encouraged to see that during the past year, ICT services have become more affordable worldwide. Among the three services examined, fixed broadband services showed the largest price fall, followed by mobile cellular and fixed telephone services. Despite these improvements, the broadband price gap between developed and developing countries remains huge and broadband access remains the single most expensive and least affordable ICT service in the developing world. Moreover, countries with the highest broadband prices are all ranked relatively low in the IDI, reinforcing the argument that the affordability of services is crucial to building an inclusive information society.

The role of ICTs in enhancing economic growth and socio-economic development is now well established. Measuring the impact of ICT uptake is therefore a critical input to ICT policy making. I am pleased to see that an increasing number of Member States collect ICT household - or demand side - data, which serve as a useful input to improve the research on ICT impact. The report shows that having Internet access at home could improve educational achievements, female labour force participation and child health. After all, it is only through the successful use of ICTs that real social and economic benefits will occur.

The main objective of *Measuring the Information Society* is to inform the ICT policy debate in ITU Member States by providing a comprehensive international performance evaluation based on quantitative indicators and benchmarks, and by identifying areas of high and low growth in ICT-related development. It is my hope that the report will be useful to policy makers, the ICT industry, market analysts and others who are monitoring global ICT developments. Governments and industry alike need to observe continuously market developments in order to assess their ICT policies and strategies and identify areas that warrant further attention.

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Executive Summary

Recent market developments

Despite the recent economic downturn, the use of Information and Communication Technology (ICT) services, such as mobile phones and the Internet, continues to grow worldwide. By the end of 2009, there were an estimated 4.6 billion mobile cellular subscriptions, corresponding to 67 per 100 inhabitants globally. Last year, mobile cellular penetration in developing countries passed the 50 per cent mark reaching an estimated 57 per 100 inhabitants at the end of 2009. Even though this remains well below the average in developed countries, where penetration exceeds 100 per cent, the rate of progress remains remarkable. Indeed, mobile cellular penetration in developing countries has more than doubled since 2005, when it stood at only 23 per cent.

Internet use has also continued to expand, albeit at a slower pace. In 2009, an estimated 26 per cent of the world's population (or 1.7 billion people) were using the Internet. In developed countries the percentage remains much higher than in the developing world where four out of five people are still excluded from the benefits of being online. China alone accounted for one-third of Internet users in the developing world. While Internet penetration in developed countries reached 64 per cent at the end of 2009, in developing countries it reached only 18 per cent (and only 14 per cent if China is excluded).

One important challenge in bringing more people online is the limited availability of fixed broadband access, which is primarily confined to Internet users in developed countries and some developing countries. More than half of fixed broadband subscribers in the developing world are in China, which overtook the United States as the largest fixed broadband market in the world in 2008. Broadband penetration rates correspond to 23 per 100 inhabitants in developed countries and only four per cent in developing countries (two per cent excluding China).

Promising developments are currently taking place in the mobile broadband sector. The introduction of high-speed mobile Internet access in an increasing number of countries will further boost the number of Internet users, particularly in the developing world. Indeed, the number of mobile broadband subscriptions has grown steadily and in 2008 surpassed those for fixed broadband. At the end of 2009, there were an estimated 640 million mobile and 490 million fixed broadband subscriptions.

The ICT Development Index (IDI)

The above indicators illustrate the trend of specific ICTs, but do not track the overall progress countries are making towards becoming information societies. A useful tool to monitor such progress is the ICT Development Index (IDI), a composite index made up of 11 indicators covering ICT access, use and skills. It has been constructed to measure the level and evolution over time of ICT developments taking into consideration the situations of both developed and developing countries.

The latest IDI results show that between 2007 and 2008, all 159 countries included in the index improved their scores, confirming the ongoing diffusion of ICTs and the overall transition to a global information society. Actual IDI scores vary little among the ten economies with the highest rankings (between 7.07 and 7.85 on a scale from 1-10), with only minor rank changes between 2007 and 2008.

The top ten 2008 IDI countries are (in order of their ranks) Sweden, Luxembourg, the Republic of Korea, Denmark, the Netherlands, Iceland, Switzerland, Japan, Norway and the United Kingdom. All but two of these countries are from Europe, the world's leading region in ICT infrastructure and services uptake. Mobile cellular penetration rates exceed 100 per cent in most European countries, and close to two out of three Europeans are using the Internet.

Overall, countries that rank towards the top of the IDI are from the developed world, whereas most of those towards the bottom of the IDI are low-income countries from the group of Least Developed Countries (LDCs).

Nevertheless, several countries - including some developing countries - have shown strong improvements in their IDI score and ranking between 2007 and 2008. Notable examples include Bahrain, Cape Verde, Greece, Macedonia, Nigeria, United Arab Emirates (UAE), and Viet Nam. While some of these countries still rank low on the IDI (e.g., Nigeria or Viet Nam), their improvements illustrate the progress these countries are making in information society developments.

A closer look at each of the three IDI sub-indices (access, use and skills) reveals that on average, between 2007 and 2008, the access and use sub-indices increased equally - unlike between 2002 and 2008 when the access sub-index grew faster. This confirms that an increasing number of countries are moving towards more intensive ICT usage, with flattening growth in the access sub-index, and increasing growth in the use sub-index, in particular as a result of growing broadband use. The skills sub-index has changed little between 2007 and 2008 as it is based on proxy indicators measuring literacy and education for which the majority of countries, especially developed countries, have already reached relatively high levels.

The top performers in the overall IDI tend to also rank highly in the IDI access and use sub-indices. Countries that have made outstanding progress in the area of ICT access (reflecting a substantial increase in fixed or mobile telephony, international Internet bandwidth or household access to the Internet and computers) include Armenia, Croatia, Estonia, Macedonia, Qatar, Romania, Saudi Arabia, St Vincent and the Grenadines and Viet Nam. The countries that made the largest improvements in the use sub-index include Bahrain, Georgia, Greece, Kazakhstan, Lao P.D.R., Luxembourg, Macao (China), Nigeria, Sweden, Singapore and UAE (reflecting a substantial increase in Internet usage, and fixed or mobile broadband uptake).

There are large inter- and intra-regional disparities in IDI performance. The differences are especially large in the Americas and Asia and the Pacific regions, reflecting the income differences in those regions. Plotting the IDI against GNI per capita confirms these patterns. While the distribution along the trend line is fairly homogenous for the CIS and Europe, the other four regions (Africa, Americas, Arab States and Asia and the Pacific) show a pattern with a cluster of lower income countries at one end combined with a few higher income countries at the other end, reflecting substantial differences in both ICT development and income levels within these regions.

Monitoring the Digital Divide

The digital divide remains high on the agenda of national and international ICT policy makers, and one of the key objectives of the IDI is to help monitor and assess the digital divide, and highlight areas for improvement.

While the IDI values are on average much higher in developed than in developing countries, growth over the past years has been equally strong and even slightly higher in developing countries. The largest differences between developed and developing countries can be seen on the ICT use sub-index, where developing countries are still far behind developed countries, in particular for the uptake of mobile and fixed broadband.

The digital divide was analysed for four groups of countries, reflecting high, upper, medium and low IDI levels, along with the evolution from 2002 to 2008. The results illustrate that the digital divide between the "high" group and each of the other three groups is shrinking and that especially the "upper" group is catching up with the "high" group. The divides between the three other groups are increasing.

The analysis shows that the digital divide is still significant, although it is slightly shrinking, especially between those countries with very high ICT levels and those with lower levels. This is partly explained by the flattening of ICT growth in the group of countries that are most advanced. At the same time, countries with reasonably high levels of ICT have made strong improvements thus increasing the gap with those towards the lower end of the scale. Given the relatively short time lag of ICT indicators compared to other development indicators, countries with low ICT levels could catch up relatively quickly, provided their ICT sectors receive adequate policy attention.

Another way of measuring differences in ICT development is provided by the time-distance methodology, which measures the number of years a country or region lags behind a benchmark country or region in terms of development indicators. The results illustrate that the gap between developed and developing countries in terms of ICT indicators is relatively small – especially compared to that for other development indicators, such as life expectancy or infant mortality rates. Indeed, in 2008, mobile cellular penetration and fixed broadband penetration in developing countries had reached the level that Sweden (ranking first in the IDI) had almost a decade earlier, and the number of Internet users per 100 inhabitants was the same as Sweden's just over 11

years earlier. In contrast, life expectancy in developing countries is lagging Sweden by 66 years, and the infant mortality in developing countries in 2007 was at the same level where Sweden stood 72 years earlier.

The ICT Price Basket

The cost of ICT services affects both ICT uptake and the use of ICTs. The ICT Price Basket, which measures the affordability of fixed and mobile telephony and fixed broadband Internet services, and the IDI are therefore closely related: lower prices may increase access and use, and higher levels of ICT uptake may reduce prices, with operators leveraging on economies of scale. Increased market liberalization and competition also tends to reduce prices, which in turn leads to higher levels of ICT uptake.

The ICT Price Basket allows policy makers to compare the cost of ICT services across countries, and provides a starting point for looking into ways of lowering prices – for example, by introducing or strengthening competition, by reviewing specific tariff policies and by evaluating operators' revenues and efficiency.

Between 2008 and 2009, the cost of ICT services has dropped in almost all of the 161 countries included in the ICT Price Basket, with an average drop of 15 per cent. Fixed broadband services showed the largest price fall (42 per cent), compared to 25 and 20 per cent in mobile cellular and fixed telephone services, respectively.

In 2009, the ICT Price Basket corresponded on average to 13 per cent of GNI per capita. The ten economies with the lowest ICT service prices relative to income are Macao (China), Hong Kong (China), Singapore, Kuwait, Luxembourg, the United States, Denmark, Norway, the United Kingdom and Iceland. Overall, people in developed countries have to spend relatively less of their income (1.5 per cent) on ICT services than people in developing countries (17.5 per cent). This shows that, with a few exceptions, ICT services tend to be more affordable in developed countries and less affordable in developing countries, especially the least developed countries (LDCs).

The IDI and the ICT Price Basket are strongly correlated: high IDI values are associated with relatively lower prices, and vice versa. Furthermore, all (41) economies with an IDI value greater than five (compared to a maximum of 7.85 achieved by Sweden) have an ICT Price Basket value that represents less than two per cent of their monthly GNI per capita. At the other end of the scale, all of the countries with an ICT Price Basket value of more than ten (i.e. relatively expensive) have IDI values below three (i.e. relatively low). This suggests that prices are only a relevant factor for ICT developments when they fall below a certain threshold, making ICT services affordable to a significant part of the population.

The analysis of the three sub-baskets highlights that prices vary considerably between countries and regions, as well as between services. In 2009, the mobile cellular sub-basket becomes the cheapest of the three sub-baskets. At 5.7 per cent of monthly GNI per capita in 2009, it lies just below the fixed telephone sub-basket (at 5.9) and well below the fixed broadband sub-basket (at 122).

The ten economies with the lowest relative prices for fixed lines are very diverse in terms of income levels, development status and geographic location. They include Iran, UAE, Belarus, Singapore, Kuwait, the Republic of Korea and the United States. The ten countries with the greatest decrease in the fixed telephone sub-basket are all low-income African countries that have relatively high fixed telephone tariffs.

The ten economies with the lowest mobile cellular sub-basket include Hong Kong (China), Norway, Denmark, Singapore and Austria. The countries with relatively low mobile cellular prices also tend to rank well on the overall ICT Price Basket and are generally high-income economies. Countries where mobile cellular tariffs dropped dramatically between 2008 and 2009 include Azerbaijan (81 per cent), Sri Lanka (67 per cent), Nepal (64 per cent), Ukraine (58 per cent) and Mexico (52 per cent).

Average mobile cellular prices vary substantially across regions, ranging from as little as 1.1 per cent of monthly income in Europe to as much as 17.7 per cent in Africa. Mobile services are relatively affordable in the CIS (representing on average 2.7 per cent of income) compared to the Americas and Asia and the Pacific (around 3 per cent) and the Arab States (4.6 per cent). Although prices are dropping somewhat faster in developed countries, the cost of mobile services still corresponds to an equivalent of 1.2 per cent of monthly income compared to 7.8 per cent in developing countries.

At 122 per cent of monthly GNI per capita, the fixed broadband sub-basket remains by far the most expensive component of the ICT Price Basket. The countries with the relatively cheapest broadband prices are almost identical to those ranked at the top of the ICT Price Basket.

They are high-income economies performing well in the IDI, such as Hong Kong (China), Singapore, Denmark, Luxembourg, the US, the UK, Switzerland and Sweden.

A regional comparison of prices for fixed broadband services highlights a striking disparity, mainly between Africa and the other regions. On average, a high-speed Internet connection represents 500 per cent of average monthly GNI per capita in Africa, making fixed broadband effectively inaccessible for most people in the region. In the Arab States and Asia and the Pacific regions, the fixed broadband sub-basket represents 71 and 46 per cent of income, respectively, compared to around ten per cent in both the Americas and CIS. At less than two per cent of average monthly income, fixed broadband services are by far the cheapest in Europe.

The broadband price gap is equally apparent between developed and developing countries (with an average price of PPP$ 28 and 190, respectively). Broadband access remains the single most expensive and least affordable service in the developing world. In 2009, there were still 28 countries where the price of the fixed broadband sub-basket exceeded the monthly GNI per capita, compared to 29 in 2008. These countries are all ranked relatively low in the IDI, reinforcing the argument that the affordability of services is crucial to building an inclusive information society.

Measuring ICT impact

One of the main objectives of the IDI is to measure the development potential of ICTs, or the extent to which countries can use ICTs to enhance growth and development, based on available capabilities and skills required to make effective use of ICTs and enhance their impact.

ICTs have a wide range of different economic effects which, directly or indirectly, can increase welfare and facilitate social and economic development. Direct effects include productivity gains resulting from the development and deployment of ICTs, and the development of new, related technologies. Indirect effects include trade creation and trade facilitation in service sectors, employment opportunities created by ICT-enabled reforms, enhanced flexibility for firms and workers; and the creation of new business models and opportunities. The possible broader socio-economic impacts have been explored less frequently. This is, at least in part, due to the data challenges involved in measuring and tracking such effects.

The report finds that ICTs can have important economic and socio-economic benefits, including those on a range of development goals. Analysis using ICT household data reveals that better educational performance has a positive statistical association with greater household Internet access, pointing to one possible channel via which the potential benefits of ICTs might occur. A statistical association was also found between the proportion of households with Internet access and female labour force participation, suggesting further potential benefits from the use of ICTs. These could occur directly or indirectly, for example by promoting gender equality, especially in the use of ICTs, and in helping women into economic activity. Indeed, available data illustrate that the differences between men and women using the Internet tend to be relatively small (less than 10 percentage points in most developing countries),

While these are preliminary indications that warrant further investigation, the analysis does point to the importance of ICT use and suggests that this is a key area to include in ICT policies that aim to build an inclusive information society. As the IDI framework itself indicates, ICT use is the second stage in ICT development. Maximizing the benefits of ICTs will depend on the use that is being made of them.

Chapter 1

Introduction

Even though economic recovery is now well under way, the recent global economic and financial crisis has not spared the ICT industry. The production of IT-related equipment has experienced reduced demand and investments. There has also been some evidence of reduced investments in planned network upgrades, and the roll-out of next generation networks (NGNs) has been delayed or abandoned as a result of financial constraints. At the same time, the industry has benefited from a series of stimulus packages introduced in several major economies – particularly OECD member countries - in response to the crisis, which included the telecommunication sector. Important government-led investments in broadband infrastructure are seen as a means to offset the negative effects of the crisis, and enhance further growth prospects, based on the recognition that ICTs are key enablers for overall economic and socio-economic development, stimulating innovation, and creating new jobs[1].

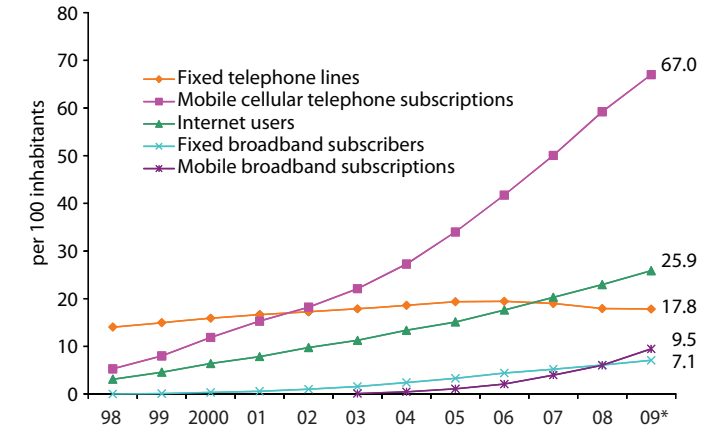
1.1 Recent market developments

Despite the recent economic downturn, the use of ICT services, such as mobile phones and the Internet, seems to have suffered little from the crisis. Indeed, ITU figures display continuous growth in ICT services uptake (Chart 1.1).[2] This is supported by continuously falling prices of devices such as computers and handsets. The steady growth of the number of mobile cellular subscriptions is striking, reaching an estimated 4.6 billion by the end of 2009 and a penetration of 67 per 100 inhabitants globally. This confirms that the demand for mobile telephony is fairly resilient, with consumers being willing to continue spending part of their disposable income on mobile services - even at times of financial constraints.

Growth in mobile telephony continues to be strongest in the developing world where there are now more than twice as many mobile subscriptions as in the developed world (3.2 billion and 1.4 billion, respectively), reflecting the relative size of these markets. China and India alone account for over 1.2 billion subscriptions (750 million and 480 million, respectively). While in 2000, developing countries accounted for around 40 per cent of total subscriptions, this share had increased to close to 70 per cent by 2009. Between 2008 and 2009, mobile cellular penetration in developing countries surpassed the 50 per cent mark to reach an estimated 57 per 100 inhabitants by the end of 2009 (Chart 1.2), while in developed countries penetration largely exceeded 100 per cent. The relatively low cost of mobile cellular services and devices will continue to drive market growth globally.

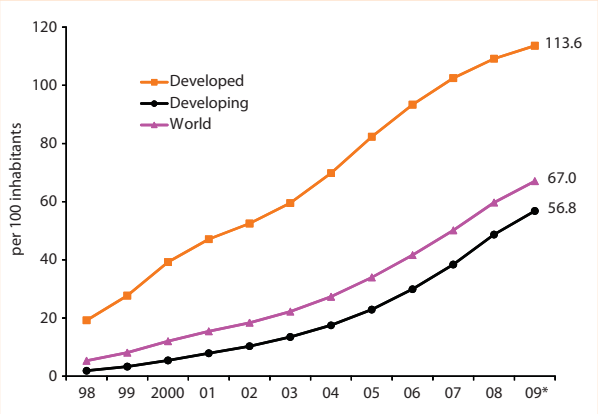
Internet use has also continued to grow albeit at a lower pace (Chart 1.3). Internet penetra-

Chart 1.1: Global ICT developments, 1998-2009



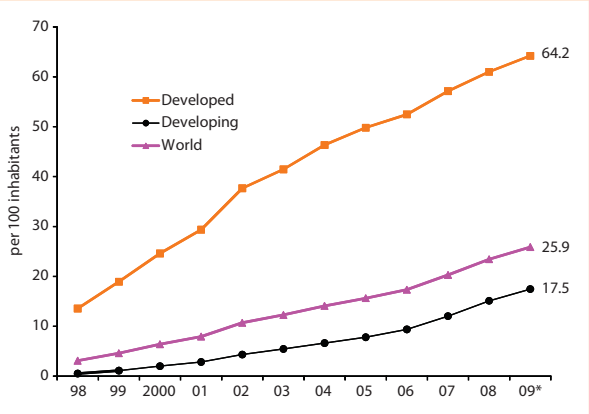
Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.2: Mobile cellular subscriptions by level of development, 1998-2009



Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.3: Internet users by level of development, 1998-2009



Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

tion rates have grown on average at around six per cent annually since 2007 in developed countries. In developing countries, average annual growth during the same time period has been strong at over 21 per cent, though much lower than the average annual growth these countries experienced between 1998 and 2009 (38 per cent). In 2009, an estimated 26 per cent of the world population (or 1.7 billion people) were using the Internet. However, in developed countries the proportion is much higher than in developing countries (64.2 and 17.5 per cent of the population, respectively). China alone accounted for one-third of Internet users in the developing world. By 2009, over 80 per cent of the population in developing countries was still excluded from the online world and its benefits.

The introduction of high-speed mobile Internet access in an increasing number of countries could further boost the number of Internet users, especially in the developing world. Indeed, the number of mobile broadband subscriptions surpassed the number of fixed broadband subscribers in 2008 (Chart 1.1). The number of mobile broadband subscriptions refers to subscriptions that have access to a high-speed mobile network. Since the number does not reflect actual usage – which is currently still difficult to measure – it must be used with caution and rather indicates a potential for Internet access.

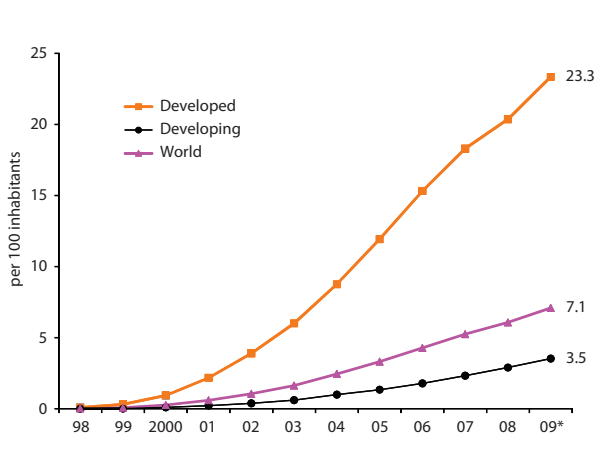
Fixed broadband access is still largely confined to Internet users in developed countries and a large and persistent broadband divide can be observed, with 23.3 per cent penetration in developed countries compared to only 3.5 per cent in developing countries in 2009 (Chart 1.4). Fixed broadband subscribers in the developing world are heavily concentrated in a few countries, with China accounting for half of the 200 million fixed broadband subscribers, having overtaken the United States as the largest fixed broadband market in the world in 2008.

The gap between developed and developing countries is even wider for mobile broadband penetration, with 38.7 and 3.0 per cent penetration, respectively (Chart 1.5). The mobile broadband market in developed countries is dominated by Europe, accounting for 220 million mobile broadband subscriptions (over one third of world total) and the highest regional penetration rate.

Mobile broadband subscriptions can be expected to increase significantly in the near future though. Indeed, as mobile broadband licenses - and the related services - will become available in more and more countries, Internet access through mobile devices will be provided to an increasing number of people. In 2009, a number of developing countries had not yet launched 3G licenses and, therefore, high-speed mobile Internet access was not available. The diffusion of this new technology will also bring about new issues for consideration, such as the cost and quality of mobile Internet services, the types of mobile applications available, and the related benefits for users.

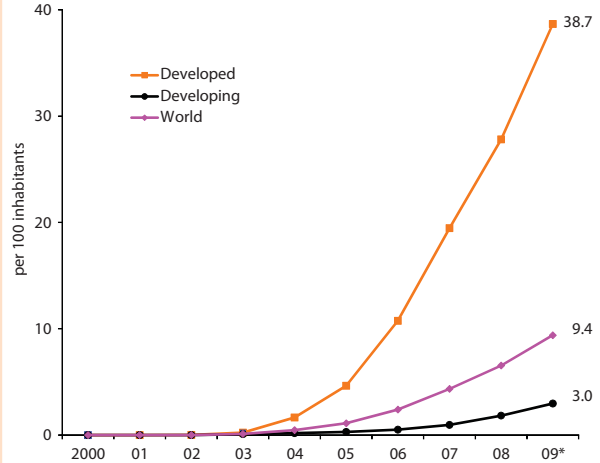
While these data on ICT infrastructure and access provide an overview of ICT market developments, they constitute only part of the story and are not sufficient to fully understand progress made by countries towards becoming information societies.

Chart 1.4: Fixed broadband subscribers by level of development, 1998-2009



Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.5: Mobile broadband subscriptions by level of development, 2000-2009



Note: * Estimates.
Source: ITU World Telecommunication/ICT Indicators database.

As infrastructure and access become more widespread, it is increasingly important to obtain more and better information about the use of ICTs and their impact on economic and social development, thus covering the demand side as well as the supply side of the market.

1.2 Main objectives and content of the report

Set against the background outlined above, the aim of this publication is to contribute to the improved measurement and monitoring of the information society at the global, regional, and national levels. It presents two key tools for benchmarking information society developments: the ICT Development Index (IDI), which includes a total of 159 countries,[3] and the ICT Price Basket, calculated for 161 countries. Both metrics were presented for the first time in the 2009 edition of *Measuring the Information Society – The ICT Development Index* (ITU, 2009b). They were developed following calls for international benchmarking expressed in the outcome documents of the World Summit on the Information Society (WSIS)[4] and the mandates calling for the development of an ICT index resulting from the ITU Plenipotentiary Conference[5] and the World Telecommunication Development Conference,[6] both held in 2006.

The IDI combines 11 indicators related to ICT access, use and skills into a single composite index. The ICT Price Basket is made up of three sub-baskets, measuring fixed telephone, mobile cellular and fixed broadband Internet service prices. The ICT Price Basket value is presented as a percentage of income; it thus measures the relative cost, or affordability, of ICT services in a country. This new edition of the report compares 2007 and 2008 data for the IDI, and 2008 and 2009 data for the ICT Price Basket. It highlights key developments at the global, regional and national levels, showcasing top performers and identifying the main drivers of change. The report also examines the evolution of the digital divide between 2002 and 2008.

The main objective of the report is to inform the ICT policy debate in ITU Member States by providing quantitative performance indicators and benchmarks, and by identifying areas of high and low growth in ICT-related development. This will allow policy makers to assess their national ICT policies and strategies and identify areas that warrant further attention.

The data presented in this report are collected by ITU from its Member States and through online research. They were complemented by data obtained from the UNESCO Institute for Statistics (UIS) for the indicators included in the IDI sub-index skills; population data from the UN Population Division, and GNI data and PPP conversion factors from the World Bank.

The report is structured as follows:

Having given the background and context of the report in Chapter 1, **Chapter 2** presents and discusses the results of the IDI for 159 countries for 2007 and 2008. It also briefly recalls the methodology used to construct

the IDI. The chapter highlights top performers, as well as the most dynamic countries in terms of IDI rank and value change. The analysis is first presented at the global level, for the IDI as well as its three sub-indices (access, use and skills), to compare changes in the different stages of ICT development. It then discusses the IDI results for six regions.[7]

Chapter 3 analyses the evolution of the digital divide. Monitoring of the digital divide is essential for policy debate at both the international and national levels. It is also required to track progress towards achieving international development goals, such as the WSIS targets and the Millennium Development Goals.[8] The chapter therefore applies the IDI results to monitor the evolution of the digital divide between 2002 and 2008, based on the methodology developed by Orbicom (2003). The chapter also introduces the concept of time-distance, which measures the number of years that a country or region lags behind a chosen benchmark country or region in terms of different ICT- or other development-related indicators.

Chapter 4 presents the results of the 2009 ICT Price Basket, which monitors the cost of ICT services, for 161 countries. As data are now available for 2008 and 2009, price changes that have taken place over the past year are also analysed. This corresponds to the main objective of the ICT Price Basket: to provide policy makers with a tool to monitor the cost of ICT services over time. The results of the ICT Price Basket are presented at the global and regional levels, for the ICT Price Basket, as well as for each of the three sub-baskets (fixed telephone line, mobile cellular, fixed broadband Internet).

One of the main objectives of the IDI is to measure the development potential of ICTs, or the extent to which countries can use ICTs to enhance growth and development, based on available capabilities and skills to make effective use of ICTs and increase impact. **Chapter 5** provides an overview of the current status of the debate on ICT impact measurement. It also analyses some of the socio-economic impacts of one of the key indicators included in the IDI, namely households with access to the Internet, using recent ITU data obtained from countries' household surveys. The chapter highlights the importance of ICT use to further inform policy makers and help identify key policies and programmes for building an inclusive information society.

Endnotes

1 ITU (2009a), OECD (2009a); see chapter 5 of this report for discussion on the impact of ICTs on growth.

2 Figures for 2009 are estimates based on available data as of September 2009.

3 The terms "country" and "economy" are used interchangeably in this publication.

4 See Geneva Plan of Action, paragraph 28 (http://www.itu.int/wsis/docs/geneva/official/poa.html) and Tunis Agenda, paragraphs 113-119 (http://www.itu.int/wsis/docs2/tunis/off/6rev1.html).

5 ITU PP-06, resolution 131.

6 ITU WTDC-06, resolution 8.

7 Africa, Americas, Arab States, Asia and the Pacific, CIS (Commonwealth of Independent States), and Europe.

8 See paragraph B6 of the Geneva Plan of Action (http://www.itu.int/wsis/docs/geneva/official/poa.html) as well as the target 8F of the Millennium Development Goals, at http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm.

Chapter 2

The ICT Development Index (IDI)

2.1 Introduction

The ICT Development Index (IDI) was presented for the first time in the 2009 edition of *Measuring the Information Society* (ITU, 2009b). This section briefly recalls the main objectives, conceptual framework and methodology of the IDI.[1]

The main objectives of the IDI are to measure:

- The *level and evolution over time* of ICT developments in countries and relative to other countries.
- Progress in ICT development in *both developed and developing countries:* the index should be global and reflect changes taking place in countries at different levels of ICT development.
- The *digital divide*, i.e. differences between countries with different levels of ICT development.
- The *development potential* of ICTs or the extent to which countries can make use of ICTs to enhance growth and development, based on available capabilities and skills.

Conceptual framework

The recognition that ICTs can be a development enabler, if applied and used appropriately, is critical to countries that are moving towards information or knowledge-based societies and is central to the IDI's conceptual framework. The ICT development process, and a country's transformation to becoming an information society, can be described using the following three-stage model:

- stage 1: ICT readiness (reflecting the level of networked infrastructure and access to ICTs);
- stage 2: ICT intensity (reflecting the level of use of ICTs in the society);
- stage 3: ICT impact (reflecting the result/outcome of efficient and effective ICT use).

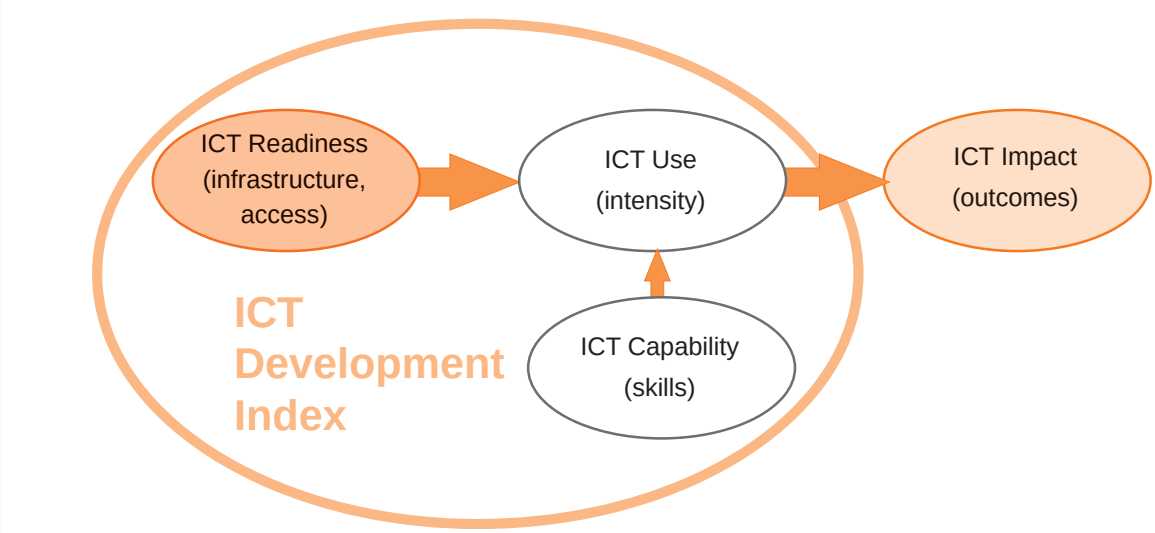
Moving through these three stages depends on the combination of three components: ICT infrastructure/access (stage 1), ICT intensity/ use (stage 2), and ICT skills. Accordingly, the first two stages are reflected in the first two components of the IDI. Reaching the final stage, and maximising the impact of ICTs, crucially depends on the third component: skills (Figure 2.1). Indeed, ICT skills determine the effective use that is made of ICTs and are critical to maximizing the potential impact of ICTs on socio-economic development. Economic growth and development will remain below potential if economies are not capable of exploiting new technologies and realizing their benefits. Therefore the IDI includes a measure of the capability to use ICTs effectively.

A single indicator cannot track progress in these three components of the ICT development process, thus requiring the construction of a composite index such as the IDI.

Based on this conceptual framework, the IDI is divided into the following three sub-indices:

- *Access sub-index:* captures ICT readiness and includes five infrastructure and access indicators (fixed telephony, mobile telephony, international Internet bandwidth, households with computers, and households with Internet).
- *Use sub-index:* captures ICT intensity and includes three ICT intensity and usage indicators (Internet users, fixed broadband, and mobile broadband).

Figure 2.1: Three stages in the evolution towards an information society



Source: ITU.

- *Skills sub-index:* captures ICT capability or skills as indispensable input indicators and includes three proxy indicators (adult literacy, gross secondary and tertiary enrolment). The skills sub-index therefore has less weight in the computation of the IDI compared to the other two sub-indices.

The IDI aims to capture the evolution of the information society as it goes through its different stages of development, taking into consideration technology convergence and the emergence of new technologies. The choice of indicators included in each of the three sub-indices reflects that particular stage. Therefore, the indicators in each sub-index may change over time to reflect technological developments related to ICTs, and as more and better data become available. For example, what is considered basic infrastructure today – such as fixed lines – may not be as relevant in the future in light of increasing fixed-mobile substitution. Similarly, broadband is currently considered an advanced technology, characterizing intense Internet use and is, therefore, included in stage 2 (use sub-index). However, in the future it may become essential and move to stage 1 (access sub-index), while another, new technology may appear in stage 2.[2]

Methodology

The IDI is a composite index made up of three sub-indices, including 11 indicators (Figure 2.2). A detailed definition of each indicator is provided in Annex 1.

The selection of the indicators was based on:[3]

- Data availability and quality. This is one of the main factors guiding the selection of the indicators to be included, especially since data are required for a large number of countries, as the IDI is a global index, and because of the relative paucity of ICT-related data, especially at the household level, in the majority of developing countries (Box 2.1). In particular, the three indicators included in the skills sub-index should be considered as proxies until data directly relating to ICT skills become available for more countries.[4]

- The results of various statistical analyses. The statistical associations between various indicators were examined, and principal components analysis (PCA) was used to examine the underlying nature of the data and to explore whether the different dimensions are statistically well-balanced.

- The relevance of a particular indicator for contributing to the main objectives and conceptual framework of the IDI. For example, the selection of indicators should be relevant to both developed and developing countries, and should reflect – as much as possible - the framework's three components described above.

- The recommendations made by experts and participants at the 6th World Telecommunication/

Box: 2.1: Improving data quality through household ICT statistics

More and more countries are collecting ICT data through official household surveys in order to avoid the limitations of supply-side data collected from operators.

Take the example of mobile cellular subscriptions. The 100 per cent mark has been surpassed by an increasing number of countries since 2002, and by the end of 2008, several countries had even surpassed the 200 per cent mark. However, the number of subscriptions is not identical to the number of subscribers, and differences are even greater compared to the number of users of mobile cellular services. For example, the average mobile subscription penetration in the European Union (EU) is 121 per cent, whereas mobile user penetration is 87 per cent (2008). Moreover, the difference between subscriptions and users is not consistent across EU countries (for example, in Norway subscription penetration is 110 and user penetration 98 per 100 inhabitants; in Lithuania, the corresponding figures are 151 and 89). While the number of mobile cellular subscriptions is an indication of the size of the mobile market, there are a number of shortcomings in the data.

The principal reasons for discrepancies between the number of mobile cellular subscribers, subscriptions, and the number of mobile users are:

- The double counting of subscribers, which occurs when one person owns multiple SIM cards, for example one for private and another for professional purposes. High mobile termination rates, which affect the price of calls from one network to another, may constitute another reason for owning multiple SIM cards. Indeed, if it is expensive to call a number on a different network, it might be more advantageous to simply buy another SIM card from another operator to avoid the interconnection charge, and to benefit from cheaper on-net calls.
- The sharing of a mobile phone among several people, as may be the case in developing countries or certain households. In this case there would be only one subscriber or subscription counted for multiple users.
- While more and more countries are trying to distinguish between active and non-active subscriptions, inactive accounts remain a data challenge. Ideally, non-active prepaid subscriptions (for example three months after a service has last been used) should not be counted.
- Foreign visitors. A number of countries have large numbers of foreigners and visitors who may subscribe to mobile cellular services in the country. The impact on the penetration rate will be particularly significant in small countries (such as Luxembourg) or in countries, where visitors make up a large percentage of the population base, as for example in the UAE.

While these data issues are particularly flagrant in the case of mobile cellular services, similar problems affect other indicators included in the IDI that are not collected through household surveys. For example, it is not clear how many of the number of fixed telephone lines and fixed broadband subscribers are used by businesses and how many are used by individuals. These data issues make international comparisons difficult and prevent policy makers from truly assessing the development of the information society.

ICT data collected through household surveys are not affected by these shortcomings. They provide information on the actual use of ICTs. They may also be broken down by characteristics such as age, income levels and gender, providing more in-depth information for analysis.

ITU is actively encouraging more countries to collect ICT data through household surveys[6], offering training courses and technical guidebooks. At the international level, ITU collects household ICT data from National Statistical Offices and harmonizes them for international comparisons. It is expected that as more household ICT data will become available over time, these will be included in the IDI and replace some of the supply side indicators.

ICT Indicators Meeting (2007) and in the online "single index" forum subsequently established.[5]

The IDI was computed using the same methodology as in the 2009 publication,[7] applying the following steps (Figure 2.2 and Annex 1):[8]

- *Preparation of the complete data set.* This step includes filling in missing values using various statistical techniques.
- *Normalization of data.* This is necessary to transform the values of the IDI indicators into the same unit of measurement. The chosen normalization method was the distance to a reference measure (or goalpost). The reference values were either 100 or obtained through a statistical procedure.
- *Rescaling of data.* The data were rescaled on a scale from 1-10 in order to compare the values of the indicators and the sub-indices.

Figure 2.2: ICT Development Index: indicators and weights

ICT access	Ref. Value	(%)
1. Fixed telephone lines per 100 inhabitants	60	20
2. Mobile cellular telephone subscriptions per 100 inhabitants	170	20
3. International Internet bandwidth (bit/s) per Internet user	100'000*	20
4. Proportion of households with a computer	100	20
5. Proportion of households with Internet access at home	100	20

40

ICT use	Ref. Value	(%)
6. Internet users per 100 inhabitants	100	33
7. Fixed broadband Internet subscribers per 100 inhabitants	60	33
8. Mobile broadband subscriptions per 100 inhabitants	100	33

40

ICT skills	Ref. Value	(%)
9. Adult literacy rate	100	33
10. Secondary gross enrolment ratio	100	33
11. Tertiary gross enrolment ratio	100	33

20

ICT Development Index

Note: * This corresponds to a log value of 5, which was used in the normalization step.
Source: ITU.

- *Weighting of indicators and sub-indices*. The indicator weights were chosen based on the PCA results. The access and use sub-indices were given equal weight (40 per cent each). The skills sub-index was given less weight (20 per cent) since it is based on proxy indicators.

This chapter presents the IDI results for 2007 and 2008. It should be noted that some of the 2007 IDI results have changed from those published in the previous edition of this report as a result of country data revisions, updates of the population data from the UN Population Division, and because five more countries are included in the updated IDI (159 compared to 154 in last year's edition).

Section 2.2 presents the IDI results at the global level. It highlights some of the top performers, as well as the most dynamic countries in terms of changes in the IDI value and rank. It also looks at the relationship between a country's IDI score and its income level.

Section 2.3 analyses the three sub-indices (access, use and skills), providing additional insights into areas of high/low ICT growth, in order to identify areas requiring further attention from policy makers and investors.

Finally, section 2.4 presents a regional analysis of the IDI. It shows IDI results for six geographic regions (Africa, Americas, Arab States, Asia and the Pacific, CIS and Europe), as well as a comparative analysis of the six regions. The analysis builds on the ITU regional statistical reports published in 2009 at the occasion of the six regional preparatory meetings for the World Telecommunication Development Conference (WTDC) 2010.[9]

2.2 Global IDI analysis

Overall results

The 2007[10] and 2008 IDI results for the 159 countries included in the index, ranked by the 2008 IDI values, are shown in Table 2.2. All countries improved their IDI scores, confirming the ongoing diffusion of ICTs and the overall transition to a global information society.

The average values of the IDI and its three sub-indices increased between 2007 and 2008 (Table 2.1).[11] The access and use sub-indices increased equally, unlike between 2002 and 2008 when the access sub-index grew faster. This corresponds to the sequential model upon which the IDI is based, whereby countries move from stage 1 (readiness) to stage 2 (intensity and usage) before reaching stage 3 (impact). An increasing number of countries are moving from stage 1 to stage 2, with flattening growth in the access sub-index, and increasing growth in the use sub-index, in particular as a result of the increase in broadband access and use in many countries. The skills sub-index has changed little between 2007 and 2008 as it is based on proxy indicators related to literacy and education for which the majority of countries, especially developed countries, have already reached relatively high levels.

Selected top IDI countries

As in the previous year, all top ten countries are from Europe, with the exception of the Republic of Korea and Japan, ranked 3rd and 8th respectively. The European region is a world leader in ICT infrastructure and services uptake (ITU, 2009b). Internet usage and fixed and mobile broadband uptake have increased significantly over the past few years. By the end of 2008, the European market, representing around ten per cent of the global population, accounted for more than 18 per cent of the world's mobile cellular subscriptions, 21 per cent of fixed telephone lines, 22 per cent of Internet users, 31 per cent of fixed broadband subscribers, and 34 per cent of mobile broadband subscriptions. Mobile cellular penetration rates exceed 100 per cent in most European countries, and close to two out of three Europeans are using the Internet (see section 2.4 on the regional analysis).

Among the top ten IDI countries, actual IDI scores vary little (between 7.07 and 7.85), with only some minor changes in the ranking between 2007 and 2008. The performance of selected top countries is highlighted below.

Sweden continues to top the IDI ranking in 2008, as it did in 2007. The country ranks high in each of the three sub-indices. Its levels of household computer and Internet access are particularly high, and Internet user penetration is around 88 per cent – surpassed only by Iceland. In addition to achieving the highest level of the IDI, Sweden is also among the ten countries that experienced the largest value increases (Chart 2.1). Sweden is likely to remain a leader in ICT development with, for example, Swedish operator TeliaSonera being the first worldwide to launch commercial 4G services in Sweden and Norway in December 2009.[13]

Luxembourg moved up four places in the IDI ranking to second place in 2008 - a significant improvement given the short time period (one year) and the already high IDI values of countries at the top of the list. It is also among the ten countries with the largest IDI value increases between 2007 and 2008 (Chart 2.1). Luxembourg ranks second and first in the ICT access and use sub-indices, respectively, with the highest levels of international Internet bandwidth per user and mobile broadband subscriptions, as well as very high levels of households with ICTs (Box 2.2).

Table 2.1: IDI changes, 2007-2008

	IDI 2007*		IDI 2008*		Change in average value* 2007-2008	Change in average value* 2002-2008[12]
	Average value	Range	Average value	Range		
IDI	3.32	0.73 – 7.27	3.58	0.79 – 7.85	0.26	1.16
Access sub-index	3.76	0.86 – 8.68	4.07	0.89 – 8.82	0.31	1.49
Use sub-index	1.39	0.01 – 5.89	1.70	0.01 – 7.09	0.31	1.18
Skills sub-index	6.30	1.34 – 9.75	6.37	1.36 – 9.84	0.07	0.47

Note: * Simple averages.
Source: ITU.

Table 2.2: ICT Development Index (IDI), 2008 and 2007

Economy	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Economy	Rank 2008	IDI 2008	Rank 2007	IDI 2007
Sweden	1	7.85	1	7.27	Azerbaijan	81	3.18	82	2.77
Luxembourg	2	7.71	6	6.98	Lebanon	82	3.17	78	3.02
Korea (Rep.)	3	7.68	2	7.23	Albania	83	3.12	84	2.74
Denmark	4	7.53	3	7.18	Iran (I.R.)	84	3.08	86	2.73
Netherlands	5	7.37	5	7.06	Tunisia	85	3.06	83	2.74
Iceland	6	7.23	4	7.06	Viet Nam	86	3.05	93	2.61
Switzerland	7	7.19	8	6.83	Ecuador	87	2.95	85	2.73
Japan	8	7.12	7	6.89	Armenia	88	2.94	89	2.66
Norway	9	7.11	9	6.78	Dominican Rep.	89	2.91	87	2.73
United Kingdom	10	7.07	12	6.70	Philippines	90	2.87	95	2.61
Hong Kong, China	11	7.04	10	6.78	Fiji	91	2.81	88	2.69
Finland	12	7.02	11	6.70	South Africa	92	2.79	91	2.64
Germany	13	6.95	13	6.60	Syria	93	2.76	90	2.65
Singapore	14	6.95	15	6.47	Paraguay	94	2.75	98	2.46
Australia	15	6.90	14	6.51	Mongolia	95	2.71	94	2.61
New Zealand	16	6.81	16	6.38	Egypt	96	2.70	100	2.44
Austria	17	6.72	19	6.25	Morocco	97	2.68	103	2.33
France	18	6.55	22	6.09	Cuba	98	2.66	92	2.62
United States	19	6.54	17	6.33	Kyrgyzstan	99	2.65	96	2.52
Ireland	20	6.52	20	6.14	Algeria	100	2.65	97	2.47
Canada	21	6.49	18	6.30	Bolivia	101	2.62	101	2.39
Estonia	22	6.41	25	5.86	Cape Verde	102	2.62	107	2.27
Belgium	23	6.36	21	6.10	El Salvador	103	2.61	99	2.45
Macao, China	24	6.29	28	5.73	Guatemala	104	2.53	102	2.35
Spain	25	6.27	26	5.84	Sri Lanka	105	2.51	104	2.32
Slovenia	26	6.26	27	5.77	Honduras	106	2.50	105	2.32
Israel	27	6.19	23	5.93	Indonesia	107	2.46	108	2.15
Italy	28	6.15	24	5.91	Turkmenistan	108	2.38	106	2.27
United Arab Emirates	29	6.11	33	5.20	Botswana	109	2.30	110	2.08
Greece	30	6.03	31	5.28	Uzbekistan	110	2.25	113	2.06
Malta	31	5.82	29	5.48	Tajikistan	111	2.25	109	2.11
Portugal	32	5.77	30	5.32	Nicaragua	112	2.18	112	2.08
Bahrain	33	5.67	35	4.95	Gabon	113	2.16	111	2.08
Hungary	34	5.64	34	5.18	Namibia	114	2.04	114	1.95
Lithuania	35	5.55	32	5.22	Swaziland	115	1.90	115	1.78
Croatia	36	5.53	37	4.95	Ghana	116	1.75	119	1.54
Czech Republic	37	5.45	39	4.92	India	117	1.75	116	1.62
Slovak Republic	38	5.38	41	4.86	Lao P.D.R.	118	1.74	117	1.60
Cyprus	39	5.37	40	4.91	Myanmar	119	1.71	118	1.60
Poland	40	5.29	36	4.95	Cambodia	120	1.70	120	1.53
Latvia	41	5.28	38	4.95	Kenya	121	1.69	121	1.52
Brunei Darussalam	42	5.07	42	4.77	Nigeria	122	1.65	134	1.36
Bulgaria	43	4.87	43	4.42	Bhutan	123	1.62	124	1.48
Romania	44	4.73	48	4.11	Gambia	124	1.62	123	1.50
Qatar	45	4.68	45	4.25	Djibouti	125	1.57	125	1.48
St. Vincent and the Grenadines	46	4.59	49	4.10	Mauritania	126	1.57	128	1.43
Montenegro	47	4.57	44	4.36	Sudan	127	1.57	122	1.50
Russia	48	4.54	46	4.13	Pakistan	128	1.54	127	1.45
Argentina	49	4.38	47	4.13	Yemen	129	1.52	126	1.48
Uruguay	50	4.34	51	3.96	Zimbabwe	130	1.51	129	1.43
TFYR Macedonia	51	4.32	63	3.40	Senegal	131	1.49	136	1.34
Saudi Arabia	52	4.24	54	3.76	Congo	132	1.48	135	1.36
Serbia	53	4.23	52	3.85	Lesotho	133	1.46	131	1.40
Chile	54	4.20	50	3.99	Comoros	134	1.46	130	1.41
Belarus	55	4.07	53	3.77	Côte d'Ivoire	135	1.45	133	1.37
Malaysia	56	3.96	55	3.66	Zambia	136	1.42	142	1.26
Turkey	57	3.90	56	3.63	Bangladesh	137	1.41	137	1.34
Ukraine	58	3.87	58	3.56	Cameroon	138	1.40	132	1.37
Trinidad & Tobago	59	3.83	57	3.61	Angola	139	1.40	138	1.31
Brazil	60	3.81	61	3.49	Togo	140	1.36	140	1.27
Venezuela	61	3.67	66	3.33	Benin	141	1.35	146	1.20
Panama	62	3.66	64	3.39	Nepal	142	1.34	141	1.27
Colombia	63	3.65	69	3.27	Haiti	143	1.31	143	1.24
Bosnia and Herzegovina	64	3.65	65	3.38	Madagascar	144	1.31	139	1.27
Kuwait	65	3.64	59	3.54	Uganda	145	1.30	144	1.21
Seychelles	66	3.64	62	3.44	Malawi	146	1.28	145	1.20
Jamaica	67	3.54	60	3.52	Mali	147	1.19	149	1.08
Maldives	68	3.54	72	3.11	Rwanda	148	1.19	148	1.11
Kazakhstan	69	3.47	70	3.17	Tanzania	149	1.17	151	1.05
Costa Rica	70	3.46	67	3.31	Congo (Dem. Rep.)	150	1.16	147	1.13
Oman	71	3.45	71	3.17	Papua New Guinea	151	1.08	150	1.06
Mauritius	72	3.44	68	3.30	Eritrea	152	1.08	152	1.03
Moldova	73	3.37	73	3.11	Mozambique	153	1.05	154	0.97
Jordan	74	3.33	79	2.98	Ethiopia	154	1.03	153	0.97
Peru	75	3.27	74	3.03	Burkina Faso	155	0.98	155	0.93
Thailand	76	3.27	75	3.03	Guinea-Bissau	156	0.97	156	0.88
Mexico	77	3.25	76	3.03	Guinea	157	0.93	158	0.85
Libya	78	3.24	80	2.92	Niger	158	0.90	157	0.86
China	79	3.23	77	3.03	Chad	159	0.79	159	0.73
Georgia	80	3.22	81	2.87					

Source: ITU.

Box 2.2: Geography and demographics facilitate high ICT uptake in Luxembourg

Luxembourg ranks second in the 2008 IDI, mainly as a result of high mobile cellular penetration (147 per cent), mobile broadband penetration (82.6 per cent), and international Internet bandwidth per user (over nine million bit/s/user), ranking first globally in the latter two indicators. However, Luxembourg is a small country with an atypical geographic situation and demographic composition, which contribute to its high penetration rates.

The country, which borders Belgium, Germany and France, has a land area of approximately 2'586 square kilometres (less than twice the size of London in the UK) and a population of less than half a million people. This makes it easier to roll out infrastructure and provide citizens with access to ICTs. At the same time, Luxembourg has a much larger population during the day. Cross-border workers constitute over 40 per cent of private sector workers and represent about 30 per cent of the country's population. While they are not counted in the population figure,[14] many of them subscribe to mobile services in Luxembourg and are therefore counted in both the mobile cellular and mobile broadband subscription data.[15] This particularity of Luxembourg also increases the 'International Internet bandwidth per user' data which takes only into account Internet users living in the country. Additionally, Luxembourg has a very high ratio of enterprises per inhabitants,[16] which increases the bandwidth requirements of the country.

The country is also doing very well in the area of household ICT access and use. Luxembourg ranks in the top ten worldwide for the percentage of both households with a computer and households with Internet access. Household data are not affected by demographic particularities, such as cross-border workers in Luxembourg, highlighting the importance for countries to collect household ICT statistics.

The **Republic of Korea** lost one place, moving to third place in 2008, mainly because of a relative loss in rank in the ICT access sub-index. For example, as most mobile cellular subscriptions in Korea are post-paid, the double-SIM card effect is relatively small compared to other countries (Box 2.3), and its penetration rate remains below 100 per cent. However, Korea has the highest level of households with Internet access (including via mobile networks), and tops the skills sub-index.

Box 2.3: The limits of international data – the cases of the Republic of Korea and Japan

The Republic of Korea is an ICT leader in a number of ways. Some 95 per cent of Korean homes have a broadband Internet connection - by far the highest percentage worldwide. The country also has the highest proportion of households with fibre optic connections, a technology that is essential for supporting the next generation of ultra-high speed applications (ITU, 2008). Korea has a strong domestic ICT industry with a number of large ICT manufacturers and operators, including Samsung, LG, KT, Hanaro Telecom and LG Telecom.

Other factors that contribute to the country's strong performance include high educational levels, government awareness and support for ICT projects as well as an "ICT culture": Koreans are known to be ICT savvy and eager to adopt new technologies. The country was one of the first worldwide to adopt mobile broadband third generation technologies and by the end of 2008 the country had over 35 million mobile broadband subscriptions for a population of about 49 million people.

However, when it comes to mobile cellular subscriptions, the Republic of Korea remains behind other countries. By the end of 2008, Korea had a mobile penetration of 95 per cent, which is relatively low in international comparisons since many other countries, including developing countries, have surpassed the 100 per cent mark. This is largely due to the fact that Korea has very few prepaid subscriptions (prepaid services are generally reserved for tourists and visitors) and therefore multiple SIM cards are rare (see also Box 2.1).

'International Internet bandwidth per user' is another indicator where the performance of the Republic of Korea is relatively weak (ranked 58th globally). International bandwidth is low since Korean Internet users rely mainly on national bandwidth, available abundantly and at relatively low cost. Koreans have produced a large amount of national Internet content in local language and surf 'at home' (on web sites that are hosted within the country, not abroad), in their local language. The top twenty most popular Korean websites are all hosted in Korea.[17] Few Koreans visit websites abroad due to language constraints.

A similar situation is found in Japan, which ranks low in terms of international Internet bandwidth but which has a large amount of local content. Although they are important, indicators related to national bandwidth and local content are not included in the IDI due to lack of data for the large majority of countries. While including data on international Internet bandwidth penalizes certain countries, such as the Republic of Korea and Japan, it is an essential indicator for measuring ICT-related developments.

Iceland moved down two positions, ranked sixth in the 2008 IDI. Iceland has very high ICT access values, in particular for households with computer and Internet. As a result, the country has one of the highest numbers of Internet users per inhabitant. However, broadband is still limited, and mobile broadband services were launched relatively late so that the country ranks low in terms of mobile broadband subscriptions.

Japan dropped one place, ranked eighth in 2008. Although the country improved on all of its sub-indices, some other top IDI countries outperformed it in both ICT access and use. This is partly due to the number of mobile cellular subscriptions. As in the Republic of Korea (Box 2.3), most cellular subscriptions in Japan are post-paid and therefore few users have more than one SIM card. In addition, international bandwidth per Internet user is still relatively low compared to many other advanced ICT economies. On the ICT use side, while mobile broadband has increased, fixed broadband penetration has increased only marginally over the past year to 23.6 per cent in 2008 (compared to 41 per cent in Sweden).

The **United Kingdom** moved up two places to tenth in the 2008 IDI. This is largely due to relatively strong improvements in ICT use. For example, mobile broadband penetration increased from around 20 per cent in 2007 to almost 34 per cent in 2008. While this is not among the top penetration levels, its growth, combined with the already relatively high values of the other ICT indicators, contributed to the strong performance of the UK.

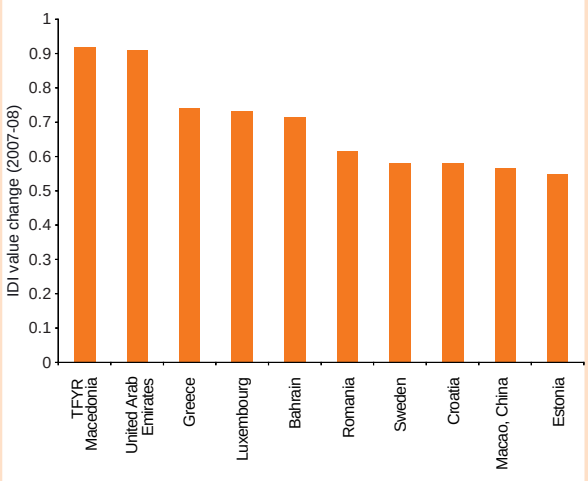
France moved up four places, ranking 18th in the 2008 IDI. It mainly improved on the ICT access sub-index, especially on household computer and Internet access (from 62 to 68 per cent and from 49 to 62 per cent, respectively).

The **United States** moved down two places, to 19th place in 2008, with its IDI value rising by less than the IDI of any of the other top twenty economies. In particular, the US lost seven places on the access sub-index, although it maintained its position in the use sub-index. Mobile cellular penetration remains relatively low in the country (87 per cent, compared to the developed country average of almost 108 per cent). Furthermore, household computer and Internet access is lower than in several of the top performing European countries and has not increased much between 2007 and 2008 (from 70 to 72 per cent, and from 62 to 63 per cent, respectively).

Most dynamic economies

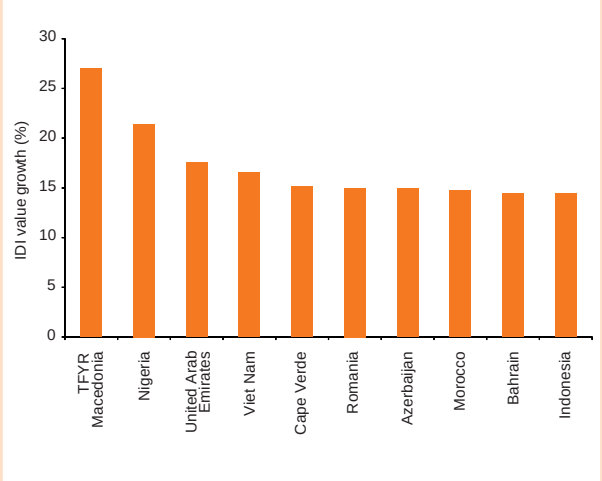
While it is important to examine the top performers, additional insights can be obtained from a closer look at the IDI value and rank changes, to assess the dynamics of the ICT development process and the potential progress that could be made by countries transitioning to information societies. The ten countries with the largest IDI value increases between 2007 and 2008 are presented in Chart 2.1, the highest percentage growth of the IDI in Chart 2.2, and the biggest rank improvements in Chart 2.3. The normalized changes in each of the 11 indicators included in the IDI are illustrated in "spider" charts (Figure 2.3).

Chart 2.1: IDI value change (absolute values), top ten economies (2007-2008)



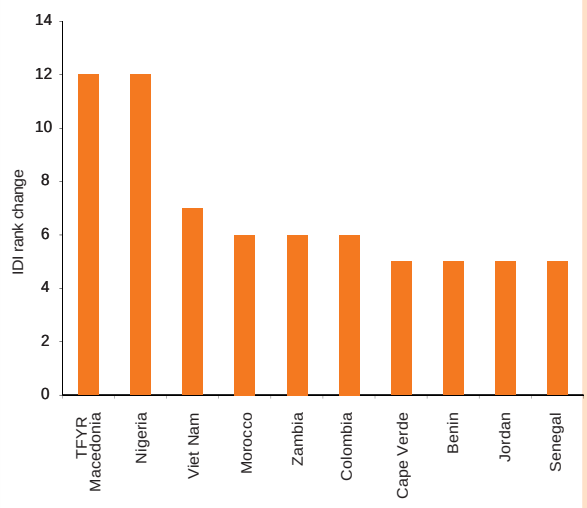
Source: ITU.

Chart 2.2: IDI value growth (%), top ten economies (2007-2008)



Source: ITU.

Chart 2.3: IDI rank change, top ten countries (2007-2008)



Source: ITU.

Estonia's (ranked 22nd) strong improvement in the IDI scores between 2007 and 2008 is mainly due to a high growth in mobile penetration (from 147 to 188 per 100 inhabitants) and in international Internet bandwidth (see Figure 2.3a). Mobile broadband is also starting to take off and has increased from 3 to 15 subscriptions per 100 inhabitants.

The **United Arab Emirates** (ranked 29th) experienced a large value increase as a result of strong performance in both ICT access and use (Box 2.4). Furthermore, it was the first country to surpass the 200 per cent mobile cellular penetration mark in 2008.

Greece (rank 30) and **Bahrain** (rank 33; see Box 2.5), made significant progress in the use sub-index, moving up 11 and 12 places, respectively. Both countries made improvements in each of the three indicators included in this sub-index: Internet users, and fixed and mobile broadband (Figure 2.3c and d).

Croatia (rank 36) increased its values on all three sub-indices, across most of the indicators (Figure 2.3e). The significant increase in international bandwidth per Internet user reflects the growing need for bandwidth, due to a larger number of Internet users.

TFYR Macedonia (rank 51 in the 2008 IDI) stands out with substantial absolute, percentage and rank changes. It has made significant improvements in the overall IDI, moving up 12 places, and especially in the access sub-index, where it moved up 17 places. This is largely due to a significant increase in international Internet bandwidth (Figure 2.3f), as well as improved household access to computers and the Internet (Box 2.6).

Jordan improved its ranking by four places, to 74th in the 2008 IDI. International Internet bandwidth in particular improved substantially, from 788 bit/s/user in 2007 to 2,893 bit/s/user in 2008. Also, household access to computers increased significantly in 2008, from 25 to 39 per cent (Figure 2.3g).

Viet Nam moved up seven places, to rank 86, with a 16 per cent percent in its IDI value. This improvement is based solely on the access sub-index, where it jumped 20 places (while it lost 9 places in the use sub-index and one in the skills sub-index). Mobile cellular subscriptions increased significantly (from 28 to 80 per 100 inhabitants), as did international Internet bandwidth, from 700 to 2,400 bit/s/user (Figure 2.3h). This follows the trend observed between 2002 and 2007, when the

Box 2.4: The United Arab Emirates - counting on ICTs to attract investment

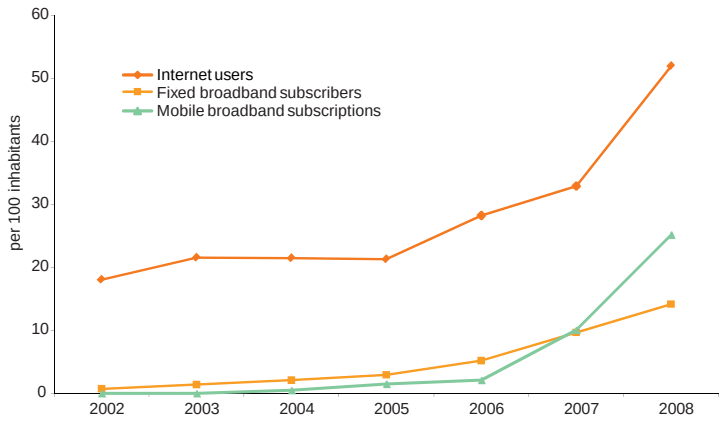
The ICT sector in the UAE has been boosted by public sector investments and efforts to make the country an attractive destination for technology companies. Indeed, the UAE has implemented policies to stimulate the adoption of ICTs, and the government is investing in an advanced ICT infrastructure so as to attract foreign investment and to diversify its economy. The recognition that telecommunication infrastructure is key to economic development and a key enabler for other sectors, is also reflected in the country's General Telecommunications Policy 2006-2010.[18] Growth in the UAE ICT market has partly been driven by strong demand for ICT products.[19]

Household access to ICTs and the number of Internet users per 100 inhabitants increased significantly between 2007 and 2008 (Figure 2.3b). Efforts are also being made to improve high-user access. The UAE's incumbent telco Etisalat reportedly connected over 550,000 households to its new fibre-to-the-home (FTTH) network and has launched a new 30 Mbps broadband package which is priced at AED 699 (USD 190) per month, and includes free installation, one month's rental waiver, five free email addresses with 5 GB capacity, and eight hours of free access each month to over 350 Etisalat wireless hotspots. The company aims to connect all the UAE households and premises through its FTTH network by 2011.[20] According to the UAE telecommunication regulator, households tend to be satisfied with the quality and prices of telecommunications and Internet services, while public Internet access points (PIACS) are also found to be popular.[21]

Box 2.5: Bahrain on its way to becoming an information society

Bahrain is one of the most dynamic countries in the IDI 2007-2008. In particular, Bahrain has improved considerably with high absolute IDI changes (more than 0,70), relative changes (15 per cent) and rank change (up 2 places). It has made significant progress on the use sub-index, gaining 12 places, with a marked increase in each of the three indicators included in this sub-index. In particular, the number of Internet users increased from 250,000 in 2007 to almost 403,000 in 2008. The number of fixed and mobile broadband Internet subscribers has also sharply increased since 2005 and 2006, respectively, driving the growth in Internet users (Box Chart 2.5).

Chart Box 2.5: Internet users and fixed and mobile broadband Internet subscribers, Bahrain, 2002-2008



Source: ITU World Telecommunication/ICT Indicators database.

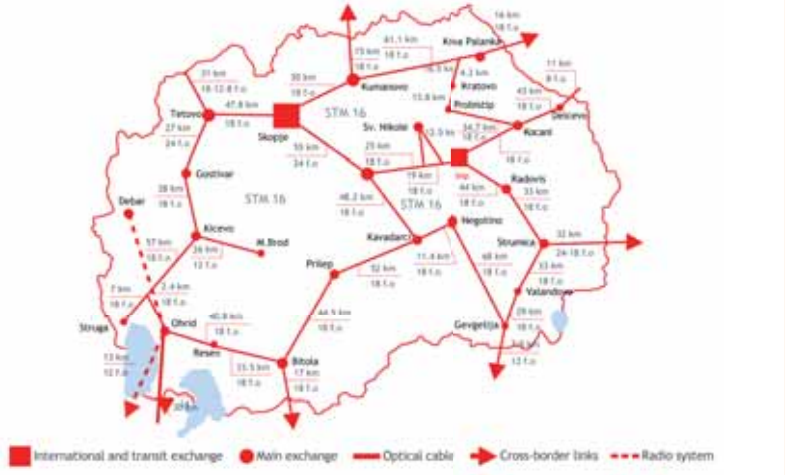
Different factors underlie these changes, including government policies, market competition and public facilities for Internet use. The launch of WiMax Internet services has also contributed to the increase in the number of subscribers in 2008.

A project to fully equip all public schools with ICTs has been in place since 2005.[22] In addition, in 2000, the government implemented a policy to provide all government employees with a computer, e-mail account and Internet access.[23] There are also some community access facilities providing free Internet access, as well as a number of widely used commercial access facilities and hotspots. At the same time, the cost of PCs and laptops has dropped significantly, including through a reduction in import taxes on these goods.[24]

Box 2.6: Government support for the information society in TFYR Macedonia

TFYR Macedonia has been very active in promoting all aspects of the information society, also with a view to attracting investment and jobs to the country.[25] Attention has been paid not only to improving the ICT infrastructure, but also other factors such as the regulatory environment, e-government, e-education, and work force skills. These efforts have benefited from ICT-related projects implemented by USAID.[26] The efforts made on infrastructure and access can also be seen in Figure 2.3f, with a particularly impressive improvement in bandwidth, and Figure Box 2.6 showing the backbone infrastructure that is being built.

Figure Box 2.6: Telecommunications infrastructure in TFYR Macedonia



Source: Invest in Macedonia.

The Government, in conjunction with the new Ministry for the Information Society actively tries to promote an "IT culture". Measures include providing a computer for every child in primary and secondary schools, offering scholarships for talented IT students, handing out vouchers for students as a direct subvention when buying computers, free Internet sessions, free-of-charge Internet clubs, free computer applications training, and the protection of digital intellectual property.

country moved up 15 places in the IDI rankings (see ITU 2009b). Supported by a strong Government-driven policy to make ICT a key development goal, Viet Nam is far ahead of other low-income economies when it comes to ICT uptake.

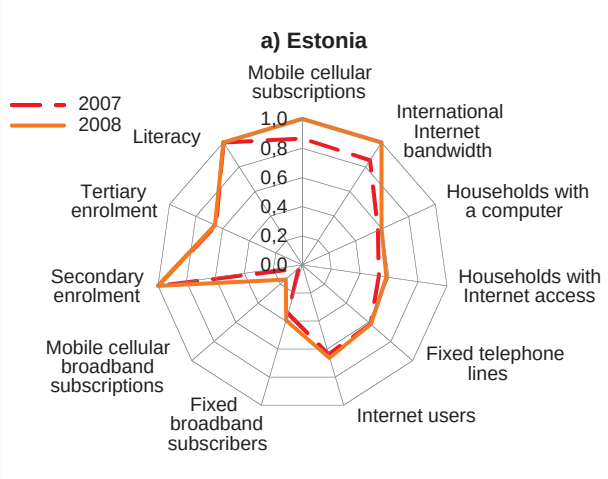
The **Philippines** (rank 90) gained five places in the overall index, with seven places on the access sub-index and four on the use sub-index. The increase in both international Internet bandwidth per Internet user and mobile cellular penetration contributed to the rank improvement (Figure 2.3i). Mobile broadband is also starting to become available, contributing to the increase in the use sub-index.

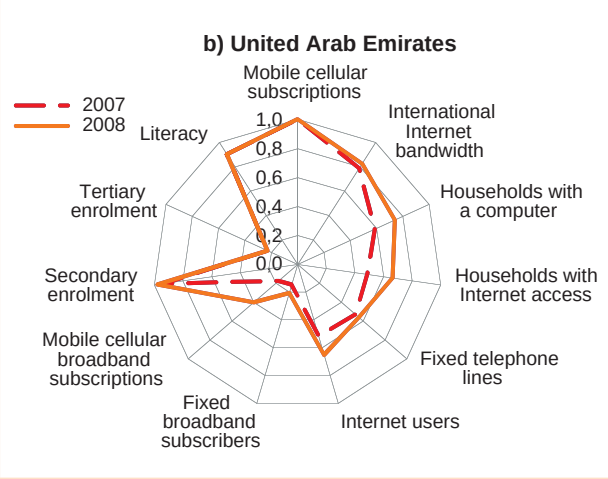
Morocco moved up six places on the global IDI, ranked 97th in 2008, improving its IDI value by 15 per cent. Morocco has made important progress on use (seven places up), with the number of Internet users per 100 inhabitants increasing from 21 to 33 between 2007 and 2008 (Figure 2.3j).

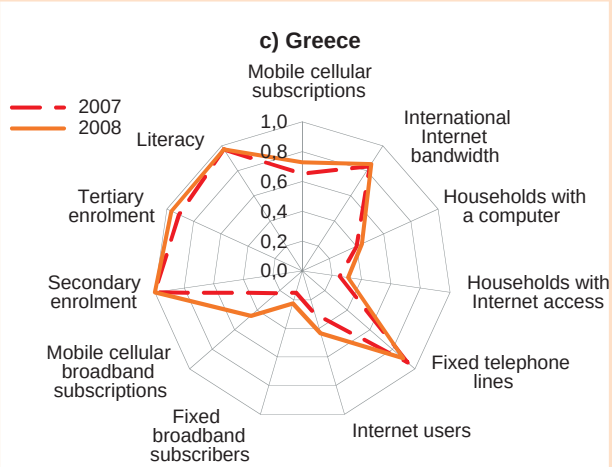
Cape Verde (rank 102) increased its IDI value by 15 per cent, improving its position by five ranks. The improvement largely results from the use sub-index, where it moved up 16 places. For example, Internet user penetration increased to 21 per cent in 2008, up from 8 per cent in 2007 (Figure 2.3k), reaching the highest level in Africa. This is primarily due to the entry of a second Internet provider (Cabocom) in 2008, ending the monopoly of the incumbent (Cabo Verde Multimedia).

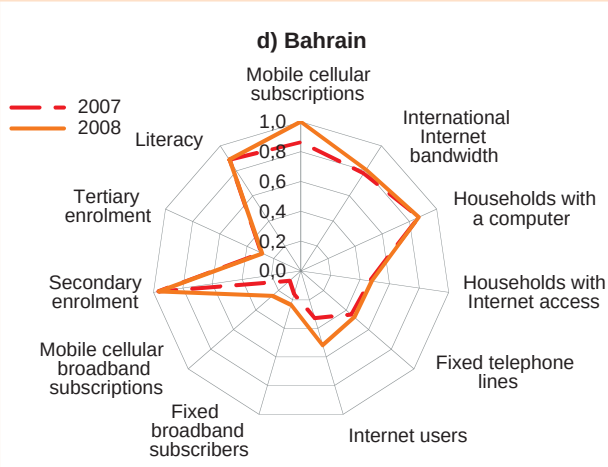
Nigeria's IDI value increased by more than 20 per cent, jumping up 12 places to 122nd in the 2008 IDI (Box 2.7). While the overall rank is still low, it represents a significant improvement for such a large country. This improvement is mainly due to an increase in ICT use (23 ranks up in the use sub-index), with the number of Internet users increasing from 7 per 100 inhabitants in 2007 to about 16 in 2008 (Figure 2.3l). While this is substantially lower than Internet penetration levels in advanced ICT countries, it is much higher than the African average of 4 per cent in 2008.

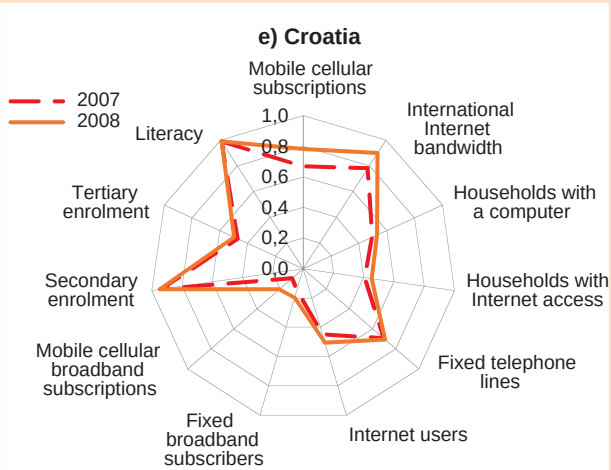
Figure 2.3: Spider charts, selected dynamic countries, 2008 and 2007*











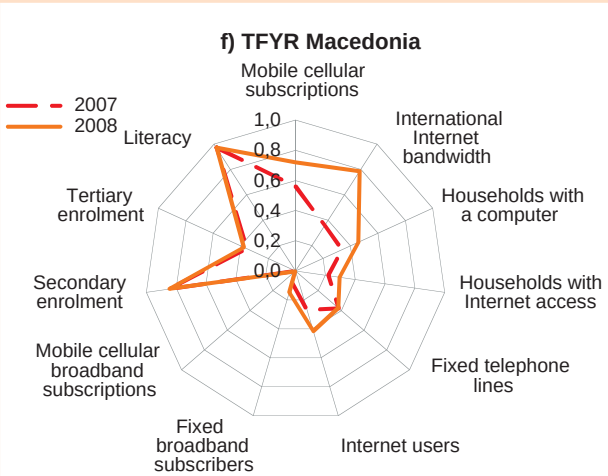
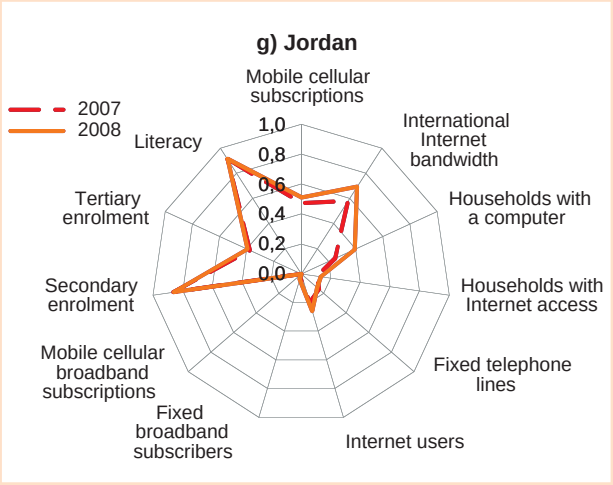
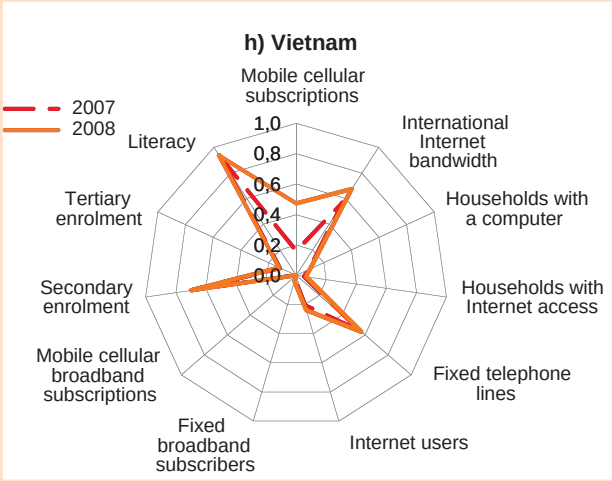
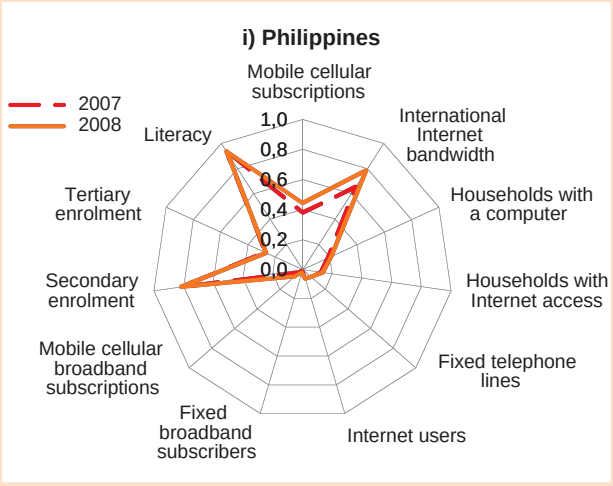
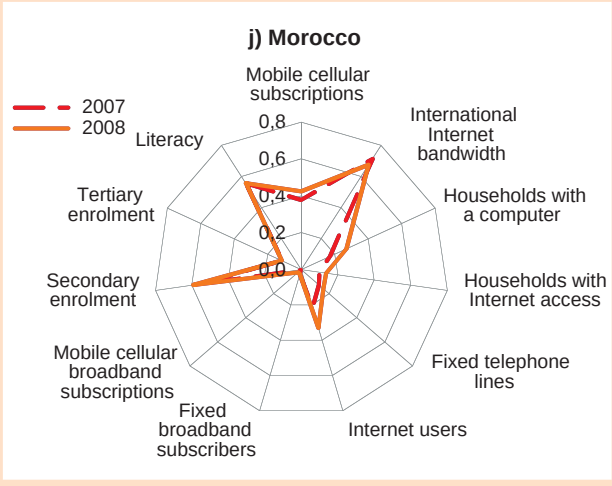


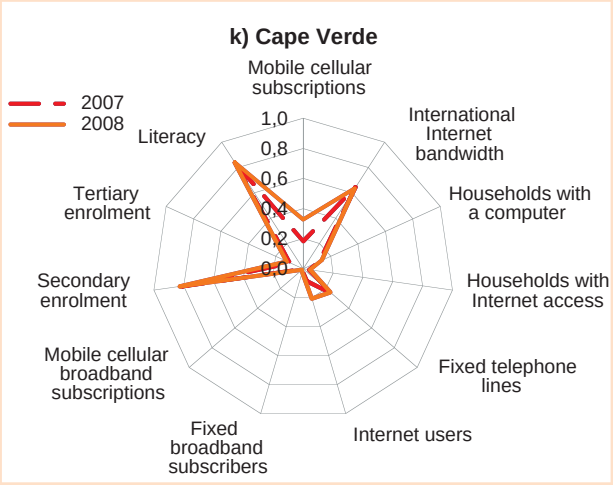
Figure 2.3: Spider charts, selected dynamic countries, 2008 and 2007* (cont'd)

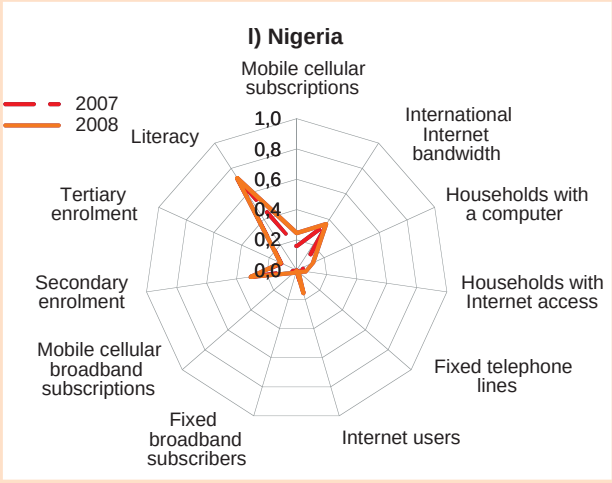












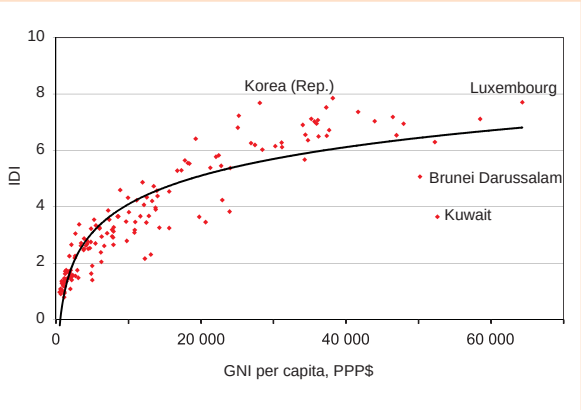
Note: * These charts show normalized changes in the indicators that are included in the IDI.
Source: ITU.

IDI by income level

The link between ICT development and income has been well established (see also Chapter 5), and most of the indicators included in the IDI are strongly correlated with GDP per capita. Plotting the IDI against GNI per capita (PPP$)[27] shows a strong relationship between the two (Chart 2.4).[28] The distribution around the trend line is fairly homogenous, especially for lower-income countries. Several of the top ranking IDI economies (such as Sweden, the Netherlands, Denmark, Iceland, and the Republic of Korea, but also New Zealand, Estonia and Slovenia) are above the trendline. The Republic of Korea is one example which has been highlighted before (ITU, 2009b), with a relatively low income level given its IDI level. It illustrates how a strong and targeted policy towards ICT development, as the Korean Government has been pursuing for many years, can drive the development of the information society, even in countries with relatively lower income per capita.

Countries below the trendline include oil exporting countries, such as Kuwait, Brunei Darussalam and Saudi Arabia. These countries have followed a different economic development strategy, focusing on the exploitation of their natural resources. Given the income levels of these countries, there is still a great potential for further ICT development and the positive economic impacts that these may bring.

Chart 2.4: IDI and GNI per capita, 2008



Source: ITU and World Bank.

2.3 IDI breakdown by sub-indices (access, use and skills)

The IDI is made up of three sub-indices – covering ICT access, use and skills. Recalling the conceptual framework of the index (section 2.1), countries go through different stages in becoming information societies. The sub-indices access and use correspond to the first two stages, while the skills sub-index captures the skills and the capability of individuals to make efficient use of ICTs, thereby driving their impact in the third stage. By looking at each sub-index separately, policy makers can identify specific areas of high or low performance, and design their national ICT plans accordingly.

IDI access sub-index

The IDI access sub-index is composed of five indicators: fixed telephone line penetration, mobile cellular penetration, international Internet bandwidth per Internet user, the proportion of households with computers and the proportion of households with Internet access. Since ICT infrastructure and access are a prerequisite to ICT use, most initial progress is made on this sub-index. The top performers in this sub-index tend to correspond to the top performers of the overall index (Table 2.3), albeit with some exceptions, such as Hong Kong (China), Germany and Singapore. The latter countries are in the top ten in the access sub-index, but not in the overall index as their performance in the use sub-index is somewhat lagging. Thus, they could improve their overall IDI ranking with policies aimed at improving ICT use.

Several of the countries that have made impressive gains on this sub-index (Charts 2.5, 2.6 and 2.7) have already been highlighted in section 2.2 (e.g. Estonia, Macedonia, Saudi Arabia, UAE, and Viet Nam). Others include Armenia, Bolivia, Croatia, Ghana, Indonesia, Kenya, Qatar, Romania, St Vincent and the Grenadines, Uzbekistan and Zambia, which are among the ten economies with the largest improvements in the access sub-index. In Hong Kong (China), the improvement is largely the result of higher international Internet bandwidth per Internet user which, even though it was already high in 2007, doubled between 2007 and 2008 (from around 400,000 to 800,000 bits/s/user).

Table 2.3: IDI access sub-index, 2008 and 2007

Economy	Rank 2008	Access 2008	Rank 2007	Access 2007
Hong Kong, China	1	8.82	1	8.68
Luxembourg	2	8.80	2	8.53
Sweden	3	8.75	3	8.46
Germany	4	8.54	7	8.19
Iceland	5	8.51	4	8.26
Switzerland	6	8.50	5	8.24
Netherlands	7	8.42	6	8.24
Denmark	8	8.34	8	8.16
United Kingdom	9	8.23	9	8.01
Singapore	10	8.02	10	7.81
Norway	11	7.91	11	7.67
Austria	12	7.69	16	7.18
Ireland	13	7.66	14	7.32
Korea (Rep.)	14	7.60	12	7.37
Estonia	15	7.59	26	6.87
United Arab Emirates	16	7.58	28	6.78
France	17	7.52	22	7.02
Canada	18	7.51	13	7.33
Finland	19	7.40	20	7.04
Macao, China	20	7.34	15	7.20
Belgium	21	7.28	19	7.05
Bahrain	22	7.26	27	6.85
New Zealand	23	7.25	24	6.94
Israel	24	7.22	23	7.01
Malta	25	7.20	25	6.94
Australia	26	7.16	18	7.05
Japan	27	7.16	17	7.07
United States	28	7.11	21	7.03
Slovenia	29	7.06	30	6.66
Spain	30	6.92	31	6.66
Italy	31	6.83	29	6.74
Croatia	32	6.74	35	6.09
Portugal	33	6.64	32	6.19
Qatar	34	6.58	37	5.85
Cyprus	35	6.47	34	6.15
Greece	36	6.45	33	6.15
Lithuania	37	6.33	36	5.91
Hungary	38	6.21	38	5.81
Slovak Republic	39	6.16	40	5.65
Czech Republic	40	6.09	43	5.52
Latvia	41	5.99	42	5.61
Poland	42	5.92	41	5.61
Brunei Darussalam	43	5.92	39	5.68
Bulgaria	44	5.67	45	5.15
Russia	45	5.59	46	5.00
Saudi Arabia	46	5.44	49	4.78
Montenegro	47	5.43	44	5.32
Romania	48	5.30	51	4.64
Argentina	49	5.27	47	4.86
TFYR Macedonia	50	5.26	67	3.71
Serbia	51	5.06	50	4.77
Trinidad & Tobago	52	4.93	48	4.79
Chile	53	4.84	52	4.50
St. Vincent and the Grenadines	54	4.78	56	4.14
Uruguay	55	4.76	54	4.30
Turkey	56	4.66	55	4.24
Maldives	57	4.61	59	4.00
Ukraine	58	4.50	57	4.06
Kuwait	59	4.50	53	4.39
Belarus	60	4.50	60	3.98
Panama	61	4.42	58	4.01
Malaysia	62	4.38	63	3.89
Oman	63	4.37	62	3.94
Seychelles	64	4.30	64	3.85
Brazil	65	4.24	65	3.78
Mauritius	66	4.19	61	3.96
Kazakhstan	67	4.10	69	3.63
Bosnia and Herzegovina	68	4.02	66	3.73
Colombia	69	3.95	71	3.52
Costa Rica	70	3.91	68	3.67
Venezuela	71	3.82	73	3.44
Viet Nam	72	3.76	92	2.84
China	73	3.75	70	3.61
Jordan	74	3.74	78	3.13
Moldova	75	3.60	74	3.26
Mexico	76	3.48	76	3.19
Syria	77	3.46	75	3.21
Peru	78	3.46	87	2.95
Jamaica	79	3.45	72	3.48
Thailand	80	3.41	81	3.05
Armenia	81	3.41	97	2.71
Azerbaijan	82	3.40	88	2.93
Iran (I.R.)	83	3.36	80	3.06
Ecuador	84	3.35	77	3.17
Morocco	85	3.33	86	2.98
Philippines	86	3.30	93	2.83
Fiji	87	3.29	79	3.08
Albania	88	3.27	94	2.80
Guatemala	89	3.27	83	2.99
El Salvador	90	3.22	85	2.99
Tunisia	91	3.21	89	2.90
Lebanon	92	3.20	84	2.99
Paraguay	93	3.19	98	2.71
South Africa	94	3.14	90	2.88
Dominican Rep.	95	3.10	91	2.85
Georgia	96	3.09	82	3.01
Algeria	97	3.05	96	2.75
Honduras	98	3.04	99	2.63
Libya	99	2.95	95	2.80
Egypt	100	2.92	100	2.55
Sri Lanka	101	2.88	102	2.54
Cape Verde	102	2.77	103	2.45
Gabon	103	2.71	101	2.54
Botswana	104	2.69	105	2.21
Bolivia	105	2.65	108	2.11
Indonesia	106	2.60	110	2.04
Nicaragua	107	2.54	104	2.30
Mauritania	108	2.36	107	2.11
Kyrgyzstan	109	2.27	111	2.02
Namibia	110	2.22	109	2.06
Turkmenistan	111	2.21	114	1.95
Mongolia	112	2.19	106	2.11
Gambia	113	2.17	115	1.92
Swaziland	114	2.12	113	1.95
Djibouti	115	2.09	112	1.98
Senegal	116	2.08	116	1.86
Ghana	117	2.06	124	1.65
Cambodia	118	2.06	120	1.78
Côte d'Ivoire	119	1.98	117	1.83
Pakistan	120	1.96	121	1.75
Lao P.D.R.	121	1.91	118	1.82
Bhutan	122	1.90	123	1.74
Tajikistan	123	1.90	126	1.64
Benin	124	1.90	130	1.56
Sudan	125	1.89	119	1.80
India	126	1.88	127	1.64
Uzbekistan	127	1.87	135	1.46
Yemen	128	1.85	122	1.75
Mali	129	1.81	125	1.65
Bangladesh	130	1.78	129	1.59
Angola	131	1.77	128	1.63
Myanmar	132	1.74	132	1.50
Kenya	133	1.65	137	1.35
Nigeria	134	1.60	146	1.27
Burkina Faso	135	1.58	131	1.51
Niger	136	1.56	133	1.47
Tanzania	137	1.54	145	1.27
Madagascar	138	1.47	134	1.46
Haiti	139	1.47	138	1.35
Cameroon	140	1.46	136	1.45
Mozambique	141	1.46	141	1.31
Malawi	142	1.44	142	1.31
Comoros	143	1.43	139	1.34
Lesotho	144	1.40	144	1.28
Cuba	145	1.37	143	1.29
Nepal	146	1.37	140	1.31
Rwanda	147	1.35	147	1.25
Ethiopia	148	1.33	148	1.23
Togo	149	1.33	150	1.13
Zambia	150	1.28	152	1.04
Uganda	151	1.24	149	1.20
Guinea-Bissau	152	1.21	153	1.03
Congo	153	1.17	155	0.98
Zimbabwe	154	1.15	156	0.97
Congo (Dem. Rep.)	155	1.09	151	1.08
Guinea	156	1.09	158	0.90
Papua New Guinea	157	1.05	154	0.99
Chad	158	1.02	157	0.91
Eritrea	159	0.89	159	0.86

Source: ITU.

Chart 2.5: IDI access sub-index growth (%), top ten countries, 2007-2008

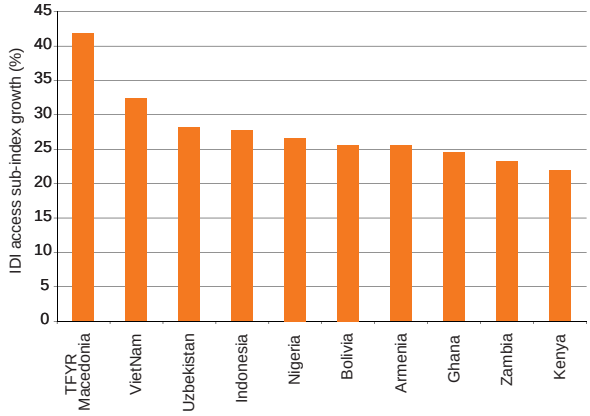


Chart 2.6: IDI access sub-index value change, top ten countries, 2007-2008

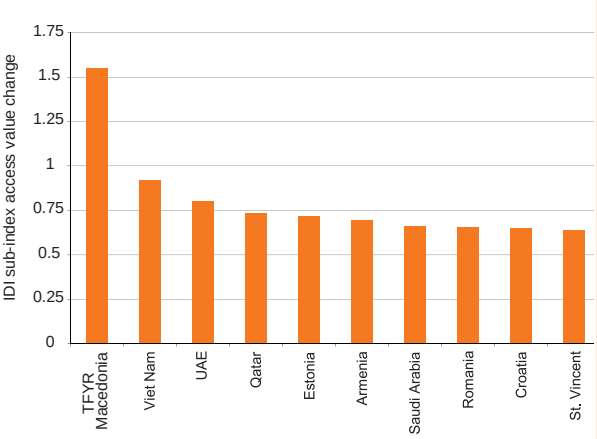
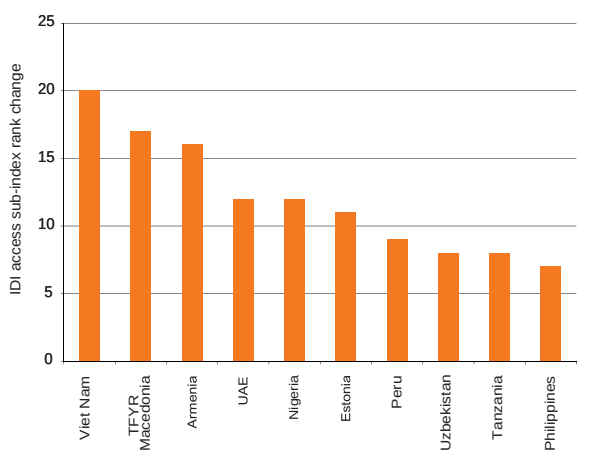


Chart 2.7: IDI access sub-index rank change, top ten countries, 2007-2008



Source: ITU.

IDI use sub-index

This sub-index includes three indicators: Internet user penetration, fixed broadband penetration, and mobile broadband penetration. It is important to note that between 2007 and 2008, the average value increase of this sub-index was fairly similar to that of the access sub-index, whereas between 2002 and 2008 the increase in the access sub-index largely exceeded that of the use sub-index. This reflects the different stages of development and suggests that more countries are progressing to the second stage, from access to use (as reflected in the growth of the broadband indicators).

The top performers in this sub-index (Table 2.4) also perform well in the overall IDI (Table 2.2), as can be expected. Two notable exceptions are Singapore (where the overall IDI score is held back by the relative poor performance on the skills sub-index), and Australia where mobile broadband penetration has increased significantly over the past year, from 32.6 per cent in 2007 to 53.7 per cent in 2008, driving relatively stronger performance on the use sub-index, while performance on the access sub-index is somewhat less strong

Several of the countries that experienced the strongest performance in this sub-index (Charts 2.8, 2.9 and 2.10) have been highlighted in section 2.2. Others include Cambodia, Georgia, Kazakhstan, Lao P.D.R., Libya, Madagsacar, Malawi and Uganda. For example, Georgia and Lao P.D.R., ranked 69th and 116th in this sub-index, respectively, each increased their ranking by 25 places (Chart 2.10). Both countries had a significant increase in their number of Internet users between 2007 and 2008 – Georgia from eight to almost 24 per 100, and Lao P.D.R. from one to about eight per 100. Similarly, Kazakhstan (rank 92 on the use sub-index) also improved on Internet use (from four to 11 per 100 inhabitants), as well as fixed broadband penetration.

IDI skills sub-index

In the absence of reliable and comparable data on ICT skills for a large number of countries, the three indicators included in the skills sub-index (adult literacy, gross secondary and tertiary enrolment) are proxies. This sub-index should be considered as an enabler for effective ICT use, but economies that rank highly in this sub-index do not necessarily rank highly in the other sub-indices or the overall IDI (Tables 2.5 and 2.2, respectively). One example is Cuba. While it

Chart 2.8: IDI use sub-index value growth (%), top ten countries, 2007-2008

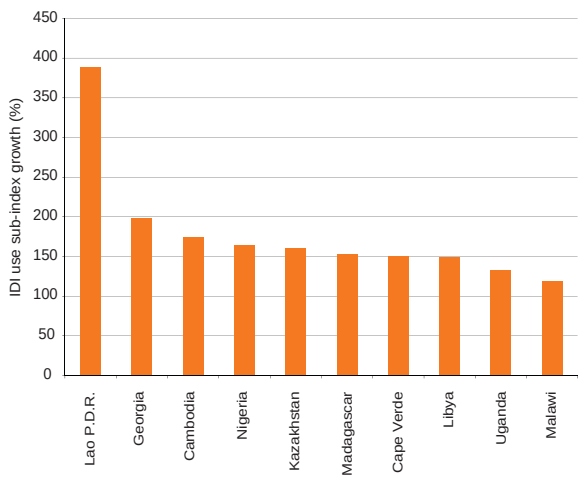


Chart 2.9: IDI use sub-index value change, top ten countries, 2007-2008

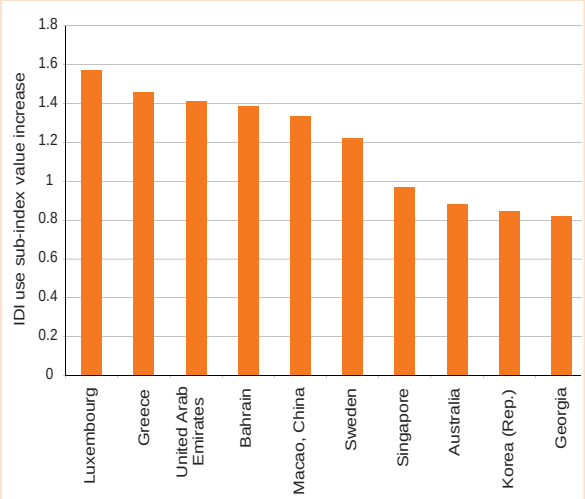
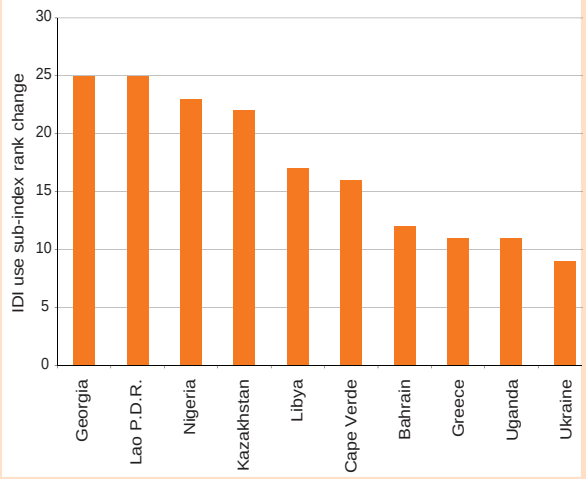


Chart 2.10: IDI use sub-index rank change, top ten countries, 2007-2008



Source: ITU.

has high literacy and gross tertiary enrolment rates, it has limited ICT infrastructure and access and is still a long way from becoming an inclusive information society.

Due to the lack of data directly related to ICT skills, this sub-index is given less weight in the calculation of the overall IDI (20 per cent compared to 40 per cent each for the access and use sub-indices). However, this may change in the future as more and better data on ICT skills become available, for example through the work on measuring ICT in education, including ICT skills, which is currently under way at the global level. Led by the UNESCO Institute for Statistics (UIS), a core set of indicators has been defined and data collections are being piloted in 25 developing countries (Box 2.8). When data become available for a larger number of countries, they will be incorporated in the IDI, replacing the current proxy indicators included in the skills sub-index.

2.4 The IDI by region

After the analysis of the global IDI (Section 2.2) and its sub-indices (Section 2.3), this section examines the IDI at the regional level.[30] The top five countries in each region, as well as their position in the global ranking, are presented in Table 2.6. The top five countries in Europe and Asia and the Pacific are all ranked highly in the overall ranking (among the first 15 globally). The United States is the only country from the Americas ranked in the global top 20, and the fifth country in that region is already ranked 50th globally. The gaps become even wider for the other regions, with the 1st and 5th country in Africa ranked 66th and 109th globally, respectively.

Indeed, the top five countries in Europe and Asia and the Pacific are ranked closely together (a difference of five and 12 places in the global IDI, respectively), but the differences become larger in the other regions: 21 places between the countries ranked first and 5th in the Americas, 25 in the CIS (but there are also relatively fewer of them), 36 in the Arab States, and 43 in Africa.

There are significant differences in the IDI values within regions (Table 2.7). In 2008, Asia and the Pacific showed the largest range (defined as the maximum minus the minimum value) in the IDI (6.60), but the largest increase in the range was registered by the Arab States (0.86 between 2007 and 2008, and 2.37 between 2002 and 2008). Furthermore, the

Table 2.4: IDI use sub-index, 2008 and 2007

Economy	Rank 2008	Use 2008	Rank 2007	Use 2007
Luxembourg	1	7.09	3	5.52
Korea (Rep.)	2	6.69	2	5.84
Sweden	3	6.39	4	5.17
Japan	4	6.34	1	5.89
Singapore	5	5.81	8	4.84
Denmark	6	5.76	5	5.12
Netherlands	7	5.66	6	5.09
Australia	8	5.54	13	4.66
Switzerland	9	5.40	9	4.80
Norway	10	5.29	12	4.71
Finland	11	5.25	7	4.84
United Kingdom	12	5.23	14	4.50
Hong Kong, China	13	5.22	11	4.73
New Zealand	14	5.11	15	4.38
Austria	15	4.94	16	4.30
Iceland	16	4.84	10	4.76
Germany	17	4.76	17	4.23
United States	18	4.64	18	4.22
France	19	4.64	20	3.98
Macao, China	20	4.37	28	3.04
Spain	21	4.31	25	3.51
Canada	22	4.31	19	4.00
Ireland	23	4.28	22	3.69
Belgium	24	4.25	21	3.83
United Arab Emirates	25	4.20	32	2.79
Israel	26	4.12	23	3.69
Italy	27	4.07	24	3.60
Estonia	28	4.02	26	3.38
Slovenia	29	3.91	27	3.11
Greece	30	3.72	41	2.26
Portugal	31	3.59	29	2.92
Hungary	32	3.44	33	2.77
Malta	33	3.37	30	2.86
Bahrain	34	3.36	46	1.97
Czech Republic	35	3.33	34	2.64
Brunei Darussalam	36	3.29	31	2.80
Slovak Republic	37	3.17	36	2.48
Cyprus	38	3.05	40	2.28
Croatia	39	3.03	38	2.30
Lithuania	40	2.93	35	2.56
Poland	41	2.86	37	2.34
Latvia	42	2.72	39	2.29
St. Vincent and the Grenadines	43	2.49	43	2.15
Malaysia	44	2.43	42	2.18
Montenegro	45	2.41	45	1.99
Bulgaria	46	2.34	47	1.77
Romania	47	2.33	48	1.58
Jamaica	48	2.12	44	2.06
TFYR Macedonia	49	1.89	57	1.18
Qatar	50	1.83	51	1.46
Uruguay	51	1.78	52	1.38
Chile	52	1.63	50	1.50
Serbia	53	1.63	55	1.27
Brazil	54	1.60	54	1.29
Seychelles	55	1.58	49	1.51
Turkey	56	1.58	53	1.36
Saudi Arabia	57	1.57	60	1.10
Colombia	58	1.55	61	1.08
Russia	59	1.45	66	1.01
Argentina	60	1.44	56	1.24
Bosnia and Herzegovina	61	1.43	63	1.05
Venezuela	62	1.39	65	1.03
Belarus	63	1.34	62	1.06
Kuwait	64	1.29	59	1.14
Trinidad & Tobago	65	1.28	68	0.95
Mauritius	66	1.27	64	1.04
Morocco	67	1.26	73	0.81
Panama	68	1.24	67	0.99
Georgia	69	1.23	94	0.41
Costa Rica	70	1.21	58	1.14
Mexico	71	1.17	69	0.95
Maldives	72	1.15	75	0.76
Libya	73	1.13	90	0.45
Moldova	74	1.13	76	0.75
China	75	1.09	72	0.81
Iran (I.R.)	76	1.07	82	0.61
Tunisia	77	1.04	81	0.62
Lebanon	78	1.03	71	0.89
Jordan	79	0.99	77	0.75
Ecuador	80	0.98	87	0.52
Azerbaijan	81	0.97	83	0.61
Peru	82	0.96	70	0.93
Viet Nam	83	0.93	74	0.77
Albania	84	0.91	86	0.52
Oman	85	0.90	80	0.66
Thailand	86	0.89	78	0.74
Dominican Rep.	87	0.87	79	0.67
Cape Verde	88	0.80	104	0.32
Egypt	89	0.77	85	0.53
Nigeria	90	0.61	113	0.23
Ukraine	91	0.61	100	0.34
Kazakhstan	92	0.60	114	0.23
Paraguay	93	0.57	102	0.34
Syria	94	0.56	84	0.57
Mongolia	95	0.55	89	0.46
Guatemala	96	0.53	91	0.44
Kyrgyzstan	97	0.53	88	0.47
Fiji	98	0.51	92	0.44
Philippines	99	0.51	103	0.32
South Africa	100	0.49	95	0.40
El Salvador	101	0.48	105	0.31
Algeria	102	0.48	96	0.39
Honduras	103	0.44	93	0.42
Cuba	104	0.43	97	0.39
Bolivia	105	0.40	98	0.37
Indonesia	106	0.39	111	0.25
Zimbabwe	107	0.39	99	0.37
Sudan	108	0.36	108	0.30
Pakistan	109	0.35	101	0.34
Haiti	110	0.34	106	0.31
Uzbekistan	111	0.33	109	0.25
Kenya	112	0.32	107	0.30
Tajikistan	113	0.32	110	0.25
Senegal	114	0.30	112	0.25
Sri Lanka	115	0.30	121	0.17
Lao P.D.R.	116	0.29	141	0.06
Uganda	117	0.29	128	0.12
Bhutan	118	0.25	118	0.20
Botswana	119	0.23	119	0.19
Swaziland	120	0.23	125	0.14
Gambia	121	0.23	116	0.21
Armenia	122	0.22	115	0.21
Gabon	123	0.22	117	0.20
Ghana	124	0.21	126	0.13
Zambia	125	0.19	122	0.16
Togo	126	0.18	120	0.18
Namibia	127	0.18	123	0.16
India	128	0.17	124	0.15
Nicaragua	129	0.16	127	0.13
Mauritania	130	0.15	137	0.07
Congo	131	0.14	133	0.09
Eritrea	132	0.14	134	0.08
Cameroon	133	0.13	132	0.10
Angola	134	0.13	131	0.10
Lesotho	135	0.12	129	0.12
Comoros	136	0.12	130	0.11
Côte d'Ivoire	137	0.11	135	0.08
Rwanda	138	0.11	138	0.07
Guinea-Bissau	139	0.08	136	0.07
Djibouti	140	0.08	142	0.06
Malawi	141	0.07	147	0.03
Benin	142	0.06	139	0.06
Papua New Guinea	143	0.06	140	0.06
Nepal	144	0.06	144	0.05
Cambodia	145	0.06	154	0.02
Madagascar	146	0.06	153	0.02
Tanzania	147	0.06	146	0.04
Mali	148	0.05	150	0.03
Mozambique	149	0.05	148	0.03
Yemen	150	0.05	145	0.05
Turkmenistan	151	0.05	143	0.05
Chad	152	0.04	149	0.03
Burkina Faso	153	0.03	151	0.03
Guinea	154	0.03	152	0.03
Niger	155	0.02	155	0.01
Congo (Dem. Rep.)	156	0.02	156	0.01
Ethiopia	157	0.01	157	0.01
Bangladesh	158	0.01	158	0.01
Myanmar	159	0.01	159	0.01

Source: ITU.

Table 2.5: IDI skills sub-index, 2008 and 2007

Economy	Rank 2008	Skills 2008	Rank 2007	Skills 2007
Korea (Rep.)	1	9.84	2	9.74
Finland	2	9.81	1	9.75
Greece	3	9.78	4	9.59
Cuba	4	9.70	3	9.74
Iceland	5	9.45	8	9.24
Denmark	6	9.43	5	9.30
Slovenia	7	9.34	6	9.28
New Zealand	8	9.34	7	9.26
Lithuania	9	9.23	11	9.15
United States	10	9.19	9	9.16
Norway	11	9.17	10	9.16
Australia	12	9.12	12	9.12
Ukraine	13	9.11	14	9.00
Sweden	14	8.98	13	9.11
Latvia	15	8.97	15	8.96
Italy	16	8.95	18	8.85
Spain	17	8.92	16	8.87
Hungary	18	8.91	22	8.75
Poland	19	8.90	17	8.86
Canada	20	8.84	20	8.81
Estonia	21	8.84	19	8.81
Belgium	22	8.73	23	8.71
Ireland	23	8.72	24	8.66
Netherlands	24	8.66	25	8.63
Belarus	25	8.65	21	8.77
Russia	26	8.62	26	8.61
Uruguay	27	8.61	29	8.46
Japan	28	8.60	27	8.55
Argentina	29	8.46	31	8.42
France	30	8.45	30	8.45
United Kingdom	31	8.44	28	8.50
Czech Republic	32	8.43	35	8.27
St. Vincent and the Grenadines	33	8.43	46	7.94
Portugal	34	8.41	32	8.38
Romania	35	8.37	40	8.10
Bulgaria	36	8.33	36	8.26
Austria	37	8.33	33	8.30
Israel	38	8.28	34	8.27
Slovak Republic	39	8.24	42	8.06
Germany	40	8.17	38	8.17
Switzerland	41	8.12	43	8.06
Croatia	42	8.10	44	7.97
Chile	43	8.08	45	7.97
Mongolia	44	8.07	47	7.90
Macao, China	45	8.05	37	8.17
Libya	46	8.05	41	8.08
Malta	47	7.98	48	7.79
Kazakhstan	48	7.94	39	8.11
Venezuela	49	7.93	50	7.71
Cyprus	50	7.81	49	7.71
Serbia	51	7.77	65	7.15
Thailand	52	7.74	52	7.56
Kyrgyzstan	53	7.66	51	7.61
Peru	54	7.50	56	7.41
Georgia	55	7.45	54	7.51
Armenia	56	7.45	55	7.44
Lebanon	57	7.42	58	7.36
Moldova	58	7.40	53	7.53
Turkmenistan	59	7.37	57	7.37
Bosnia and Herzegovina	60	7.37	60	7.30
Brazil	61	7.35	59	7.33
TFYR Macedonia	62	7.29	61	7.22
Colombia	63	7.28	63	7.15
Albania	64	7.25	70	7.03
Jordan	65	7.22	62	7.17
Azerbaijan	66	7.17	80	6.78
Montenegro	67	7.16	64	7.15
Saudi Arabia	68	7.15	69	7.04
Bahrain	69	7.11	66	7.14
Hong Kong, China	70	7.11	67	7.07
Singapore	71	7.07	68	7.07
Costa Rica	72	7.06	72	6.95
Turkey	73	7.03	74	6.92
United Arab Emirates	74	7.01	77	6.88
Panama	75	7.01	73	6.95
Bolivia	76	7.00	71	7.02
Mexico	77	6.98	78	6.88
Brunei Darussalam	78	6.91	75	6.90
Uzbekistan	79	6.86	76	6.89
Tajikistan	80	6.80	81	6.77
Tunisia	81	6.79	84	6.64
Luxembourg	82	6.77	79	6.79
Philippines	83	6.72	82	6.73
Oman	84	6.71	87	6.63
Trinidad & Tobago	85	6.70	89	6.59
South Africa	86	6.67	88	6.62
Kuwait	87	6.64	83	6.65
Dominican Rep.	88	6.60	86	6.63
Jamaica	89	6.57	90	6.53
Qatar	90	6.57	85	6.64
Iran (I.R.)	91	6.55	94	6.32
China	92	6.46	95	6.31
Seychelles	93	6.45	92	6.45
Fiji	94	6.43	93	6.42
Indonesia	95	6.33	99	6.19
Mauritius	96	6.28	91	6.48
Paraguay	97	6.23	97	6.23
Malaysia	98	6.19	98	6.19
Algeria	99	6.19	101	6.08
Sri Lanka	100	6.18	100	6.16
Maldives	101	6.16	102	6.02
Egypt	102	6.09	103	6.01
Ecuador	103	6.08	96	6.30
Cape Verde	104	5.94	105	5.82
Viet Nam	105	5.85	104	5.83
Syria	106	5.75	106	5.69
El Salvador	107	5.66	107	5.67
Botswana	108	5.66	108	5.62
Honduras	109	5.55	110	5.48
Nicaragua	110	5.51	109	5.54
Namibia	111	5.42	111	5.29
Myanmar	112	5.05	112	4.99
Guatemala	113	5.05	114	4.88
Gabon	114	4.93	113	4.91
Swaziland	115	4.80	115	4.71
Congo	116	4.74	116	4.64
India	117	4.64	117	4.55
Kenya	118	4.51	119	4.29
Zimbabwe	119	4.48	118	4.49
Lao P.D.R.	120	4.33	120	4.27
Cambodia	121	4.28	125	4.06
Lesotho	122	4.27	121	4.20
Morocco	123	4.21	124	4.09
Comoros	124	4.21	123	4.12
Ghana	125	4.20	122	4.12
Zambia	126	4.16	126	3.89
Nepal	127	3.83	131	3.61
Bhutan	128	3.82	132	3.54
Cameroon	129	3.81	129	3.74
Nigeria	130	3.80	128	3.79
Yemen	131	3.78	127	3.79
Togo	132	3.75	130	3.71
Congo (Dem. Rep.)	133	3.57	134	3.48
Djibouti	134	3.52	137	3.33
Bangladesh	135	3.48	133	3.48
Madagascar	136	3.47	136	3.38
Uganda	137	3.44	135	3.39
Malawi	138	3.38	138	3.33
Eritrea	139	3.34	139	3.29
Sudan	140	3.34	140	3.28
Gambia	141	3.28	141	3.25
Papua New Guinea	142	3.19	142	3.19
Angola	143	3.17	143	3.09
Côte d'Ivoire	144	3.09	145	3.02
Pakistan	145	3.07	144	3.06
Rwanda	146	3.03	146	2.91
Haiti	147	2.93	147	2.90
Benin	148	2.84	149	2.76
Mauritania	149	2.83	148	2.80
Senegal	150	2.68	151	2.50
Tanzania	151	2.66	150	2.65
Guinea	152	2.44	152	2.41
Ethiopia	153	2.43	153	2.38
Guinea-Bissau	154	2.27	154	2.21
Mozambique	155	2.25	155	2.16
Mali	156	2.21	156	2.04
Chad	157	1.81	157	1.76
Burkina Faso	158	1.67	158	1.56
Niger	159	1.36	159	1.34

Source: ITU.

Box 2.8: Progress in measuring ICT in education

In 2008, a set of eight new indicators on measuring ICT in education was added to the core list of ICT indicators established by the *Partnership on Measuring ICT for Development*.[29] These indicators were developed by the UNESCO Institute for Statistics (UIS) and have been subject to extensive testing and consultation processes. The key selection criteria for the indicators included policy relevance, feasibility of reliable data collection, minimization of data collection burden and international comparability. This process led to the development of the following eight indicators: (i) schools with a radio used for educational purposes; (ii) schools with a TV used for educational purposes; (iii) schools with a telephone communication facility; (iv) schools with Internet access (by type of access); (v) students who have access to the Internet at school; (vi) students enrolled by gender at the tertiary level in ICT-related fields; (vii) ICT-qualified teachers in primary and secondary schools; and (viii) the student-to-computer ratio.

In addition to the core list of indicators, UIS has also worked to define a large number of other indicators related to ICT in education, and has developed methodological tools, such as a guide to ICT for education indicators and survey materials. In 2008, an international Working Group on ICT Statistics in Education (WISE) was created, with representatives from 25 countries, in order to validate the UIS methodological tools and a prototype questionnaire on ICT in education.

While some of the indicators developed by UIS (such as students enrolled in ICT-related fields) could become important for future inclusion in the IDI (once they become widely available), new work on defining and measuring information literacy could also become relevant to the skills sub-index. According to UIS (2008), "*information literacy is the capacity of people to: recognise their information needs; locate and evaluate the quality of information; store and retrieve information; make effective and ethical use of information, and apply information to create and communicate knowledge*." Future work will have to focus on defining indicators for measuring information literacy, validating and testing them.

range has increased over time in each region. This shows that while the countries that are performing least well are improving, they are improving by less than those who are already performing well, meaning the gap between the maximum and minimum values is widening.

The link between ICT development and income has been well established (see Chart 2.4 and Chapter 5), and also holds true at the regional level. Plotting the IDI and GNI per capita against each other (Chart 2.11) points to a positive log-linear relationship between the two,[32] though income is not necessarily the only driver of ICT-development levels. While the distribution along the trend line is fairly homogenous for the CIS and Europe (albeit at higher income per capita levels for the latter), the other four regions show a pattern with a cluster of relatively lower income countries at one end combined with a few high income countries at the other end (though at relatively lower income levels for Africa), reflecting substantial differences in both ICT development and income levels within these regions. For example, the two North American countries are at the higher income end in the Americas, as are the Gulf States in the Arab States region. Regional dispersion is greatest in Asia and the Pacific (Table 2.7).

Table 2.6: The top 5 in each region and their rank in the global IDI

Regional IDI Rank	Europe	IDI Rank	Asia & Pacific	IDI Rank	Americas	IDI Rank	Arab States	IDI Rank	CIS	IDI Rank	Africa	IDI Rank
1	Sweden	1	Korea (Rep.)	3	United States	19	UAE	29	Russia	48	Seychelles	66
2	Luxembourg	2	Japan	8	Canada	21	Bahrain	33	Belarus	55	Mauritius	72
3	Denmark	4	Hong Kong, China	11	St. Vincent and the Grenadines	46	Qatar	45	Ukraine	58	South Africa	92
4	Netherlands	5	Singapore	14	Argentina	49	Saudi Arabia	52	Kazakhstan	69	Cape Verde	102
5	Iceland	6	Australia	15	Uruguay	50	Kuwait	65	Moldova	73	Botswana	109

Source: ITU.

Table 2.7: IDI ranges by region

	2008			2007			2002			Difference range 07-08	Difference range 02-08
	Min	Max	Range	Min	Max	Range	Min	Max	Range		
Asia & Pacific	1.08	7.68	6.60	1.06	7.23	6.18	0.99	5.84	4.85	0.42	1.75
The Americas	1.35	6.54	5.19	1.29	6.33	5.04	1.05	5.18	4.13	0.15	1.06
Europe	3.12	7.85	4.73	2.74	7.27	4.54	2.00	5.99	3.99	0.19	0.74
Arab States	1.46	6.11	4.66	1.41	5.20	3.80	1.07	3.36	2.29	0.86	2.37
Africa	0.79	3.64	2.85	0.73	3.44	2.71	0.52	2.57	2.05	0.14	0.80
CIS	2.25	4.54	2.29	2.11	4.13	2.02	1.77	2.71	0.94	0.27	1.35

Source: ITU.

Africa

Africa is still at an early stage of ICT development and the IDI values for all countries in the region in 2008 were relatively low. The Seychelles are the highest ranked African country (ranked 66), and like in previous years only three African countries are in the top 100 in the 2008 IDI (Table 2.8). The 2008 IDI ranges from 3.64 in the Seychelles to 0.79 in Chad (Chart 2.12), a range of 2.85. Furthermore, the range increased over time, from 2.05 in 2002 and 2.71 in 2007. The IDI value increased in all countries between 2007 and 2008, the increase ranging from 0.34 in Cape Verde to 0.03 in Cameroon and Madagascar; and from 1.07 in the Seychelles to 0.15 in Eritrea between 2002 and 2008. Most growth occurred in the IDI access sub-index, with nearly negligible growth in the use sub-index, which is extremely low in Africa, in spite of remarkable growth in some ICT services.

Slow progress in the development of broadband contributes to explaining the lack of progress in the use sub-index. Fixed broadband development through ADSL (the most commonly used technology) is constrained by a very limited and largely stagnating fixed line sector. In addition, there are very few cable networks and many countries are facing a shortage of international Internet bandwidth. As a result, fixed broadband penetration is low and broadband prices are beyond the reach of the majority of the population (see chapter 4). Mobile broadband is in its very initial stages but is showing faster growth than fixed broadband and may be Africa's most promising broadband access technology for the future.

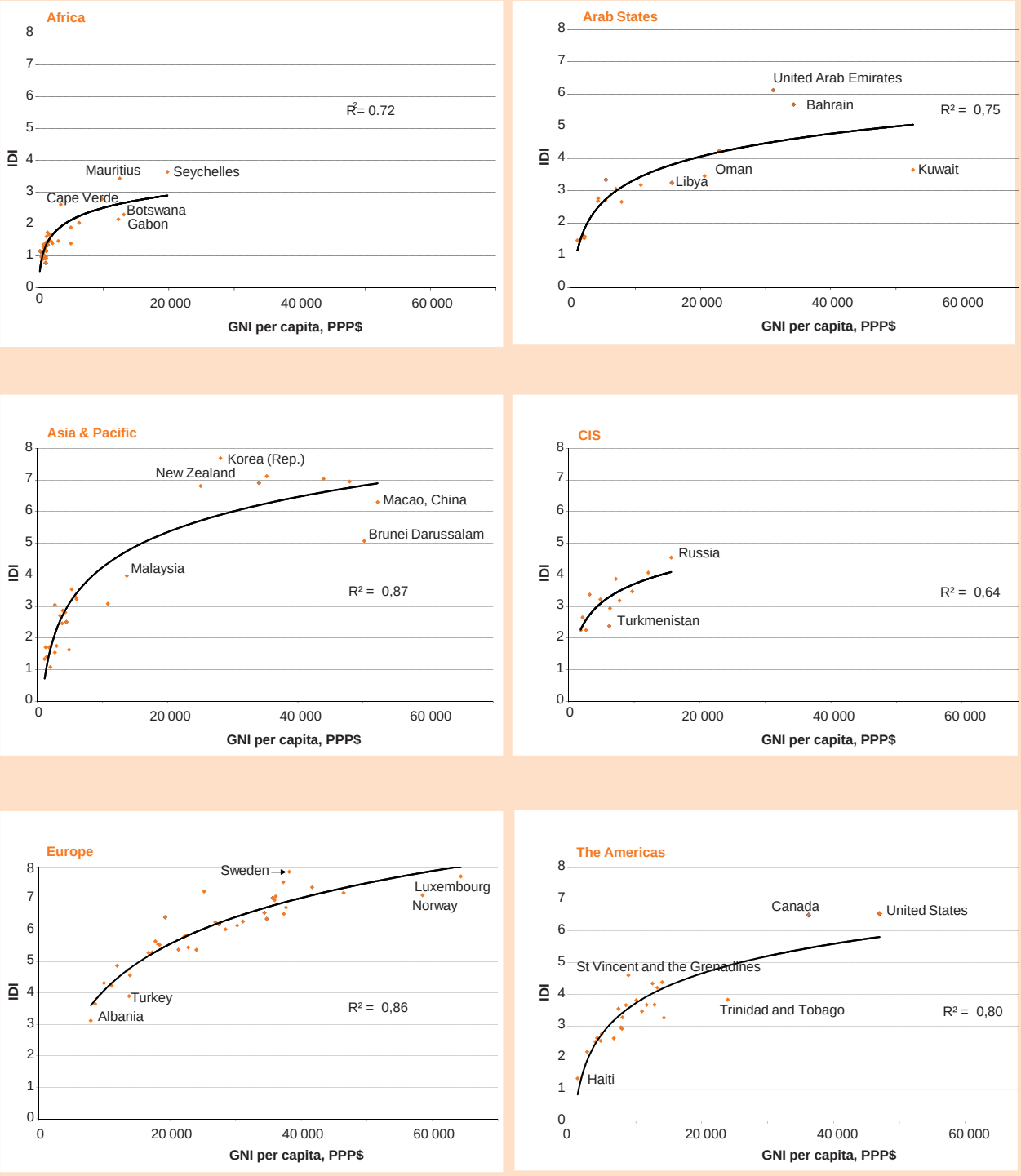
The access sub-index is progressing though, in particular with increasing access to mobile networks and the cross-country distribution of mobile subscriptions is becoming more even. These changes in the mobile sector were largely driven by the development of mobile services and applications that meet the requirements of users in the region, such as prepaid services, text messaging, and m-banking. Nonetheless, the region needs to upgrade its infrastructure and bring its mobile cellular levels closer to those of the rest of the world.

As outlined in ITU (2009c), there are two main areas of ICT policy concern for the region: (a) to sustain mobile cellular and Internet user growth and extend access to lower-income segments of the population; and (b) to take the necessary steps to enable greater broadband access. Policy recommendations therefore include enhancing liberalization and privatization and strengthening regulatory agencies; promoting infrastructure sharing; bringing down prices for telecommunications services, especially broadband Internet; promoting wireless broadband; incorporating mobile cellular into universal access policies; improving the use of Universal Access and Service Funds (UASFs), and expanding public Internet access.

Arab States

Differences in ICT development in this region reflect income differences between the countries belonging to the Gulf Cooperation Council (GCC) on the one hand, and the countries in the broader Middle East region and North Africa on the other. The United Arab Emirates (UAE) is the highest ranked country in region, ranked 29th globally (Table 2.9). Bahrain and Qatar are also in the global top 50, ranked 33rd and 45th, respectively. In 2008, the IDI values ranged from 6.11 in UAE to 1.46 in Comoros (Chart 2.13), a range of 4.66. The broad range in the IDI also reflects large income differences across

Chart 2.11: The IDI and GNI per capita, 2008



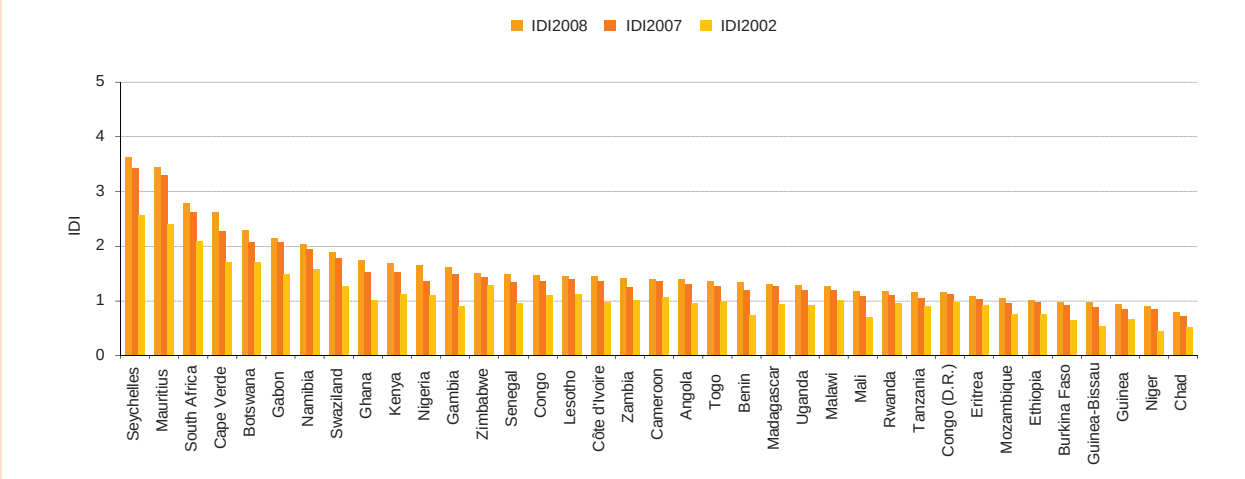
Source: ITU and World Bank.

Table 2.8: IDI – Africa

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
Seychelles	1	66	3.64	62	3.44	53	2.57	-4
Mauritius	2	72	3.44	68	3.30	63	2.40	-4
South Africa	3	92	2.79	91	2.64	78	2.09	-1
Cape Verde	4	102	2.62	107	2.27	103	1.71	5
Botswana	5	109	2.30	110	2.08	102	1.71	1
Gabon	6	113	2.16	111	2.08	110	1.49	-2
Namibia	7	114	2.04	114	1.95	108	1.59	0
Swaziland	8	115	1.90	115	1.78	115	1.28	0
Ghana	9	116	1.75	119	1.54	135	1.01	3
Kenya	10	121	1.69	121	1.52	118	1.13	0
Nigeria	11	122	1.65	134	1.36	121	1.10	12
Gambia	12	124	1.62	123	1.50	147	0.90	-1
Zimbabwe	13	130	1.51	129	1.43	114	1.29	-1
Senegal	14	131	1.49	136	1.34	140	0.96	5
Congo	15	132	1.48	135	1.36	120	1.11	3
Lesotho	16	133	1.46	131	1.40	119	1.13	-2
Côte d'Ivoire	17	135	1.45	133	1.37	138	0.98	-2
Zambia	18	136	1.42	143	1.26	134	1.02	7
Cameroon	19	138	1.40	132	1.37	124	1.08	-6
Angola	20	139	1.40	138	1.31	141	0.95	-1
Togo	21	140	1.36	141	1.27	136	1.00	1
Benin	22	141	1.35	146	1.20	150	0.75	5
Madagascar	23	144	1.31	140	1.27	142	0.93	-4
Uganda	24	145	1.30	144	1.21	145	0.92	-1
Malawi	25	146	1.28	145	1.20	133	1.02	-1
Mali	26	147	1.19	148	1.08	151	0.72	1
Rwanda	27	148	1.19	147	1.11	139	0.96	-1
Tanzania	28	149	1.17	150	1.05	146	0.91	1
Congo (D.R.)	29	150	1.16	147	1.13	138	0.98	-3
Eritrea	30	152	1.08	152	1.03	142	0.93	0
Mozambique	31	153	1.05	154	0.97	148	0.75	1
Ethiopia	32	154	1.03	153	0.97	147	0.76	-1
Burkina Faso	33	155	0.98	155	0.93	152	0.64	0
Guinea-Bissau	34	156	0.97	156	0.88	153	0.54	0
Guinea	35	157	0.93	158	0.85	151	0.66	1
Niger	36	158	0.90	157	0.86	155	0.46	-1
Chad	37	159	0.79	159	0.73	154	0.52	0

Source: ITU.

Chart 2.12: IDI - Africa



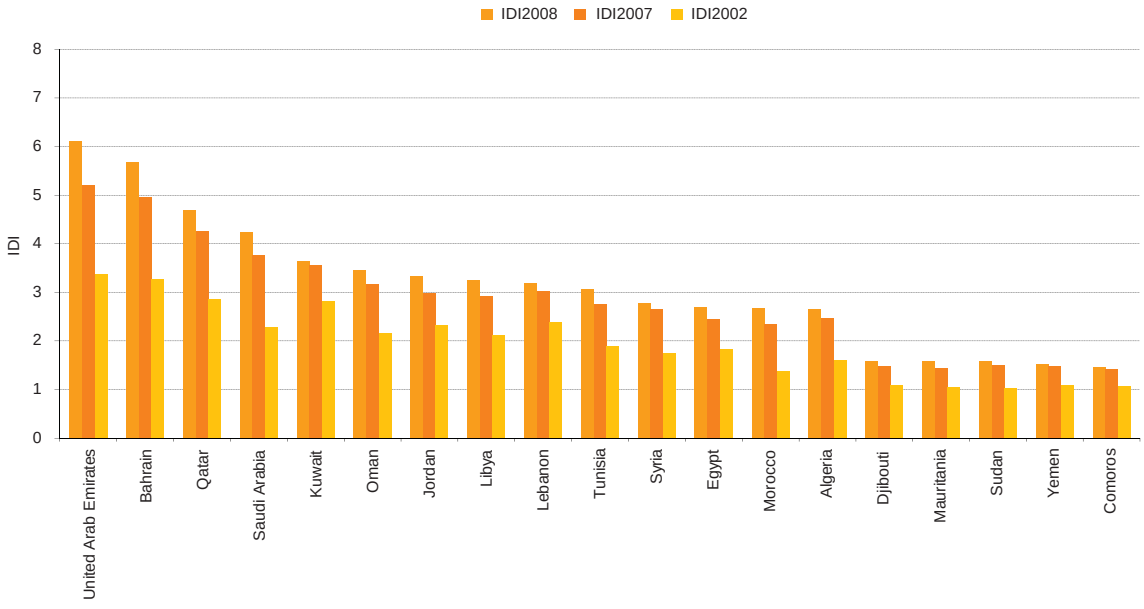
Source: ITU.

Table 2.9: IDI – Arab States

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
United Arab Emirates	1	29	6.11	33	5.20	36	3.36	4
Bahrain	2	33	5.67	35	4.95	38	3.26	2
Qatar	3	45	4.68	45	4.25	46	2.85	0
Saudi Arabia	4	52	4.24	54	3.76	68	2.28	2
Kuwait	5	65	3.64	59	3.54	47	2.82	-6
Oman	6	71	3.45	71	3.17	71	2.16	0
Jordan	7	74	3.33	79	2.98	67	2.32	5
Libya	8	78	3.24	80	2.92	77	2.10	2
Lebanon	9	82	3.17	78	3.02	64	2.39	-4
Tunisia	10	85	3.06	83	2.74	95	1.88	-2
Syria	11	93	2.76	90	2.65	101	1.73	-3
Egypt	12	96	2.70	100	2.44	97	1.82	4
Morocco	13	97	2.68	103	2.33	112	1.37	6
Algeria	14	100	2.65	97	2.47	105	1.60	-3
Djibouti	15	125	1.57	125	1.48	125	1.08	0
Mauritania	16	126	1.57	128	1.43	130	1.04	2
Sudan	17	127	1.57	122	1.50	132	1.02	-5
Yemen	18	129	1.52	126	1.48	126	1.07	-3
Comoros	19	134	1.46	130	1.41	127	1.07	-4

Source: ITU.

Chart 2.13: IDI - Arab States



Source: ITU.

the region. Furthermore, the region's low population density makes digital inclusion for everyone challenging.

Nonetheless, between 2007 and 2008, the IDI value increased in all countries, the increase ranging from 0.91 in UAE to 0.04 in Yemen. The GCC countries rank at the top of the regional IDI ranking and also accounted for the largest value increase.

Mobile cellular penetration is high in the region, in particular in the higher-income countries, and is driving progress in the access sub-index. High penetration does not only reflect income, but also results from visitors and foreign professionals staying in the region, the high share of prepaid subscriptions, and the early adoption of policies aimed at liberalizing the telecommunication market. For example, UAE currently presents the high-

est mobile cellular penetration rate worldwide, having surpassed the 200 per cent mark by the end of 2008 (see Box 2.4 for more details on ICTs in the UAE). Over the past decade, mobile telephony in the Arab States has grown significantly (at an annual rate of 55 per cent, reaching a penetration of 62 per cent by the end of 2008), while fixed telephone line and Internet users per 100 inhabitants remained low (ten and an estimated 15 per 100 inhabitants, respectively).

The use sub-index has also increased somewhat, but remains relatively low. Indeed, broadband development is still in its early stages, with fixed broadband subscribers and mobile broadband subscriptions at one and three per cent penetration, respectively.

The pace and degree of telecommunication market liberalization, especially during early stages of liberalization, in the region have been impacted by business regulations limiting the shares of foreign ownership. This, in turn, has impacted the development of the fixed, mobile and Internet/broadband sectors in the region. In order to ensure all citizens have access to high-speed broadband services, and are equipped with the necessary ICT skills, while at the same time ensuring the sector is advancing towards the next-generation telecommunication era, there is important role for policy. Policy recommendations include implementing national ICT policies as well as effective monitoring and measurement mechanisms; further liberalizing the fixed, mobile, and Internet and broadband markets; deploying high-speed broadband networks; enhancing digital literacy, raising ICT awareness and improving ICT skills; and developing a framework to enable the migration to the next-generation ICT environment (ITU, 2010).

Asia and the Pacific

The countries that make up this region cover the whole spectrum of the global IDI ranking, with the Republic of Korea ranked 3rd and Papua New Guinea ranked 151st (Table 2.10). There are therefore substantial differences in IDI values in the region. In 2008, the IDI ranged from 7.68 in Korea to 1.08 in Papua New Guinea (Chart 2.14), a range of 6.60. Furthermore, the range increased over time, from 4.85 in 2002 and 6.18 in 2007. Still, between 2007 and 2008, the IDI value increased in all countries, the increase ranging from 0.57 in Macao (China) to 0.02 in Papua New Guinea.

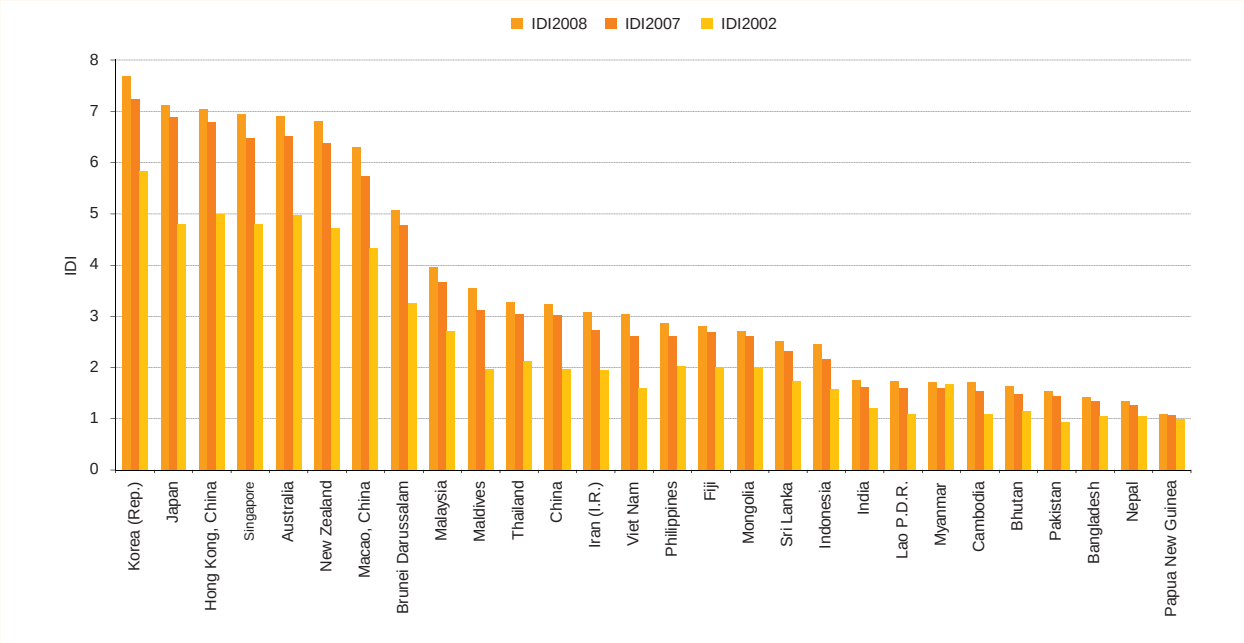
Despite large absolute increases in ICT uptake, the ICT penetration rate in many countries remains relatively low – below the world average – hindered by a large and often geographically dispersed population, difficult geographic conditions and major income differences (with the cost of ICT services remaining a crucial barrier to uptake in the region's low-income economies). As a result, both the access and use sub-indices remain below the global levels for many countries in the region.

Of particular concern are relatively low penetration rates for mobile cellular subscriptions, Internet users and household access to ICTs in low and lower-middle-income economies of the region. For example, despite the impressive number of new mobile subscriptions that have been added in the region during the past decade, growth in mobile cellular subscriptions in Asia and the Pacific has been lower than in the developing world. Similarly, there are huge divides between the few high-income economies and the rest of the economies of the region, in terms of household access and individual use of computers and – particularly – Internet. These are areas that need to be addressed urgently by ICT policymakers in those economies.

There are also large cross-country differences in broadband development, holding back progress in the use sub-index. Indeed, the region is home to several of the world's leading broadband economies, widely available mobile broadband services, and highly advanced optical fiber deployment. But at the same time there are also economies with very low broadband Internet penetration, and at a minimal speed of just 256 kbit/s.

Recent deployment of 3G networks in China, India and Viet Nam are promising developments. Initiatives in more ICT advanced countries, such as Japan's "Zero broadband areas elimination" plan, are other good examples of policies towards bridging national broadband divides. Policy recommendations for tackling the broadband divide have been presented in ITU (2009d) and include: establishing targeted broadband policies; awarding spectrum for mobile broadband and fixed wireless technology; encouraging new broadband operators and stimulating competition; creating investment incentives for the broadband industry; using universal service funds to distribute broadband to rural and underserved areas, and promoting the development of online e-government services and other local content to minimize dependence on expensive international connectivity and encourage more citizens to access relevant services and applications.

Chart 2.14: IDI - Asia and the Pacific



Source: ITU World Telecommunication/ICT Indicators database.

Table 2.10: IDI – Asia and the Pacific

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
Korea (Rep.)	1	3	7.68	2	7.23	2	5.84	-1
Japan	2	8	7.12	7	6.89	17	4.79	-1
Hong Kong, China	3	11	7.04	10	6.78	12	4.98	-1
Singapore	4	14	6.95	15	6.47	16	4.79	1
Australia	5	15	6.90	14	6.51	14	4.97	-1
New Zealand	6	16	6.81	16	6.38	18	4.72	0
Macao, China	7	24	6.29	28	5.73	23	4.33	4
Brunei Darussalam	8	42	5.07	42	4.77	39	3.25	0
Malaysia	9	56	3.96	55	3.66	50	2.71	-1
Maldives	10	68	3.54	72	3.11	87	1.97	4
Thailand	11	76	3.27	75	3.03	74	2.13	-1
China	12	79	3.23	77	3.03	90	1.96	-2
Iran (I.R.)	13	84	3.08	86	2.73	92	1.94	2
Viet Nam	14	86	3.05	93	2.61	106	1.59	7
Philippines	15	90	2.87	95	2.61	81	2.02	5
Fiji	16	91	2.81	88	2.69	85	2.00	-3
Mongolia	17	95	2.71	94	2.61	86	1.98	-1
Sri Lanka	18	105	2.51	104	2.32	99	1.74	-1
Indonesia	19	107	2.46	108	2.15	109	1.57	1
India	20	117	1.75	116	1.62	116	1.21	-1
Lao P.D.R.	21	118	1.74	117	1.60	123	1.09	-1
Myanmar	22	119	1.71	118	1.60	104	1.66	-1
Cambodia	23	120	1.70	120	1.53	122	1.10	0
Bhutan	24	123	1.62	124	1.48	117	1.15	1
Pakistan	25	128	1.54	127	1.45	144	0.92	-1
Bangladesh	26	137	1.41	137	1.34	128	1.05	0
Nepal	27	142	1.34	141	1.27	131	1.04	-1
Papua New Guinea	28	151	1.08	150	1.06	137	0.99	-1

Source: ITU.

CIS

ICT diffusion in the region is complicated by the region's large territories, difficult geographic conditions and substantial cross-country income differences. Russia is the highest ranked CIS country, ranked 48th globally (Table 2.11). The IDI values in the region are fairly low, ranging from 4.54 in Russia to 2.25 in Uzbekistan and Tajikistan (Chart 2.15), a difference of 2.29. Furthermore, the range increased over time, from 0.94 in 2002 and 2.02 in 2007. Nonetheless, between 2007 and 2008, the IDI value increased in all countries, the increase ranging from 0.41 in Russia and Azerbaijan to 0.11 in Turkmenistan.

Many countries made significant improvements in the access sub-index. The number of fixed telephone lines in the CIS continues to grow, while at the same time a clear shift from fixed to mobile telephony can be observed in the region, with mobile cellular subscriptions surpassing fixed lines in 2003. At the end of 2008, the CIS region had the second highest regional mobile cellular penetration rate in the world.

Upper-middle-income countries such as Russia and Ukraine have mobile penetration rates well above 100 per cent, high Internet growth rates and a dynamic ICT sector. At the other end of the scale, low-income countries such as Tajikistan and Uzbekistan have low ICT penetration and moderate ICT growth.

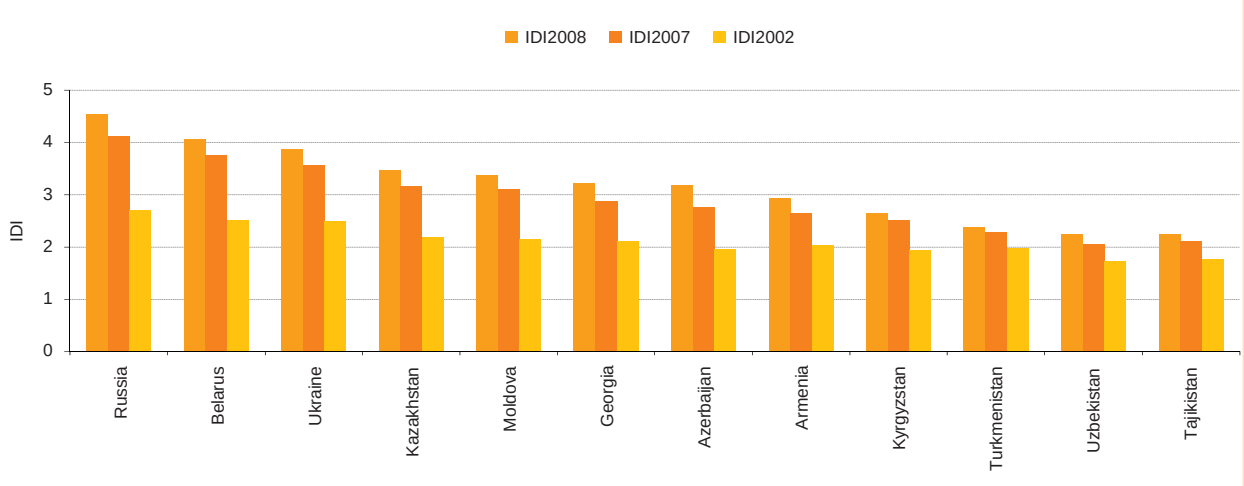
Progress in the use sub-index tends to be slow and this sub-index remains relatively low in most countries in the region. Indeed, at levels similar to those in the developing world, the CIS region's fixed and mobile

Table 2.11: IDI – CIS

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
Russia	1	48	4.54	46	4.13	51	2.71	-2
Belarus	2	55	4.07	53	3.77	56	2.52	-2
Ukraine	3	58	3.87	58	3.56	57	2.50	0
Kazakhstan	4	69	3.47	70	3.17	69	2.18	1
Moldova	5	73	3.37	73	3.11	73	2.14	0
Georgia	6	80	3.22	81	2.87	76	2.11	1
Azerbaijan	7	81	3.18	82	2.77	89	1.96	1
Armenia	8	88	2.94	89	2.66	79	2.03	1
Kyrgyzstan	9	99	2.65	96	2.52	91	1.95	-3
Turkmenistan	10	108	2.38	106	2.27	88	1.97	-2
Uzbekistan	11	110	2.25	113	2.06	100	1.74	3
Tajikistan	12	111	2.25	109	2.11	98	1.77	-2

Source: ITU.

Chart 2.15: IDI - CIS



Source: ITU World Telecommunication/ICT Indicators database.

broadband penetration rates (4.6 and 0.9 per cent in 2008, respectively) were below the world averages. Globally, the number of mobile broadband subscriptions overtook the number of fixed broadband subscribers in 2008, but in the CIS region, at the end of 2008, fixed broadband subscribers still largely exceeded mobile broadband subscriptions (12.5 million compared to 2.5 million, respectively).

Fixed infrastructure to deliver high-speed Internet access is often limited to urban centers and out of the reach of many CIS inhabitants. In many countries the market is still dominated by incumbent operators, which have yet to roll out backbone broadband infrastructure, especially outside the capital cities. Most incumbent operators have been reluctant to follow through the push towards broadband, but this has now started to change, driven by increasing deregulation, the emergence of new competitors and a strong demand for high-speed Internet services.

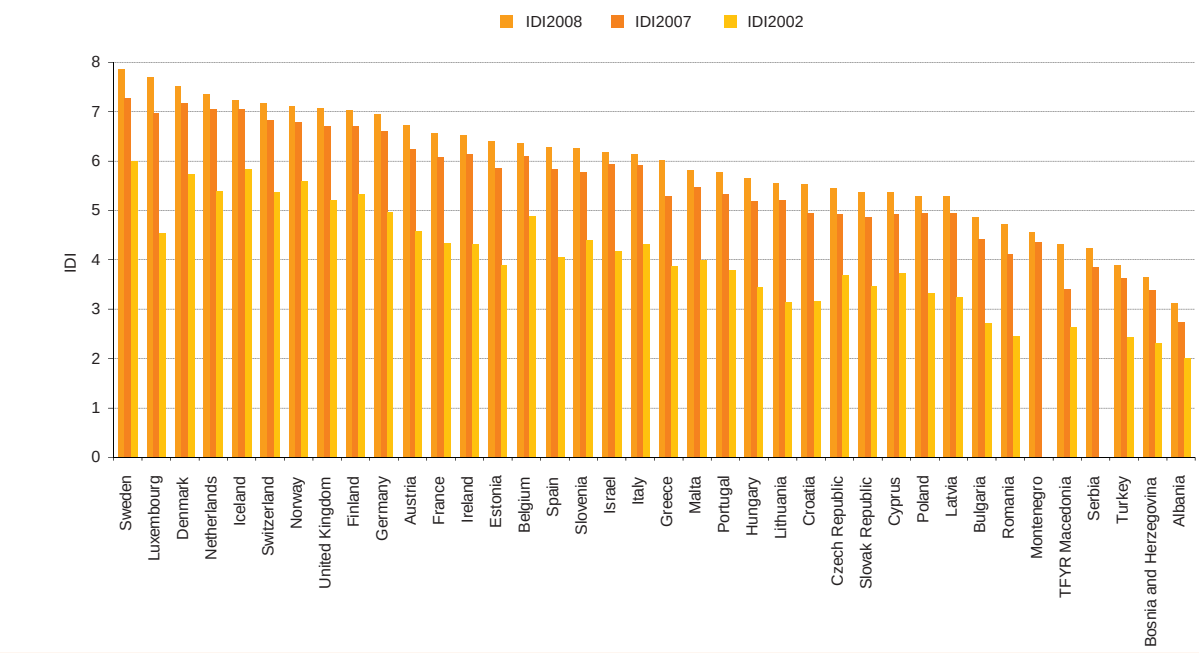
Mobile broadband networks are being launched throughout the region, including in Russia, Ukraine, Armenia, Uzbekistan and Moldova. Although penetration levels remain low, mobile broadband technologies and services are expected to help overcome the broadband divide, especially in areas with limited fixed line infrastructure. At the same time, WiMAX deployment is ongoing in several countries throughout the region, with the potential of bringing high-speed Internet to rural and underserved areas.

In view of these developments, the main priorities for policy makers in the region will be to encourage new broadband operators to enter the market and stimulate competition, use universal service funds to roll out broadband to rural and underserved areas, promote the development of online e-government services and encourage more citizens to access relevant services and applications. Favorable conditions need to be created to ensure liberalization, privatization and transparent markets, attract operators and investors and to stimulate ICT deployment and uptake. Regulatory reform is also necessary to ensure regulatory independence and the implementation of competitive safeguards. Preferential rights and conditions should be granted to mobile operators for using limited radio resources for mobile broadband services, and prices for telecommunication services, especially broadband Internet, should be reduced (ITU, 2009e).

Europe

Many European countries are among the world leaders in ICT services uptake. Sweden tops the 2008 global IDI ranking, as it did in previous years, and nine of the

Chart 2.16: IDI - Europe



Note: Both Serbia and Montenegro were not included in the 2002 IDI.
Source: ITU.

Table 2.12: IDI – Europe

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
Sweden	1	1	7.85	1	7.27	1	5.99	0
Luxembourg	2	2	7.71	6	6.98	20	4.54	4
Denmark	3	4	7.53	3	7.18	4	5.73	-1
Netherlands	4	5	7.37	5	7.06	6	5.39	0
Iceland	5	6	7.23	4	7.06	3	5.83	-2
Switzerland	6	7	7.19	8	6.83	7	5.36	1
Norway	7	9	7.11	9	6.78	5	5.60	0
United Kingdom	8	10	7.07	12	6.70	10	5.22	2
Finland	9	12	7.02	11	6.70	8	5.33	-1
Germany	10	13	6.95	13	6.60	13	4.98	0
Austria	11	17	6.72	19	6.25	19	4.58	2
France	12	18	6.55	22	6.09	22	4.33	4
Ireland	13	20	6.52	20	6.14	25	4.31	0
Estonia	14	22	6.41	25	5.86	29	3.88	3
Belgium	15	23	6.36	21	6.10	15	4.88	-2
Spain	16	25	6.27	26	5.84	27	4.05	1
Slovenia	17	26	6.26	27	5.77	21	4.40	1
Israel	18	27	6.19	23	5.93	26	4.18	-4
Italy	19	28	6.15	24	5.91	24	4.32	-4
Greece	20	30	6.03	31	5.28	30	3.88	1
Malta	21	31	5.82	29	5.48	28	4.00	-2
Portugal	22	32	5.77	30	5.32	31	3.78	-2
Hungary	23	34	5.64	34	5.18	35	3.45	0
Lithuania	24	35	5.55	32	5.22	42	3.14	-3
Croatia	25	36	5.53	37	4.95	41	3.16	1
Czech Republic	26	37	5.45	39	4.92	33	3.69	2
Slovak Republic	27	38	5.38	41	4.86	34	3.47	3
Cyprus	28	39	5.37	40	4.91	32	3.74	1
Poland	29	40	5.29	36	4.95	37	3.32	-4
Latvia	30	41	5.28	38	4.95	40	3.23	-3
Bulgaria	31	43	4.87	43	4.42	49	2.72	0
Romania	32	44	4.73	48	4.11	60	2.46	4
Montenegro	33	47	4.57	44	4.36			-3
TFYR Macedonia	34	51	4.32	63	3.40	52	2.64	12
Serbia	35	53	4.23	52	3.85			-1
Turkey	36	57	3.90	56	3.63	61	2.43	-1
Bosnia and Herzegovina	37	64	3.65	65	3.38	66	2.32	1
Albania	38	83	3.12	84	2.74	84	2.00	1

Note: Both Serbia and Montenegro were not included in the 2002 IDI.
Source: ITU.

top ten countries are European (the Republic of Korea is the only non-European country in the top 10, ranked 3rd). Furthermore, 33 of the 38 European countries are in the top 50 (Table 2.12). The 2008 IDI in the region ranges from 7.85 in Sweden to 3.12 in Albania (Chart 2.16), a range of 4.73. Furthermore, the range increased over time, from 3.99 in 2002 and 4.54 in 2007, even though the IDI increased in all countries.

Most countries in Europe, and in particular the EU members, have progressed from the first stage of ICT development (access) to the second stage (use). Key success factors include the adoption of a harmonized legal and regulatory framework and common technological platforms among EU member states. As early as 2002, all Member States agreed on the implementation of a harmonized regulatory framework, addressing key regulatory bottlenecks, such as network interconnection, open access, unbundling, spectrum policy and universal service. Adopting common, well-engineered guidelines, and customizing them to individual countries' characteristics and needs, enabled Member States to stimulate their ICT sectors through fostering competition among service providers and increasing demand among end-users. Moreover, in 2005, EU Member States agreed on the i2010 strategy to further develop the ICT sector, giving special emphasis to broadband network development in the transition to the digital economy. Since then, efforts have been focused on bridging the digital divide and enhancing digital inclusion. In this respect, EU Member States are a useful and concrete example for other European

countries, which are currently reviewing their national ICT policies and overall regulatory environment. One of their priorities is to harmonize national policies and regulations in-line with the commonly adopted EU regulatory framework.

The adoption of a uniform pan-European wireless cellular technological standard (2G / GSM) in the early '90s has also played a pivotal role in enabling mobile telephony uptake, as the benefits of economies of scale enjoyed by telecommunication vendors and operators have been passed on to end-users. Similarly, the migration to next-generation mobile telephony (IMT-2000 / 3G / UMTS), as early as 2000, has allowed European citizens to enjoy high-speed mobile broadband services early on.

The European Commission has mandated the transition to digital broadcasting in all Member States by 2012. This will enhance the quality of TV broadcasting for all European citizens, while the freed-up spectrum in the UHF band (the so-called "digital dividend") can be used for other purposes and applications, such as mobile broadband. An appropriate legal and regulatory framework needs to be developed for ensuring an effective migration to digital broadcasting, and the optimal use of the digital dividend should be decided (ITU, 2009f).

While Europe already scores very high in the IDI and its sub-indices, one remaining challenge is to ensure digital inclusion among all age groups and geographic regions in all European countries (ITU, 2009f). This can be achieved by effectively implementing national "broadband for all" strategies and policies and by enabling the migration to next-generation access (NGA) networks. At the same time, governments need to prevent the emergence of a new digital divide by connecting all, including the non-commercially viable areas. To this effect, the European Commission has recently published guidelines and rules pertaining to public financing for the development of nationwide high-speed broadband networks.

The Americas

The Americas region is characterized by the two high-income North American countries at the top, followed by a mix of countries in Latin America and the Caribbean covering a wide income range. The United States is the highest ranked country of the region, ranked 19th overall (Table 2.13). Five countries from the region are in the global top 50. The regional IDI 2008 ranged from 6.54 in the United States to 1.31 in Haiti (Chart 2.17), a range of 5.23. Furthermore, the range increased over time, from 4.13 in 2002 and 5.09 in 2007. There is a marked difference in ICT development between the region's top two countries of North America (Canada and the United States) and the other countries that make up the region. Nonetheless, between 2007 and 2008, the IDI value increased in all countries, the increase ranging from 0.49 in St Vincent and the Grenadines to 0.02 in Jamaica; and from 2.12 in St. Vincent and the Grenadines to 0.26 in Haiti between 2002 and 2008.

Most countries in the region continued to register progress in the access sub-index. While the number of fixed telephone lines in the region has stagnated, mobile telephony has grown rapidly and is likely to exceed 100 per cent penetration in most countries in the next few years. Some developing countries in the region, including Argentina, Guatemala, and Trinidad and Tobago have not only exceeded the 100 percent penetration mark but are also ahead of Canada and the United States, the region's most developed economies. Nonetheless, household access remains relatively low, especially in the region's developing nations, and with important gaps between urban and rural areas.

Progress on the use sub-index is held back by relatively low broadband penetration, and the unavailability of mobile broadband in many countries in the region, with low penetration in those countries where it is available. Internet use has grown steadily though, in part as a result of a proliferation of public access facilities. It is particularly important to enhance training and skills to raise awareness of the benefits of ICTs and to increase people's ability to use them effectively. One important advantage the region has is that its most commonly spoken languages (English, Spanish, Portuguese and French) are widely represented on the Internet. This allows application developers and users to leverage on content developed in the Americas, as well as on content available from other regions. Indeed, the region has been among the leaders in developing web presence of the public administration.

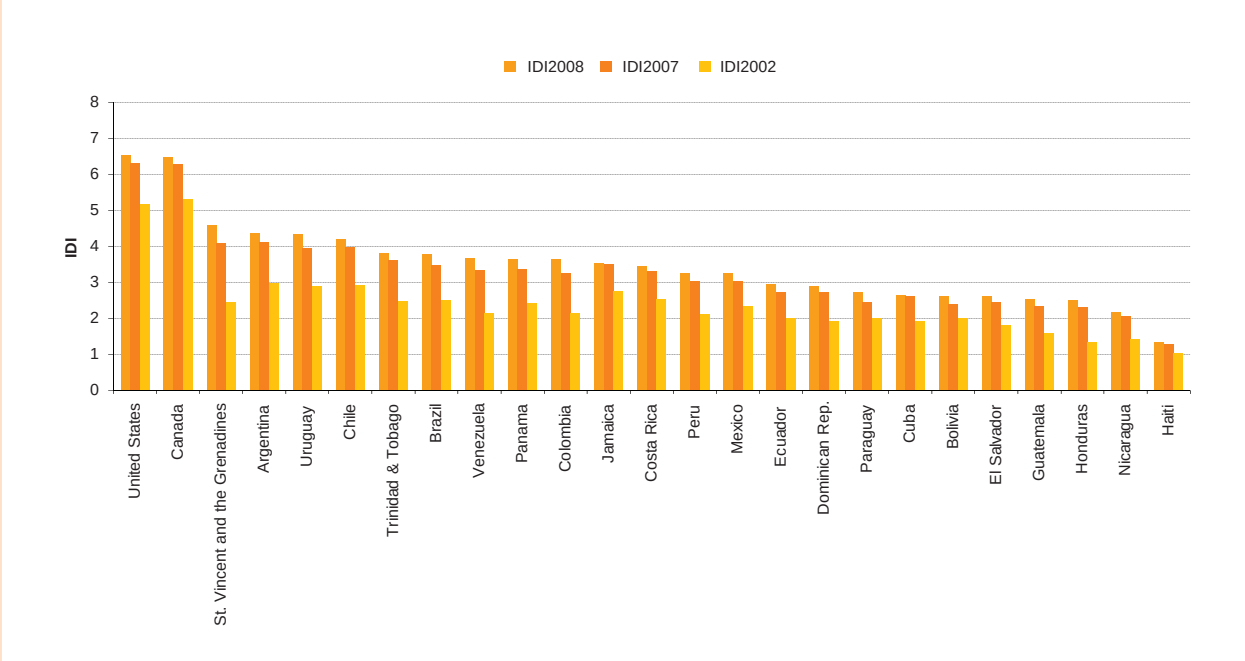
A number of regulatory obstacles are currently inhibiting the development of the region's ICT services, including barriers to convergence. For example, in the mobile sector, barriers to competition, the development of new services and greater usage remain, including the persistence of non-cost based termination rates in some countries, the lack of mobile number portability in many countries and spectrum allocation difficulties.

Table 2.13: IDI – The Americas

Economy	Regional rank 2008	Rank 2008	IDI 2008	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2007-2008
United States	1	19	6.54	17	6.33	11	5.18	-2
Canada	2	21	6.49	18	6.30	9	5.31	-3
St. Vincent and the Grenadines	3	46	4.59	49	4.10	59	2.47	3
Argentina	4	49	4.38	47	4.13	43	2.98	-2
Uruguay	5	50	4.34	51	3.96	45	2.90	1
Chile	6	54	4.20	50	3.99	44	2.94	-4
Trinidad & Tobago	7	59	3.83	57	3.61	58	2.49	-2
Brazil	8	60	3.81	61	3.49	55	2.52	1
Venezuela	9	61	3.67	66	3.33	70	2.16	5
Panama	10	62	3.66	64	3.39	62	2.42	2
Colombia	11	63	3.65	69	3.27	72	2.15	6
Jamaica	12	67	3.54	60	3.52	48	2.76	-7
Costa Rica	13	70	3.46	67	3.31	54	2.53	-3
Peru	14	75	3.27	74	3.03	75	2.13	-1
Mexico	15	77	3.25	76	3.03	65	2.34	-1
Ecuador	16	87	2.95	85	2.73	82	2.01	-2
Dominican Rep.	17	89	2.91	87	2.73	93	1.92	-2
Paraguay	18	94	2.75	98	2.46	83	2.00	4
Cuba	19	98	2.66	92	2.62	94	1.92	-6
Bolivia	20	101	2.62	101	2.39	80	2.02	0
El Salvador	21	103	2.61	99	2.45	96	1.82	-4
Guatemala	22	104	2.53	102	2.35	107	1.59	-2
Honduras	23	106	2.50	105	2.32	113	1.34	-1
Nicaragua	24	112	2.18	112	2.08	111	1.42	0
Haiti	25	143	1.31	143	1.24	129	1.05	0

Source: ITU.

Chart 2.17: IDI - The Americas



Source: ITU.

A number of policy recommendations to ensure continued ICT development, addressed in particular to the region's countries with relatively low levels of ICT access and use were highlighted by ITU (2009g). They include making legal frameworks and institutions convergence-ready to provide operators with incentives to upgrade networks so users can enjoy integrated triple-play services; harmonizing regulatory frameworks; liberalising spectrum; improving mobile competition and removing remaining structural barriers; stimulating application development; and allocating adequate resources for training and education related to ICT for development.

Endnotes

1 See ITU (2009b) for more details, including on the history and the development of the IDI.

2 This is also why the indicators collected by ITU, as well as the Partnership's core list of ICT indicators, are being revised regularly, reflecting the dynamic nature of ICTs.

3 See ITU (2009b) for more details on the discussion of the choice of indicators.

4 For example, the UNESCO Institute of Statistics is currently working on developing a set of ICT literacy skills, see: http://www.uis.unesco.org/template/pdf/cscl/InfoLit.pdf and Box 2.8.

5 The single index forum was operational from February 2008 to February 2009 and had 80 participants.

6 For more information on ITU's work in this area, see Box 5.1 and: http://www.itu.int/ITU-D/ict/partnership/index.html

7 See ITU (2009b) and Annex 1 for details.

8 It is important to recall that one of the main objectives of the IDI's methodology was that it should be easy to replicate the computation of the index.

9 See ITU (2010, 2009c,d,e,f,g).

10 The 2007 IDI presented here is not identical to the 2007 IDI presented in the previous edition of this report (ITU, 2009b) because of data revisions made by countries and by the UN Population Division, as well as the number of economies included in the IDI, which increased from 154 to 159.

11 Based on simple averages, whereby the score of each country receives an equal weight. Thus, each of these averages should be interpreted as reflecting the performance of a hypothetical average country.

12 Excludes both Serbia and Montenegro because 2002 data are not available for these two countries.

13 See http://www.victoriaadvocate.com/news/2009/dec/14/bc-eu-sweden-teliasonera-4g/?business&business-wire

14 See Luxembourg's Statistical Office, at http://www.statistiques.public.lu/fr/population/index.html

15 The same is true for the high GDP per capita figure of Luxembourg, which is in part a reflection of the very large number of cross-border workers, who contribute to the country's GDP but are not included in its population.

16 According to the World Bank's World Development Indicators, Luxembourg ranked high in terms of total businesses registered per 100'000 people. In 2005, Luxembourg ranked 10th out of a total of 93 countries.

17 See http://koreacrunch.com/archive/korean-top-20-web-sites

18 See http://www.tra.ae/pdf/legal_references/national_telecom_policy_uae.pdf

19 See http://www.prlog.org/10040359-uae-set-to-become-middle-east-most-wired-region.html

20 See http://www.telegeography.com/cu/article.php?article_id=30594&email=html

21 See http://www.tra.ae/summary_of_survey_results_bkp.php

22 See www.education.gov.bh

23 See eGovernment program, www.bahrain.bh

24 See e-Government Authority, Kingdom of Bahrain. http://www.ega.gov.bh.

25 See http://investinmacedonia.com/files/recources_files/2386/ICT%20sector%20in%20Macedonia.pdf

26 See http://macedonia.usaid.gov/Documents/USAID%20ICT%20Briefer%202009.pdf

27 GNI per capita in current international dollars (PPP$) is obtained using Purchasing Power Parity (PPP) conversion factors.

28 This relationship takes a log-linear shape (R square = 0.84), which implies that as income rises, a given absolute increase in income is associated with a smaller absolute change in the IDI.

29 See Partnership on Measuring ICT for Development (2009).

30 Based on the following six ITU-D regions: Africa, Americas, Arab States, Asia and the Pacific, CIS (Commonwealth of Independent States), and Europe.

31 This means that as income rises, a given absolute increase in income is associated with a smaller absolute change in the IDI.

Chapter 3

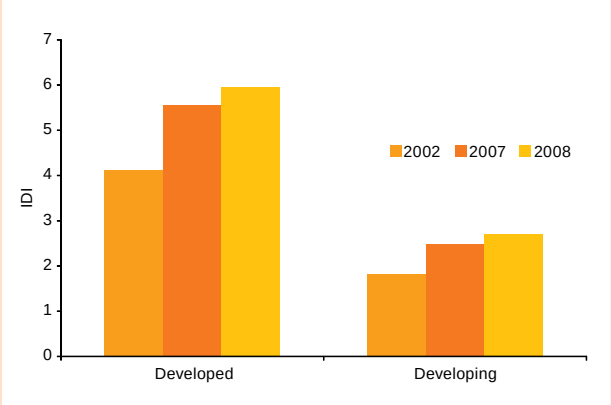
Measuring the digital divide

The digital divide remains high on the agenda of national and international ICT policy makers. One of the key objectives of the IDI is to help monitor and assess the digital divide, and highlight areas for improvement. The chapter starts by looking at the IDI by level of development (developed/developing). It then presents an analysis of the digital divide using the methodology developed by Orbicom (2003), which was also used in the previous edition of this publication (ITU, 2009b). The final section presents the concept of time distance, an alternative way of looking at the digital divide.

3.1 IDI by level of development

One approach to analyzing the global digital divide is to look at the differences in information society developments between developed and developing countries.[1] The IDI provides a useful for tool for this as it combines 11 indicators into a single index which can be used to benchmark countries, capturing a variety of ICT development aspects in both developed and developing countries.

Chart 3.1: IDI by level of development*



Note: *Simple averages.
Source: ITU.

IDI values are much higher in developed than developing countries, reaching 5.89 and 2.70 respectively, in 2008 (Chart 3.1). Between 2002 and 2008, the IDI increased in both developed and developing countries, with annual growth slightly higher in the developing world (6.4 per cent CAGR in developed countries compared to 6.8 per cent in developing countries).

Similar observations can be made about the three IDI sub-indices (access, use and skills), with higher index levels in the developed countries, and higher annual growth rates in developing countries (Charts 3.2, 3.3, 3.4), suggesting that developing countries are catching up.

The largest differences between developed and developing countries can be seen on the ICT use side with average use sub-index values of 3.77 and 0.91, respectively, in 2008. Of the three sub-indices, average annual growth rates between 2002 and 2008 were also strongest in the use sub-index, but they started from lower values.

Developed countries made the largest value gains in ICT use (2.47 points), whereas developing countries mainly improved ICT access (1.28 points), which is consistent with the three-stage model on which the IDI is based (Chapter 2). Most of the developed countries have moved to stage two (use), whereas many developing countries are still in stage one (access).

Differences between developed and developing countries are relatively smaller in the skills sub-index, and the value gains for both groups were the smallest of the three sub-indices. Some caution is needed in interpreting this observation, though, as the skills sub-index is composed of literacy and gross enrolment indicators, both of which have received much policy attention for decades and neither of which are direct indicators of ICT skills.

Chart 3.2:
Access sub-index by level of development*

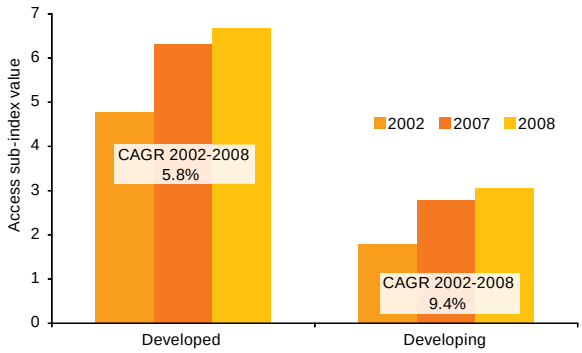


Chart 3.3:
Use sub-index by level of development*

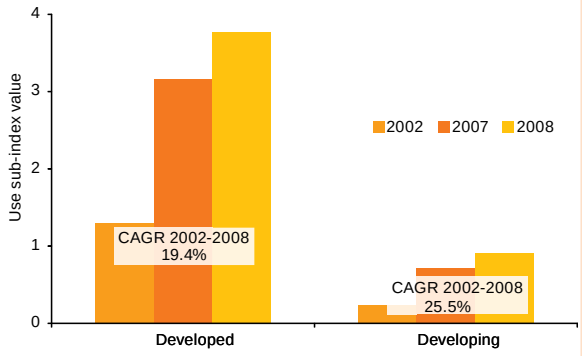
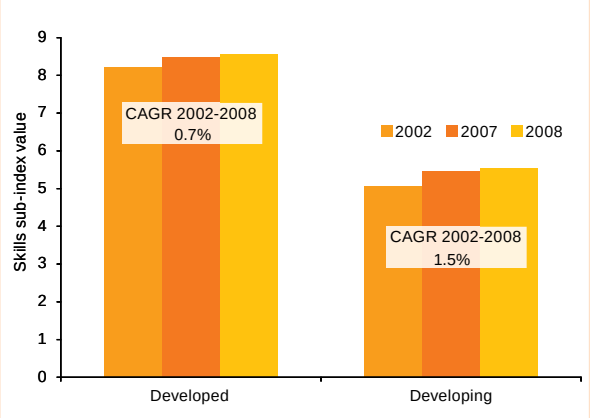


Chart 3.4:
Skills sub-index by level of development*



Note: * Simple averages.
Source: ITU.

3.2 Using the IDI to measure the digital divide

In addition to comparing the IDI by level of development, the IDI can also be used as a tool to measure the digital divide. The digital divide has been defined as "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (OECD, 2001). The digital divide reflects differences among and within countries in terms of access to physical infrastructure, such as computers and the Internet or even conventional communication infrastructure, such as fixed telephone lines. Digital divides can exist between developed and developing countries (also known as the global divide), or within a country (known as the national divide). It can manifest itself in different demographic characteristics of the population, such as age, gender, and income, or in different locations, such as urban and rural.

The digital divide is usually measured in terms of people's access to ICTs. Penetration levels of mobile cellular subscriptions, Internet users and personal computers are some of the most common measures used. However, a country may excel in one area, for example mobile cellular penetration, but lag in another, such as Internet penetration. A composite index, such as the IDI, is therefore very useful in this context.

Measuring the digital divide

The digital divide is a relative concept as it compares the level of ICT development in a country, or group of countries, with that in another at a certain point in time. For example, the Orbicom's Infostate Index defined the digital divide as the relative difference in countries' Infostates, benchmarked against a hypothetical country – obtained as the simple average of all countries included in analysis (Orbicom, 2003). Those that performed above-average were assigned a positive number, and those that performed below-average were identified by a negative number. This digital divide analysis follows the same methodology.[2]

Measuring the digital divide involves carrying out several steps. First, countries are grouped according to ICT development (or IDI) levels (high, upper, medium, and low levels), in order to monitor progress made by different country groups over time, and to compare the magnitude of the differences that exists between them.[3] Second, average IDI values for each are computed, for

both 2002 and 2008, which are used as the basis for further comparison and analysis. Third, the average IDI values of each group are normalized using the average for the overall 2008 IDI (which is the benchmark value). It is then possible to show, for each group and each year, the difference between the group's IDI value relative to the overall average IDI value. Finally, changes in the normalized IDI values are computed in order to show the evolution of the digital divides between 2002 and 2008 (see Orbicom, 2003, and ITU, 2009b, for more details on the methodology).

The country groups according to different ICT levels are given in Table 3.1, and the countries that make up each of these groups are listed in Table 3.4.

These groups include both large and small countries (in terms of population) from different regions (Figure 3.1):

- **High** (IDI values above 5.67): Economies included in this group have high levels of ICT access and use and high ICT skills. The 33 economies accounted for close to 15 per cent of the population covered by the IDI in 2008 and include 22 European countries, seven Asia and the Pacific economies, two Arab States (UAE and Bahrain), as well as Canada and the United States.

- **Upper** (IDI values between 3.64 and 5.64): Economies included in this category are those that have achieved an elevated level of access to and use of ICTs, and ICT skills, for a majority of their inhabitants. This group includes countries from different regions such as the Seychelles from Africa, Brunei Darussalam and Malaysia from the Asia and the Pacific region, three CIS countries, three Arab States, nine countries from the Americas region, and 15 European countries. Combined, they account for almost 12 per cent of the population covered by the IDI.

- **Medium** (IDI values between 2.16 and 3.54): This group accounts for more than one-third of the population covered by the IDI (37.3 per cent). It includes countries with large populations like China and Indonesia, but also small countries like Jamaica and the Maldives. In total, this group includes one European country (Albania), five African countries, nine Arab States, nine CIS countries, 10 countries from the Asia and the Pacific region, and 13 countries from the Americas region.

- Low (IDI values between 0.79 and 2.04): This group is composed of countries with low levels of ICT access, usage and skills. It also accounts for one-third of the population covered by the IDI (36.1 per cent) and comprises 46 countries, 31 of which are African. It also includes Haiti from the Americas region, five Arab States, and nine countries from the Asia and the Pacific region (including India).

Digital divide analysis and results

The average IDI values for the four groups are presented in Table 3.2. The IDI value for all groups increased between 2002 and 2008. However, the difference between the absolute IDI values for the high and low groups also increased (3.7 in 2002 and 4.3 in 2008). This does not capture the actual evolution of the digital divide though. Indeed, as the digital divide is a relative concept, the absolute IDI values do not

Table 3.1: Country groups with different ICT levels

Group	Number of countries	Population* %	IDI 2008	
			minimum	maximum
High	33	14.8	5.67	7.85
Upper	33	11.7	3.64	5.64
Medium	47	37.3	2.16	3.54
Low	46	36.1	0.79	2.04
Total	159	100.0	0.79	7.85

Note: * This is the share of the population covered by the IDI, i.e. the population of the 159 economies included in the IDI (accounting for 97.8% of the world's population).
Source: ITU.

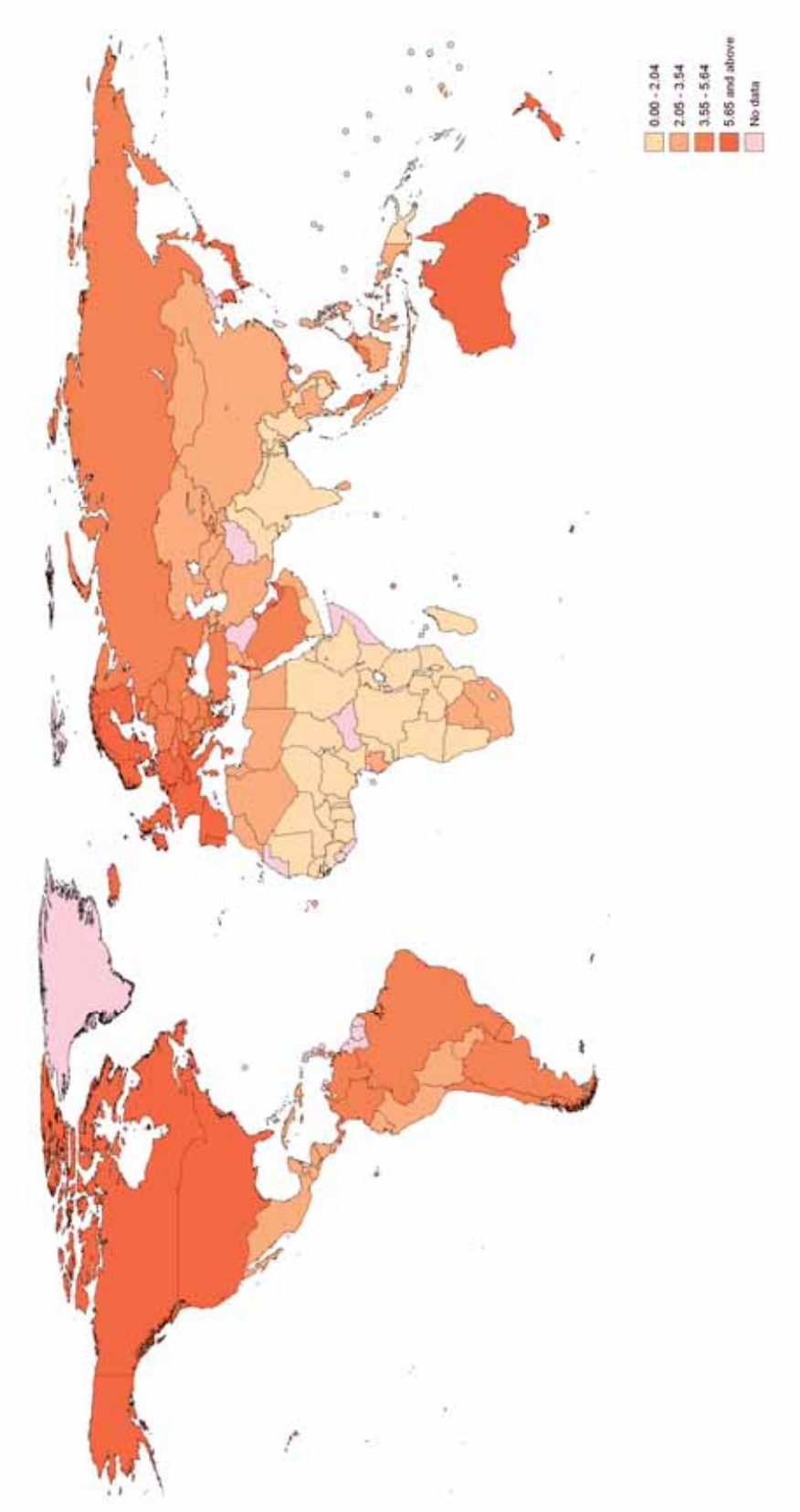


Figure 3.1: IDI by country groups, 2008

Source: ITU World Telecommunication / ICT Indicators database.

reflect the true picture of the digital divide. For example, countries that are already doing well in terms of ICT penetration and usage will not necessarily show huge growth on the basis of absolute values whereas countries that are behind in terms of ICT development may show larger increases as they are growing from lower levels. Hence the importance of normalizing the average IDI values to see how well a group is doing relative to a reference value.

The simple average of the overall 2008 IDI values (3.38) was used as the reference value for obtaining the normalized group averages (Table 3.3 and Chart 3.5). The evolution of the digital divide, and to show whether it is growing or shrinking, is obtained by subtracting the 2002 normalized IDI values from the 2008 corresponding values (see Table 3.3). For example, the digital divide between the high and low groups is slightly shrinking (the difference being -0.2, obtained by subtracting 5.5 from 5.3). The sign of the values in the final column in Table 3.3 ("Changes in digital divides") indicates whether the digital divide is shrinking (negative) or growing (positive). Thus, the digital divide between the high group and each of the other three groups is shrinking, while the divides between the three other groups are increasing.

Overall, the digital divide still exists in 2008, its magnitude being most important between the high and low groups, followed by the high and medium groups, and the high and upper groups. However, the digital divide is shrinking marginally, most notably between the high and upper groups, followed by the divide between the high and medium groups, and finally the high and low groups (Table 3.3). Thus, the digital divide between the high and each of the other three groups has decreased. Nonetheless, the divides between the upper and low, the upper and medium, and the medium and low groups have increased.

The analysis shows that the digital divide is still prevalent, although it is slightly shrinking between those countries with very high ICT levels and those with lower levels. This is partly explained by the flattening of ICT growth in the group of countries that are most advanced. At the same time, countries with upper levels of ICT have made strong improvements thus increasing the gap with those towards the lower end of the scale. Given the relatively short time lag of ICT indicators compared to other development indicators, low-performing countries could catch up relatively soon provided their ICT sectors receive adequate policy attention.

Table 3.2: IDI averages by groups*

Group	2002 IDI value	2008 IDI value	% change
High	4.7	6.7	42.0
Upper	2.8	4.5	59.3
Medium	1.9	2.9	48.9
Low	1.0	1.4	41.1
All countries (159)	2.4	3.6	48.0

Note: * Simple averages.
Source: ITU.

3.3 Time-distance analysis

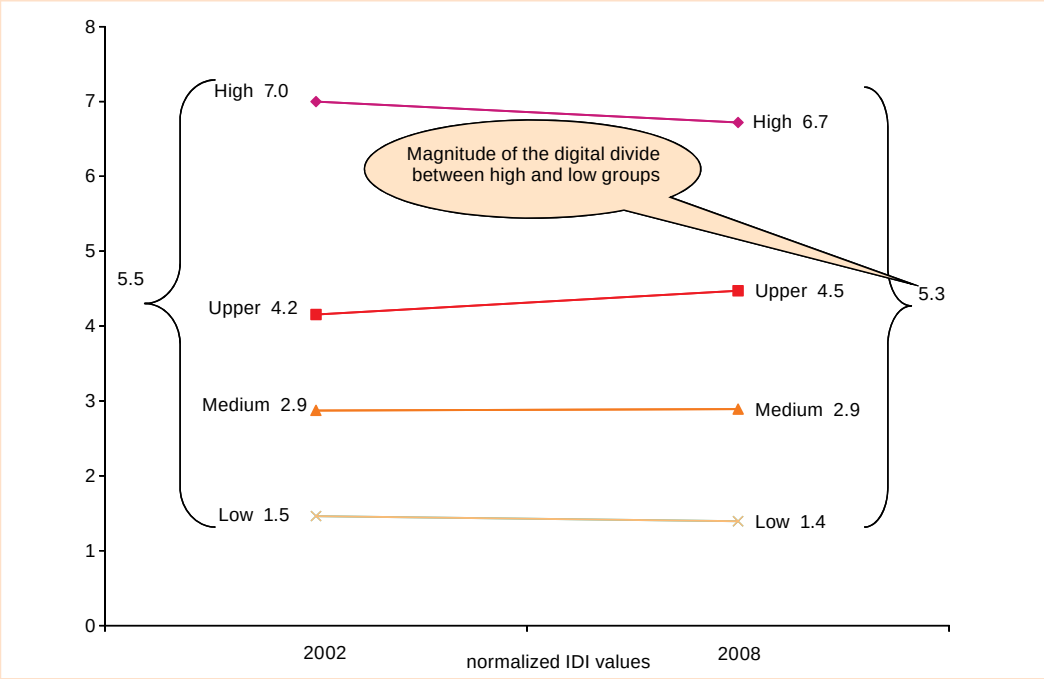
The IDI measures several aspects of ICTs, such as the development of ICTs in countries and relative to other countries, the level of advancement of ICTs at a global

Table 3.3: Evolution of the digital divide

Between	and	Magnitude of the digital divide (Difference between normalized IDI values)		Changes in digital divides
		2002	2008	2002-2008
High	Low	5.5	5.3	-0.2
High	Medium	4.1	3.8	-0.3
High	Upper	2.8	2.2	-0.6
Upper	Low	2.7	3.1	0.4
Upper	Medium	1.3	1.6	0.3
Medium	Low	1.4	1.5	0.1

Note: This table includes normalized simple group averages.
Source: ITU.

Chart 3.5: Evolution of the digital divide between IDI groups, 2002-2008



Source: ITU.

or regional level, and the digital divide, i.e. differences among countries with different levels of ICT progress. A different way of measuring differences in ICT developments is provided by the time-distance[4] methodology which measures the number of years a country or region lags behind a benchmark country or region in terms of development indicators.

In particular, time distance refers to the distance expressed in time units (e.g. the number of years) between the points in time at which the groups (e.g. two countries) being compared reached the same level of a particular indicator. For mobile cellular penetration rates, Sweden is taken as the benchmark country, as it ranks first in the IDI. Time distance then measures for each other country the number of years ago that Sweden had the same level of penetration as that country had in 2008. Thus, for country X the measure would read: in 2008, the penetration rate of country X was that of Sweden y number of years ago, if the penetration rate of country X lagged behind that of Sweden. Alternatively, if the penetration rate of Sweden lagged behind that of country X, the measure would read: in 2008, Sweden's penetration rate was that of country X, y number of years ago.

The gap between developed and developing countries in terms of ICT indicators is relatively small – especially compared to that for other development indicators, such as life expectancy or infant mortality rates (Chart 3.6). Indeed, in 2008, mobile cellular penetration and fixed broadband penetration in developing countries had reached that of Sweden just under ten years earlier, and the number of Internet users per 100 inhabitants that of Sweden just over 11 years earlier. In contrast, life expectancy in developing countries is at the level where Sweden was 66 years earlier, and infant mortality in developing countries in 2007 was at the level where Sweden was 72 years earlier. See Box 3.1 for a discussion about ICTs and child mortality.

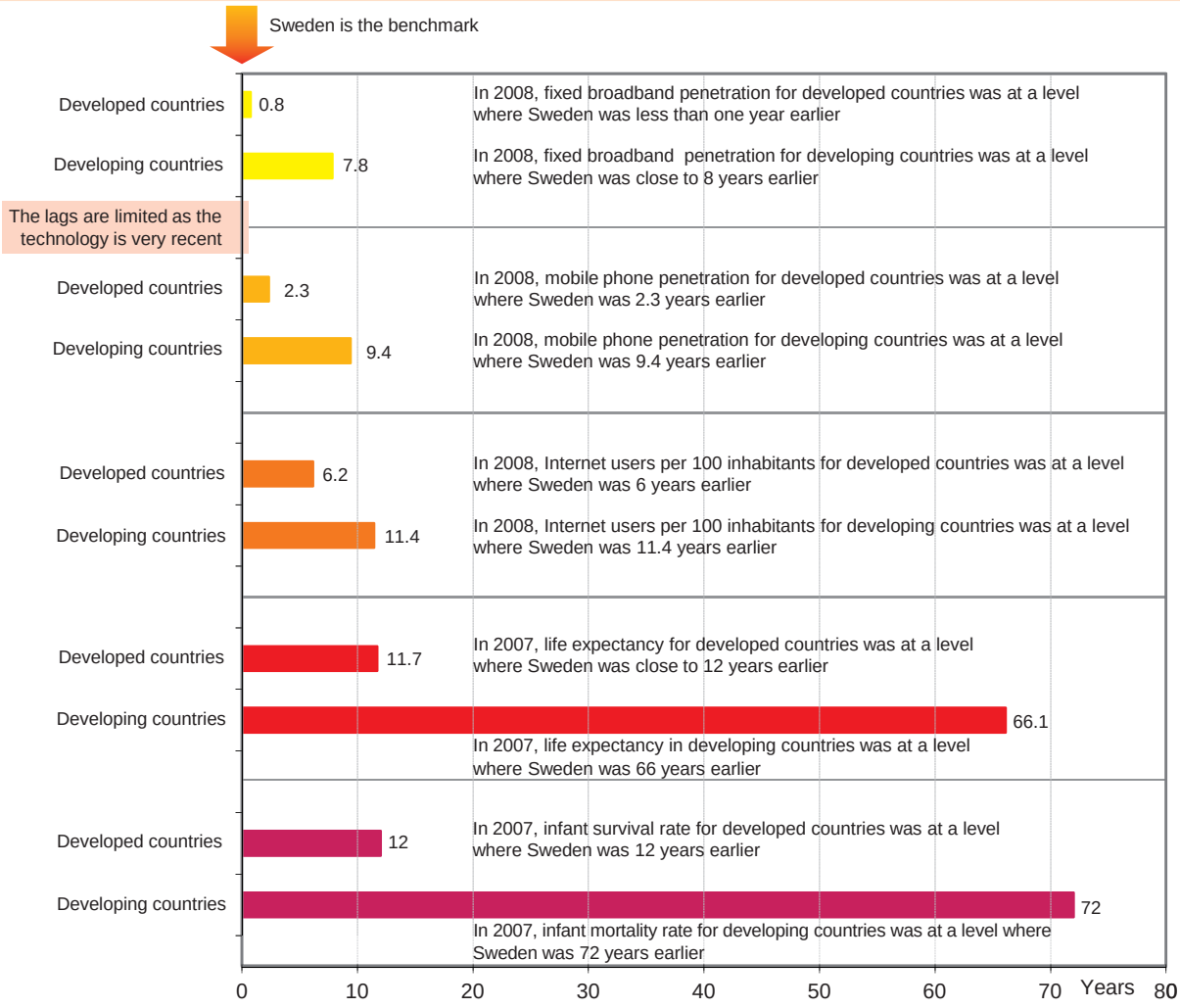
It should be kept in mind, though, that ICTs are relatively recent technologies so the time gap is bound by the date at which they were introduced, whereas for other development indicators the time gap can go back much further. Indeed, the gap can only go back as far as the date at which the benchmark country/region introduced the technology. For example, broadband has not existed for more than 10 years, so the time distance in the diffusion of this technology can not go back further than 10 years. However, for other indicators, such as life expectancy, child mortality or GDP, data records go back much further so the time distance is not bound in the short term for such variables.

Table 3.4: List of economies by IDI groups

HIGH	UPPER	MEDIUM	LOW
Australia	Argentina	Albania	Angola
Austria	Belarus	Algeria	Bangladesh
Bahrain	Bosnia and Herzegovina	Armenia	Benin
Belgium	Brazil	Azerbaijan	Bhutan
Canada	Brunei Darussalam	Bolivia	Burkina Faso
Denmark	Bulgaria	Botswana	Cambodia
Estonia	Chile	Cape Verde	Cameroon
Finland	Colombia	China	Chad
France	Croatia	Costa Rica	Comoros
Germany	Cyprus	Cuba	Congo
Greece	Czech Republic	Dominican Rep.	Congo (Dem. Rep.)
Hong Kong, China	Hungary	Ecuador	Côte d'Ivoire
Iceland	Kuwait	Egypt	Djibouti
Ireland	Latvia	El Salvador	Eritrea
Israel	Lithuania	Fiji	Ethiopia
Italy	Malaysia	Gabon	Gambia
Japan	Montenegro	Georgia	Ghana
Korea (Rep.)	Panama	Guatemala	Guinea
Luxembourg	Poland	Honduras	Guinea-Bissau
Macao, China	Qatar	Indonesia	Haiti
Malta	Romania	Iran (I.R.)	India
Netherlands	Russia	Jamaica	Kenya
New Zealand	Saudi Arabia	Jordan	Lao P.D.R.
Norway	Serbia	Kazakhstan	Lesotho
Portugal	Seychelles	Kyrgyzstan	Madagascar
Singapore	Slovak Republic	Lebanon	Malawi
Slovenia	St. Vincent and the Grenadines	Libya	Mali
Spain	TFYR Macedonia	Maldives	Mauritania
Sweden	Trinidad & Tobago	Mauritius	Mozambique
Switzerland	Turkey	Mexico	Myanmar
United Arab Emirates	Ukraine	Moldova	Namibia
United Kingdom	Uruguay	Mongolia	Nepal
United States	Venezuela	Morocco	Niger
		Nicaragua	Nigeria
		Oman	Pakistan
		Paraguay	Papua New Guinea
		Peru	Rwanda
		Philippines	Senegal
		South Africa	Sudan
		Sri Lanka	Swaziland
		Syria	Tanzania
		Tajikistan	Togo
		Thailand	Uganda
		Tunisia	Yemen
		Turkmenistan	Zambia
		Uzbekistan	Zimbabwe
		Viet Nam	

Source: ITU.

Chart 3.6: Time distance for various indicators by developed and developing regions*



Note: * 2008 for mobile cellular and fixed broadband penetration and Internet users, 2007 for infant mortality.
Source: ITU and SICENTER, based on ITU and UNICEF data.

Regional comparisons – measuring up against the world

As with any (development) indicator, aggregate technology penetration rates are dominated by those of developing countries. In 2008, the world mobile cellular penetration rate was at the level of penetration in Europe just over seven years earlier (Chart 3.7), with gaps of just over four years for fixed broadband penetration (Chart 3.8), and seven years for Internet user penetration (Chart 3.9). For mobile cellular penetration, the Asia and the Pacific and Africa regions were lagging the world's penetration rate by some one and a half and three years, respectively, whereas for fixed broadband and Internet users the same regions as well as the CIS and Arab States regions were lagging the world's rate. Thus, while for mobile telephony only two out of six regions lag the world's penetration rate, for fixed broadband penetration and Internet penetration this is the case for four out of six regions.

The digital divide is still evident for each of these three ICT indicators, though somewhat less in the case of mobile cellular penetration than for fixed broadband and Internet penetration. For mobile cellular penetration rates, developed countries lead the world's penetration rate by over six years, and LDCs lag it by more than five years. Mobile cellular penetration in developing countries was fairly close to that of the world as a whole, lagging it by less than one year. For fixed broadband the situation is somewhat different as it was introduced more recently than mobile telephony and the lag cannot go back further than 10 years, as is the case for LDCs where fixed broadband penetration tends to still be very low. Developed countries lead the world's penetration rate by over five years, and developing countries lag it by three years. The differences are somewhat more pronounced for Internet users per 100 inhabitants as

Box 3.1: ICT use and child mortality

ICTs can play an important role in helping to achieve the Millennium Development Goals (MDGs), including Goal No. 4: Reducing Child Mortality. Indeed, decreases in the number of maternal/infant deaths have been linked to the use of ICTs, both in health centres and in the home, and could be considered as an indication that ICTs have an important role in saving both mother and child (ITU, 2003, 2006). ICTs play a double role. On the one hand, they provide increased access to knowledge and information about pregnancies, disease and healthy behaviour; on the other hand, ICTs enable remote consultations and monitoring and may improve the delivery of health care services.

A similar point has been made about the influence of education on child mortality rates. For example, women, as primary caretakers, are most likely to implement the behaviours that can improve their children's health. To the extent that education improves an individual's ability to undertake these changes, more educated mothers will have healthier babies, and maternal education has been found to be strongly and inversely correlated with infant and child mortality in developing countries (Cutler *et al.*, 2006). A similar point can be made about using the Internet, particularly when used by mothers as it provides easy access to vast amounts of information about healthy behaviour during pregnancy, guidance and recommendations about bringing up babies and children, or exchange experiences with other mothers. Indeed, evidence on Internet usage shows that relatively more women use the Internet to seek health-related information, such as on specific diseases, injuries, or dietary and nutritional information (van Welsum and Montagnier, 2007).

The Local Digital Health Content project in Ghana constitutes a practical example of ICT initiatives in Africa used to improve maternal health and reduce child mortality. The project creates and distributes local knowledge relevant to maternal and child health in a digital format to help the illiterate and semi-literate, in particular through the Health Foundation of Ghana (HFG).[5] By using video materials and pictures in the form of a story board on a video compact disc, this ICT-based approach is also inclusive of those who cannot access the Internet by themselves, either because they lack access or skills to do so. An example is the production of a DVD about breast feeding, including pictures and film in local languages. The use of the Internet and of mobile cellular phones has also contributed to reducing deaths during childbirth, both of the mother and the child.[6]

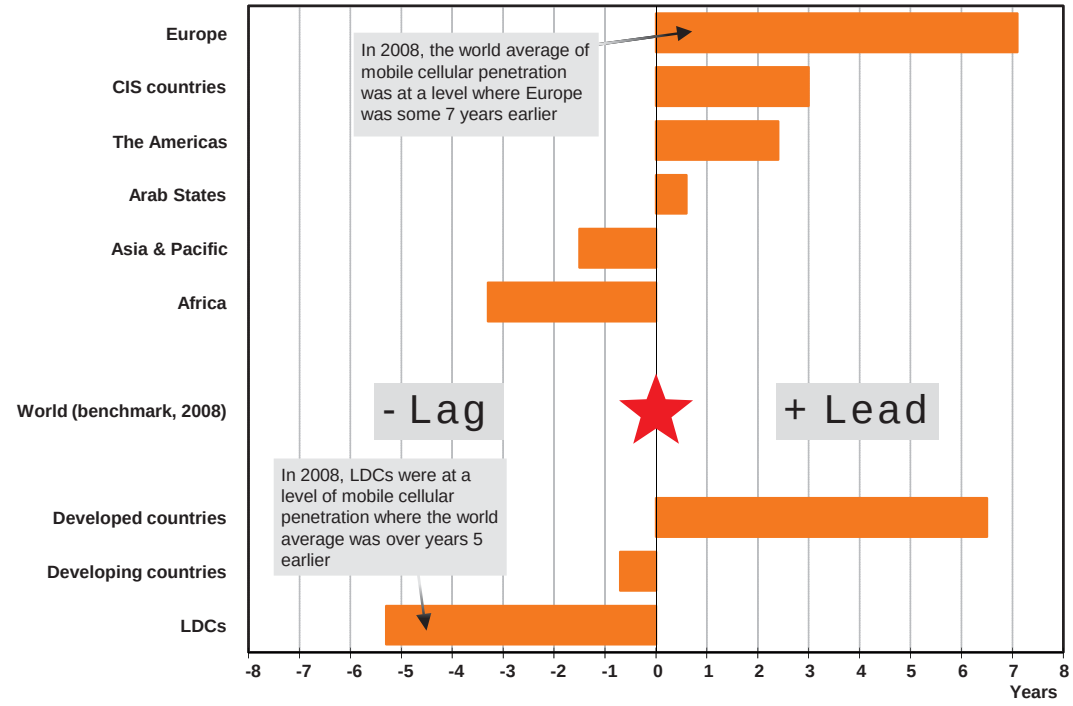
Similarly, in India, Sisu Samrakshak (SSK), or "Child protector",[7] uses ICTs in regional languages to provide illiterate communities with knowledge and information on health, hygiene and sanitation through audio, picture, video, touch tone screen and culturally appropriate images. The information provided covers different stages of child development, starting from the mother's pregnancy to adolescence, such issues as women's health during pregnancy, nutrition, child development, safe motherhood, immunization, common illness, and their remedies. Mothers are addressed as the primary care-takers, but SSK allows for community learning with government officials from health, nutrition and education departments playing a key role. SSK is available as an auto-install programme on CD, available in English, Telugu and Kannada languages, and can easily be replicated in other regional languages where a ICTs intervention can be supported. The audio files have also been adapted for radio broadcasting to allow an even wider diffusion (Rao, 2009).

developed countries lead the world's penetration rate by nine years, while developing countries lag it by two years and LDCs by 11 years.

The mobile cellular divide in years…measuring up to Sweden

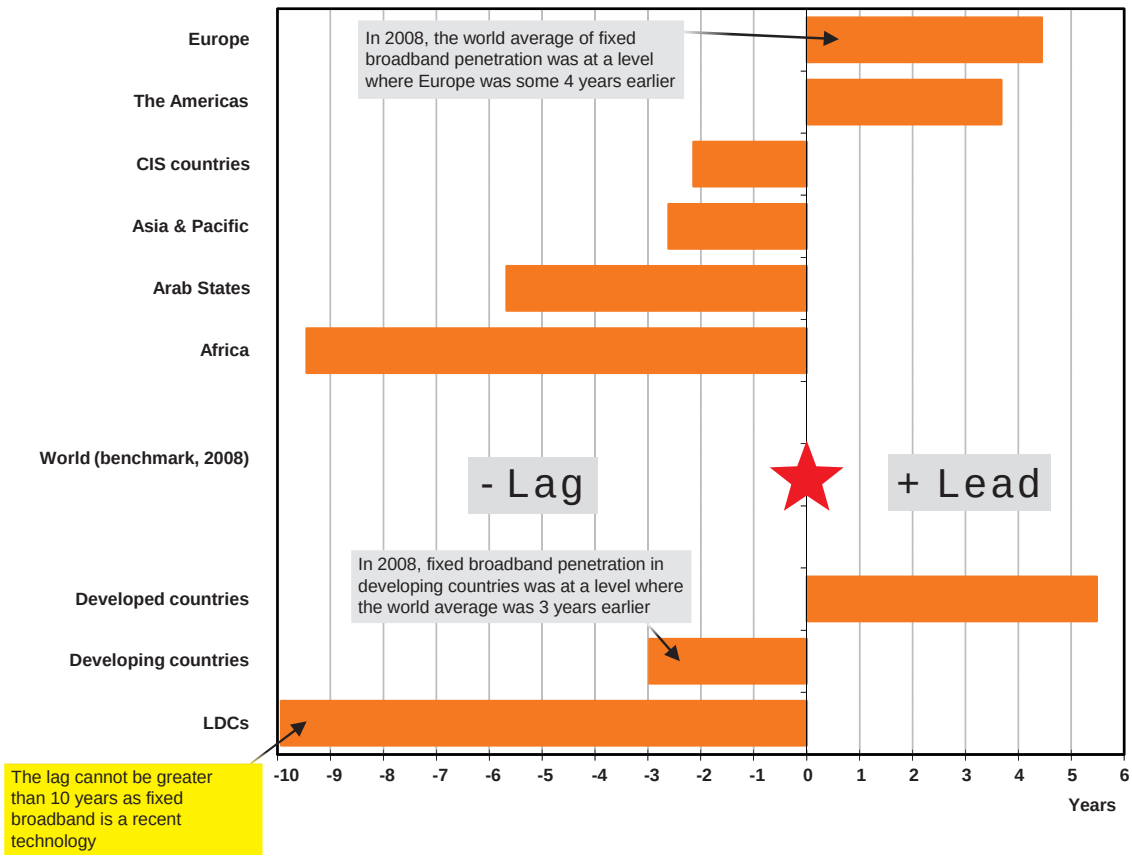
Looking at time distance for mobile cellular penetration in individual economies (Chart 3.10) shows that Hong Kong (China) leads by four years over Sweden. However, the lags are relatively small compared to those for other development indicators. Indeed, in 2008 the country furthest behind (Myanmar) in terms of mobile cellular penetration is at the level where Sweden was some 24 years earlier.[8] By comparison, the GDP per capita lag for most of the LDCs, compared to Sweden, is over 160 years (Sicherl, 2009).

Chart 3.7: Time distance for mobile cellular penetration, by region and by level of development



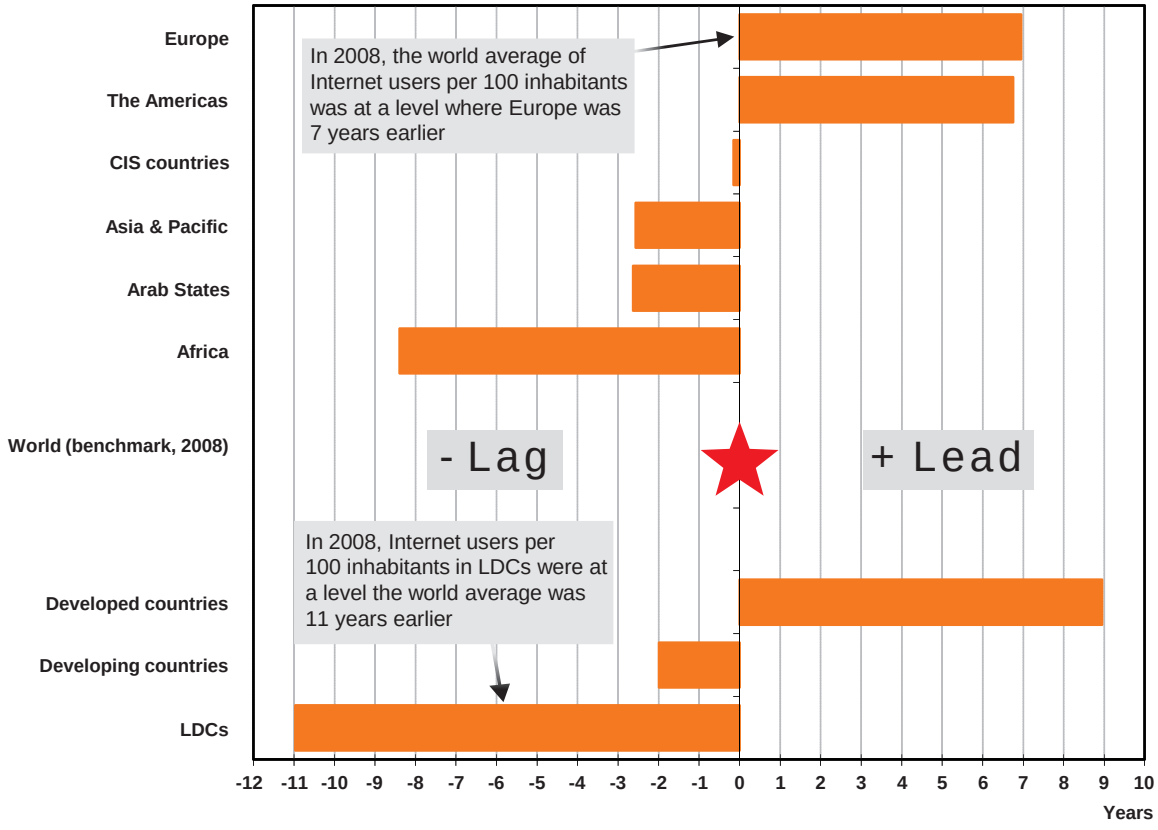
Source: ITU and SICENTER.

Chart 3.8: Time distance for fixed broadband penetration, by region and by level of development



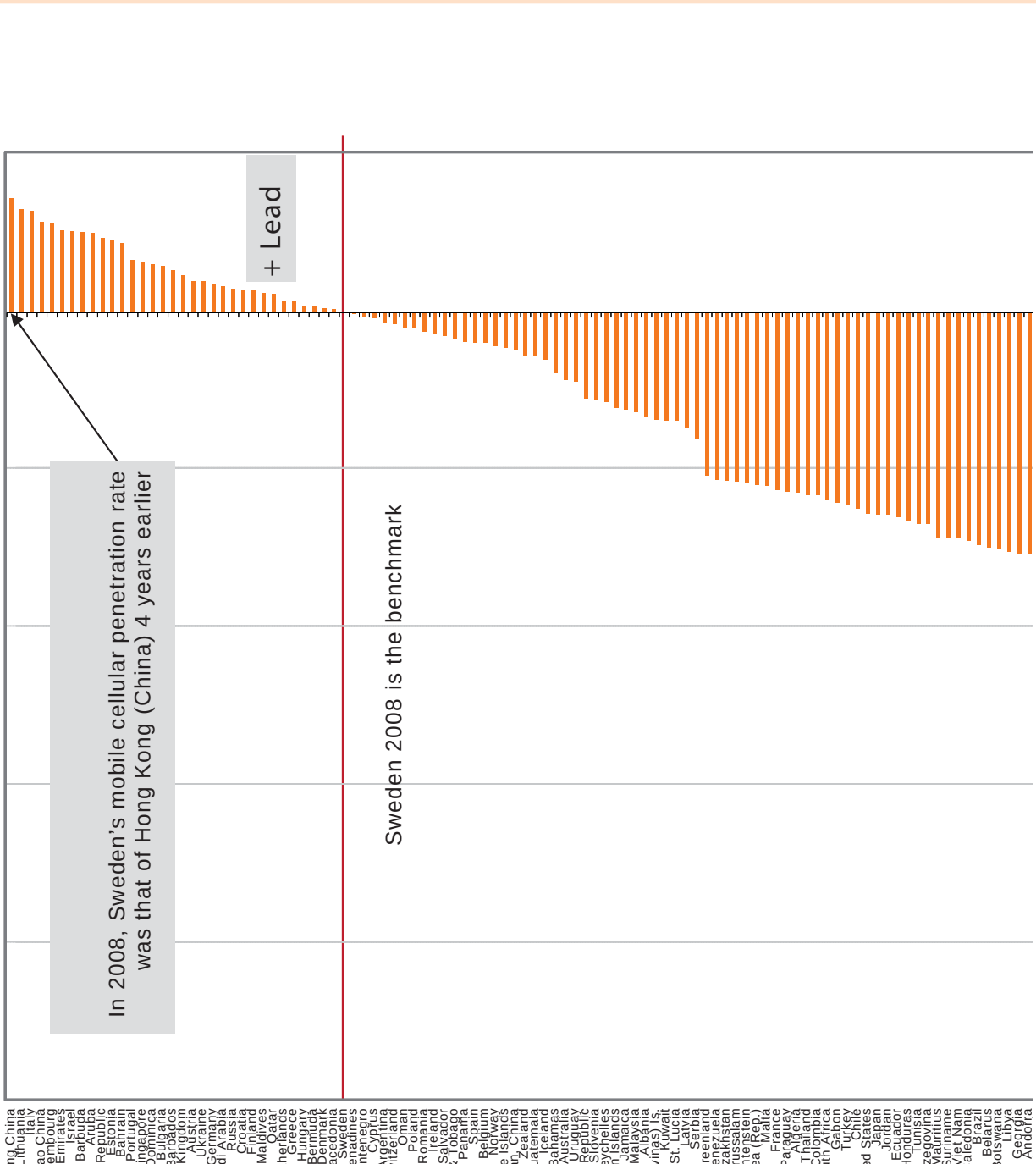
Source: ITU and SICENTER.

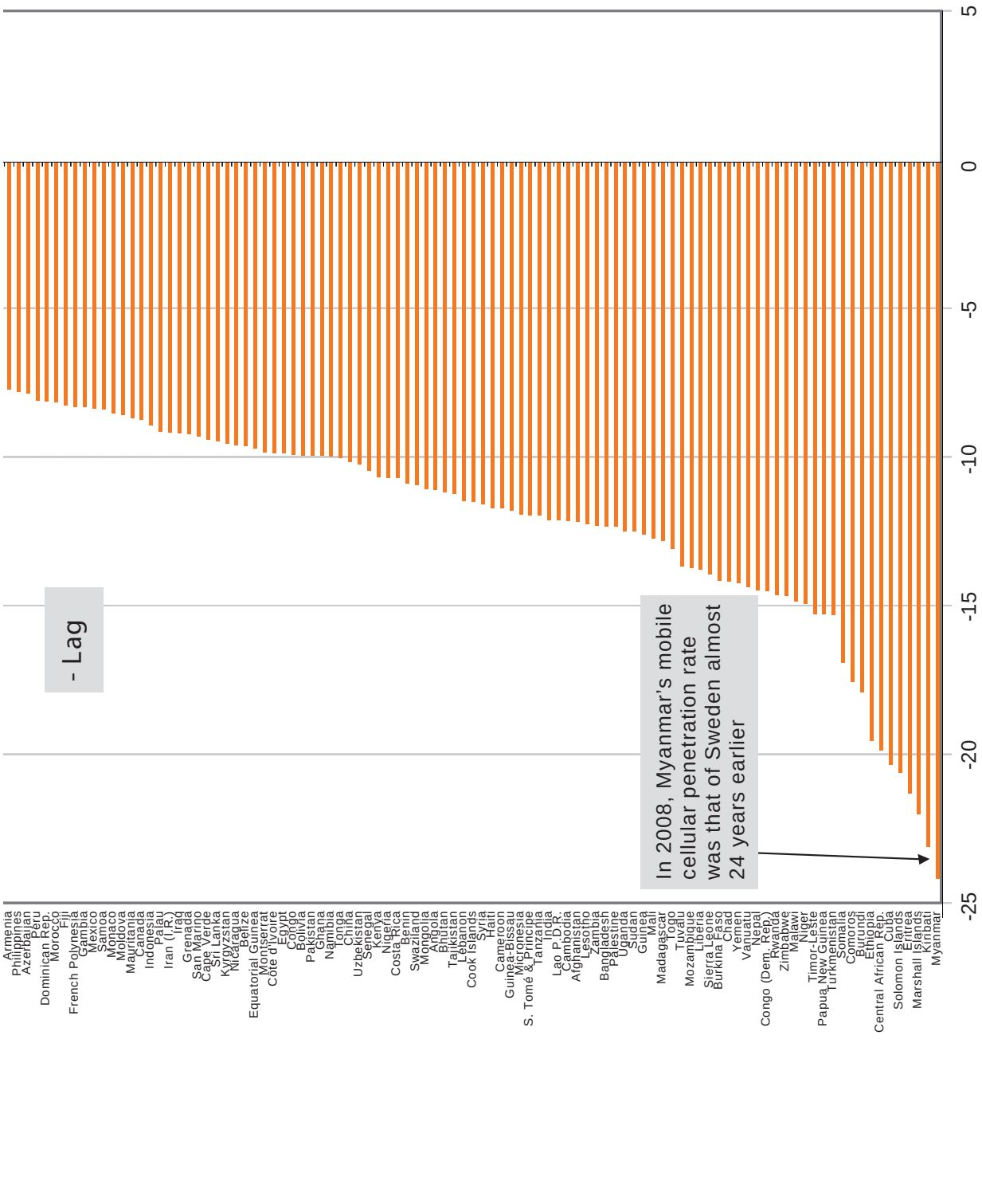
Chart 3.9: Time distance for Internet users per 100 inhabitants, by region and by level of development



Source: ITU and SICENTER.

Chart 3.10: Time distance for mobile cellular penetration, individual economies





Source: ITU and SICENTER.

Endnotes

1 As defined by the UN. Note that the developing countries include Republic of Korea and Singapore, both of which rank fairly high on the IDI.

2 This same methodology was also used in the previous edition of the IDI (ITU, 2009b).

3 In order to do such analysis, the 159 economies included in the IDI were grouped into four categories (high, upper, medium, and low) based on the 2008 IDI values. The countries were grouped by locating the position of the average IDI value in the list of 2008 index scores. The average value was placed after the 66th country, which resulted in 66 countries above the average and 93 below. The 66 countries were then classified into two equal groups (high and upper). The remaining 93 countries located below the average, were also divided into two groups (medium and low).

4 For more information on the methodology, see http://www.gaptimer.eu/overview_of_the_methodology.html.

5 http://www.iconnect-online.org/Documents/GhanaHealthICT4DIConnectEng.pdf.

6 http://allafrica.com/stories/200912010751.html.

7 This project was jointly developed by the UNICEF Hyderabad Field Office, CoOptions Technologies Ltd., and the Andhra Pradesh government in 2000.

8 Because mobile telephony is relatively recent, the time gap cannot go back further than the first year for which data are available for the benchmark, meaning that the maximum possible time distance would be 27 years as the first non-zero data point for Sweden goes back to 1981.

Chapter 4

The ICT Price Basket

4.1 Introduction and objectives of the ICT Price Basket

This is the second version of the ITU ICT Price Basket, which was first presented in the 2009 edition of *Measuring the Information Society*. The latest ICT Price Basket is based on 2009 tariffs for fixed telephone, mobile cellular and fixed broadband Internet services in 161 countries. Its objective is to monitor the cost of ICT services, which influence or even determine whether or not people will subscribe to certain services and use ICTs. Although ICT infrastructure is crucial for ICT access and use, the services offered have to be affordable for the information society to thrive. As prices are expected to influence ICT uptake and use, the ICT Price Basket is published in conjunction with the IDI. Thus, the ICT Price Basket and the IDI are, implicitly, related: lower prices may increase access and use, and higher levels of ICT access and use may bring down prices, with operators leveraging on economies of scale. Additionally, higher levels of ICT uptake are usually a result of increased liberalization and competition, both of which tend to lead to lower prices.

The price of ICT services is determined by a number of factors, including various measures of regulatory intervention, the level of competition, market size, operators' cost for providing services, as well as profit margins. The recent evolution of ICT markets has shown that tariffs tend to decrease with competition, although in some countries tariffs for fixed line services, which used to be cross- subsidized by some (often state-run) incumbent operators, initially increased or remained unchanged.[1] The ICT Price Basket shows that in a number of countries, fixed telephone prices remain relatively low, suggesting that state subsidies and regulations continue to have an effect.

The mobile cellular market has witnessed dramatic price reductions in recent years, and between 2008 and 2009 the mobile component of the ICT Price Basket dropped by 25 per cent. Handset prices also continue to drop and operators try to adapt to an increasingly competitive environment, with declining profit margins and Average-Revenues-Per-Users. Increasingly, customers are being attracted by improved services as well as lower prices. The drop in mobile prices has had a significant impact on 'connecting the previously unconnected' and the ITU estimates that by the end of 2009, there were more than 4.6 billion mobile subscriptions worldwide (see Chapter 1).

Increasingly, a more mature and growing broadband market is also witnessing a drop in fixed broadband prices, and the broadband component of the ICT Price Basket registered the biggest fall in prices between 2008 and 2009 (over 40 per cent). Furthermore, the decline in fixed broadband prices has come with an increase in broadband speeds;[2] a trend also confirmed by the ICT Price Basket, which shows that subscribers tend to get higher speeds for either less, or the same amount of, money.

While many governments (usually regulatory telecommunication/ICT authorities) and several regional and international organizations, including the OECD and the World Bank, collect and publish price data for selected telecommunication services, these are usually limited to a country, a region or a single telecommunication service.[3] The ITU ICT Price Basket is the first price index to track and benchmark the affordability of ICT services globally.

Objectives of the ICT Price Basket

A key objective of the ICT Price Basket is to provide information on the cost and affordability of ICT services. It is a benchmarking tool to inform policy decisions. Since prices are shown not only in absolute values (USD and PPP adjusted) but also as a percentage of income

(GNI per capita), they are illustrative of the relative cost (or affordability) of ICT services in a country. The ICT Price Basket thus allows policy makers to compare the cost of ICT services in their country to the cost in other countries, and provides a starting point for looking into ways of lowering prices – for example, by introducing or strengthening competition, by reviewing operators' revenues and efficiency, or by reviewing specific tariff policies.[4]

This chapter compares the 2009 and 2008 ICT Price Baskets to show how prices have evolved, within each country but also for the different regions and the world as a whole. As updated versions of the ICT Price Basket will become available in the future, it will allow policy makers to evaluate the impact on prices of different initiatives and policies, such as the licensing of additional operators, the introduction of mobile number portability, or the liberalization of international gateway services and the construction of new backbone infrastructure.

The analysis recognizes the importance of fixed, mobile and broadband Internet prices. Values and rankings are therefore not only presented for the overall ICT Price Basket, but also for each of the three sub-baskets (see section 4.2 and 4.4 for more information on the three sub-baskets)

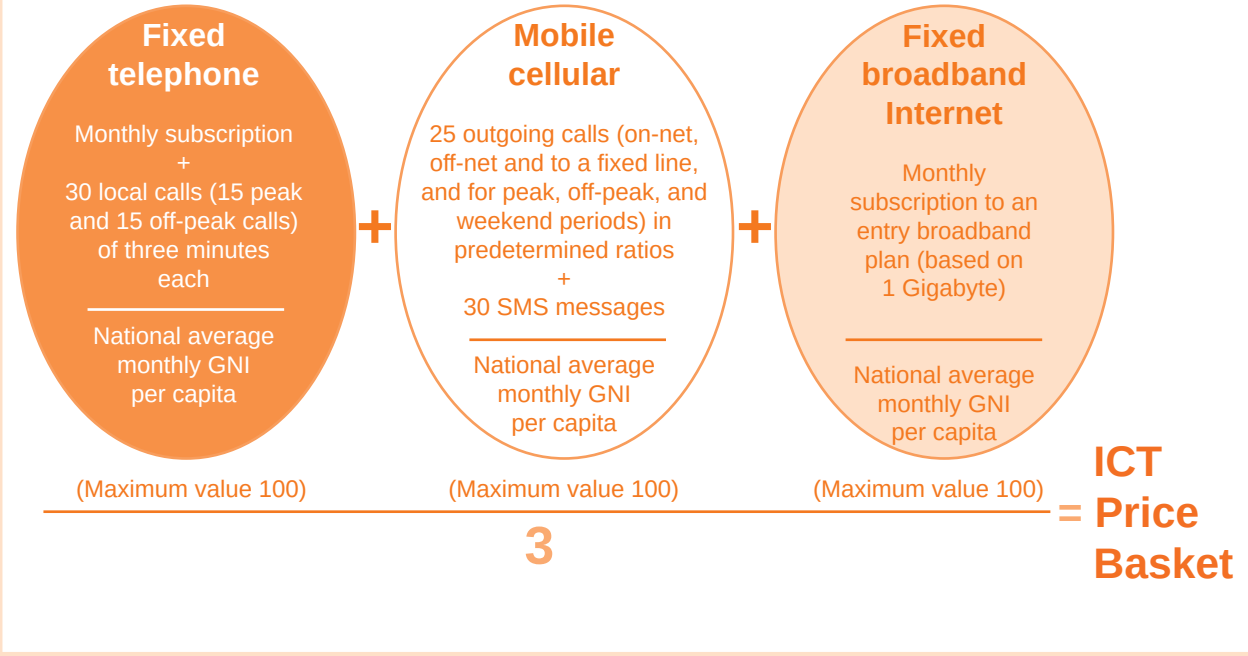
The ICT Price Basket results and rankings are also linked to ICT developments as measured by the IDI (section 4.3 and chart 4.2). It should be noted, though, that the IDI and the tariff data do not correspond to exactly the same time period, as the IDI is based on end 2008 data, whereas the tariff information was collected in the second half of 2009.

4.2 ICT Price Basket methodology

The ICT Price Basket is a composite basket that includes the following three tariff sets: fixed telephone, mobile cellular and fixed broadband Internet services.

The 2009 ICT Price Basket includes a total of 161 countries. Data were collected through the *ITU Tariffs Indicators Questionnaire 2009*, which was sent out to all ITU Member States as well as to national statistical contacts

Figure 4.1: ICT Price Basket methodology



Note: 1) In countries where no mobile prepaid offers are available, the monthly fixed cost (minus the free minutes included, if applicable) of a postpaid subscription is added to the basket.
2) For monthly fixed broadband Internet plans that limit the amount of data transferred by including caps below 1 Gigabyte, the cost for additional bytes is added.
3) 25 outgoing calls are equivalent to a total of 37.1 minutes. For more details on the OECD/Teligen methodology, see OECD (2002).
Source: ITU.

in August 2009. For those countries that did not reply to the questionnaire, prices were gathered directly from national operators' web sites, in local currencies, and translated into United States dollars (USD).[5] If one or several of the tariffs were unavailable for a country, the country was not included in the ICT Price Basket.

The ICT Price Basket is the value obtained by the simple average of the price of each sub-basket (in USD) expressed as a percentage of a country's monthly GNI per capita[6] and capped at 100 per cent (Figure 4.1). Therefore, the three ICT service components each receive equal weight. The ICT Price Basket ranges between a theoretical 'zero' (tariffs represent 'zero' per cent of average monthly GNI per capita, i.e. all three services are for free), and 100 (the price of all three sub-baskets is equal to, or exceeds, the monthly GNI per capita). The countries included in the analysis are then ranked on the basis of the value of the ICT Price Basket.

Fixed telephone prices

The fixed telephone sub-basket represents the cost of local fixed residential telephone services. It includes the fee of the monthly subscription charged for subscribing to the Public Switched Telephone Network (PSTN), plus the cost of 30 local calls to the same (fixed) network (15 peak and 15 off-peak calls) of three minutes each. Annex 2 provides more information on the fixed telephone sub-basket methodology.

Mobile cellular prices

The mobile cellular sub-basket is based on the 2001 methodology of the OECD low-user basket. This basket gives the price of a standard basket of mobile monthly usage in USD determined by the OECD for 25 outgoing calls per month (on-net, off-net and to a fixed line, and for peak, off-peak and weekend periods, according to predetermined ratios) plus 30 SMS messages.[7]

The mobile sub-basket used in the ICT Price Basket is based on prepaid tariffs. Prepaid tariffs (as opposed to postpaid tariffs) were used since they represent the dominant payment method in the majority of countries. By end 2008, 63 per cent of all mobile subscriptions were prepaid. Annex 2 provides more information on the mobile cellular sub-basket methodology.

Fixed broadband Internet prices

The fixed broadband Internet sub-basket is calculated based on the price of the monthly subscription to an entry-level fixed broadband plan. Annex 2 provides more details on the fixed broadband Internet sub-basket methodology. Given the increasing number of countries launching 3G networks and national and international efforts to track *mobile* broadband uptake and usage, it is expected that mobile broadband prices will eventually be included in the ICT Price Basket.

Calculating the three price sub-baskets

The sub-baskets for the fixed telephone, mobile cellular and fixed broadband Internet tariffs are presented as follows:

1. In USD, using the UN operational rates of exchange and exchange rates from www.oanda.com.

2. In current international dollars (PPP$), using Purchasing Power Parity (PPP) conversion factors. PPPs are the rates of currency conversion that eliminate the differences in price levels between countries. Per capita volume indices based on PPP converted data reflect only differences in the volume of goods and services produced. Comparative price levels are defined as the ratios of PPPs to exchange rates. They provide measures of the differences in price levels between countries. The PPPs are given in national currency units per US dollar.[8] This helps identifying price and exchange rate distortions and provides a measure of the cost taking into account purchasing power equivalences between countries.[9]

3. As a percentage of monthly GNI per capita in 2008 (Atlas method[10]), the latest available year, capped at 100 per cent. Thus, the lower the percentage, the lower the relative cost of the service. The value of the sub-baskets is only capped at 100 per cent for the purpose of calculating the overall ICT Price Basket. Thus, a sub-basket value could exceed 100 per cent, indicating that the cost of that service would exceed the average monthly GNI per capita.

It should be noted that while the ICT Price Basket provides a fair international comparison of relative prices over time, it does not necessarily show the cheapest offers available. Making prices comparable between countries requires a number of limiting assumptions which need to be kept in mind for the analysis and interpretation of the results (see Box 4.1).

Box 4.1: How much are we really paying - or the limits of comparing prices

Since the ICT Price Basket is a composite basket that sums the prices for fixed telephone, mobile cellular and fixed broadband services, it provides an approximate overview of the cost of these services across countries, and over time. Tariff data are collected according to specific criteria to maximize the cross-country comparability of the results. These include:

- Tariffs from the dominant market operators (in terms of subscriber numbers) are used since these are the tariffs that most people are paying.
- Entry-level offers and packages are used since these are most likely used by low-income subscribers. Also, more sophisticated packages and offers, with more minutes/bytes included, make comparisons more difficult.
- Special offers, limited to a certain time period, are not taken into consideration since they are not likely to be representative over time.

While these criteria are necessary to make prices comparable, they can lead to distortions and do not always show what subscribers are actually paying. For example, in some countries so-called special offers are advertised all-year round, although the operator reserves the right to cancel the offer at any given time. Entry-level services tend to be more expensive than packages that include a greater amount of minutes/sms, and in some cases the difference in price is substantial, to encourage users to pay a little bit more money for much more value.

This is particularly true for the growing number of multi-play offers that more and more operators now advertise. In an increasingly converged telecommunications environment, customers can choose to pay a lump sum for broadband Internet access, fixed telephony and television services, all-in-one. One example is France's alternative operator Iliad, which launched *Alice*, a low cost 'triple-play' - broadband Internet, TV and voice telephony – service for less than EUR 20 (about USD 30) in November 2009.[11] This is considerably cheaper than the EUR 30 that operators across Europe have been charging so far for triple-play services.

While this trend will put pressure on rival operators to cut their prices accordingly, greatly benefiting users, it does not necessarily mean that the price of each component of the triple-play service is going to drop and, therefore, the evolution of the ICT Price Basket may not reflect this trend. While the availability of converged services today is still limited[12], more markets, including in the developing world, are expected to join this trend soon.[13]

Price comparisons will become even more complicated with the launch by some operators, including Verizon[14] and Cable&Wireless,[15] of quadruple-play offers, which include mobile cellular services.

4.3 ICT Price Basket results and assessment

The ICT Price Basket ranks countries based on the relative prices for fixed telephony, mobile cellular and broadband Internet services. The value of the ICT Price Basket should be interpreted as an indication of relative cost as it is calculated as the simple average of the three sub-components, expressed as a percentage of average monthly GNI per capita.

The results of the 2009 and 2008 ICT Price Baskets are presented in Table 4.1. They show a drop in prices for almost all countries. For those countries where the ICT Price Basket value increased (indicating a rise in prices), the change was very small. Overall, prices dropped by almost 15 per cent in just one year, with the ICT Price Basket value decreasing from 15 in 2008, to under 13 in 2009. Fixed broadband services showed the largest price drop, 42 per cent, compared to 25 and 20 per cent in mobile cellular services and fixed telephony, respectively (Table 4.2). For the ICT Price Basket, the drop in prices was greatest in developed countries, where prices came down by 23 per cent, compared to 14 per cent in developing countries (Chart 4.1, left).[16] While these findings suggest that the price divide between developed and developing countries is increasing, this is not actually the case since the percentage change would be higher for developing countries if the sub-baskets were not capped at 100 per cent. While the 100 per cent cap does not apply to the fixed telephone or mobile sub-baskets (because they do not exceed 100 per cent of monthly GNI per capita in any country), there are close to 30 countries with a fixed broadband sub-basket that exceeds the 100 per cent mark. For more information on the sub-baskets and the percentage changes between developed and developing regions, see section 4.4.

Table 4.1: ICT Price Basket and sub-baskets, 2009 and 2008

Rank	Economy	ICT Price Basket		Fixed telephone sub-basket as a % of GNI per capita		Mobile cellular sub-basket as a % of GNI per capita		Fixed broadband sub-basket as a % of GNI per capita		GNI per capita, US$, 2008 (or latest available year)
		2009	2008	2009	2008	2009	2008	2009	2008	
1	Macao, China	0.23	0.63	0.30	0.78	0.09	0.24	0.30	0.86	35'360
2	Hong Kong, China	0.26	0.50	0.27	0.43	0.03	0.10	0.49	0.96	31'420
3	Singapore	0.33	0.41	0.27	0.26	0.14	0.15	0.58	0.81	34'760
4	Kuwait	0.37	0.80	0.27	0.35	0.24	0.30	0.60	1.75	38'420
5	Luxembourg	0.40	0.47	0.42	0.49	0.18	0.22	0.59	0.70	84'890
6	United States	0.40	0.41	0.32	0.45	0.39	0.40	0.50	0.39	47'580
7	Denmark	0.41	0.47	0.50	0.62	0.13	0.13	0.59	0.66	59'130
8	Norway	0.41	0.55	0.41	0.59	0.12	0.15	0.70	0.90	87'070
9	United Kingdom	0.57	0.72	0.64	0.77	0.44	0.57	0.63	0.83	45'390
10	Iceland	0.58	0.70	0.48	0.54	0.25	0.31	1.00	1.26	40'070
11	Canada	0.58	0.73	0.53	1.00	0.51	0.59	0.71	0.60	41'730
12	Finland	0.59	0.62	0.46	0.51	0.33	0.37	0.97	1.00	48'120
13	Switzerland	0.60	0.65	0.58	0.58	0.62	0.71	0.60	0.65	65'330
14	Sweden	0.60	0.62	0.62	0.59	0.35	0.44	0.84	0.84	50'940
15	Austria	0.61	1.07	0.71	0.81	0.18	0.68	0.94	1.71	46'260
16	Israel	0.61	N/A	0.83	N/A	0.67	N/A	0.33	N/A	24'700
17	Netherlands	0.75	0.76	0.66	0.82	0.71	0.46	0.87	1.00	50'150
18	Belgium	0.75	0.87	0.91	1.07	0.56	0.65	0.78	0.90	44'330
19	Korea (Rep.)	0.79	0.84	0.29	0.39	0.68	0.89	1.41	1.24	21'530
20	Germany	0.81	0.79	0.92	0.89	0.27	0.31	1.23	1.18	42'440
21	Ireland	0.82	0.82	1.06	1.05	0.51	0.47	0.88	0.95	49'590
22	United Arab Emirates	0.82	0.83	0.20	0.25	0.21	0.21	2.03	2.03	23'950
23	Costa Rica	0.84	1.27	0.80	1.00	0.46	0.97	1.24	1.83	6'060
24	Italy	0.86	0.84	0.96	0.98	0.62	0.61	0.98	0.92	35'240
25	Australia	0.86	0.91	0.77	0.92	1.04	0.88	0.77	0.92	40'350
26	Bahrain	0.87	0.78	0.33	0.29	0.46	0.40	1.82	1.66	17'390
27	Belarus	0.87	N/A	0.23	N/A	0.77	N/A	1.62	N/A	5'380
28	Malta	0.88	1.13	0.41	0.85	0.78	0.89	1.45	1.66	16'680
29	Cyprus	0.92	0.77	1.32	1.27	0.27	0.25	1.19	0.79	22'950
30	Trinidad & Tobago	0.93	1.14	1.41	1.68	0.47	0.67	0.91	1.08	16'540
31	Slovenia	0.95	1.15	0.98	1.18	0.79	0.71	1.09	1.57	24'010
32	France	0.95	1.09	0.83	0.96	1.00	1.11	1.02	1.18	42'250
33	Greece	1.02	1.04	1.06	1.08	0.99	1.02	1.00	1.02	28'650
34	Russia	1.02	1.81	0.67	1.86	0.73	1.37	1.66	2.21	9'620
35	Japan	1.09	0.87	0.72	0.58	1.39	1.03	1.18	1.01	38'210
36	Spain	1.11	1.26	1.07	1.25	1.19	1.36	1.08	1.18	31'960
37	Saudi Arabia	1.12	1.49	0.71	0.72	0.58	0.68	2.06	3.09	15'500
38	Portugal	1.28	1.74	1.60	1.63	0.54	1.67	1.69	1.92	20'560
39	New Zealand	1.28	1.23	1.42	1.43	1.20	0.96	1.23	1.28	27'940
40	Lithuania	1.28	1.60	1.45	1.82	0.86	1.05	1.54	1.93	11'870
41	Poland	1.37	2.74	1.76	3.42	0.97	1.52	1.39	3.29	11'880
42	Latvia	1.46	1.82	1.13	1.44	0.74	0.89	2.52	3.14	11'860
43	Estonia	1.49	1.99	1.11	1.24	1.03	1.24	2.34	3.50	14'270
44	Serbia	1.60	1.59	0.82	1.23	1.09	1.25	2.88	2.28	5'700
45	Oman	1.64	2.49	1.25	3.51	0.61	0.59	3.06	3.37	12'270
46	Malaysia	1.65	1.93	0.82	0.94	0.85	1.09	3.27	3.75	6'970
47	Mauritius	1.67	4.95	1.06	1.21	0.84	0.97	3.11	12.69	6'400
48	Mexico	1.69	3.56	2.08	3.21	1.04	2.15	1.95	5.32	9'980
49	Croatia	1.72	2.14	1.70	1.88	1.62	2.15	1.83	2.40	13'570
50	Ukraine	1.79	5.20	1.06	1.99	1.62	3.84	2.70	9.77	3'210
51	Kazakhstan	1.82	N/A	0.38	N/A	1.71	N/A	3.36	N/A	6'140
52	Maldives	1.87	2.12	1.36	1.54	1.14	1.27	3.11	3.53	3'630
53	Romania	1.87	3.05	2.92	2.38	1.60	2.33	1.10	4.43	7'930
54	St. Kitts and Nevis	2.09	N/A	1.07	N/A	1.19	N/A	4.01	N/A	10'960
55	Slovak Republic	2.10	2.36	1.88	2.51	2.06	1.65	2.36	2.91	14'540
56	Uruguay	2.10	3.21	1.82	2.45	1.84	2.59	2.64	4.58	8'260
57	Panama	2.18	2.11	2.34	1.97	0.96	1.10	3.23	3.26	6'180
58	Hungary	2.18	2.46	2.25	3.13	1.44	1.67	2.84	2.58	12'810
59	Czech Republic	2.18	2.17	2.12	2.57	1.28	1.54	3.13	2.40	16'600
60	Antigua & Barbuda	2.19	N/A	1.29	N/A	1.08	N/A	4.21	N/A	13'620
61	Sri Lanka	2.25	7.31	3.18	3.73	0.61	1.86	2.95	16.34	1'780
62	Turkey	2.39	N/A	1.77	N/A	3.07	N/A	2.34	N/A	9'340
63	Qatar	2.42	N/A	0.91	N/A	0.86	N/A	5.49	N/A	12'000
64	Algeria	2.43	3.31	1.19	1.51	1.77	2.71	4.35	5.72	4'260
65	Tunisia	2.64	2.87	1.02	1.14	2.63	2.69	4.27	4.78	3'290
66	Argentina	2.71	3.68	0.64	0.95	2.28	2.48	5.20	7.61	7'200
67	Barbados	2.79	3.90	2.54	2.73	1.38	1.63	4.44	7.34	9'330
68	Montenegro	2.81	2.49	1.85	0.96	1.18	1.56	5.40	4.95	6'440
69	Venezuela	2.99	3.45	1.17	1.15	3.72	4.05	4.07	5.14	9'230
70	Mongolia	3.02	N/A	0.47	N/A	2.55	N/A	6.04	N/A	1'680
71	Jamaica	3.07	5.15	2.38	3.51	1.38	2.25	5.47	9.69	4'870
72	Lebanon	3.08	3.88	1.95	2.27	3.00	4.61	4.29	4.78	6'350
73	Seychelles	3.09	3.29	1.30	1.62	1.31	1.48	6.66	6.78	10'290
74	Bhutan	3.16	15.19	1.91	2.39	1.26	2.05	6.30	41.13	1'900
75	China	3.21	4.37	0.92	1.88	1.51	1.83	7.19	9.41	2'940
76	Bosnia and Herzegovina	3.25	3.60	2.33	3.00	2.49	3.12	4.93	4.69	4'510
77	Bulgaria	3.37	3.78	3.01	2.40	3.85	4.85	3.24	4.08	5'490
78	Egypt	3.40	3.95	1.97	2.05	2.76	3.46	5.46	6.33	1'800
79	Grenada	3.43	4.13	2.44	2.98	1.69	1.90	6.15	7.52	5'710
80	Chile	3.49	4.49	3.01	3.87	1.30	1.97	6.15	7.62	9'400

Rank	Economy	ICT Price Basket		Fixed telephone sub-basket as a % of GNI per capita		Mobile cellular sub-basket as a % of GNI per capita		Fixed broadband sub-basket as a % of GNI per capita		GNI per capita, US$, 2008 (or latest available year)
		2009	2008	2009	2008	2009	2008	2009	2008	
81	India	3.64	4.71	3.50	4.41	1.57	2.06	5.84	7.66	1'070
82	St. Lucia	3.72	5.69	2.52	2.52	2.29	2.59	6.35	11.98	5'530
83	Iran (I.R.)	3.87	5.42	0.07	0.07	1.21	1.31	10.33	14.87	3'540
84	Fiji	3.94	5.24	2.34	3.11	3.29	4.38	6.19	8.23	3'930
85	TFYR Macedonia	3.97	4.24	3.89	3.03	3.89	4.57	4.12	5.11	4'140
86	St. Vincent and the Grenadines	4.11	7.41	2.53	3.09	1.94	3.40	7.86	15.73	5'140
87	Brazil	4.14	7.68	2.19	5.91	5.66	7.51	4.58	9.61	7'350
88	Thailand	4.15	3.25	3.52	2.04	1.00	1.38	7.94	6.34	2'840
89	South Africa	4.20	4.24	4.45	4.67	2.60	2.57	5.54	5.48	5'820
90	Dominican Rep.	4.29	5.80	3.36	4.87	2.33	3.07	7.18	9.47	4'390
91	Colombia	4.29	6.09	1.46	1.33	2.46	3.53	8.96	13.42	4'660
92	Albania	4.30	7.11	1.86	1.58	4.18	8.28	6.86	11.47	3'840
93	El Salvador	4.47	5.43	3.96	4.28	2.44	4.43	7.01	7.58	3'480
94	Armenia	4.94	7.98	1.46	2.30	2.08	3.80	11.28	17.84	3'350
95	Botswana	5.46	6.14	3.33	3.47	1.50	1.70	11.54	13.25	6'470
96	Jordan	5.51	6.13	3.43	3.48	2.08	1.88	11.01	13.02	3'310
97	Ecuador	5.56	6.52	0.42	0.50	3.10	3.52	13.15	15.55	3'640
98	Indonesia	5.81	7.65	3.33	3.30	1.67	3.87	12.44	15.77	2'010
99	Azerbaijan	5.82	16.02	0.78	1.14	1.39	7.16	15.27	39.77	3'830
100	Peru	5.98	6.93	4.30	5.35	2.69	2.78	10.96	12.67	3'990
101	Dominica	5.99	6.56	2.74	3.07	3.22	3.10	12.02	13.49	4'770
102	Paraguay	6.16	11.49	3.65	5.19	2.92	4.13	11.91	25.15	2'180
103	Moldova	6.65	11.17	2.34	2.95	6.70	8.48	10.91	22.08	1'470
104	Namibia	6.95	8.59	3.71	5.19	3.65	4.09	13.47	16.48	4'200
105	Cape Verde	7.09	11.26	1.93	4.22	5.98	9.90	13.37	19.65	3'130
106	Suriname	7.32	9.03	0.55	0.72	2.22	2.27	19.21	24.10	4'990
107	Guatemala	7.39	7.74	3.48	4.26	3.27	2.23	15.42	16.72	2'680
108	Pakistan	7.56	11.05	3.49	4.98	1.28	2.66	17.89	25.50	980
109	Syria	7.73	14.02	0.72	0.85	4.38	6.23	18.08	34.98	2'090
110	Georgia	8.62	11.96	1.70	4.14	3.68	4.80	20.49	26.93	2'470
111	Micronesia	9.04	8.56	4.10	3.89	2.52	2.39	20.49	19.41	2'340
112	Belize	9.15	13.18	5.50	6.59	4.67	4.70	17.28	28.26	3'820
113	Philippines	9.25	10.68	10.12	10.49	3.95	4.24	13.68	17.31	1'890
114	Viet Nam	9.34	11.90	2.86	3.54	4.37	6.38	20.80	25.78	890
115	Morocco	9.69	12.38	10.93	14.62	10.32	11.83	7.83	10.68	2'580
116	Sudan	10.80	15.97	4.12	5.49	3.60	5.99	24.70	36.43	1'130
117	Guyana	16.73	18.31	2.17	2.35	6.27	6.86	41.75	45.72	1'420
118	Bolivia	18.06	19.73	19.28	21.65	6.01	5.63	28.89	31.91	1'460
119	Nicaragua	19.68	19.94	5.26	6.20	15.54	16.88	38.25	36.72	1'080
120	Angola	21.45	30.55	5.76	9.47	3.83	5.52	54.76	76.67	3'450
121	Tonga	21.90	21.04	3.03	3.31	2.76	3.01	59.90	56.80	2'560
122	Djibouti	25.00	N/A	8.61	N/A	7.02	N/A	59.36	N/A	1'130
123	Nepal	25.73	34.28	8.93	12.08	3.69	10.33	64.58	80.43	400
124	Lesotho	28.03	29.62	14.20	15.00	14.35	15.15	55.56	58.70	1'080
125	Kyrgyzstan	28.21	N/A	2.05	N/A	4.65	N/A	77.93	N/A	740
126	Senegal	29.79	32.98	29.74	25.43	10.29	12.23	49.34	61.28	970
127	Kenya	29.81	48.03	15.69	20.42	11.66	23.67	62.07	296.12	770
128	Ghana	31.36	40.49	6.84	9.49	7.63	11.98	79.60	130.96	670
129	Côte d'Ivoire	31.61	36.96	26.54	30.00	14.04	19.53	54.27	61.35	980
130	Uzbekistan	34.30	N/A	1.50	N/A	1.41	N/A	263.03	N/A	910
131	Vanuatu	35.18	42.12	12.22	16.51	6.67	9.84	86.64	293.47	2'330
132	Bangladesh	35.55	35.60	3.61	3.42	3.05	3.38	116.31	137.73	520
133	Yemen	35.64	35.96	0.83	1.16	6.09	6.71	277.82	311.37	950
134	Tajikistan	35.83	N/A	1.77	N/A	5.71	N/A	727.27	N/A	600
135	Samoa	36.08	30.99	4.46	5.07	3.78	4.30	202.44	83.59	2'780
136	Swaziland	36.15	35.96	2.35	2.25	6.10	5.65	408.56	873.24	2'520
137	Lao P.D.R.	37.24	38.09	6.10	8.16	5.63	6.11	315.12	555.08	740
138	Zambia	37.37	53.35	31.10	41.56	16.07	18.50	64.92	137.19	950
139	Mauritania	37.93	40.58	17.07	18.43	14.16	14.12	82.58	89.18	840
140	Ethiopia	37.98	41.57	3.76	8.07	10.19	16.65	2085.05	3512.83	280
141	Nigeria	38.88	42.98	5.90	13.30	10.74	15.65	108.61	890.41	1'160
142	Guinea	39.60	40.24	9.22	10.15	9.60	10.57	1546.19	2400.00	390
143	S. Tomé & Principe	40.20	41.98	11.31	14.55	9.29	11.38	243.88	377.22	1'020
144	Cameroon	40.60	45.76	14.74	16.95	14.58	20.32	92.49	210.03	1'150
145	Cambodia	41.86	43.01	15.65	17.86	9.94	11.16	177.03	201.24	600
146	Papua New Guinea	41.98	41.24	4.76	5.71	21.19	18.02	168.43	203.70	1'010
147	Gambia	42.20	45.91	7.26	15.11	19.33	22.62	945.43	1439.28	390
148	Comoros	46.65	48.76	17.73	20.53	22.23	25.74	685.44	793.67	750
149	Mali	46.76	49.25	19.50	23.74	20.78	24.02	114.61	139.58	580
150	Rwanda	47.68	54.99	23.70	27.34	19.34	37.62	257.64	344.35	410
151	Benin	47.69	51.71	17.34	22.43	25.74	32.71	204.63	220.38	690
152	Uganda	50.33	60.41	28.29	44.45	22.71	36.78	555.35	600.00	420
153	Malawi	52.85	57.82	13.84	16.07	44.70	57.39	2038.33	4320.00	290
154	Tanzania	53.72	55.36	33.30	32.83	27.85	33.25	173.35	204.01	440
155	Burkina Faso	54.96	58.57	28.82	28.66	36.06	47.06	228.13	5193.56	480
156	Madagascar	55.48	71.71	35.80	68.50	30.63	46.64	297.23	450.25	410
157	Central African Rep.	55.78	57.73	29.51	33.43	37.84	39.75	3891.20	4407.69	410
158	Mozambique	56.16	68.03	42.62	66.20	25.85	37.90	260.22	375.28	370
159	Myanmar	58.18	N/A	4.92	N/A	69.61	N/A	155.40	N/A	220
160	Togo	58.52	67.89	38.39	43.62	37.16	60.05	558.39	352.82	400
161	Niger	67.58	72.39	47.01	58.16	55.74	59.00	966.90	249.24	330

Note: N/A - Not available.
Source: ITU.

Table 4.2: ICT Price Basket and sub-baskets*

	2008	2009	Average 2008/2009 value decrease	
			Absolute	Percentage
ICT Price Basket	15.0	12.8	2.2	14.8
Fixed telephone sub-basket	7.4	5.9	1.5	20.4
Mobile cellular sub-basket	7.5	5.7	1.9	25.0
Fixed broadband sub-basket	210.8	122	88.8	42.1

Note: * Simple averages. Discrepancies may be due to rounding.
Source: ITU.

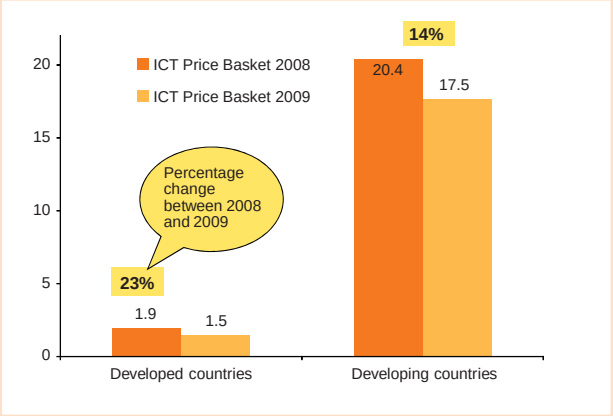
People in developed countries have to spend relatively less of their income on ICT services than people from developing countries (Chart 4.1, left). This shows that, apart from some exceptions, ICT services tend to be (relatively) most affordable in developed countries and least affordable in developing countries. Exceptions are Costa Rica and Belarus on the high end of the ICT Price Basket ranking, and Swaziland, Samoa and Vanuatu on the low end.

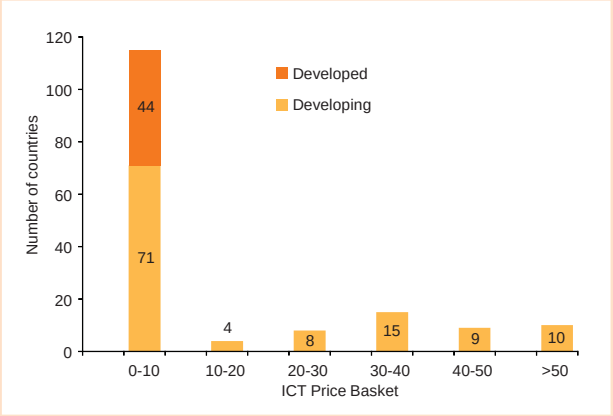
Similarly, the ICT Price Basket value represents at most 10 per cent of monthly per capita income in developed countries; this is the case for only 71 out of the 117 developing countries included in the ICT Price Basket. In ten developing countries, the ICT Price Basket value is even above 50 (Chart 4.1, right). The map in Figure 4.2 illustrates the global differences in ICT prices.

The results of the ICT Price Basket further suggest that the relative price of ICT services is linked to a country's ICT development level as countries with high prices tend to have lower ICT access and usage. The economies ranked at the top of the ICT Price Basket, i.e. those with the lowest relative prices for ICT services, also tend to be highly ranked in the IDI, such as Sweden, Luxembourg, Denmark, Hong Kong (China), and Singapore.

Plotting the IDI against the ICT Price Basket shows a strong relationship between the two (Chart 4.2), strengthening the argument that high IDI values are associated with low ICT Price Basket values, and vice versa. Furthermore, all (41)[17] economies with an IDI value greater than five (up to a maximum of 7.85, achieved by Sweden) have an ICT Price Basket value that represents less than 2.2 per cent of their monthly GNI per capita.

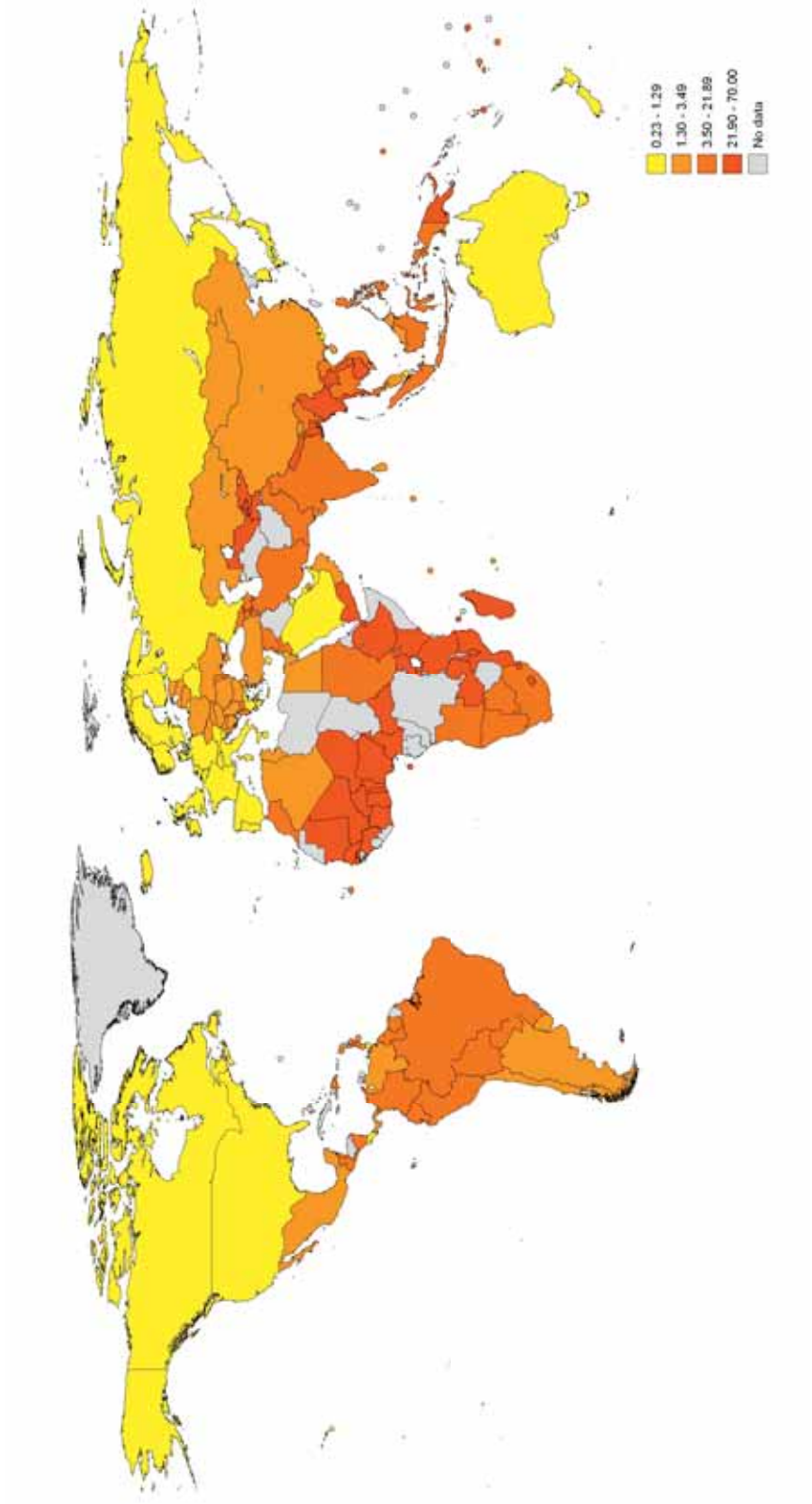
Chart 4.1: ICT Price Basket by level of development





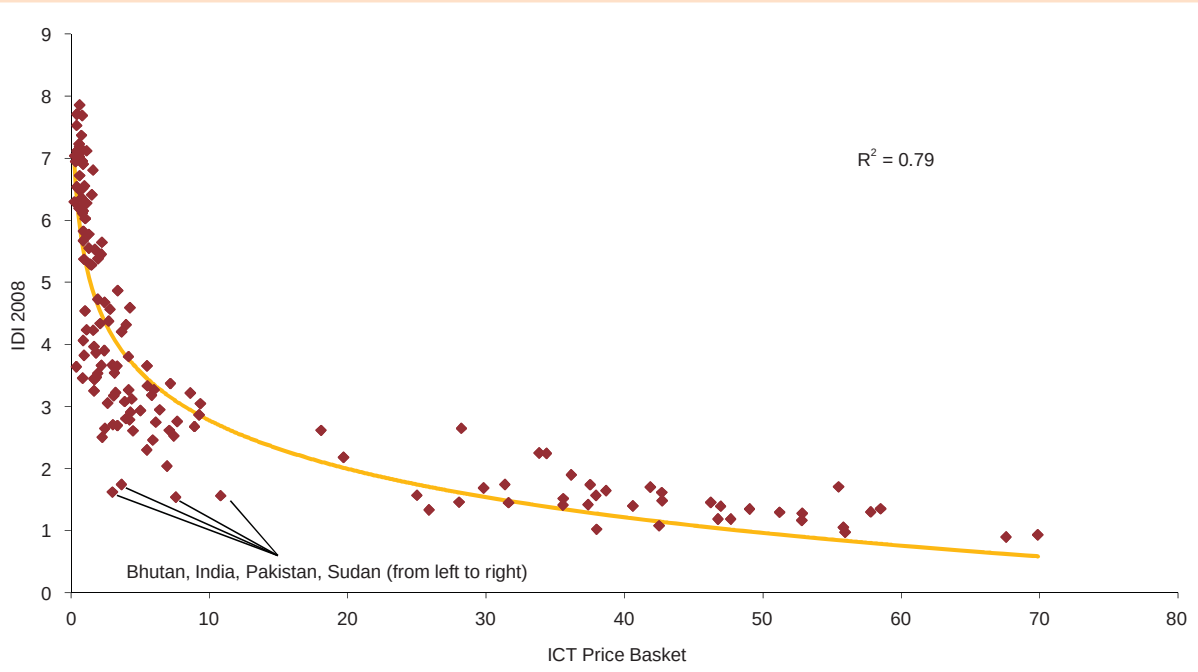
Source: ITU.

Figure 4.2: ICT Price Basket by country groups, 2009



Note: This map shows countries according to their ICT Price Basket value grouped in quartiles.
Source: ITU World Telecommunication/ICT Indicators database.

Chart 4.2: Relationship between the IDI and the ICT Price Basket



Source: ITU World Telecommunication/ICT Indicators database.

Similarly, low IDI values correspond to high ICT Price Basket values. It can also be observed that most countries with prices above a certain threshold show little differences in their IDI value. None of the countries with an ICT Price Basket value of more than ten has IDI values above three. This suggests that prices become a relevant factor for ICT uptake only when they fall below a certain threshold, making ICT services affordable to a significant part of the population.

Chart 4.2 also shows that there are several countries, such as Bhutan, India, Pakistan and Sudan, which are well below the trend line (with lower IDI levels for relatively lower Price Basket values) pointing to the existence of potential barriers to the uptake of ICTs, other than prices.

Looking at the ten countries where the ICT Price Basket decreased the most between 2008 and 2009 shows that most of these are countries where ICT services were relatively more expensive to begin with (Table 4.3).[18]

Table 4.3: Ten economies with the greatest decrease in ICT Price Basket value

ICT Price Basket Rank 2009	Country	ICT Price Basket 2009	ICT Price Basket 2008	2008-2009 value change
127	Kenya	29.8	48.0	-18.2
156	Madagascar	55.5	71.7	-16.2
138	Zambia	37.4	53.4	-16.0
74	Bhutan	3.2	15.2	-12.0
158	Mozambique	56.1	68.0	-11.9
99	Azerbaijan	5.8	16.0	-10.2
152	Uganda	50.3	60.4	-10.1
160	Togo	58.5	67.9	-9.4
128	Ghana	31.4	40.5	-9.1
120	Angola	21.4	30.6	-9.1

Note: Includes only those 148 countries that were included in both the 2008 and 2009 ICT Price Basket.
Source: ITU.

With the exception of Bhutan and Azerbaijan, ranked 74th and 99th in the ICT Price Basket, all rank in the bottom quartile of the countries included in the 2009 ICT Price Basket. In these countries, prices remain high in spite of a substantial drop in prices. The list includes eight African countries, one from Asia and the Pacific and one from the CIS region.

4.4 Sub-basket results and assessment

The ICT Price Basket combines three different ICT services and is, therefore, made up of different types of price components (such as the monthly subscription cost and the cost of calls) and different types and levels of usage (such as SMS, minutes of calls, and unlimited broadband access). The average price reflected in the ICT Price Basket should therefore be interpreted as being indicative of relative costs rather than as a reflection of absolute price levels. The combined ICT Price Basket hides differences in the absolute and relative prices of the three services. Therefore, for analytical and policy purposes, it is important to look at each of the ICT services separately (fixed telephony, mobile cellular and fixed broadband Internet).

The three individual sub-baskets are not directly comparable. For example, of the three sub-baskets, broadband access is the most expensive ICT, and is on average seven times as expensive (in absolute USD) as the mobile and fixed baskets, which have similar USD prices. Although there are limits to comparing an always-on broadband connection - which provides users with unlimited access to the Internet - to the mobile and fixed telephone baskets, which include a limited number of calls, all three sub-baskets are based on entry plans.

The analysis of the different components highlights that prices vary considerably between countries and regions, as well as between services. Prices fluctuate from as little as USD 0.2 for the fixed telephone basket in Iran, USD 0.8 for the mobile cellular basket in Hong Kong (China), and USD 4.4 for the fixed broadband basket in Sri Lanka, to as much as USD 44, USD 44, and USD 1'329 for the same services in Ireland, Japan, and the Central African Republic, respectively.

This section presents each sub-basket separately and highlights the main changes that have taken place between 2008 and 2009, in relative terms (as a percentage of GNI per capita),[19] in USD and in PPP$. The individual sub-baskets were not capped[20] so they can exceed 100 per cent of average monthly GNI per capita.

Fixed telephone sub-basket

a. Fixed telephone prices as a percentage of GNI per capita

Contrary to 2008, the fixed telephone sub-basket (Table 4.5) is no longer the cheapest of the three sub-baskets. At 5.9 per cent of monthly GNI per capita in 2009, it today lies just above the mobile cellular sub-basket (at 5.7) and well below the fixed broadband sub-basket (at 122). The fixed telephone sub-basket decreased on average by 20 per cent compared to 2008, which is the smallest percentage change of all three sub-baskets (Table 4.2). Increased competition, including from Voice-over-IP (VoIP) and the mobile sector (fixed-to-mobile substitution), has forced operators in many countries to adapt their fixed line tariffs. Examples include India and Viet Nam, where operators

Table 4.4: Ten economies with the greatest decrease in fixed telephone sub-basket, 2008-2009

ICT Price Basket Rank 2009	Country	Fixed telephone sub-basket as % of GNI capita, 2009	Fixed telephone sub-basket as % of GNI capita, 2008	2008-2009 value change
156	Madagascar	35.8	68.5	-32.7
158	Mozambique	42.6	66.2	-23.6
152	Uganda	28.3	44.4	-16.2
161	Niger	47.0	58.2	-11.2
138	Zambia	31.1	41.6	-10.5
147	Gambia	7.3	15.1	-7.8
141	Nigeria	5.9	13.3	-7.4
160	Togo	38.4	43.6	-5.2
151	Benin	17.3	22.4	-5.1
127	Kenya	15.7	20.4	-4.7

Source: ITU.

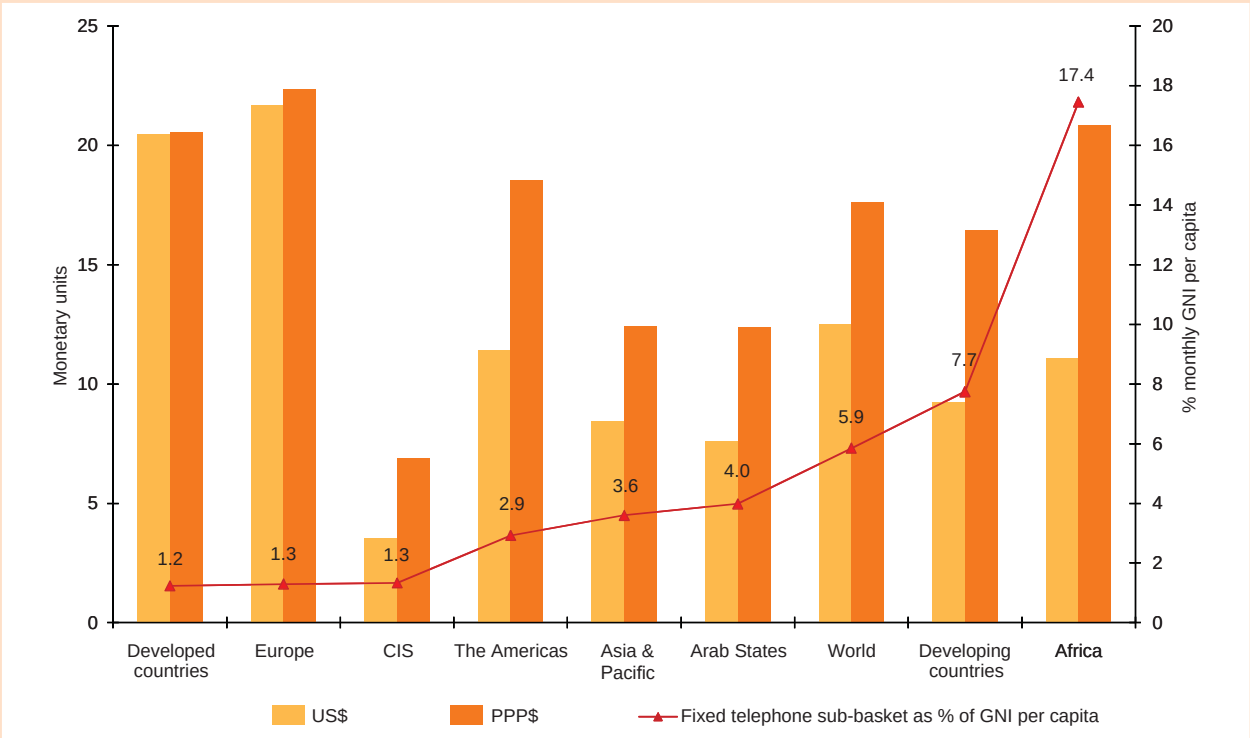
Table 4.5: Fixed telephone sub-basket, 2009 and 2008

Rank	Economy	Fixed telephone sub-basket as % of GNI capita		Value change	Relative change (%)	Fixed telephone sub-basket, US$	Fixed telephone sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
1	Iran (I.R.)	0.07	0.07	0.00	-1	0.20	0.47
2	United Arab Emirates	0.20	0.25	-0.05	-18	4.09	5.65
3	Belarus	0.23	N/A	N/A	N/A	1.02	2.59
4	Singapore	0.27	0.26	0.00	1	7.73	10.16
5	Kuwait	0.27	0.35	-0.08	-24	8.62	10.26
6	Hong Kong, China	0.27	0.43	-0.16	-37	7.10	10.05
7	Korea (Rep.)	0.29	0.39	-0.10	-25	5.23	8.21
8	Macao, China	0.30	0.78	-0.48	-61	8.99	13.28
9	United States	0.32	0.45	-0.13	-28	12.78	12.78
10	Bahrain	0.33	0.29	0.03	11	4.71	7.20
11	Kazakhstan	0.38	N/A	N/A	N/A	1.95	3.27
12	Norway	0.41	0.59	-0.18	-31	29.44	18.85
13	Malta	0.41	0.85	-0.45	-52	5.64	15.23
14	Ecuador	0.42	0.50	-0.08	-15	1.27	2.61
15	Luxembourg	0.42	0.49	-0.07	-15	29.71	21.22
16	Finland	0.46	0.51	-0.04	-9	18.46	12.95
17	Mongolia	0.47	N/A	N/A	N/A	0.66	1.43
18	Iceland	0.48	0.54	-0.06	-10	16.02	15.93
19	Denmark	0.50	0.62	-0.13	-20	24.49	14.45
20	Canada	0.53	1.00	-0.47	-47	18.30	16.21
21	Suriname	0.55	0.72	-0.17	-24	2.27	3.06
22	Switzerland	0.58	0.58	0.00	-1	31.49	20.09
23	Sweden	0.62	0.59	0.02	4	26.17	20.01
24	United Kingdom	0.64	0.77	-0.13	-17	24.09	23.14
25	Argentina	0.64	0.95	-0.30	-32	3.86	8.15
26	Netherlands	0.66	0.82	-0.15	-19	27.79	21.93
27	Russia	0.67	1.86	-1.19	-64	5.39	9.11
28	Austria	0.71	0.81	-0.10	-12	27.29	21.09
29	Saudi Arabia	0.71	0.72	0.00	0	9.20	11.60
30	Japan	0.72	0.58	0.13	23	22.78	17.62
31	Syria	0.72	0.85	-0.12	-14	1.26	2.13
32	Australia	0.77	0.92	-0.14	-16	26.04	20.18
33	Azerbaijan	0.78	1.14	-0.35	-31	2.50	4.00
34	Costa Rica	0.80	1.00	-0.20	-20	4.05	7.67
35	Malaysia	0.82	0.94	-0.12	-13	4.78	8.60
36	Serbia	0.82	1.23	-0.41	-33	3.91	7.26
37	Israel	0.83	N/A	N/A	N/A	17.03	17.82
38	France	0.83	0.96	-0.13	-13	29.32	21.94
39	Yemen	0.83	1.16	-0.33	-28	0.66	1.41
40	Qatar	0.91	N/A	N/A	N/A	9.07	12.02
41	Belgium	0.91	1.07	-0.16	-15	33.62	25.22
42	China	0.92	1.88	-0.96	-51	2.26	4.05
43	Germany	0.92	0.89	0.03	4	32.70	26.46
44	Italy	0.96	0.98	-0.02	-2	28.19	22.88
45	Slovenia	0.98	1.18	-0.20	-17	19.58	20.49
46	Tunisia	1.02	1.14	-0.12	-11	2.79	5.95
47	Mauritius	1.06	1.21	-0.15	-13	5.65	10.48
48	Ireland	1.06	1.05	0.01	1	43.77	30.94
49	Ukraine	1.06	1.99	-0.93	-47	2.84	8.34
50	Greece	1.06	1.08	-0.02	-2	25.38	23.72
51	Spain	1.07	1.25	-0.18	-15	28.49	26.14
52	St. Kitts and Nevis	1.07	N/A	N/A	N/A	9.78	14.39
53	Estonia	1.11	1.24	-0.13	-11	13.20	15.86
54	Latvia	1.13	1.44	-0.31	-21	11.20	13.10
55	Venezuela	1.17	1.15	0.01	1	8.98	10.23
56	Algeria	1.19	1.51	-0.33	-22	4.21	7.37
57	Oman	1.25	3.51	-2.26	-64	12.76	20.19
58	Antigua & Barbuda	1.29	N/A	N/A	N/A	14.67	21.84
59	Seychelles	1.30	1.62	-0.32	-20	11.15	26.84
60	Cyprus	1.32	1.27	0.04	3	25.17	40.32
61	Maldives	1.36	1.54	-0.18	-12	4.12	5.56
62	Trinidad & Tobago	1.41	1.68	-0.27	-16	19.48	27.00
63	New Zealand	1.42	1.43	-0.01	-1	33.11	29.24
64	Lithuania	1.45	1.82	-0.37	-20	14.32	19.25
65	Armenia	1.46	2.30	-0.85	-37	4.07	7.94
66	Colombia	1.46	1.33	0.14	10	5.68	9.05
67	Uzbekistan	1.50	N/A	N/A	N/A	1.13	3.35
68	Portugal	1.60	1.63	-0.02	-1	27.47	28.04
69	Georgia	1.70	4.14	-2.44	-59	3.49	6.50
70	Croatia	1.70	1.88	-0.18	-10	19.22	22.96
71	Poland	1.76	3.42	-1.66	-49	17.38	26.13
72	Turkey	1.77	N/A	N/A	N/A	13.76	21.24
73	Tajikistan	1.77	N/A	N/A	N/A	0.89	2.89
74	Uruguay	1.82	2.45	-0.63	-26	12.52	16.94
75	Montenegro	1.85	0.96	0.89	93	9.93	18.08
76	Albania	1.86	1.58	0.28	18	5.96	12.36
77	Slovak Republic	1.88	2.51	-0.63	-25	22.74	27.81
78	Bhutan	1.91	2.39	-0.48	-20	3.02	8.63
79	Cape Verde	1.93	4.22	-2.29	-54	5.03	5.12
80	Lebanon	1.95	2.27	-0.32	-14	10.30	17.14

Rank	Economy	Fixed telephone sub-basket as % of GNI capita		Value change	Relative change (%)	Fixed telephone sub-basket, US$	Fixed telephone sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
81	Egypt	1.97	2.05	-0.09	-4	2.95	7.99
82	Kyrgyzstan	2.05	N/A	N/A	N/A	1.26	3.93
83	Mexico	2.08	3.21	-1.13	-35	17.29	29.40
84	Czech Republic	2.12	2.57	-0.45	-17	29.35	35.34
85	Guyana	2.17	2.35	-0.19	-8	2.56	4.26
86	Brazil	2.19	5.91	-3.72	-63	13.43	16.35
87	Hungary	2.25	3.13	-0.88	-28	24.00	32.36
88	Bosnia and Herzegovina	2.33	3.00	-0.67	-22	8.76	15.20
89	Moldova	2.34	2.95	-0.62	-21	2.86	5.43
90	Fiji	2.34	3.11	-0.77	-25	7.66	9.59
91	Panama	2.34	1.97	0.37	19	12.05	22.59
92	Swaziland	2.35	2.25	0.10	5	4.94	9.74
93	Jamaica	2.38	3.51	-1.13	-32	9.65	16.74
94	Grenada	2.44	2.98	-0.54	-18	11.61	16.40
95	St. Lucia	2.52	2.52	0.00	0	11.61	19.33
96	St. Vincent and the Grenadines	2.53	3.09	-0.56	-18	10.86	18.26
97	Barbados	2.54	2.73	-0.20	-7	19.72	31.89
98	Dominica	2.74	3.07	-0.34	-11	10.89	19.02
99	Viet Nam	2.86	3.54	-0.68	-19	2.12	6.14
100	Romania	2.92	2.38	0.54	22	19.29	33.01
101	Bulgaria	3.01	2.40	0.61	26	13.78	26.33
102	Chile	3.01	3.87	-0.86	-22	23.61	34.91
103	Tonga	3.03	3.31	-0.27	-8	6.47	8.33
104	Sri Lanka	3.18	3.73	-0.55	-15	4.71	11.22
105	Botswana	3.33	3.47	-0.14	-4	17.96	34.14
106	Indonesia	3.33	3.30	0.04	1	5.58	9.82
107	Dominican Rep.	3.36	4.87	-1.51	-31	12.30	22.81
108	Jordan	3.43	3.48	-0.05	-2	9.45	14.71
109	Guatemala	3.48	4.26	-0.78	-18	7.76	14.27
110	Pakistan	3.49	4.98	-1.48	-30	2.85	9.80
111	India	3.50	4.41	-0.91	-21	3.13	9.37
112	Thailand	3.52	2.04	1.48	73	8.34	16.74
113	Bangladesh	3.61	3.42	0.19	6	1.56	4.22
114	Paraguay	3.65	5.19	-1.55	-30	6.63	13.63
115	Namibia	3.71	5.19	-1.48	-28	12.99	18.25
116	Ethiopia	3.76	8.07	-4.31	-53	0.88	3.14
117	TFYR Macedonia	3.89	3.03	0.86	28	13.42	28.53
118	El Salvador	3.96	4.28	-0.32	-7	11.49	21.65
119	Micronesia	4.10	3.89	0.22	6	8.00	10.19
120	Sudan	4.12	5.49	-1.37	-25	3.88	7.62
121	Peru	4.30	5.35	-1.05	-20	14.30	27.09
122	South Africa	4.45	4.67	-0.22	-5	21.60	34.44
123	Samoa	4.46	5.07	-0.62	-12	10.32	14.69
124	Papua New Guinea	4.76	5.71	-0.95	-17	4.00	6.91
125	Myanmar	4.92	N/A	N/A	N/A	0.90	2.48
126	Nicaragua	5.26	6.20	-0.94	-15	4.73	11.63
127	Belize	5.50	6.59	-1.09	-17	17.50	27.59
128	Angola	5.76	9.47	-3.72	-39	16.55	21.87
129	Nigeria	5.90	13.30	-7.40	-56	5.70	10.71
130	Lao P.D.R.	6.10	8.16	-2.06	-25	3.76	9.05
131	Ghana	6.84	9.49	-2.65	-28	3.82	10.56
132	Gambia	7.26	15.11	-7.85	-52	2.36	7.94
133	Djibouti	8.61	N/A	N/A	N/A	8.11	16.91
134	Nepal	8.93	12.08	-3.15	-26	2.98	8.86
135	Guinea	9.22	10.15	-0.94	-9	2.99	5.90
136	Philippines	10.12	10.49	-0.37	-3	15.94	32.21
137	Morocco	10.93	14.62	-3.69	-25	23.50	36.77
138	S. Tomé & Principe	11.31	14.55	-3.24	-22	9.61	16.59
139	Vanuatu	12.22	16.51	-4.29	-26	23.73	35.61
140	Malawi	13.84	16.07	-2.23	-14	3.35	9.37
141	Lesotho	14.20	15.00	-0.80	-5	12.78	22.56
142	Cameroon	14.74	16.95	-2.21	-13	14.13	25.47
143	Cambodia	15.65	17.86	-2.21	-12	7.83	21.66
144	Kenya	15.69	20.42	-4.74	-23	10.07	19.46
145	Mauritania	17.07	18.43	-1.36	-7	11.95	26.26
146	Benin	17.34	22.43	-5.09	-23	9.97	19.13
147	Comoros	17.73	20.53	-2.80	-14	11.08	15.85
148	Bolivia	19.28	21.65	-2.37	-11	23.46	56.12
149	Mali	19.50	23.74	-4.25	-18	9.42	15.57
150	Rwanda	23.70	27.34	-3.64	-13	8.10	18.75
151	Côte d'Ivoire	26.54	30.00	-3.47	-12	21.67	31.71
152	Uganda	28.29	44.45	-16.16	-36	9.90	28.42
153	Burkina Faso	28.82	28.66	0.16	1	11.53	25.82
154	Central African Rep.	29.51	33.43	-3.92	-12	10.08	16.78
155	Senegal	29.74	25.43	4.31	17	24.04	39.46
156	Zambia	31.10	41.56	-10.46	-25	24.62	36.54
157	Tanzania	33.30	32.83	0.47	1	12.21	34.58
158	Madagascar	35.80	68.50	-32.70	-48	12.23	29.34
159	Togo	38.39	43.62	-5.23	-12	12.80	24.47
160	Mozambique	42.62	66.20	-23.57	-36	13.14	28.58
161	Niger	47.01	58.16	-11.16	-19	12.93	24.41

Source: ITU.
Note N/A - Not available.

Chart 4.3: Fixed telephone sub-basket by region and by level of development, 2009



Source: ITU.

have responded to increased competition by reducing fixed-line tariffs, a step that has resulted in a 20 per cent drop in the fixed telephone sub-basket for both countries.[21]

The ten economies with the lowest relative prices for fixed lines are very diverse in terms of income levels, development status and geographic location (Table 4.5). They include Iran, the UAE, Belarus, Singapore, Kuwait, the Republic of Korea and the United States. For a number of countries, there are substantial differences between their overall rank and their fixed telephone sub-basket rank, with fixed telephony prices relatively cheap compared to mobile and broadband services. It should be noted that the fixed telephone sub-basket does not include the price of the (one-time) connection charge, which is relatively high in a number of countries, including in Iran and Kuwait. In some countries, citizens benefit from particularly cheap, or even free, local calls, as is the case in the United States, but pay relatively more for long-distance national calls. Some telecommunication operators offer subsidized fixed telephone services so that customers receive services below the market price. In some countries, for example Ecuador and Colombia, subscribers pay according to where they live and tariffs are cheaper in poorer areas.[22]

While the 2009 results and rankings show an overall drop in fixed telephone prices, there were some exceptions. An increase in fixed prices is usually the result of policies implemented to ensure that the price for the service reflects its underlying cost, such as a modification on price caps and tariff rebalancing. Tariff rebalancing took place, for example, in Bulgaria and has led to a 26 per cent increase of the fixed telephone basket.[23] In some cases the value change between 2008 and 2009 is actually the result of a change – generally an increase - in GNI per capita (the denominator) and not a change in prices. The ten countries with the greatest decrease in the fixed telephone sub-basket are all in Africa (Table 4.4) and are low-income, developing countries with relatively high fixed telephone tariffs.[24]

There are major regional differences in terms of the fixed telephone sub-basket. Africa is by far the region with the highest relative fixed telephone prices (on average over 17 per cent of monthly income). In all other geographic regions, the fixed telephone basket represents less than five per cent of income, and in Europe it accounts for as little as 1.3 per cent. Looking at countries by development level also shows a notable difference, with the fixed telephone sub-basket accounting on average for 1.2 per cent of monthly GNI in developed countries, compared to 7.7 per cent in developing countries (Chart 4.3).

b. Price in USD and PPP$

Fixed telephone prices ranked by dollar values (both USD and PPP$) show that several low-income developing economies from different regions rank at the top, indicating that they have low prices, both in USD and PPP terms. They include Iran, Yemen, Mongolia, Tajikistan, and Ethiopia.

In developed countries, the average 2009 price of the fixed telephone sub-basket is USD 20, while that of developing countries is USD 9, compared to USD 22 and USD 10, respectively, in 2008. On average, fixed tariffs dropped by six per cent in developed countries and by nine per cent in developing countries between 2008 and 2009. In PPP$ prices, the gap is smaller but developed economies still have higher fixed telephone prices: PPP$ 20 compared to PPP$ 16 in developing economies.

Significant price differences, especially in PPP terms, can be observed by development status. Countries with the most expensive fixed telephone sub-baskets in USD are mainly developed, high-income countries, including Ireland, New Zealand, Germany, Switzerland and Luxembourg. The only developing country in the bottom 20 is Zambia, with a fixed telephone sub-basket of USD 24.6. However, in PPP$ prices, the situation is reversed, with the list of the countries with the most expensive PPP$ prices dominated by developing countries, including Bolivia, Senegal, Morocco, Zambia and Vanuatu. Only five of the twenty most expensive countries in terms of fixed telephone sub-basket at PPP$ prices are developed: the Czech Republic, Romania, Hungary, Ireland and New Zealand.

The fixed telephone sector has historically been subject to regulatory intervention, especially when incumbent operators were state-owned, and regulations were used to provide universal service and access. Over time, developments, including increasingly privatized and liberalized markets and a clear shift towards mobile telephony, have altered regulations and in fewer countries governments intervene and impose price limits. The large difference in prices between countries suggests, however, that universal access and tariff policies continue to have an impact on today's availability and affordability of basic, fixed telephone service, especially in developing countries.

Mobile cellular sub-basket

a. Mobile cellular prices as a percentage of GNI per capita

In 2009, the mobile cellular sub-basket, at 5.7 per cent of monthly GNI per capita, has become the least expensive of the three sub-baskets. This is the result of deeper liberalization and privatization in the mobile cellular market, which is the most competitive of the telecommunication services sectors. Mobile cellular tariffs continue to decrease and between 2008 and 2009, the mobile basket dropped by 25 per cent - compared to 20 per cent for the fixed telephone and 42 per cent for the fixed broadband sub-basket (Table 4.2).

The ten economies with the lowest mobile cellular sub-basket include Hong Kong (China), Norway, Denmark, Singapore, and Kuwait (Table 4.6). The countries with relatively low mobile cellular prices also tend to rank well on the overall ICT Price Basket and are generally high-income economies. Costa Rica stands out since it has a relatively low GNI per capita but ranks high (17th) on the mobile cellular sub-basket. This is even more surprising given that to date, Costa Rica has only one mobile cellular operator and no competition,[25] but prices have been kept low through government-run operator's subsidies.[26] Sri Lanka also stands out as a country with relatively low income levels and relatively cheap mobile cellular tariffs, ranked 25th on the mobile sub-basket, compared to 61st on the overall ICT Price Basket. Its mobile prices dropped by almost 70 per cent between 2008 and 2009, one of the highest percentage changes worldwide. During that period, the country's mobile market underwent a mobile "price war", triggered by the introduction of a fifth operator.[27] Other countries where mobile cellular tariffs dropped dramatically include Azerbaijan (81 per cent), Nepal (64 per cent), Ukraine (58 per cent), and Mexico (52 per cent), where the mobile cellular sub-basket value dropped from 2.15 in 2008, to 1.04 in 2009.

The most expensive mobile cellular tariffs in relative terms are found in low-income, developing countries, mainly from Africa and Asia and the Pacific. They include Niger, Malawi, Togo, Burkina Faso, Tanzania and Benin. At the same time, these countries are included in the list of economies with the greatest value decrease in the mobile cellular sub-basket

Table 4.6: Mobile cellular sub-basket, 2009 and 2008

Rank	Economy	Mobile cellular sub-basket as % of GNI capita		Value change	Relative change (%)	Mobile cellular sub-basket, US$	Mobile cellular sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
1	Hong Kong, China	0.03	0.10	-0.07	-71	0.75	1.07
2	Macao, China	0.09	0.24	-0.15	-61	2.75	4.06
3	Norway	0.12	0.15	-0.03	-21	8.66	5.54
4	Denmark	0.13	0.13	0.00	3	6.46	3.81
5	Singapore	0.14	0.15	-0.01	-8	3.94	5.18
6	Austria	0.18	0.68	-0.51	-74	6.81	5.26
7	Luxembourg	0.18	0.22	-0.04	-19	12.64	9.02
8	United Arab Emirates	0.21	0.21	0.00	0	4.13	5.71
9	Kuwait	0.24	0.30	-0.06	-19	7.81	9.30
10	Iceland	0.25	0.31	-0.06	-21	8.32	8.27
11	Germany	0.27	0.31	-0.04	-13	9.55	7.73
12	Cyprus	0.27	0.25	0.02	7	5.17	8.28
13	Finland	0.33	0.37	-0.04	-10	13.39	9.39
14	Sweden	0.35	0.44	-0.09	-21	14.77	11.29
15	United States	0.39	0.40	-0.01	-3	15.28	15.28
16	United Kingdom	0.44	0.57	-0.14	-24	16.54	15.88
17	Costa Rica	0.46	0.97	-0.52	-53	2.32	4.38
18	Bahrain	0.46	0.40	0.06	15	6.72	10.27
19	Trinidad & Tobago	0.47	0.67	-0.20	-30	6.48	8.99
20	Ireland	0.51	0.47	0.04	9	20.92	14.79
21	Canada	0.51	0.59	-0.08	-13	17.74	15.72
22	Portugal	0.54	1.67	-1.14	-68	9.17	9.36
23	Belgium	0.56	0.65	-0.08	-13	20.81	15.61
24	Saudi Arabia	0.58	0.68	-0.11	-15	7.44	9.38
25	Sri Lanka	0.61	1.86	-1.25	-67	0.90	2.15
26	Oman	0.61	0.59	0.02	3	6.24	9.87
27	Switzerland	0.62	0.71	-0.09	-13	33.70	21.50
28	Italy	0.62	0.61	0.01	2	18.35	14.89
29	Israel	0.67	N/A	N/A	N/A	13.80	14.44
30	Korea (Rep.)	0.68	0.89	-0.21	-24	12.20	19.18
31	Netherlands	0.71	0.46	0.25	53	29.69	23.43
32	Russia	0.73	1.37	-0.65	-47	5.83	9.85
33	Latvia	0.74	0.89	-0.15	-17	7.28	8.51
34	Belarus	0.77	N/A	N/A	N/A	3.43	8.73
35	Malta	0.78	0.89	-0.11	-13	10.78	29.10
36	Slovenia	0.79	0.71	0.08	12	15.81	16.54
37	Mauritius	0.84	0.97	-0.12	-13	4.50	8.36
38	Malaysia	0.85	1.09	-0.24	-22	4.93	8.86
39	Qatar	0.86	N/A	N/A	N/A	8.61	11.41
40	Lithuania	0.86	1.05	-0.19	-18	8.55	11.49
41	Panama	0.96	1.10	-0.14	-13	4.95	9.29
42	Poland	0.97	1.52	-0.55	-36	9.61	14.44
43	Greece	0.99	1.02	-0.03	-3	23.60	22.06
44	France	1.00	1.11	-0.11	-10	35.22	26.36
45	Thailand	1.00	1.38	-0.37	-27	2.37	4.77
46	Estonia	1.03	1.24	-0.21	-17	12.26	14.72
47	Mexico	1.04	2.15	-1.12	-52	8.62	14.66
48	Australia	1.04	0.88	0.16	18	34.91	27.05
49	Antigua & Barbuda	1.08	N/A	N/A	N/A	12.25	18.24
50	Serbia	1.09	1.25	-0.16	-13	5.18	9.61
51	Maldives	1.14	1.27	-0.13	-10	3.46	4.67
52	Montenegro	1.18	1.56	-0.38	-24	6.34	11.53
53	St. Kitts and Nevis	1.19	N/A	N/A	N/A	10.84	15.95
54	Spain	1.19	1.36	-0.17	-12	31.64	29.03
55	New Zealand	1.20	0.96	0.23	24	27.87	24.62
56	Iran (I.R.)	1.21	1.31	-0.10	-8	3.57	8.40
57	Bhutan	1.26	2.05	-0.79	-39	1.99	5.69
58	Czech Republic	1.28	1.54	-0.27	-17	17.66	21.27
59	Pakistan	1.28	2.66	-1.38	-52	1.05	3.59
60	Chile	1.30	1.97	-0.67	-34	10.18	15.05
61	Seychelles	1.31	1.48	-0.17	-11	11.26	27.09
62	Jamaica	1.38	2.25	-0.88	-39	5.59	9.69
63	Barbados	1.38	1.63	-0.24	-15	10.76	17.40
64	Azerbaijan	1.39	7.16	-5.77	-81	4.44	7.11
65	Japan	1.39	1.03	0.37	36	44.34	34.29
66	Uzbekistan	1.41	N/A	N/A	N/A	1.07	3.15
67	Hungary	1.44	1.67	-0.22	-13	15.42	20.79
68	Botswana	1.50	1.70	-0.20	-12	8.08	15.36
69	China	1.51	1.83	-0.31	-17	3.71	6.64
70	India	1.57	2.06	-0.49	-24	1.40	4.19
71	Romania	1.60	2.33	-0.73	-31	10.60	18.13
72	Ukraine	1.62	3.84	-2.22	-58	4.34	12.74
73	Croatia	1.62	2.15	-0.52	-24	18.35	21.92
74	Indonesia	1.67	3.87	-2.20	-57	2.80	4.92
75	Grenada	1.69	1.90	-0.21	-11	8.03	11.34
76	Kazakhstan	1.71	N/A	N/A	N/A	8.76	14.69
77	Algeria	1.77	2.71	-0.94	-35	6.27	10.98
78	Uruguay	1.84	2.59	-0.74	-29	12.70	17.19
79	St. Vincent and the Grenadines	1.94	3.40	-1.45	-43	8.32	13.99
80	Slovak Republic	2.06	1.65	0.41	25	24.93	30.50

Rank	Economy	Mobile cellular sub-basket as % of GNI capita		Value change	Relative change (%)	Mobile cellular sub-basket, US$	Mobile cellular sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
81	Armenia	2.08	3.80	-1.73	-45	5.80	11.32
82	Jordan	2.08	1.88	0.20	11	5.75	8.95
83	Suriname	2.22	2.27	-0.05	-2	9.21	12.38
84	Argentina	2.28	2.48	-0.20	-8	13.70	28.97
85	St. Lucia	2.29	2.59	-0.30	-12	10.54	17.55
86	Dominican Rep.	2.33	3.07	-0.74	-24	8.52	15.80
87	El Salvador	2.44	4.43	-2.00	-45	7.07	13.31
88	Colombia	2.46	3.53	-1.07	-30	9.54	15.19
89	Bosnia and Herzegovina	2.49	3.12	-0.63	-20	9.36	16.23
90	Micronesia	2.52	2.39	0.13	6	4.91	6.25
91	Mongolia	2.55	N/A	N/A	N/A	3.57	7.75
92	South Africa	2.60	2.57	0.03	1	12.60	20.10
93	Tunisia	2.63	2.69	-0.07	-2	7.20	15.37
94	Peru	2.69	2.78	-0.09	-3	8.94	16.94
95	Tonga	2.76	3.01	-0.25	-8	5.89	7.58
96	Egypt	2.76	3.46	-0.69	-20	4.15	11.22
97	Paraguay	2.92	4.13	-1.21	-29	5.31	10.92
98	Lebanon	3.00	4.61	-1.61	-35	15.85	26.37
99	Bangladesh	3.05	3.38	-0.33	-10	1.32	3.56
100	Turkey	3.07	N/A	N/A	N/A	23.91	36.90
101	Ecuador	3.10	3.52	-0.42	-12	9.41	19.32
102	Dominica	3.22	3.10	0.12	4	12.82	22.39
103	Guatemala	3.27	2.23	1.05	47	7.31	13.44
104	Fiji	3.29	4.38	-1.09	-25	10.76	13.48
105	Sudan	3.60	5.99	-2.39	-40	3.39	6.66
106	Namibia	3.65	4.09	-0.44	-11	12.77	17.94
107	Georgia	3.68	4.80	-1.13	-23	7.57	14.07
108	Nepal	3.69	10.33	-6.64	-64	1.23	3.66
109	Venezuela	3.72	4.05	-0.33	-8	28.60	32.58
110	Samoa	3.78	4.30	-0.52	-12	8.75	12.45
111	Angola	3.83	5.52	-1.69	-31	11.02	14.56
112	Bulgaria	3.85	4.85	-1.00	-21	17.62	33.68
113	TFYR Macedonia	3.89	4.57	-0.68	-15	13.43	28.55
114	Philippines	3.95	4.24	-0.28	-7	6.22	12.57
115	Albania	4.18	8.28	-4.10	-50	13.37	27.72
116	Viet Nam	4.37	6.38	-2.02	-32	3.24	9.37
117	Syria	4.38	6.23	-1.85	-30	7.63	12.90
118	Kyrgyzstan	4.65	N/A	N/A	N/A	2.87	8.92
119	Belize	4.67	4.70	-0.02	-1	14.88	23.46
120	Lao P.D.R.	5.63	6.11	-0.48	-8	3.47	8.35
121	Brazil	5.66	7.51	-1.86	-25	34.64	42.18
122	Tajikistan	5.71	N/A	N/A	N/A	2.86	9.30
123	Cape Verde	5.98	9.90	-3.92	-40	15.60	15.88
124	Bolivia	6.01	5.63	0.38	7	7.32	17.51
125	Yemen	6.09	6.71	-0.62	-9	4.82	10.28
126	Swaziland	6.10	5.65	0.46	8	12.81	25.26
127	Guyana	6.27	6.86	-0.60	-9	7.41	12.31
128	Vanuatu	6.67	9.84	-3.18	-32	12.95	19.43
129	Moldova	6.70	8.48	-1.77	-21	8.21	15.58
130	Djibouti	7.02	N/A	N/A	N/A	6.61	13.79
131	Ghana	7.63	11.98	-4.35	-36	4.26	11.77
132	S. Tomé & Principe	9.29	11.38	-2.09	-18	7.89	13.62
133	Guinea	9.60	10.57	-0.98	-9	3.12	6.15
134	Cambodia	9.94	11.16	-1.22	-11	4.97	13.76
135	Ethiopia	10.19	16.65	-6.46	-39	2.38	8.50
136	Senegal	10.29	12.23	-1.94	-16	8.32	13.65
137	Morocco	10.32	11.83	-1.51	-13	22.18	34.71
138	Nigeria	10.74	15.65	-4.91	-31	10.38	19.51
139	Kenya	11.66	23.67	-12.01	-51	7.48	14.46
140	Côte d'Ivoire	14.04	19.53	-5.49	-28	11.46	16.77
141	Mauritania	14.16	14.12	0.04	0	9.91	21.78
142	Lesotho	14.35	15.15	-0.79	-5	12.92	22.81
143	Cameroon	14.58	20.32	-5.74	-28	13.97	25.19
144	Nicaragua	15.54	16.88	-1.35	-8	13.98	34.35
145	Zambia	16.07	18.50	-2.43	-13	12.72	18.88
146	Gambia	19.33	22.62	-3.30	-15	6.28	21.13
147	Rwanda	19.34	37.62	-18.28	-49	6.61	15.30
148	Mali	20.78	24.02	-3.24	-13	10.04	16.60
149	Papua New Guinea	21.19	18.02	3.17	18	17.83	30.78
150	Comoros	22.23	25.74	-3.51	-14	13.89	19.87
151	Uganda	22.71	36.78	-14.07	-38	7.95	22.82
152	Benin	25.74	32.71	-6.97	-21	14.80	28.39
153	Mozambique	25.85	37.90	-12.05	-32	7.97	17.33
154	Tanzania	27.85	33.25	-5.41	-16	10.21	28.92
155	Madagascar	30.63	46.64	-16.01	-34	10.47	25.10
156	Burkina Faso	36.06	47.06	-11.00	-23	14.43	32.31
157	Togo	37.16	60.05	-22.89	-38	12.39	23.69
158	Central African Rep.	37.84	39.75	-1.91	-5	12.93	21.52
159	Malawi	44.70	57.39	-12.69	-22	10.80	30.25
160	Niger	55.74	59.00	-3.26	-6	15.33	28.95
161	Myanmar	69.61	N/A	N/A	N/A	12.76	35.13

Note: N/A - Not available.
Source: ITU.

Table 4.7: Ten economies with the greatest decrease in mobile cellular sub-basket, 2008-2009

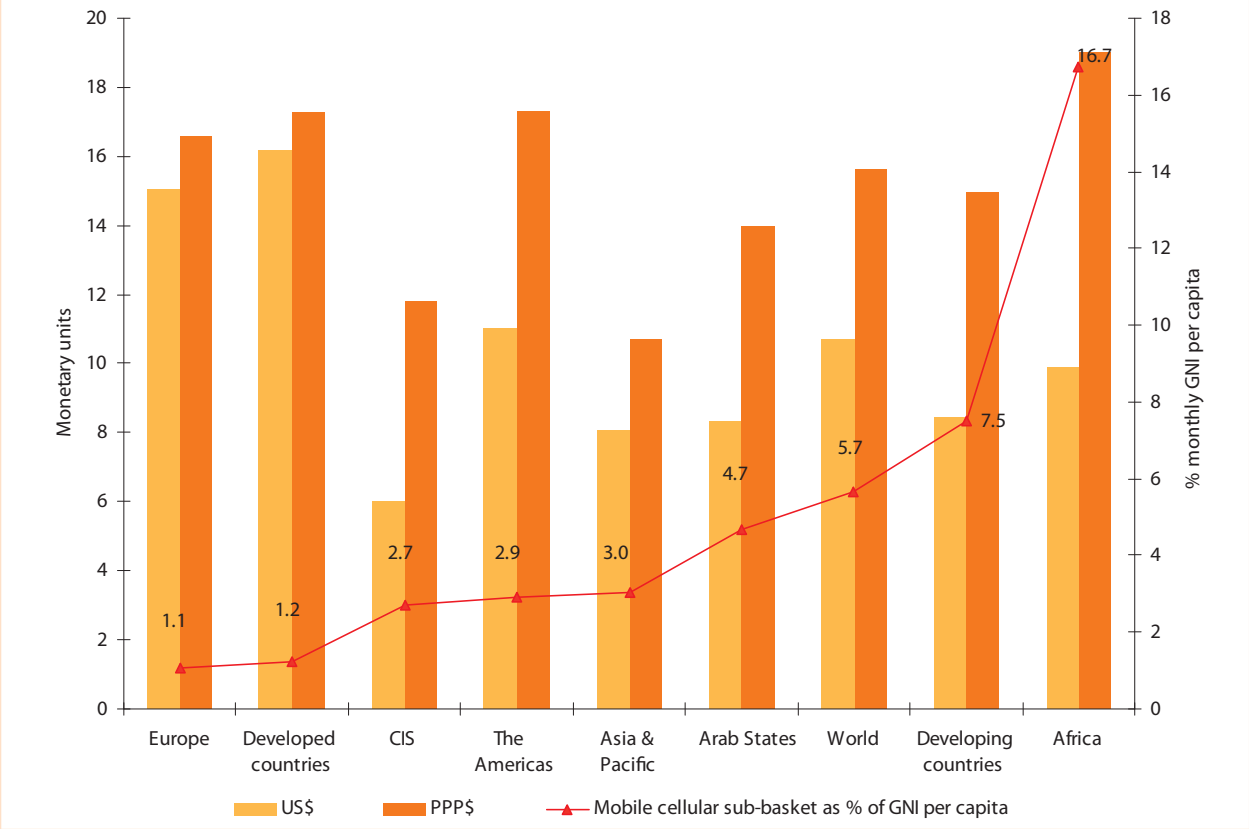
ICT Price Basket Rank 2009	Country	Mobile cellular sub-basket as % of GNI capita, 2009	Mobile cellular sub-basket as % of GNI capita, 2008	2008-2009 value change
160	Togo	37.2	60.0	-22.9
150	Rwanda	19.3	37.6	-18.3
156	Madagascar	30.6	46.6	-16.0
152	Uganda	22.7	36.8	-14.1
153	Malawi	44.7	57.4	-12.7
158	Mozambique	25.9	37.9	-12.0
127	Kenya	11.7	23.7	-12.0
155	Burkina Faso	36.1	47.1	-11.0
151	Benin	25.7	32.7	-7.0
154	Tanzania	27.9	33.3	-5.4

Source: ITU.

(Table 4.7). Similar to fixed telephony, the greatest value changes - indicating a drop in prices - are found in low-income, developing economies that rank very low on the overall ICT Price Basket. Countries where prices remain very high relative to income levels and where prices have dropped only little (both absolute and percentage change) include Niger, the Central African Republic, and Mali.

Average mobile cellular prices vary substantially across regions (Chart 4.4). While Europeans pay on average as little as 1.1 per cent of their monthly income for

Chart 4.4: Mobile cellular sub-basket by region and by level of development, 2009



Source: ITU.

the mobile cellular sub-basket, Africans pay as much as 16.7 per cent. Mobile prices are relatively affordable in the CIS, where they represent on average 2.7 per cent of incomes, compared to around three per cent in the Americas and Asia and the Pacific, and 4.7 per cent in the Arab States. Although prices are dropping somewhat faster in developing countries, the difference in relative prices remains important, with people in developed countries paying an equivalent of 1.2 per cent of their monthly income for mobile services, compared to 7.5 per cent in developing countries.

b. Price in USD and PPP$

A comparison of the price of telecommunication services converted into USD shows substantial regional differences, with Europe and the Americas being the most expensive regions. Prices in USD also differ significantly between developed and developing countries and the mobile sub-basket is twice as expensive in developed as in developing countries. These differences are much more moderate in PPP$ terms. The price gap between developed and developing regions is USD 8, compared to less than PPP$ 2. In every region, PPP$ prices are higher than USD prices because each region includes a number of lower-income countries. Unlike for the fixed telephone sub-basket, the list of countries with the lowest mobile cellular sub-baskets in PPP$ terms includes high- as well as low-income economies, including Hong Kong (China) and Denmark but also Sri Lanka, Bangladesh and Nepal. This suggests that market regulation, including liberalization and competition, can have an important impact on prices across the developed and the developing worlds and that national policies and private sector developments, not only income levels, are important factors in influencing prices.

Asia and the Pacific is the region with the lowest mobile sub-basket in terms of PPP$ prices and seven economies in the top-ten list are from this region, namely Hong Kong (China), Sri Lanka, Bangladesh, Pakistan, Nepal, Macao (China), and India. In the Americas and Europe the mobile cellular sub-basket represents more than PPP$ 15. This compares to PPP$ 12 and 13 in the CIS and the Arab States, respectively.

Fixed broadband sub-basket

a. Fixed broadband prices as a percentage of GNI per capita

Between 2008 and 2009, the results of the broadband sub-basket show that prices decreased by as much as 42 per cent, more than twice as much as in the fixed sub-basket and substantially more than in the mobile sub-basket. At 122 per cent of monthly GNI per capita, the broadband sub-basket remains by far the most expensive component of the ICT Price Basket (Table 4.2). Despite broadband Internet access generally becoming more affordable, it is still outside the reach of many of the world's inhabitants.

The countries with the relatively cheapest fixed broadband prices are almost identical to those ranked at the top of the ICT Price Basket. They are high-income economies performing well in the IDI, such as Hong Kong (China), Singapore, Denmark, Luxembourg, the United States, the United Kingdom, Switzerland and Sweden (Table 4.9). Fixed broadband accounts for less than 1.5 per cent of average monthly income in all of the top 20 IDI economies. Those countries where high-speed Internet access remains prohibitively expensive are exclusively low-income developing countries, and most of them are Least Developed Countries (LDCs). In 2009, there were still 28 countries where the price of the fixed broadband sub-basket exceeded the monthly GNI per capita, compared to 29 in 2008.[28] In another 13 countries, the price accounted for more than half of the monthly per capita income. These countries are all ranked relatively low in the IDI, reinforcing the argument that the affordability of services is crucial to the creation of an information society.

Steep falls in fixed broadband prices have taken place in a number of developing countries. In Burkina Faso and Nigeria, the broadband sub-basket decreased from over 5'000 to 228, and from 890 to 109, respectively. All of the ten countries with the greatest decrease in the fixed broadband sub-basket between 2008 and 2009 are low-income countries, nine of which are from Africa (Table 4.8). In total, in over twenty countries the broadband sub-basket value was reduced by more than 50 per cent. These include both developed and developing countries from all regions, such as Moldova, Brazil, Poland, Azerbaijan, Mexico and Ukraine.

A regional comparison of prices for fixed broadband services highlights a striking disparity, mainly between Africa and the other regions. On average, a high-speed Internet connection represents 500 per cent of monthly GNI per capita in Africa, making fixed broadband effectively inaccessible for most people in the region. In the Arab States and Asia and the Pacific regions, the fixed broadband sub-basket represents on average 71 and 46 per cent of income, respectively, compared to around ten per cent in both the Americas and CIS. At

less than two per cent of average monthly income, fixed broadband services are by far the cheapest in Europe. The broadband price gap is equally apparent between developed and developing countries, with a sub-basket value of two for the former, and 174 for the latter (Chart 4.5).

b) Prices in USD and PPP$

Fixed broadband prices vary from as little as USD 4.4 in Sri Lanka, to as much as USD 1'329 in the Central African Republic. Some developing countries stand out for having very low broadband prices in PPP$ terms and feature in the list of the top-ten least expensive countries, including Sri Lanka, Costa Rica, the Maldives and India.

In most African countries, with only a few exceptions, (such as Mauritius, South Africa, Cape Verde, Kenya and Senegal), fixed broadband access costs over USD 50 per month, and even more in PPP$. The exorbitant average cost of fixed broadband in Africa, in both USD and PPP$ is illustrated in Chart 4.5.

Prices shown in PPP$ terms also highlight the broadband price gap between developed and developing countries, with the latter paying seven times as much for broadband than the former. The ICT price divide between developed and developing countries is clearly the most pronounced in fixed broadband services, while prices are very similar between developed and developing countries for fixed telephone and mobile services.

The gap is shrinking though (Chart 4.6) with the broadband sub-basket falling from PPP$ 297 in 2008, to PPP$ 190 in developing countries in 2009, when it remained unchanged in developed countries.

4.5 Sub-basket results by region and level of development

Between 2008 and 2009, the price for all three ICT sub-baskets in terms of PPP$ dropped in developing countries, while they remained the same (such as for fixed broadband) or slightly increased in the developed countries. While in the developing world the price changes in PPP$ was relatively small for the mobile and fixed services, fixed broadband prices fell by over 36 per cent (Chart 4.6). During the same period relative prices decreased on average in all regions and for each of the three ICT services (fixed telephone, mobile and broadband, see Chart 4.7).

The greatest drop in prices has taken place in the fixed broadband sector, where prices fell between 14 per cent in the Arab States and 47 per cent in the CIS. Price drops were higher in developing countries (41 per cent) than in developed countries (29 per cent), suggesting that the broadband price divide between the developed and developing world is narrowing. While Africa's broadband sub-basket has dropped by 44 per cent, the service remains prohibitively expensive to most of its population as it represented almost five times the average monthly income in 2009. Broadband prices also remain very expensive in the Arab States and in Asia and the Pacific,

Table 4.8: Ten economies with the greatest decrease in fixed broadband sub-basket, 2008-2009

ICT Price Basket Rank 2009	Country	Broadband sub-basket as % of GNI per capita, 2009	Broadband sub-basket as % of GNI per capita, 2008	2008-2009 value change
155	Burkina Faso	228.1	5193.6	-4965.4
153	Malawi	2038.3	4320.0	-2281.7
140	Ethiopia	2085.1	3512.8	-1427.8
142	Guinea	1546.2	2400.0	-853.8
141	Nigeria	108.6	890.4	-781.8
157	Central African Rep.	3891.2	4407.7	-516.5
147	Gambia	945.4	1439.3	-493.8
136	Swaziland	408.6	873.2	-464.7
137	Lao P.D.R.	315.1	555.1	-240.0
127	Kenya	62.1	296.1	-234.0

Source: ITU.

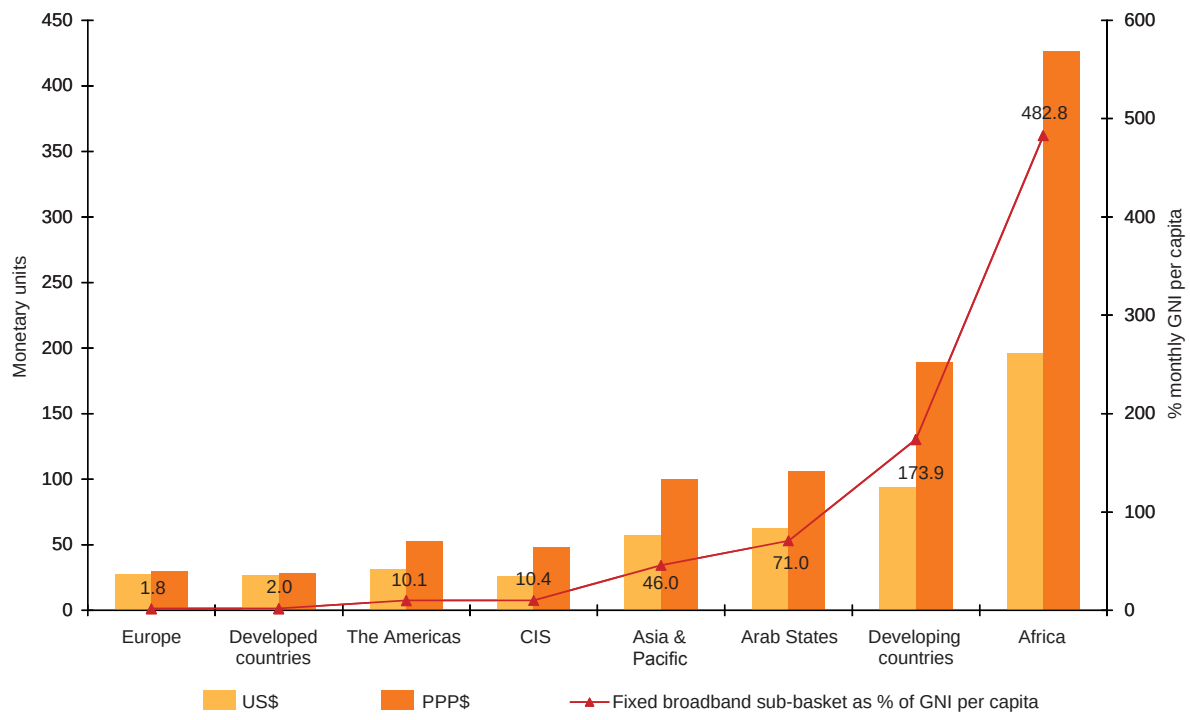
Table 4.9: Fixed broadband sub-basket, 2009 and 2008

Rank	Economy	Fixed broadband sub-basket as % of GNI capita		Value change	Relative change (%)	Fixed broadband sub-basket, US$	Fixed broadband sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
1	Macao, China	0.30	0.86	-0.56	-65	8.86	13.10
2	Israel	0.33	N/A	N/A	N/A	6.72	7.03
3	Hong Kong, China	0.49	0.96	-0.48	-49	12.77	18.09
4	United States	0.50	0.39	0.11	29	19.95	19.95
5	Singapore	0.58	0.81	-0.23	-29	16.70	21.98
6	Denmark	0.59	0.66	-0.07	-11	29.10	17.16
7	Luxembourg	0.59	0.70	-0.11	-15	42.03	30.02
8	Switzerland	0.60	0.65	-0.04	-7	32.69	20.86
9	Kuwait	0.60	1.75	-1.15	-66	19.24	22.90
10	United Kingdom	0.63	0.83	-0.20	-24	23.81	22.87
11	Norway	0.70	0.90	-0.19	-21	51.02	32.67
12	Canada	0.71	0.60	0.11	18	24.78	21.95
13	Australia	0.77	0.92	-0.14	-16	26.04	20.18
14	Belgium	0.78	0.90	-0.11	-13	28.99	21.74
15	Sweden	0.84	0.84	-0.01	-1	35.47	27.13
16	Netherlands	0.87	1.00	-0.13	-13	36.23	28.59
17	Ireland	0.88	0.95	-0.07	-7	36.36	25.71
18	Trinidad & Tobago	0.91	1.08	-0.17	-16	12.56	17.41
19	Austria	0.94	1.71	-0.77	-45	36.09	27.89
20	Finland	0.97	1.00	-0.02	-2	38.99	27.34
21	Italy	0.98	0.92	0.06	6	28.84	23.40
22	Greece	1.00	1.02	-0.02	-2	23.91	22.35
23	Iceland	1.00	1.26	-0.26	-21	33.52	33.34
24	France	1.02	1.18	-0.16	-13	36.09	27.01
25	Spain	1.08	1.18	-0.09	-8	28.84	26.46
26	Slovenia	1.09	1.57	-0.49	-31	21.74	22.75
27	Romania	1.10	4.43	-3.34	-75	7.24	12.39
28	Japan	1.18	1.01	0.17	17	37.45	28.95
29	Cyprus	1.19	0.79	0.39	49	22.67	36.30
30	New Zealand	1.23	1.28	-0.05	-4	28.54	25.20
31	Germany	1.23	1.18	0.05	4	43.41	35.13
32	Costa Rica	1.24	1.83	-0.58	-32	6.29	11.89
33	Poland	1.39	3.29	-1.90	-58	13.73	20.64
34	Korea (Rep.)	1.41	1.24	0.18	14	25.32	39.79
35	Malta	1.45	1.66	-0.21	-13	20.14	54.39
36	Lithuania	1.54	1.93	-0.39	-20	15.19	20.41
37	Belarus	1.62	N/A	N/A	N/A	7.24	18.43
38	Russia	1.66	2.21	-0.55	-25	13.28	22.43
39	Portugal	1.69	1.92	-0.22	-12	28.97	29.58
40	Bahrain	1.82	1.66	0.16	10	26.32	40.20
41	Croatia	1.83	2.40	-0.57	-24	20.66	24.68
42	Mexico	1.95	5.32	-3.37	-63	16.24	27.62
43	United Arab Emirates	2.03	2.03	0.00	0	40.60	56.17
44	Saudi Arabia	2.06	3.09	-1.02	-33	26.67	33.62
45	Estonia	2.34	3.50	-1.17	-33	27.79	33.38
46	Turkey	2.34	N/A	N/A	N/A	18.24	28.15
47	Slovak Republic	2.36	2.91	-0.56	-19	28.57	34.94
48	Latvia	2.52	3.14	-0.62	-20	24.86	29.06
49	Uruguay	2.64	4.58	-1.94	-42	18.14	24.56
50	Ukraine	2.70	9.77	-7.07	-72	7.23	21.24
51	Hungary	2.84	2.58	0.26	10	30.27	40.82
52	Serbia	2.88	2.28	0.60	26	13.67	25.34
53	Sri Lanka	2.95	16.34	-13.39	-82	4.38	10.42
54	Oman	3.06	3.37	-0.32	-9	31.25	49.43
55	Mauritius	3.11	12.69	-9.58	-76	16.58	30.77
56	Maldives	3.11	3.53	-0.42	-12	9.41	12.71
57	Czech Republic	3.13	2.40	0.73	30	43.30	52.15
58	Panama	3.23	3.26	-0.03	-1	16.62	31.16
59	Bulgaria	3.24	4.08	-0.84	-21	14.81	28.32
60	Malaysia	3.27	3.75	-0.48	-13	19.02	34.19
61	Kazakhstan	3.36	N/A	N/A	N/A	17.19	28.84
62	St. Kitts and Nevis	4.01	N/A	N/A	N/A	36.67	53.96
63	Venezuela	4.07	5.14	-1.07	-21	31.31	35.66
64	TFYR Macedonia	4.12	5.11	-0.98	-19	14.22	30.23
65	Antigua & Barbuda	4.21	N/A	N/A	N/A	47.78	71.15
66	Tunisia	4.27	4.78	-0.50	-11	11.72	25.02
67	Lebanon	4.29	4.78	-0.49	-10	22.69	37.75
68	Algeria	4.35	5.72	-1.37	-24	15.43	27.04
69	Barbados	4.44	7.34	-2.90	-40	34.50	55.79
70	Brazil	4.58	9.61	-5.03	-52	28.03	34.13
71	Bosnia and Herzegovina	4.93	4.69	0.23	5	18.52	32.12
72	Argentina	5.20	7.61	-2.40	-32	31.22	66.01
73	Montenegro	5.40	4.95	0.45	9	28.97	52.72
74	Egypt	5.46	6.33	-0.86	-14	8.20	22.19
75	Jamaica	5.47	9.69	-4.22	-44	22.19	38.49
76	Qatar	5.49	N/A	N/A	N/A	54.95	72.85
77	South Africa	5.54	5.48	0.06	1	26.89	42.88
78	India	5.84	7.66	-1.82	-24	5.21	15.61
79	Mongolia	6.04	N/A	N/A	N/A	8.46	18.38
80	Chile	6.15	7.62	-1.47	-19	48.15	71.18

Rank	Economy	Fixed broadband sub-basket as % of GNI capita		Value change	Relative change (%)	Fixed broadband sub-basket, US$	Fixed broadband sub-basket, PPP$
		2009	2008	2009-2008		2009	2009
81	Grenada	6.15	7.52	-1.37	-18	29.26	41.33
82	Fiji	6.19	8.23	-2.04	-25	20.26	25.37
83	Bhutan	6.30	41.13	-34.83	-85	9.98	28.51
84	St. Lucia	6.35	11.98	-5.63	-47	29.26	48.72
85	Seychelles	6.66	6.78	-0.13	-2	57.09	137.40
86	Albania	6.86	11.47	-4.60	-40	21.97	45.56
87	El Salvador	7.01	7.58	-0.57	-7	20.34	38.33
88	Dominican Rep.	7.18	9.47	-2.28	-24	26.28	48.74
89	China	7.19	9.41	-2.22	-24	17.62	31.54
90	Morocco	7.83	10.68	-2.84	-27	16.84	26.35
91	St. Vincent and the Grenadines	7.86	15.73	-7.87	-50	33.65	56.61
92	Thailand	7.94	6.34	1.60	25	18.79	37.72
93	Colombia	8.96	13.42	-4.46	-33	34.78	55.36
94	Iran (I.R.)	10.33	14.87	-4.54	-31	30.48	71.62
95	Moldova	10.91	22.08	-11.17	-51	13.37	25.37
96	Peru	10.96	12.67	-1.70	-13	36.46	69.08
97	Jordan	11.01	13.02	-2.01	-15	30.37	47.27
98	Armenia	11.28	17.84	-6.55	-37	31.50	61.47
99	Botswana	11.54	13.25	-1.71	-13	62.23	118.31
100	Paraguay	11.91	25.15	-13.24	-53	21.64	44.51
101	Dominica	12.02	13.49	-1.47	-11	47.78	83.46
102	Indonesia	12.44	15.77	-3.33	-21	20.83	36.63
103	Ecuador	13.15	15.55	-2.39	-15	39.90	81.93
104	Cape Verde	13.37	19.65	-6.28	-32	34.87	35.50
105	Namibia	13.47	16.48	-3.00	-18	47.16	66.24
106	Philippines	13.68	17.31	-3.63	-21	21.55	43.53
107	Azerbaijan	15.27	39.77	-24.49	-62	48.75	78.06
108	Guatemala	15.42	16.72	-1.30	-8	34.44	63.30
109	Belize	17.28	28.26	-10.99	-39	55.00	86.71
110	Pakistan	17.89	25.50	-7.61	-30	14.61	50.24
111	Syria	18.08	34.98	-16.90	-48	31.49	53.23
112	Suriname	19.21	24.10	-4.89	-20	79.89	107.40
113	Georgia	20.49	26.93	-6.45	-24	42.17	78.43
114	Micronesia	20.49	19.41	1.08	6	39.95	50.89
115	Viet Nam	20.80	25.78	-4.98	-19	15.43	44.65
116	Sudan	24.70	36.43	-11.74	-32	23.26	45.70
117	Bolivia	28.89	31.91	-3.02	-9	35.15	84.10
118	Nicaragua	38.25	36.72	1.52	4	34.42	84.56
119	Guyana	41.75	45.72	-3.97	-9	49.41	82.03
120	Senegal	49.34	61.28	-11.94	-19	39.88	65.46
121	Côte d'Ivoire	54.27	61.35	-7.09	-12	44.32	64.86
122	Angola	54.76	76.67	-21.91	-29	157.43	207.95
123	Lesotho	55.56	58.70	-3.15	-5	50.00	88.30
124	Djibouti	59.36	N/A	N/A	N/A	55.90	116.60
125	Tonga	59.90	56.80	3.10	5	127.78	164.40
126	Kenya	62.07	296.12	-234.05	-79	39.83	76.97
127	Nepal	64.58	80.43	-15.85	-20	21.53	64.09
128	Zambia	64.92	137.19	-72.27	-53	51.40	76.27
129	Kyrgyzstan	77.93	N/A	N/A	N/A	48.06	149.35
130	Ghana	79.60	130.96	-51.36	-39	44.44	122.88
131	Mauritania	82.58	89.18	-6.60	-7	57.80	127.07
132	Vanuatu	86.64	293.47	-206.83	-70	168.23	252.44
133	Cameroon	92.49	210.03	-117.54	-56	88.63	159.82
134	Nigeria	108.61	890.41	-781.79	-88	104.99	197.35
135	Mali	114.61	139.58	-24.97	-18	55.40	91.55
136	Bangladesh	116.31	137.73	-21.42	-16	50.40	135.91
137	Myanmar	155.40	N/A	N/A	N/A	28.49	78.42
138	Papua New Guinea	168.43	203.70	-35.27	-17	141.76	244.69
139	Tanzania	173.35	204.01	-30.65	-15	63.56	180.03
140	Cambodia	177.03	201.24	-24.21	-12	88.51	244.99
141	Samoa	202.44	83.59	118.85	142	468.99	667.33
142	Benin	204.63	220.38	-15.76	-7	117.66	225.70
143	Burkina Faso	228.13	5193.56	-4965.43	-96	91.25	204.36
144	S. Tomé & Principe	243.88	377.22	-133.35	-35	207.29	357.73
145	Rwanda	257.64	344.35	-86.71	-25	88.03	203.79
146	Mozambique	260.22	375.28	-115.06	-31	80.23	174.45
147	Uzbekistan	263.03	N/A	N/A	N/A	199.47	588.42
148	Yemen	277.82	311.37	-33.55	-11	219.94	469.09
149	Madagascar	297.23	450.25	-153.02	-34	101.55	243.56
150	Lao P.D.R.	315.12	555.08	-239.96	-43	194.32	467.60
151	Swaziland	408.56	873.24	-464.68	-53	857.97	1691.69
152	Uganda	555.35	600.00	-44.65	-7	194.37	557.98
153	Togo	558.39	352.82	205.57	58	186.13	355.94
154	Comoros	685.44	793.67	-108.24	-14	428.40	612.73
155	Tajikistan	727.27	N/A	N/A	N/A	363.64	1183.63
156	Gambia	945.43	1439.28	-493.85	-34	307.27	1033.54
157	Niger	966.90	249.24	717.66	288	265.90	502.15
158	Guinea	1546.19	2400.00	-853.81	-36	502.51	990.42
159	Malawi	2038.33	4320.00	-2281.67	-53	492.60	1379.64
160	Ethiopia	2085.05	3512.83	-1427.78	-41	486.51	1739.27
161	Central African Rep.	3891.20	4407.69	-516.49	-12	1329.49	2213.12

Note N/A - Not available.
Source: ITU.

Chart 4.5: Fixed broadband sub-basket by region and by level of development, 2009



Source: ITU.

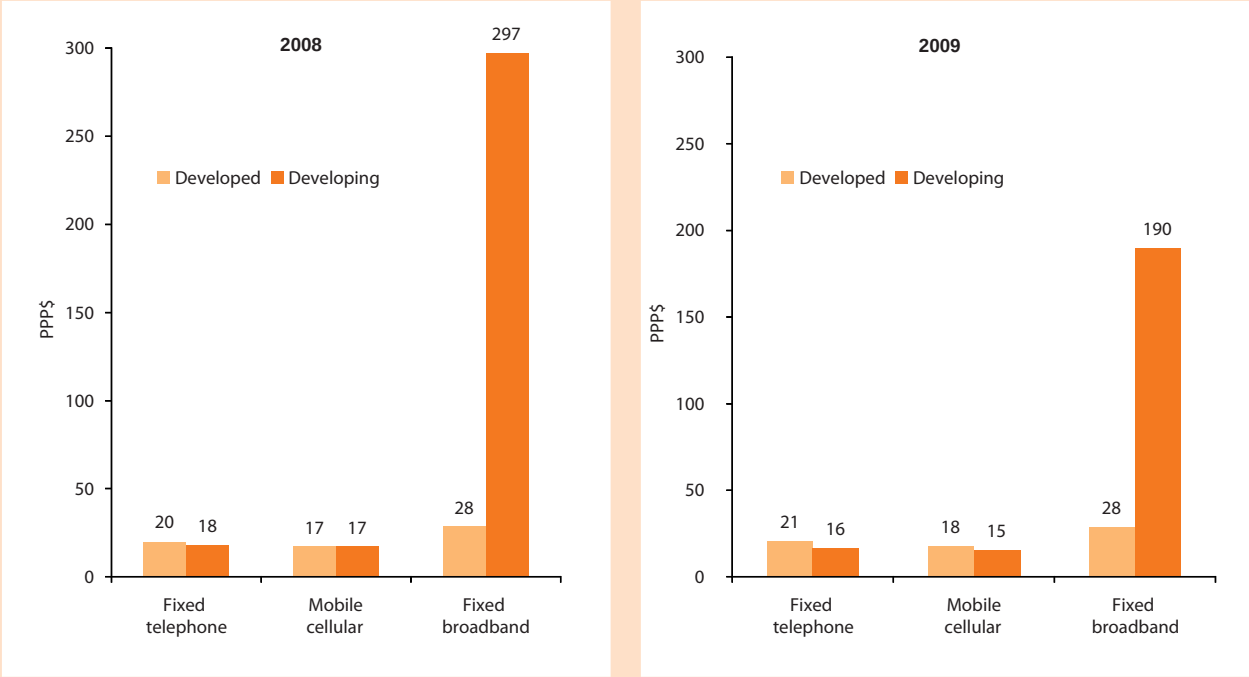
where the fixed broadband sub-basket stood at 71 and 46 per cent, respectively.

Despite the growing popularity and uptake of mobile cellular services in Africa, it remains the region with the relatively most expensive mobile prices. Even after a 25 per cent price drop between 2008 and 2009, the mobile basket still represented almost 17 per cent of the average monthly income. Even though the mobile sub-basket fell by 25 per cent in developing and by 23 per cent in developed countries, it remains much more expensive in developing countries. Indeed, their mobile sub-basket is six times the value of the mobile sub-basket in developed countries.

The fixed telephone sub-basket decreased by 21 per cent in developing countries, compared to 13 per cent in the developed world. In all regions, the relative price of the fixed telephone sub-basket remained similar to that of the mobile sub-basket, with prices particularly high in Africa, where the fixed telephone sub-basket represented 17.5 per cent of monthly GNI per capita in 2009, compared to only 1.3 per cent in Europe.

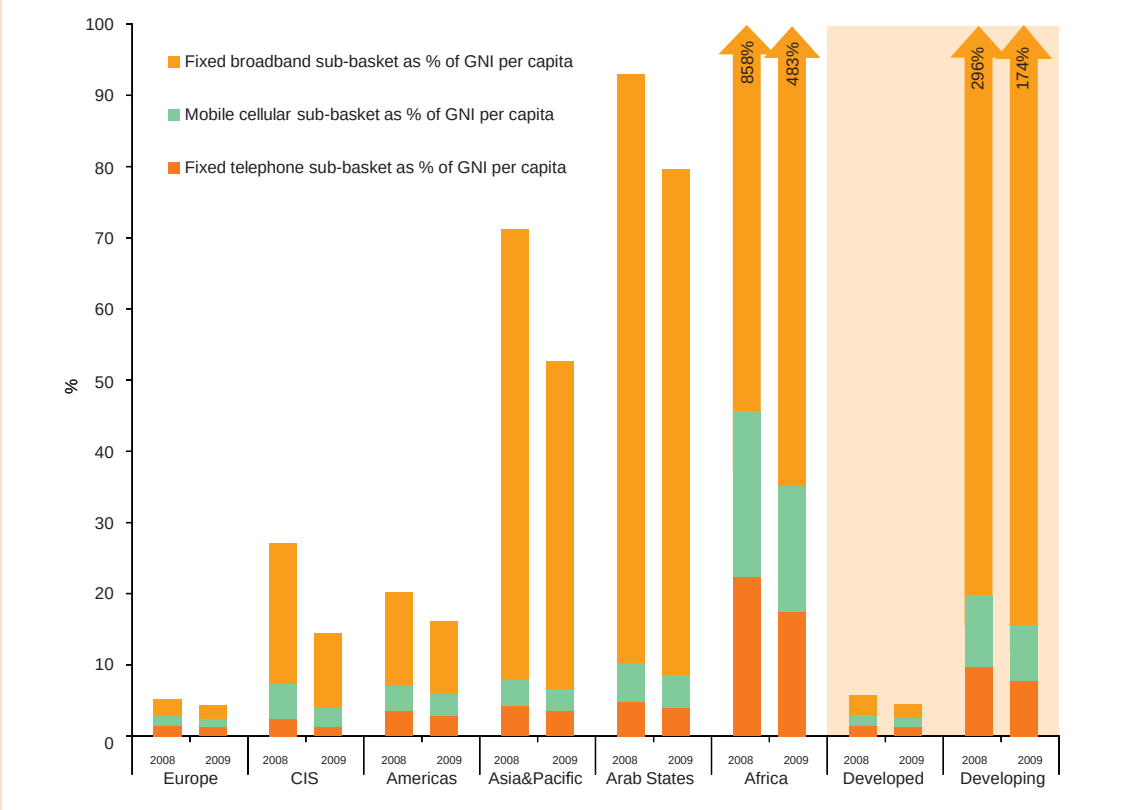
To conclude, the overall findings suggest that while prices are falling globally, and particularly in developing regions, major price differences remain. Fixed broadband access is still the single most expensive and least ICT affordable service in the developing world in 2009. This finding has important policy implications and suggests that countries with high fixed broadband prices need to put in place policies to reduce this price in order to bring more people online. The notion that prices are a crucial factor in spreading the uptake of ICTs is supported by Chart 4.8, which compares Africa's mobile and fixed broadband prices on the one hand, and penetration rates on the other hand. While mobile prices are relatively low, penetration is relatively high. Fixed broadband prices, on the other hand, remain high and penetration negligible.

Chart 4.6: ICT Price sub-baskets by level of development, 2008 (left) compared to 2009 (right)



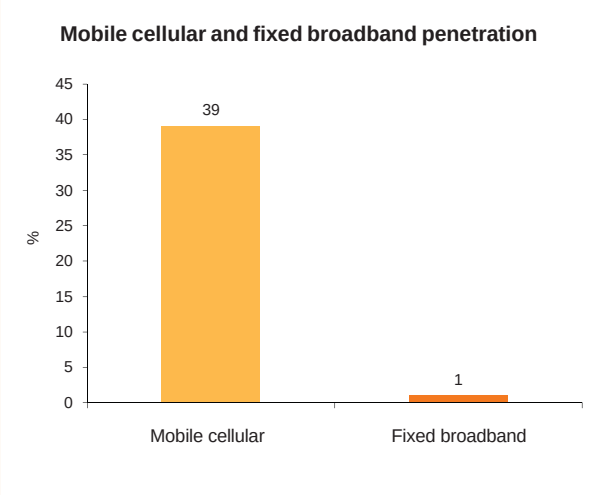
Source: ITU.

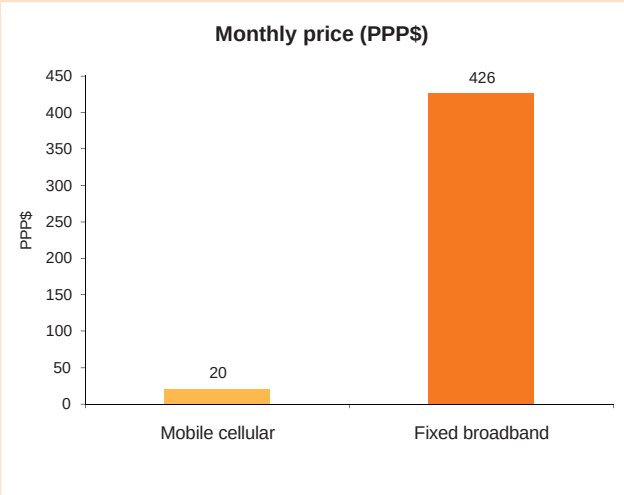
Chart 4.7: ICT Price Basket by region and by level of development, 2008-2009



Source: ITU.

Chart 4.8: Comparing mobile cellular and fixed broadband penetration and prices in Africa, 2009





Source: ITU World Telecommunication/ICT Indicators database.

Endnotes

[1] For example, in many countries, the price for local calls was kept to a minimum to allow as many users as possible to make affordable local calls, through (cross-) subsidies, which allowed operators to recover revenues lost on low-priced local calls in other areas, for example, international calls. Increasing competition in the ICT market put pressure on the higher profit segment to reduce prices and obliged incumbent operators to abandon cross-subsidies and to make prices cost-oriented (often increasing the price for local calls).

[2] This finding refers to OECD countries. See OECD, 2009b, p. 278-279.

[3] See ITU (2009b) for examples of prices that are being tracked.

[4] While the ICT Price Basket is a useful tool to asses the effects of different policies, it is important to bear in mind that not all regulatory changes will have an immediate impact on prices. Some policies may take some time before they have an impact on tariffs, whereas others, such as the revision of interconnection charges, may have an immediate impact.

[5] Using the UN operational rates of exchange, as well as exchange rates from www.oanda.com.

[6] World Bank, USD, Atlas Method.

[7] 25 outgoing calls are equivalent to a total of 37.1 minutes. For more details on the OECD/Teligen methodology, see OECD (2002).

[8] See http://www.oecd.org/dataoecd/61/54/18598754.pdf.

[9] Intuitively, if country A and country B have the same price in USD for an Internet connection, but in country A prices of other products are in general cheaper (in USD), then, by applying PPP exchange rates, the Internet connection in country A will be more expensive. That is so because, compared to country B, in country A the same amount of USD (exchanged into national currency at market exchange rates) can buy more products or services. Therefore, the Internet connection in country A is more expensive in terms of what could be bought with that amount in each country. The International Comparison Program (ICP) is the major global initiative to produce internationally comparable price levels. It is overseen by a Global Office housed in the World Bank and is implemented through the National Statistical Offices of 107 countries. Together with the OECD/Eurostat PPP data, it provides a set of 150 benchmark countries and PPP data for all countries included in the ICT Price Basket, except for Cuba. For more information on PPP methodology and data, see http://go.worldbank.org/UI22NH9ME0

[10] The World Bank's Atlas method is used for the Bank's official estimates of the size of economies in terms of GNI converted to current U.S. dollars. GNI takes into account all production in the domestic economy (GDP) plus the net flows of factor income (such as rents, profits, and labor income) from abroad. The Atlas method smoothes exchange rate fluctuations by using a three year moving average, price-adjusted conversion factor. See: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20399244~menuPK:1504474~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[11] See http://www.telegeography.com/cu/article.php?article_id=31202&email=html. It should be noted that subscribers to this low-cost triple play offer have to pay an initial 40 Euros connection charge plus a 45 Euros cancellation fee. The minimum subscription time is one year, see: http://console.aliceadsl.fr/documents/cgu.pdf

[12] See a discussion on the availability and prospects of triple play services in Africa, at http://allafrica.com/stories/200806161066.html

[13] See, for example, Telekom Kenya's announcement to launch triple play services, http://www.telegeography.com/cu/article.php?article_id=30513

[14] See http://www.dslreports.com/shownews/Verizon-Offers-Quadruple-Play-Discounts-105043

[15] See http://www.lightreading.com/document.asp?doc_id=185037

[16] Since the ICT Price Basket's sub-components are capped at 100, the overall percentage change is relatively lower for countries that exceeded 100 per cent. This is particularly the case for developing countries, where the broadband sub-basket exceeds 100 per cent for a number of countries.

[17] This refers to all those economies that were included in both the IDI and the ICT Price Basket.

[18] It is important to note that since each sub-basket is capped at a maximum of 100 per cent of GNI per capita, the overall change for the ICT sub -basket will not reflect these changes. For the actual changes within each sub-basket, see Tables 4.5, 4.7, and 4.9.

[19] The analysis is based on the concept of affordability. Therefore, countries with the lowest absolute prices are not necessarily those where the services are most affordable.

[20] They were capped at 100 per cent for the calculation of the overall ICT Price Basket.

[21] See for example: http://www.blonnet.com/2009/03/06/stories/2009030651300400.htm and http://www.developingtelecoms.com/roadmap-to-vietnams-ict-future.html

[22] In Ecuador, the Secretaría Técnica del Frente Social is in charge of classifying areas according to zones with different levels of poverty. Based on these, the operator provides services at lower cost for poorer areas.

[23] See http://www.pr-inside.com/bulgaria-telecoms-mobile-broadband-and-r1654094.htm

[24] It should be noted that in some countries, for example Niger, the change is not due to a drop in prices but to an increase in GNI per capita.

[25] More mobile operators are expected to be licensed, and competition introduced, in 2010, see: http://www.cellular-news.com/story/38132.php

[26] See http://www.tigweb.org/express/panorama/article.html?start=10625&ContentID=24325

[27] See http://www.lankabusinessonline.com/fullstory.php?nid=34675027

[28] In 2009, a total of 161 countries were included in the ICT Price Basket, compared to 150 in 2008. Four of the countries that in 2009 had a fixed broadband sub-basket that exceeded the monthly GNI per capita, were not included in the 2008 ICT Price Basket.

Chapter 5

The impact of ICTs on growth and development

5.1 Introduction

Countries go through different stages in becoming information societies, as reflected in the IDI's conceptual framework (Figure 2.1). Access and use are the first two stages, which combined with the right skills and competencies should lead to the third and final stage: maximizing the impact of ICTs. Furthermore, one of the objectives of the IDI is to assess the development potential of ICTs, in particular the extent to which countries can make use of ICTs to enhance growth and development (see Section 2.1).

That ICTs have both economic and socio-economic impacts is also recognized in the ICT-related development goals set out in the World Summit on the Information Society (WSIS) targets. These targets, to be achieved by 2015, include connecting villages, schools, health centers, libraries and government agencies, adding ICTs to school curricula, and ensuring more than half of the world's inhabitants has access to ICTs within their reach. Recent data on households with Internet access, also included in the access sub-index of the IDI, will allow further analysis of different aspects of these targets, in particular the latter.

ICTs can also be considered as enablers for achieving several of the Millennium Development Goals (MDGs). Particular areas in which the development of ICTs will be important include health (ICT-enabled health applications such as mobile services and remote monitoring, increased information); education (educational methods, improving the educational performance of children, enabling remote education); and promoting gender equality by helping women into economic activity (for example through ICT- enabled telework).

More generally, ICTs also have a wide range of different economic effects which, either directly or indirectly, can enhance welfare and facilitate social and economic development. In particular, the economic impact of ICTs will often materialize in the form of productivity gains resulting from the development and deployment of ICTs, and the development of new, related technologies. However, there are other indirect channels through which ICTs can have an impact on growth and welfare. These include:

- trade creation and trade facilitation in service sectors via lower trade costs, improved information, and an increasing range of tradable products;
- employment, with direct effects on employment from investments in ICTs and the ICT sector, and indirect effects from the employment opportunities created by ICT-enabled reforms and structural change;
- enhanced flexibility for firms and workers which may improve employment conditions – hours, location, work practices – and welfare, and possibly reduce congestion and pollution;
- business creation: many services, for example, can be delivered from any location, ICTs have created new business models and opportunities.

To date, the majority of empirical studies of the impact of ICTs have focused on the potential economic impacts, such as those on productivity growth, trade levels and employment patterns. The possible broader socio-economic impacts have been explored less frequently. This is, at least in part, due to the challenges involved in measuring such effects and, hence, a lack of data. Indeed, the economic impact of ICTs on productivity itself faces many measurement and analytical challenges (section 5.2). Existing analysis has also demonstrated the increasing importance of intangible assets and complementary investments for determining the impact of ICTs on productivity (section 5.3). Such factors are difficult to measure and analyse. However, new and improved data become available all

the time, broadening the range of impacts that can be explored. The second part of this chapter draws on recent ICT household data to examine the associated potential broader economic and socio-economic impacts, especially those related to education and female labour market participation (section 5.4).

5.2 Productivity impact analysis

Productivity impacts are often singled out as the key economic effect of ICTs. However, analysis of the impact of ICTs is hampered by measurement and analytical challenges. Significant difficulties still remain in spite of rapid progress in both statistical and econometric techniques, especially since the use of ICTs is particularly important in services activities, which are, in turn, difficult to measure. Furthermore, ICTs enable innovation, and in particular non-technological forms of innovation (e.g. organization change) which are also difficult to measure. Faced with such measurement challenges, productivity effects can be hard to capture. More generally, when regressing productivity increases on the drivers of change, of which ICTs are one, it remains difficult to disentangle the ICT-specific effects. In many cases, this comes down to an interpretation of the residual of the equation being estimated (van Welsum, 2008).

Nonetheless, the body of empirical evidence is building up as new data and new techniques become available. To get an accurate picture of the links between ICTs and growth it is important to look at the effects and transmission mechanisms at different levels of analysis. Thus, productivity impacts of ICTs have been examined at the aggregate, sectoral and firm level. As increasing amounts of firm-level data become available, such studies will usefully complement existing evidence, providing additional insights into the links between ICTs and growth.

At the macro level, the links between ICTs and growth can be examined using both growth accounting techniques and country-level econometric studies. Overall the evidence points to a positive impact from ICTs on productivity, even though there is no strict consensus over the magnitude of the effect.[1] Most of the work on the economic impact of ICTs has focused on OECD countries. Some studies have also looked at the impact of ICTs on growth in Latin America (e.g. de Vries *et al.*, 2007). There is also a related literature on the economic impact of the narrower concept of telecommunication infrastructure investment on growth and productivity, including in developing countries. These studies also tend to find evidence of a positive impact.[2]

In neoclassical growth accounting, productivity impacts from ICT-producing goods show up in measured total factor productivity (TFP), whereas investments in ICTs lead to capital deepening which boosts labour productivity. However, there are a number of difficulties in using these techniques because of the limiting assumptions and hypotheses they sometimes require, in addition to data limitations (in particular for ICT investment), and the need for price deflators adjusted for quality change (hedonic deflators).

Even though measurement and international comparability have improved over time, international comparisons of studies of the impact of ICTs remain difficult. Many studies find that the acceleration in TFP stems from increases in technology use rather than ICT production. Increased attention is now also being paid to the importance of intangible capital,[3] with many (macro) studies trying to come up with estimates for this 'missing factor'. These studies show significant impacts from taking, or failing to take, intangibles into account (Section 5.3). Other unresolved econometric issues include the interaction of ICTs with other variables, such as workforce skills or indicators of regulations that constrain either competition or the ability of firms to reorganize after acquiring ICTs, or more generally, any other factor affecting the overall use made of ICTs. Finally, the impact of ICTs is also likely to change over time as the technologies evolve very rapidly.[4]

5.3 The importance of intangibles and complementary investments

There are several direct and indirect links between ICTs and intangible assets (IAs). Some ICTs, such as software, are themselves classified as an IA. More generally, many IAs are implemented with the help of ICTs and ICTs act as enablers of productivity and growth effects of IAs. Thus, many studies of the empirical effects of ICTs support the idea that it is not so much acquiring ICTs that matters for productivity impacts, but rather the use that is made of them. When ICTs act to make other innovations effective they will provide even larger gains. Indeed, the main driver of productivity improvements has not necessarily been the spending on ICTs, but rather the changes and innovations that these ICTs have enabled, such as the re-organization and streamlining of existing business processes, for example order tracking, inventory control, accounting services, and the tracking of product delivery (Atrostic and Nguyen, 2006). As ICTs enable the structural transformation of most economic sectors, the expected economic impact will be far greater than would be predicted from

just looking at the capital investment associated with ICTs since this approach fails to take into account the extensive complementary innovations enabled by ICTs (Brynjolfsson and Hitt, 2000).

Studies of the economic impacts of ICTs increasingly allow for the role of intangibles in explaining productivity impacts of ICTs. For example, Basu *et al.* (2003) argue that the US–UK total factor productivity (TFP) differential from 1995 onwards can be explained by a combination of unmeasured investments in intangible organization capital and ICTs, and the complementary investments and innovations they induce. It has also been suggested that the internal organization of US firms plays a role in their ability to use ICTs more efficiently, in particular through the managerial and other organizational changes they allow to be implemented (Bloom *et al.*, 2007).

Not only have ICT-enabled improvements in workplace organization, and organizational change more generally, been found to improve productivity, but the way in which new work practices are implemented within establishments also matters. Furthermore, strong complementarities have been found among work practices, workforce skills, and the share of the workforce using computers. Furthermore, plants with relatively higher-educated workers or greater use of computers by non-managerial employees exhibit higher productivity (Black and Lynch, 2001).

The effects of organizational changes on firm-level productivity may rival the effects of changes in the production process. The ability to create economic value from intellectual assets depends crucially on the management capabilities of individual firms and the implementation of appropriate business strategies (OECD, 2006, 2008). The extent to which ICTs enable complementary organizational investments such as new business processes and work practices constitutes a significant component of the value of ICTs. These investments, in turn, lead to productivity gains by allowing firms to reduce costs and increase output quality, either through new products or through improvements in intangible aspects of existing products, such as convenience, customization, timeliness, quality and variety (Brynjolfsson and Hitt, 2000).

However, the productivity effects of these complementary factors may take some time to appear because, for example, it can take time and resources to learn how to use ICT properly. Initially there may even be a fall in productivity as resources are allocated to learning. The longer term productivity and output contributions of computerization at the firm-level have been found to be up to five times greater than those that may materialize in the short run (Brynjolfsson and Hitt, 2003).

Some studies have tried to identify directly the growth contribution of IT capital, and intangible capital more generally, using an augmented growth accounting system. For example, Oliner *et al.* (2007), in a study for the United States, found that the growth contribution of intangible capital deepening follows the general pattern for IT capital, being high during the period 1995-2000 and then falling back between 2000 and 2006. Nevertheless, intangible capital increases less rapidly than IT capital in each period as a result of the quality-adjusted declines in computer prices that lower the relative user cost of IT capital. This user-cost effect was especially pronounced during 1995-2000, when fall in the prices for IT capital goods was particularly marked.

5.4 The importance of household Internet access

In addition to the productivity impacts, there are many other possible economic and socio-economic impacts of ICTs. Household Internet uptake is key to achieving several of the ICT for development-related targets (WSIS Targets and MDGs) and is important not only for the economic but also the socio-economic benefits associated with it, such as digital inclusion, access to knowledge and information, acquisition of skills increasingly demanded in a range of occupations and sectors, and school performance. This section focuses on recent household data, in particular household Internet access and individual Internet use (Box 5.1) and looks at some of the factors that may be associated with it.

Many studies[5] have examined the determinants of household computer and Internet adoption and have identified age, education and income as the main drivers. Data on Internet use collected through household surveys shows that Internet use increases with the level of education (Charts 5.1 and 5.2).

ICTs can have beneficial effects on skills already at a young age. Indeed, studies carried out in OECD countries have found that household computer ownership increases children's educational performance (Schmitt and Wadsworth, 2004), as does the frequency of computer use. In many of the studied countries, the effect of computer use at home is greater than that of computer usage at school (Spiezia, 2010).

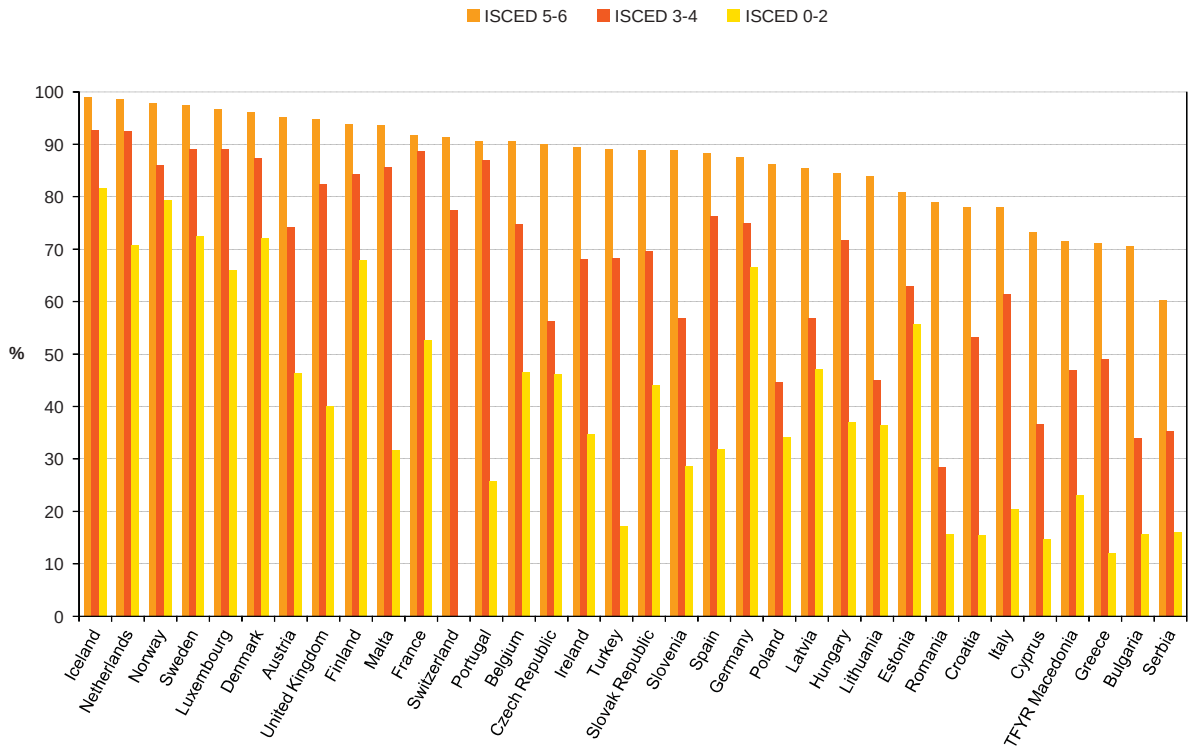
Children's educational attainment (proxied by net secondary enrolment rates) is plotted against data on households

Box 5.1: Household ICT statistics collected by ITU

The ITU has a long history of collecting, harmonising and disseminating international statistics on telecommunication and ICTs, its World Telecommunication/ICT Indicators (WTI) database dating back to the 1960s. More recently, following the WSIS, data collection has been expanded to include a larger number of Internet-related statistics. At the same time, there is an increasing demand for data on the usage of ICTs, which cannot be provided through subscriber data that are collected mainly from administrative data sources, usually telecommunication operators. Instead, statistics on Internet and telephone usage, for example, are being collected through household surveys carried out by national statistical offices (NSOs). Data coming from these sources provide more reliable information on the use of ICTs and important insights to questions such as, where people access the Internet and what they use it for. Therefore, in 2003, the ITU started to expand its global data collection to include ICT statistics based on household surveys through an annual questionnaire sent to NSOs in all countries.

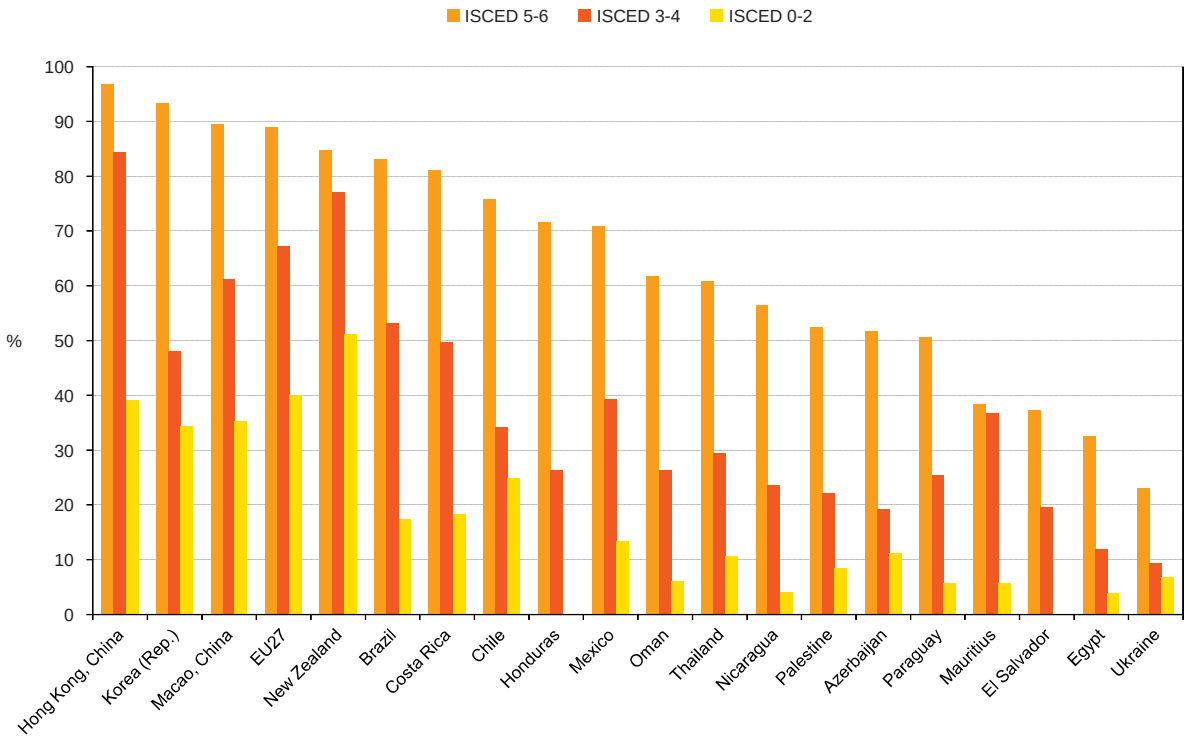
The indicators on ICT access by households and individuals are part of the core list of indicators developed by the *Partnership on Measuring ICT for Development* (which also includes indicators on ICT infrastructure and access, ICT use by businesses, the ICT producing sector and ICT in education). There are 12 ICT household indicators plus one household reference indicator on the core list; six of these are related to household ICT access, and six are related to individual ICT use. The indicators used in this section are part of the core ICT household indicators. See ITU (2009h) for more information.

Chart 5.1: Percentage of Internet users by level of education,[6] European countries, 2008*



Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

Chart 5.2: Percentage of Internet users by level of education, non-European economies, 2008*



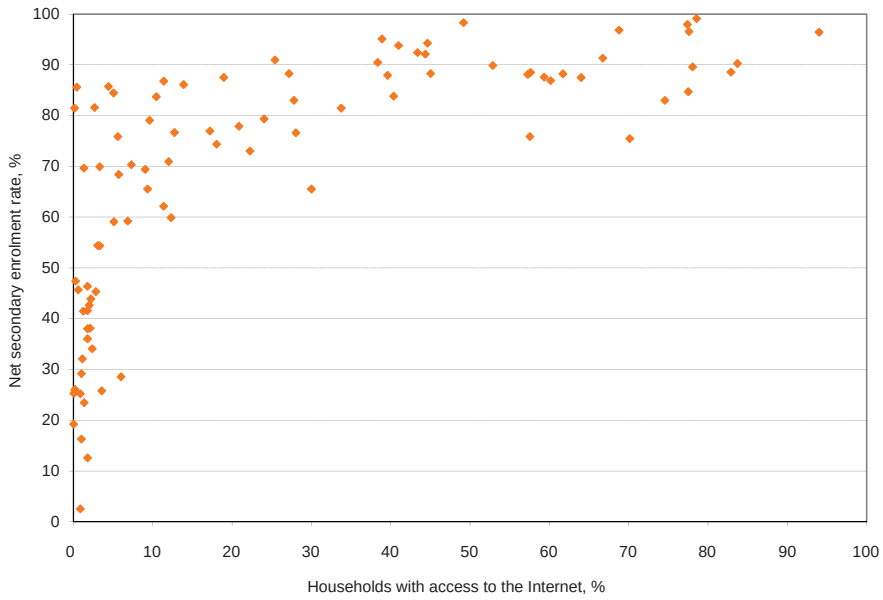
Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

with Internet access (Chart 5.3). Even though for further analysis it would be necessary to control for other factors, and in particular for those that determine both computer use and educational performance, the plot points to a positive non-linear statistical association (of a log-linear form) between these two indicators. This could point to the existence of thresholds effects, and/or the importance of other omitted factors (such as income, occupation, education or immigration status of the parents, and characteristics of the schools, including the use of ICTs). At 0.82 the Spearman rank correlation coefficient is very high (and very highly statistically significant). Furthermore, the statistical association appears to have strengthened over time as the Spearman rank correlation was 0.73 in the equivalent data for 2002. Thus, subject to a threshold effect, better educational performance is statistically positively associated with greater household Internet use, pointing to one possible channel for the potential benefits of household Internet use to occur.

Age also matters for Internet use, which, with the exception of the youngest age group (<15 years), tends to decrease with age (Charts 5.4 and 5.5). In most countries for which data are available, Internet usage is highest for the <15 age group, and when this is not available it tends to be highest in the 15-24 age group. Over time these differences are likely to become smaller, and eventually disappear as the younger generation moves through the different age cohorts, and new generations will grow up with the Internet.

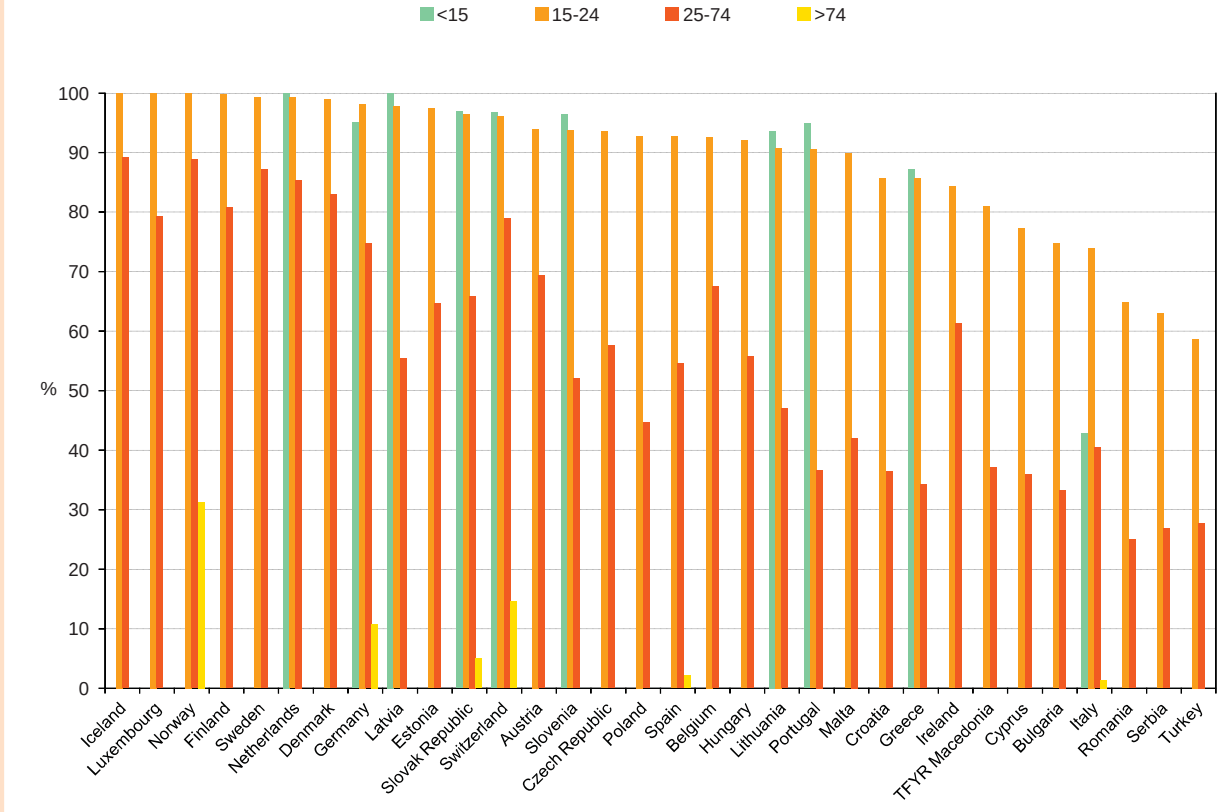
Another important area where household Internet access could play a role is the participation of women in society, and in particular female labour market participation. Having Internet access at home can empower women. It increases their access to knowledge and information, it may broaden their skills, in particular ICT skills and ICT-enabled skill development, and allow women to achieve projects, create enterprises, and build careers outside the home.[7] Furthermore, having home Internet access creates the possibility of doing telework and outsourced work (Box 5.2). The Internet also plays a role in labour market intermediation and job search: it increases the information flow about available jobs, makes job applications easier and therefore implies a lower cost of job search (OECD, 2004b; Autor, 2008).

Chart 5.3: Percentage of households with Internet and net secondary enrolment rates, 2007*



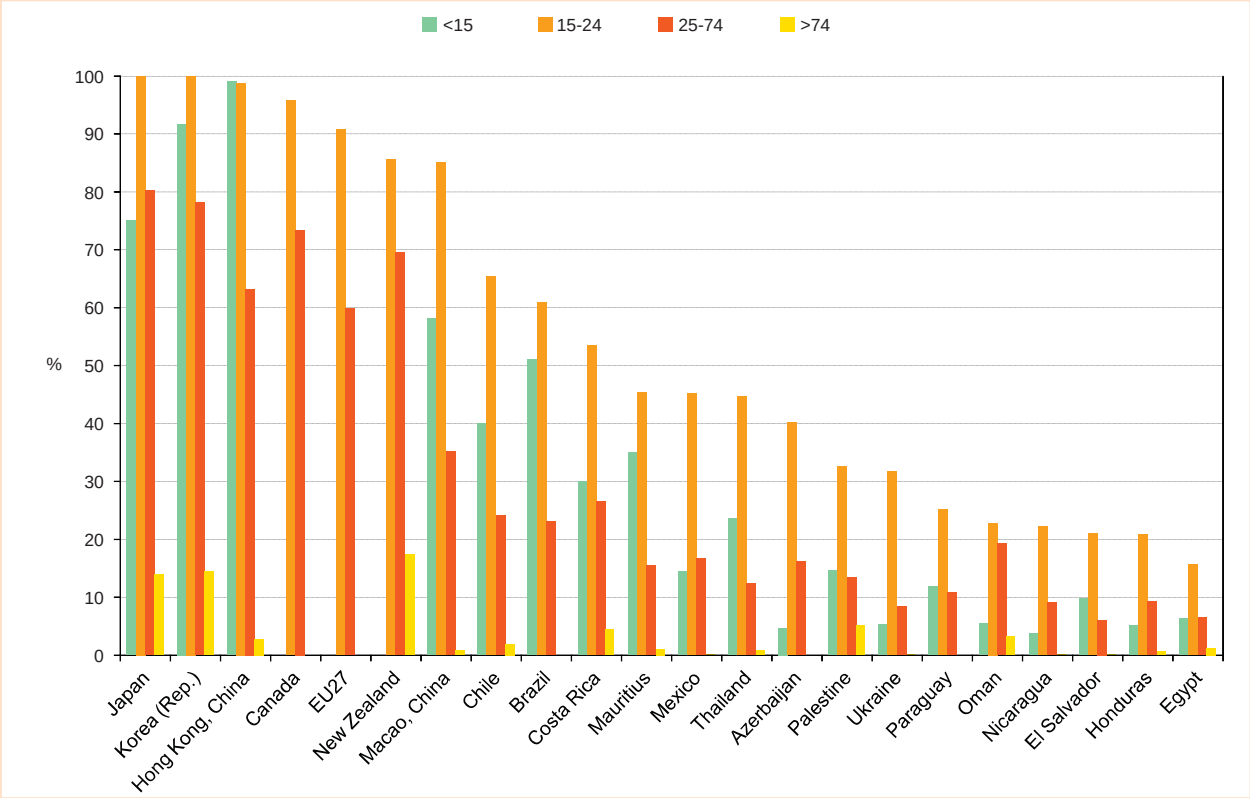
Note: * Or 2006 in some cases.
Source: ITU and UIS.

Chart 5.4: Percentage of Internet users by age, European countries, 2008*



Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

Chart 5.5: Percentage of Internet users by age, non-European economies, 2008*



Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

In order for ICTs to be able to help the economic position of women, women need access to the technologies and tools. Home Internet access is especially important for women even though the Internet may also be accessed from other locations, such as community access points, libraries, post offices, and cultural centres. Studies show that in OECD countries, gender equality in ICT-related education and training, and ICT access and use has not yet fully been achieved (van Welsum and Montagnier, 2007), but the differences between men and women using the Internet tend to be relatively small (less than 10 percentage points in most countries), though men tend

Box 5.2: The potential role of ICT-enabled offshoring and outsourcing

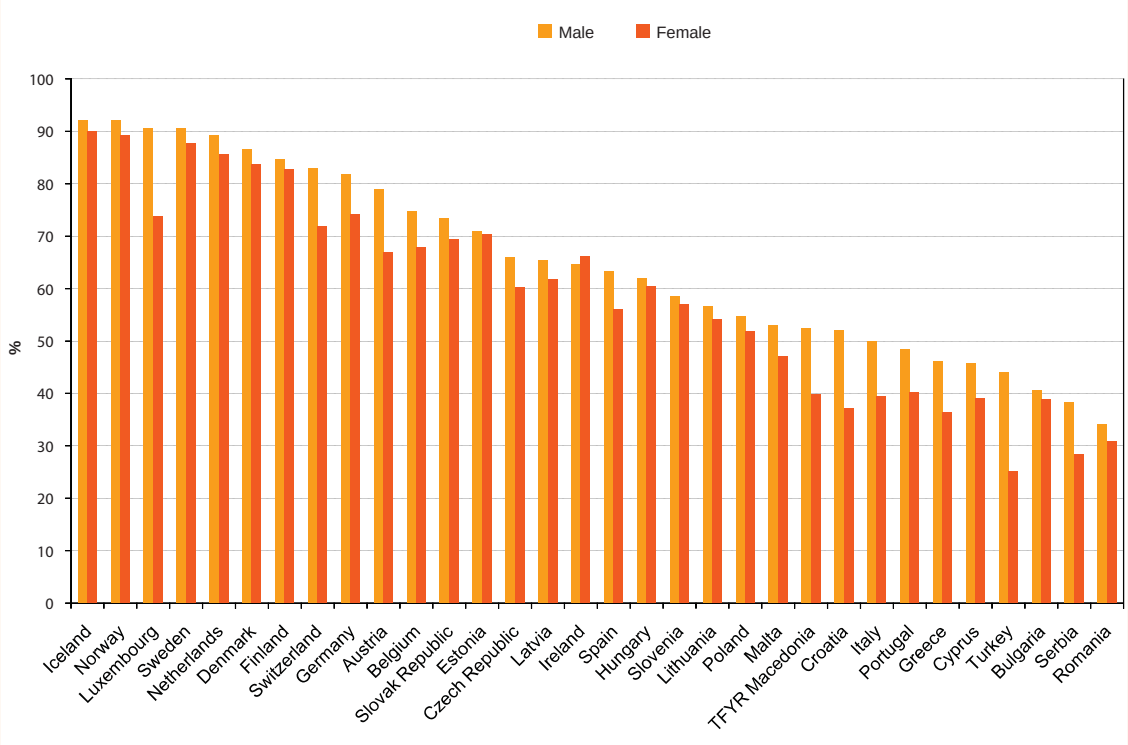
With the rapid development and diffusion of ICTs, the potential for tasks that can be carried out remotely has hugely increased in recent years. Van Welsum and Vickery (2005) estimated that, for OECD countries, around 20 per cent of total employment is accounted for by people who are performing the types of functions and activities that could potentially be carried out from any location, based on the following four characteristics:

- People carrying out jobs where they are likely to make intensive use of ICTs in order to produce their output.
- Their output can be traded/transmitted with the help of ICTs (such as ICT-enabled trade in services).
- The work has a high explicit information or "codified knowledge" content (and no or little tacit or implicit knowledge).
- The work does not necessarily require face-to-face contact.

Provided the infrastructure and required skills base are in place, such tasks could be carried out from home, in remote or rural areas, and in developing countries, thereby also increasing women's employment opportunities.

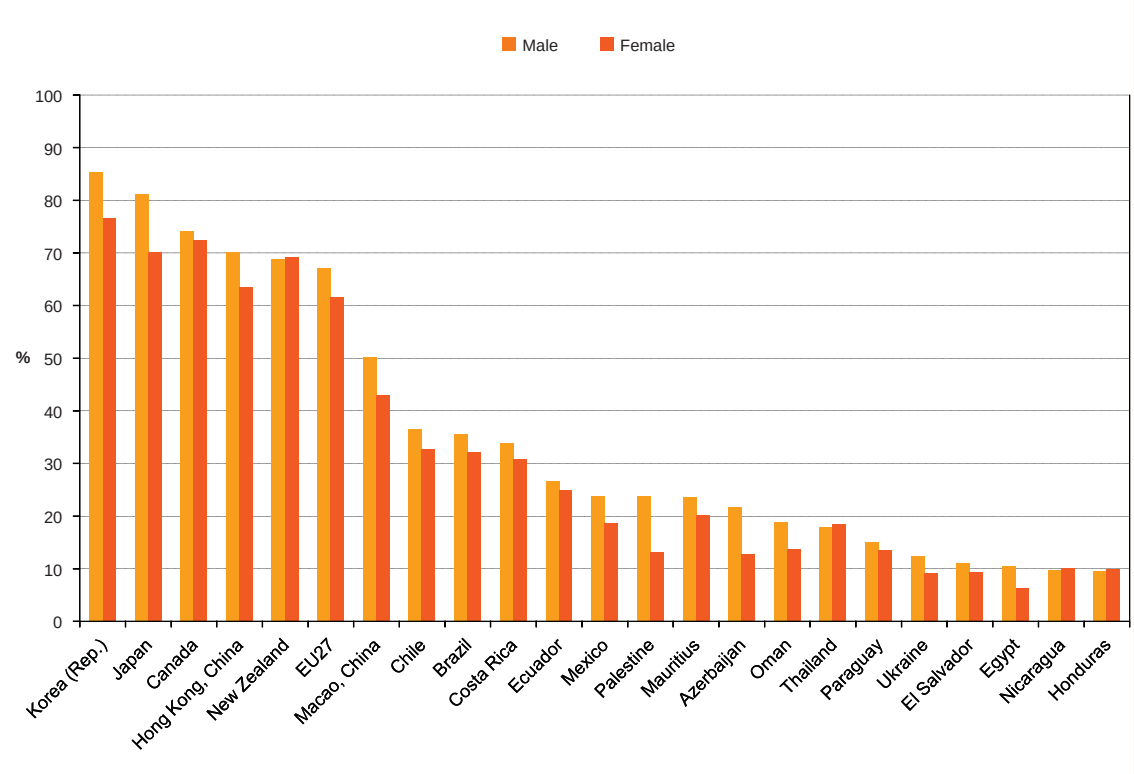
Source: van Welsum and Vickery (2005).

Chart 5.6: Percentage of Internet users by gender, European countries, 2008*



Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

Chart 5.7: Percentage of Internet users by gender, non-European economies, 2008*



Note: * Or latest available year.
Source: ITU, based on Eurostat and national sources.

to have a slightly higher share of Internet users, except in Honduras, Ireland, New Zealand, Nicaragua, and Thailand, where the share of women using the Internet is greater than that of men (Charts 5.6 and 5.7).

The percentage of households with Internet is plotted against female labour market participation rates in 2007 (correlation coefficient 0.49; Chart 5.8). There are many other variables that may have an impact on female labour market participation, such as the cost and availability of child care, tax treatments, female education, overall labour market conditions and cultural attitudes (Jaumotte, 2003), but a direct or indirect role for household Internet access in promoting gender equality, especially in the use of ICTs, in changing cultural attitudes in favour of women, and in helping women into economic activity cannot be ruled out.

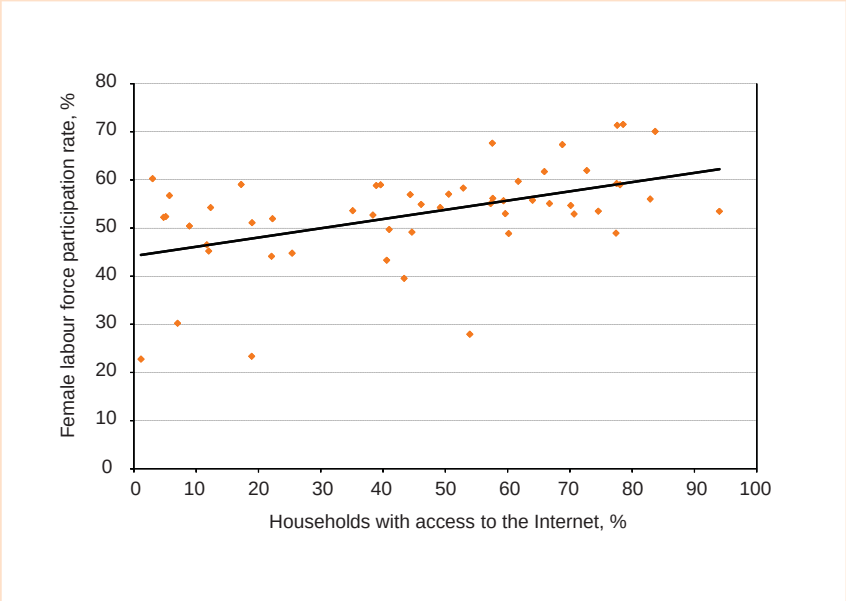
Finally, employment status also matters for Internet use. In most countries Internet usage is highest amongst those in employment (employee or self-employed), followed by the unemployed and those not in the labour force (Charts 5.9 and 5.10).

To conclude, ICTs can have important economic and socio-economic benefits, including those on a range of development goals. This is reflected in the objectives of the IDI, which include measuring the development potential of ICTs.

Basic descriptive analysis using ICT household data revealed that better educational performance is statistically positively associated with greater household Internet access, pointing to one possible channel via which the potential benefits of ICTs might occur. A statistical association was also found between households with Internet access and female labour force participation, suggesting further potential benefits from the use of ICTs. These could occur directly or indirectly, for example by promoting gender equality, especially in the use of ICTs, and in helping women into economic activity.

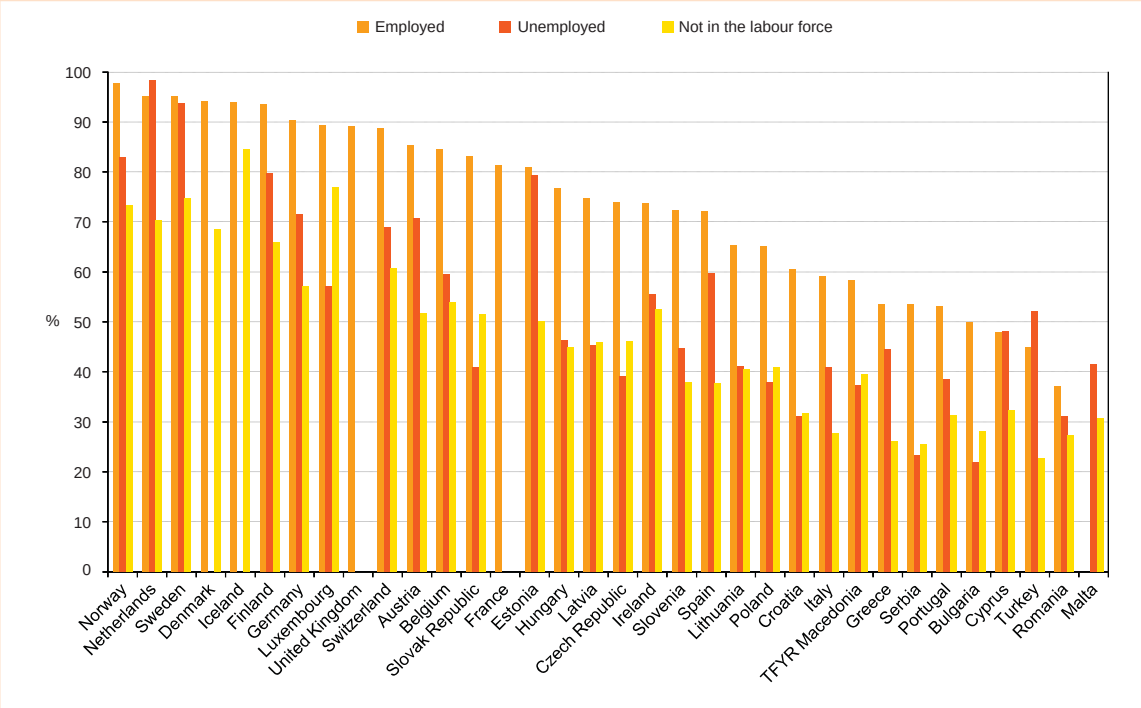
While these are preliminary indications that warrant further investigation, the analysis does point to the importance of ICT use and suggests that this is a key area to include in ICT policies that aim to build an inclusive information society. As the IDI framework itself indicates, ICT use is the second stage in ICT development, and maximizing the benefits of ICTs will depend on the use that is being made of them.

Chart 5.8: Percentage of households with Internet and female labour force participation rates, 2007



Source: ITU and ILO.

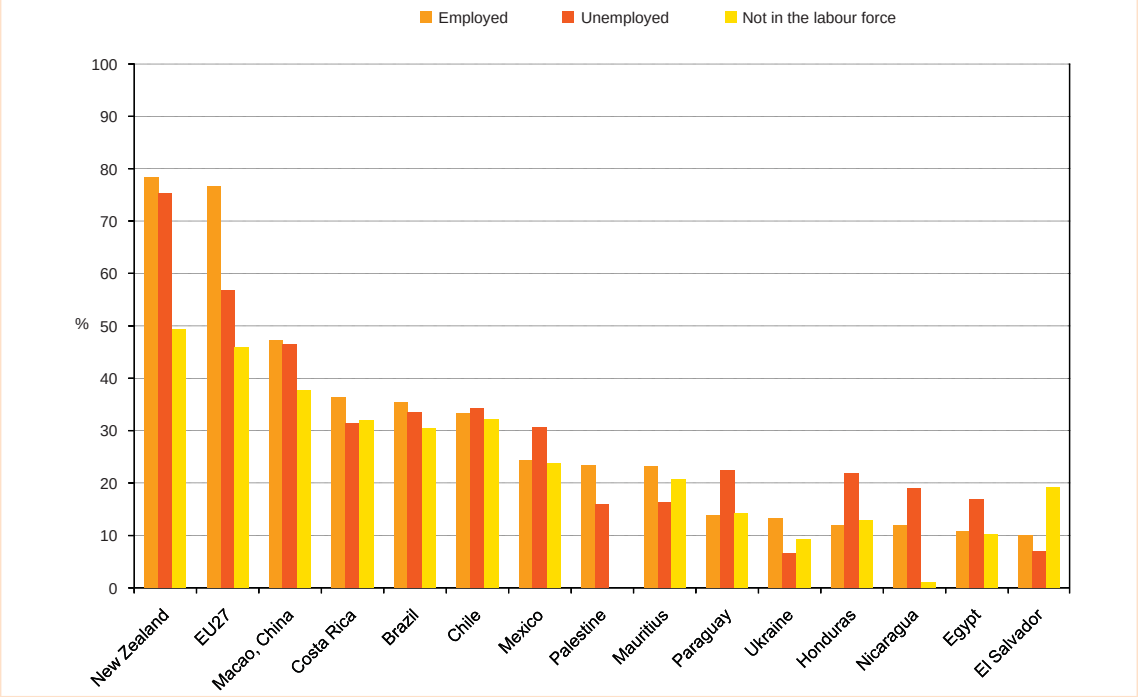
Chart 5.9: Percentage of Internet users by labour force status*, European countries, 2008**



Note: * "Not in the labour force", refers to people of working age who are neither employed nor unemployed at the time of the labour force survey.
** Or latest available year.

Source: ITU.

Chart 5.10: Percentage of Internet users by labour force status*, non-European countries, 2008**



Note: *"Not in the labour force", refers to people of working age who are neither employed nor unemployed at the time of the labour force survey.
** Or latest available year.

Source: ITU, based on Eurostat and national sources.

Endnotes

1 See, for example, OECD (2004a), and the references therein.

2 See, for example, Datta and Agarwal (2004), Roller and Waverman (2001) and Um *et al.* (2009).

3 Other terms such as "intellectual capital", "intangibles", "intangible assets" and "knowledge capital" tend to be used interchangeably with "intellectual assets". There is no single definition of intangible capital, but most definitions agree the term refers to non-physical assets with three core characteristics: i) they are viewed as sources of probable future economic profits; ii) lack physical substance; and iii) to some extent, they can be, retained and traded by a firm. They include R&D, patents, software, and trademarks, but also human resources and capabilities, organizational competencies (e.g. databases, technology, routines and culture) and "relational" capital (e.g. organizational designs and processes, and customer and supplier networks). See OECD (2008) for a discussion of definitional and measurement issues.

4 For example, broadband is a relatively recent, but continuously evolving technology. Furthermore, the minimum threshold for bit rates in internationally comparable data is set at 256 kbit/s, which is commonly considered too low to achieve a major impact. As a result, it has been difficult to measure the impact of broadband, and disentangle it from the impact of other ICTs. This may change as more and better data become available. For example, recent work for OECD countries has found a significant impact of broadband infrastructure on growth (Czernich *et al.*, 2009).

5 See, for example, European Commission (2009) and the references therein.

6 As given by the ISCED (International Standard Classification of Education) levels. ISCED0-2 corresponds to pre-primary, primary and lower secondary education. ISCED3-4 includes upper secondary and post-secondary non-tertiary education, and ISCED5-6 corresponds to first and second stage tertiary education.

7 See, for example, World Bank (2006); van Welsum and Montagnier (2007).

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Annex 1. ICT Development Index (IDI) methodology

This Annex outlines the methodology used to compute the IDI and provides more details on the indicators included in the index and their definition as well as on the various steps involved, such as the imputation of missing values, the normalization procedure, the weights applied to the indicators and sub-indices, and the results of the sensitivity analysis.

1. Indicators included in the IDI

The selection of indicators was based on certain criteria, including data availability and results of various statistical analyses, such as principal components analysis (PCA).[1] The following 11 indicators are included in the IDI (grouped by the three sub-indices: access, use, and skills).

A) ICT infrastructure and access indicators

Indicators included in this group provide an indication for the available ICT infrastructure and access to basic ICTs. Data for all of these indicators are collected by the ITU.

1. Fixed telephone lines per 100 inhabitants

Fixed telephone lines refer to telephone lines connecting a subscriber's terminal equipment to the public switched telephone network (PSTN) and which have a dedicated port on a telephone exchange. This term is synonymous with the terms "main station" and "Direct Exchange Line" (DEL) that are commonly used in telecommunication documents. It may not be the same as an access line or a subscriber. The number of ISDN channels and fixed wireless subscribers are included.

2. Mobile cellular telephone subscriptions per 100 inhabitants

Mobile cellular telephone subscriptions refer to the number of subscriptions to a public mobile telephone service using cellular technology, which provides access to the Public Switched Telephone Network (PSTN). This includes analogue and digital cellular systems, including IMT-2000 (Third Generation, 3G). Post-paid and prepaid subscriptions are included. Prepaid subscriptions include those that have been used within a reasonable period of time (e.g. three months). The ITU advises countries to exclude inactive users of subscriptions, but some countries still include them.

In the past, the indicator was called mobile cellular subscribers (not subscriptions). However, the indicator includes both prepaid and postpaid subscriptions and one subscriber (person) may have multiple subscriptions. For example, at the end of 2008, there were 4 billion subscriptions worldwide. This figure will continue to grow rapidly and may reach or even surpass the world population. Therefore, it would be useful to distinguish between the number of mobile subscriptions and the number of individuals using a mobile phone. Even though the latter indicator would be more appropriate for inclusion in the IDI, very few countries currently collect this information through household surveys. As more data become available,[2] the number of mobile users should eventually replace the number of mobile subscriptions in the index.

3. International Internet bandwidth (bit/s) per Internet user

International Internet bandwidth refers to the capacity that backbone operators provide to carry Internet traffic. It is measured in bits per second per Internet users. Data for international Internet bandwidth are compiled by the ITU from responses received from countries through its annual questionnaire, and supplemented by data from Telegeography.

4. Proportion of households with a computer

A *computer* refers to a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants or TV sets.

There are certain data limits to this indicator as estimates have to be calculated for many developing countries which are not yet collecting ICT household statistics (see below on missing data). Over time, as more data become available, the quality of the indicator will improve.

5. Proportion of households with Internet access at home

The *Internet* is a world-wide public computer network. It provides access to a number of communication services including the World Wide Web and carries email, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer - it may also be by mobile phone, games machine, digital TV etc.). Access can be via a fixed or mobile network.

There are certain data limits to this indicator as estimates have to be calculated for many developing countries which are not yet collecting ICT household statistics (see below on missing data). Over time, as more data become available, the quality of the indicator will improve.

B) ICT use indicators

1. Internet users per 100 inhabitants

Even though more and more countries are collecting the number of Internet users through household surveys, data still have to be estimated for many countries, usually based on the number of Internet subscribers and the prevalence and popularity of public or shared Internet access points.

For most developed and larger developing countries, Internet user data are based on user surveys, usually conducted by national statistical agencies. The data are either provided directly from the NSOs to the ITU, or ITU carries out the research required to obtain them. For countries where Internet user surveys are not available, it is common to estimate the number of users based on a multiple of the numbers of paying Internet subscribers. As a result, the actual number of users is usually less accurately measured in developing economies where fewer surveys exist. In addition, the increasing use of the Internet through mobile devices is not necessarily reflected in these estimates. In the future, an increasing number of household surveys will help improve the data availability.

2. Fixed broadband Internet subscribers per 100 inhabitants

Fixed broadband Internet subscribers refer to subscribers to paid high-speed access to the public Internet (a TCP/IP connection). High-speed access is defined as being at least 256 kbit/s, in one or both, directions. Fixed broadband Internet includes cable modem, DSL, fibre and other fixed broadband technology (such as satellite broadband Internet, Ethernet LANs, fixed-wireless access, Wireless Local Area Network, WiMAX etc.) Subscribers with access to data communications (including the Internet) via mobile cellular networks are excluded.

3. Mobile broadband subscriptions per 100 inhabitants

Mobile broadband subscriptions refer to subscriptions to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (here defined as greater than or equal to 256 kbit/s in one or both directions) such as W-CDMA, HSDPA, CDMA2000 1xEV-DO, CDMA 2000 1xEV-DV etc, irrespective of the device used to access the Internet (handheld computer, laptop or mobile cellular telephone etc). These services are typically referred to as 3G or 3.5G and include:

- Wideband CDMA (W-CDMA), an IMT-2000/3G mobile network technology, based on CDMA that presently delivers packet-switched data transmission speeds up to 384 kbit/s and up to 2 Mbit/s when fully implemented. It is known as Universal Mobile Telecommunications System (UMTS) in Europe.

- High-speed Downlink Packet Access (HSDPA), an upgrade to W-CDMA to allow downlink data transmission at speeds of typically 8-10 Mbit/s. It is complemented by High-Speed Uplink Packet Access (HSUPA), which offers uplink speeds of around 5 Mbit/s.

- CDMA2000 1xEV-DO (Evolution, Data Optimised), an IMT-2000 3G mobile network technology, based on CDMA that delivers packet-switched data transmission speeds of up to 4.9 Mbit/s.

The first commercial IMT-2000/3G networks were launched in 2002/2003 and the ITU started to collect this indicator in 2006. Currently only few (and mainly developed) countries have started collecting data for mobile broadband subscriptions and definitions often vary between countries. The OECD is currently finalizing a definition for mobile broadband. The ITU uses the Wireless Intelligence's[86] data for '3G' subscribers with access to data at speeds of 256 kbit/s in one or both directions (including CDMA 2000 1x EV-DO & W-CDMA) for countries where data on this indicator are not available. Wireless Intelligence collects these data directly from operators. It should be noted that these data do not refer to active subscribers and they do not indicate how many people are actually using IMT-2000/3G networks to access the Internet. Indeed, some subscribers to these networks might not even be aware of the possibility to access the Internet, or they may not make use of this functionality. While ITU is using the Wireless Intelligence data for countries that do not provide data to ITU, countries are invited and encouraged to verify and change the data if they are collecting them from operators. It is expected that, over time, more and more countries will provide national data.

C) ICT skills indicators

Data on adult literacy rates and gross secondary and tertiary enrolment ratios are collected by the UNESCO Institute for Statistics (UIS).

1. Adult literacy rate

According to the UIS, the "*Adult literacy rate* is defined as the percentage of population aged 15 years and over who can both read and write with understanding a short simple statement on his/her everyday life."[4]

2. Gross enrolment ratio (secondary and tertiary level)

According to the UIS, "The *gross enrolment ratio* is the total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school-year."

2. Imputation of missing data

A critical step in the construction of the index is to create a complete data set, without missing values. There are several imputation techniques that can be applied to estimate missing data.[5] Each of the imputation techniques, like any other method employed in the process, has their own strengths and weaknesses. The most important consideration is to ensure that the imputed data will reflect a country's actual level of ICT access, usage and skills.

Given that ICT access and usage are both correlated with national income, hot deck imputation was chosen as the method for estimating the missing data. Hot deck imputation uses data from countries with "similar" characteristics. GDP per capita and geographic location were used as the main criteria in identifying countries with similar characteristics. For example, missing data for country A were estimated for a certain indicator by first identifying the countries that have similar levels of GDP per capita and that are from the same region. Then the indicator that has a known relationship to the indicator to be estimated was considered. For instance, Internet user data of country A was estimated by using Internet user data of country B from the same region, with similar level of GDP per capita and similar level of Internet subscriptions. The same logic was applied to estimate missing data for all indicators included in the IDI.

3. Normalization of data

Normalization of the data is necessary before any aggregation can be made to ensure that the dataset uses the same unit of measurement. For the indicators selected for the construction of the IDI, it is important to transform the values to the same unit of measurement since some of them are expressed as a percentage of the population or households, where the maximum value is 100, while other indicators (although also expressed as a percentage) can have values exceeding 100, such as mobile cellular subscriptions or international Internet bandwidth.

There are certain particularities that need to be taken into consideration when selecting the normalization method for the IDI. For example, in order to identify the digital divide, it is important to measure the relative performance of countries (i.e. the divide among countries). Second, the normalization procedure should produce index results that allow countries to track progress of their evolution towards an information society over time.

A further important criterion for the selection of the normalization method was to choose one that can be replicated by countries. Indeed, some countries have shown a strong interest in applying the index methodology at the national or regional level. Therefore, certain methods cannot be applied, for example those that rely on the values of other countries, which might not be available to users.

For the IDI, the *distance to a reference measure* was used as the normalization method. The reference measure is the *ideal value* that could be reached for each variable (similar to a goalpost). In all of the indicators chosen, this is 100, except for four indicators:

- International Internet bandwidth per Internet user, which in 2008 ranges from 10 (bits/s/user) to more than 1 million. To diminish the effect of the large number of outliers at the high end of the value scale, the data were first transformed to a logarithmic (log) scale. The ideal value was then computed by adding two standard deviations to the mean of the rescaled values, resulting in a log value of 5.
- Mobile cellular subscriptions, which in 2008 range from 0.74 to 209 per 100 inhabitants. The ideal value was computed using the same methodo-

logy used for the bandwidth data, by adding two standard deviations to the mean. The resulting reference value was 170 subscriptions per 100 inhabitants.

– Fixed telephone lines per 100 inhabitants range between 0.06 and 64 in 2008. The same methodology was used to compute the reference value, resulting in a rounded value of 60 per 100 inhabitants.

– Fixed broadband subscribers per 100 inhabitants. This is a fairly recent indicator and values range from zero to over 41 per 100 inhabitants. In line with main (fixed) telephone lines, the ideal value was defined at 60 per 100 inhabitants.

After normalizing the data, the individual series were all rescaled to identical ranges, from 1-10. This was necessary in order to compare the values of the indicators and the sub-indices.

4. Weighting and aggregation

The indicators and sub-indices included in the IDI were weighted based on the PCA results conducted in 2009.[6] Annex Table 1.1 summarizes the weights used for the indicators and sub-indices.

5. Calculating the IDI

Sub-indices were computed by summing up the weighted values of the indicators included in the respective subgroup.

- ICT access is measured by fixed telephone lines per 100 inhabitants, mobile cellular subscriptions per 100 inhabitants, international Internet bandwidth per Internet user, the proportion of households with computer and the proportion of households with Internet access at home.

- ICT use is measured by Internet users per 100 inhabitants, fixed broadband Internet subscribers per 100 inhabitants and mobile broadband subscriptions per 100 inhabitants.

- ICT skills are measured by adult literacy rate, secondary gross enrolment ratio, and tertiary gross enrolment ratio.

The values of the sub-indices were calculated first by normalizing the indicators included in each sub-index in order to have the same unit of measurement. The *reference values* applied in the normalization were discussed above. The sub-index value was calculated by taking the simple average (using equal weights) of the normalized indicator values.

Annex Table 1.1: Weights used for indicators and sub-indices included in the IDI

	Weights (Indicators)	Weights (Sub-index)
ICT access		
Fixed telephone lines per 100 inhabitants	0.20	0.40
Mobile cellular telephone subscriptions per 100 inhabitants	0.20	
International Internet bandwidth per Internet user	0.20	
Proportion of households with a computer	0.20	
Proportion of households with Internet access at home	0.20	
ICT use		
Internet users per 100 inhabitants	0.33	0.40
Fixed broadband Internet subscribers per 100 inhabitants	0.33	
Mobile broadband subscriptions per 100 inhabitants	0.33	
ICT skills		
Adult literacy rate	0.33	0.20
Secondary gross enrolment ratio	0.33	
Tertiary gross enrolment ratio	0.33	

For the final index computation, the ICT access and ICT use sub-indices were given 40 per cent weight each, and the skills sub-index (because it is based on proxy indicators) 20 per cent weight. The final index value was then computed by summing up the weighted sub-indices. Annex Box 1.1 illustrates the process of computing the IDI using the example of Sweden (which tops the IDI 2008).

Annex Box 1.1: Example of how to calculate the IDI value

	SWEDEN			
	Indicators	**Ideal value***		**2008**
	ICT access			
a	Fixed telephone lines per 100 inhabitants	60		57.8
b	Mobile cellular telephone subscriptions per 100 inhabitants	170		118.3
c	International Internet bandwidth per Internet user**	100'000		109'928.4
d	Proportion of households with a computer	100		87
e	Proportion of households with Internet access at home	100		84
	ICT use			
f	Internet users per 100 inhabitants	100		88
g	Fixed broadband Internet subscribers per 100 inhabitants	60		41.2
h	Mobile broadband subscriptions per 100 inhabitants	100		35.5
	ICT skills			
i	Adult literary rate	100		99.0
j	Secondary gross enrolment ratio	100		96.4
k	Tertiary gross enrolment ratio	100		74.4
	Normalized values			
	ICT access	**Formula**	**Weight**	
z1	Fixed telephone lines per 100 inhabitants	a/60	0.20	0.96
z2	Mobile cellular telephone subscriptions per 100 inhabitants	b/170	0.20	0.70
z3	International Internet bandwidth per Internet user	log(c)/5	0.20	1.00
z4	Proportion of households with a computer	d/100	0.20	0.87
z5	Proportion of households with Internet access at home	e/100	0.20	0.84
	ICT use			
z6	Internet users per 100 inhabitants	f/100	0.33	0.88
z7	Fixed broadband Internet subscribers per 100 inhabitants	g/60	0.33	0.69
z8	Mobile broadband subscriptions per 100 inhabitants	h/100	0.33	0.35
	ICT skills			
z9	Adult literary rate	i/100	0.33	0.99
z10	Secondary gross enrolment ratio	j/100	0.33	0.96
z11	Tertiary gross enrolment ratio	k/100	0.33	0.74
	Sub-indices			
	ICT access sub-index (L)	**y1+y2+y3+y4+y5**	**0.40**	**0.87**
y1	Fixed telephone lines per 100 inhabitants	z1*.20		0.19
y2	Mobile cellular telephone subscriptions per 100 inhabitants	z2*.20		0.14
y3	International Internet bandwidth per Internet user	z3*.20		0.20
y4	Proportion of households with a computer	z4*.20		0.17
y5	Proportion of households with Internet access at home	z5*.20		0.17
	ICT use sub-index (M)	**y6+y7+y8**	**0.40**	**0.64**
y6	Internet users per 100 inhabitants	z6*.33		0.29
y7	Fixed broadband Internet subscribers per 100 inhabitants	z7*.33		0.23
y8	Mobile broadband subscriptions per 100 inhabitants	z8*.33		0.12
	ICT skills sub-index (N)	**y9+y10+y11**	**0.20**	**0.90**
y9	Adult literary rate	z9*.33		0.33
y10	Secondary gross enrolment ratio	z10*.33		0.32
y11	Tertiary gross enrolment ratio	z11*.33		0.25
IDI	**ICT Development Index**	**((L*.40)+(M*.40)+(N*.20))*10**		**7.85**

Note: *The ideal value was computed by adding two standard deviations to the mean value of the indicator.
**To diminish the effect of the large number of outliers at the high end of the value scale, the data were first transformed to a logarithmic (log) scale. The ideal value of 100'000 bit/s per Internet user is equivalent to 5 if transformed to a log scale.

Source: ITU.

6. Sensitivity analysis

Sensitivity analysis was carried out to investigate the robustness of the index results, in terms of the relative position in the overall ranking, using different combinations of methods and techniques to compute the index.

Potential sources of variation or uncertainty can be attributed to different processes employed in the computation of the index, including the selection of individual indicators, the imputation of missing values, and the normalization, weighting and aggregation of the data.

Each of the processes or combination of processes affects the IDI value. A number of tests were carried out to examine the robustness of the IDI results (rather than the actual values). The tests computed the possible index values and country rankings for different combinations of the processes mentioned above. Results show that while the computed index values change, the message remains the same. The IDI was found to be extremely robust to different methodologies – with the exception of some countries, particularly countries in the "high" group.

The relative position of countries included in the "high" group (see Chapter 3) can change depending on the methodology used. Therefore, caution should be taken when drawing conclusions based on the ranking of these countries. However, the relative position of countries included in the "low" group is in no way affected by the methods or techniques used, and the countries in this group ranked low in all index computations using different methodologies. This confirms the results conveyed by the IDI.

Endnotes

1 Principal components analysis was used to examine the underlying nature of the data. A more detailed description of the analysis is available in Annex 1 of the 2009 edition of Measuring the Information Society.

2 This is a Partnership core indicator to be collected via household surveys. See Partnership on Measuring ICT for Development (2005 and 2009).

3 Wireless Intelligence is a research group that is part of the GSM Association.

4 UIS "Education Indicators: Technical Guidelines", see http://www.uis.unesco.org/ev.php?ID=5202_201&ID2=DO_TOPIC

5 See OECD and European Commission (2008).

6 For more details, see Annex 1 of ITU (2009b).

Annex 2: ICT Price Basket methodology

Fixed telephone sub-basket

There were some 1.2 billion fixed telephone lines worldwide by the end of 2009. Even though on a global level the number of fixed telephone lines has started to decline over the past two years, the ICT Price Basket includes a sub-basket for fixed telephony because fixed telephone access remains an important access technology in its own right in a large number of countries. Additionally, the conventional fixed telephone line is used not only for dial-up Internet access, but also as a basis to upgrade to DSL broadband technology, which today represents about 65 per cent of all fixed broadband access. While more and more countries are moving away from narrowband/dial-up Internet access to broadband, dial-up Internet access still remains the only form of Internet access available to many people, especially in the developing world. Since the ICT Price Basket does not include dial-up (but only fixed broadband) prices, and since dial-up Internet access requires users to subscribe to a fixed telephone line, the fixed telephone sub-basket can also be considered as a proxy for the price of dial-up Internet access.

The fixed telephone sub-basket has been developed to capture the average monthly cost of a basic local fixed residential telephone service. Following the methodology of the World Bank's "Price Basket for residential fixed line,"[1] it includes the monthly subscription fee plus the cost of 30 three-minute local calls to the same (fixed) network (15 peak and 15 off-peak calls). However, the one-time connection charge is not included, unlike in the World Bank's basket, in order to improve the comparability with the other sub-baskets. As a result, it includes only recurring monthly charges.

The cost of a 3-minute local call refers to the cost of a 3-minute call within the same exchange area (local call) using the subscriber's equipment (i.e., not from a public telephone). It thus refers to the amount the subscriber must pay for a 3-minute call and not the average price for each 3-minute interval. For example, some operators charge a connection fee for every call or a different price for the first minute of a call. In this case, the actual amount for the (first) three minutes is calculated. If a fixed telephone price plan includes 30 (or more) free local calls, then the sub-basket considers the price for the 30 calls as 'zero'.

Many operators indicate whether advertised prices include taxes or not. If they are not included, and if the tax rate is advertised, taxes are added to the price sub-basket to improve the comparability of prices between countries. The sub-basket does not take into consideration the price of a telephone set.

Prices were collected in the second half of 2009, through the *ITU Tariffs Indicators Questionnaire 2009*, which was sent to all ITU Member States' administrations and statistical contacts. For those countries that did not reply, tariffs were collected directly from operators' websites. In this case, tariffs were collected from the operator with the largest market share (as measured by the number of subscribers), since the tariffs selected should reflect what the majority of consumers pay. For example, if most of the customers are in urban areas, the tariffs that apply to urban areas were chosen. For those countries where 2009 data were not available, 2008 data from the ITU World Telecommunication/ICT Indicators database were used. All prices were translated into USD using the UN operational rate of exchange and exchange rates from www.oanda.com.

The mobile cellular sub-basket

The mobile cellular market is the fastest growing telecommunication market and is unequalled in terms of subscriber numbers and popularity. ITU estimates that by the end of 2009 there were some 4.6 billion mobile cellular subscriptions worldwide. No other ICT service has been able to reach the same number of subscriptions, particularly in the developing world, in so little time.

The mobile cellular sub-basket is based on the 2001 methodology of the OECD "low-user basket" (OECD, 2002). It represents the price of a standard basket of mobile monthly usage in USD determined by the OECD for 25 outgoing calls per month (on-net, off-net and to a fixed line, and for peak, off-peak and weekend periods, according to predetermined ratios)[2] plus 30 short messaging service (SMS) messages.[3] Since the price of calls often depends on the time of day or week it is made, peak, off-peak, and weekend periods are taken into consideration. The cost of local SMS is the charge to the consumer for sending a single SMS within the local exchange area. Many operators indicate if advertised prices include taxes or not. If they are not included, and if the tax rate is advertised, taxes are added to the sub-

basket, to improve the comparability of tariffs between countries. The predetermined ratios used to calculate the OECD mobile low-user basket are shown in Annex Box 2.1. Annex Box 2.2 provides an example of how to calculate the ICT Price Basket for a specific economy (Macao (China), which tops the ICT Price Basket 2009).

While prepaid tariffs tend to be more expensive (per minute) than postpaid tariffs, they were chosen because they are often the only payment method available to low-income users who might not have a regular income and will thus not qualify for a postpaid, subscription-based service. Rather than representing the cheapest option available, the mobile cellular sub-basket therefore represents a basic, representative package available to all customers. In countries where no prepaid offers are available, the monthly fixed cost (minus the free minutes of calls included, if applicable) of a postpaid subscription is added to the sub-basket.

Tariffs were collected in the second half of 2009, through the *ITU Tariffs Indicators Questionnaire 2009*, which was sent to all ITU Member States' administrations and statistical contacts. For those countries that did not reply, tariffs were collected directly from operators' websites, or through correspondence with the operator. Tariffs refer to those offered by the major operator (in terms of subscriber market share). The connection price, which applies in some countries (usually representing the price of the SIM card), is not taken into consideration and since prepaid services do not include any monthly charges, these do not apply, either. All prices were converted into USD.

Fixed broadband sub-basket

Broadband Internet access is essential for taking advantage of the Internet's full potential. Most of the applications and services available today, including downloading documents or videos, require a high-speed connection. The number of fixed broadband subscribers had increased to close to 500 million by the end of 2009, and over two thirds of all Internet subscribers today have broadband access. While developed countries were the first to start moving towards high-speed technologies, in some developing countries, fixed broadband subscribers represent 90 per cent or more of total Internet subscribers.

As mobile broadband services are currently not available in a number of countries, mobile broadband prices are not included in the ICT Price Basket. ITU estimates that by the end of 2009, about one third of its Member States had not yet launched commercially available mobile broadband services although more and more countries, including China and India, had started to roll out services.[4]

The fixed broadband sub-basket gives a broad representation of the typical fixed broadband offers available in an economy. The price is calculated based on a 256 kbit/s connection and a minimum of 1 Gigabyte of data. Broadband is defined as any dedicated connection to the Internet at speeds equal to, or greater than, 256 kbit/s, in one or both directions. Where several offers were available, preference was given to a 256 kbit/s connection. Preference was given to 'unlimited' offers, when available. If providers set a limit (cap) to the amount of data that can be transferred within a month to less than one Gigabyte, then the price per additional Megabyte was used (and added to the monthly tariff) to calculate the cost of one Gigabyte of data per month. Whenever possible, prices are for DSL services (since this is the most popular access method worldwide). The sub-basket does not include installation charges, modem prices, or telephone line rentals that are often required for ADSL service.

The tariff represents the cheapest broadband entry plan (although special offers – limited in time or to specific geographic areas – were not taken into consideration) but does not necessarily represent the fastest or most cost-effective connection since often the price for a higher-speed plan is relatively cheaper (in terms of the caps).

Tariffs were collected in the second half of 2009, through the *ITU Tariffs Indicators Questionnaire 2009*,

Annex Box 2.1: Formula for the low-user mobile basket

$$M_{low\_user} = 5.32 * Net_{peak} + 4.9 * Net_{off\text{-}peak} + 3.78 * Net_{weekend} + 6.38 * Fix_{peak} + 5.88 * Fix_{off\text{-}peak} + 4.54 * Fix_{weekend} + 2.39 * Off\text{-}Net_{peak} + 2.21 * Off\text{-}Net_{off\text{-}peak} + 1.70 * Off\text{-}Net_{weekend} + 30 * SMS$$

Source: ITU, based on OECD (2002).

which was sent to all ITU Member States' administrations and statistical contacts. For those countries that did not reply, tariffs were collected from Internet Service Providers' (ISP) websites or through direct correspondence with ISPs. For countries where it was not clear which ISP has the dominant market share, preference was given to tariffs offered by the (past) incumbent telecommunication operator. In some cases, especially where tariffs were not clearly advertised or only in the local language, and where ISPs did not respond to queries, alternative ISPs were chosen. All prices were converted into USD.

Annex Box 2.2: Example of how to calculate the ICT Price Basket

MACAO, CHINA		% GNI	US$	PPP$
Fixed telephony				
(a)	Monthly subscription (residential)		8.25	12.18
(b)	Cost 3-minute local call (peak)		0.02	0.04
(c)	Cost 3-minute local call (off-peak)		0.02	0.04
Mobile cellular telephony				
(d)	On-net per minute local call (peak)		0.05	0.07
(e)	On-net per minute local call (off-peak)		0.05	0.07
(f)	On-net per minute local call (weekend/evening)		0.05	0.07
(g)	Off-net per minute local call (peak)		0.05	0.07
(h)	Off-net per minute local call (off-peak)		0.05	0.07
(i)	Off-net per minute local call (weekend/evening)		0.05	0.07
(j)	To fixed per minute local call (peak)		0.05	0.07
(k)	To fixed per minute local call (off-peak)		0.05	0.07
(l)	To fixed per minute local call (weekend/evening)		0.05	0.07
(m)	Local SMS		0.03	0.05
Fixed broadband Internet*				
(n)	Monthly fee (residential)		8.87	13.09
(ni)	Cap			
(nii)	Price per additional GB			
GNI per capita**				
	GNI per capita		35'360	
(o)	Monthly GNI per capita		2'947	
Sub-baskets				
Fixed telephone sub-basket				
(p)	(a) + 15 * (b) +15 * (c)		8.99	13.27
(q)	US$ (p) / (o)	0.30		
Mobile cellular sub-basket				
(r)	5.32 * (d) + 4.9 * (e) + 3.78 * (f) + 2.39 * (g) + 2.21 * (h) + + 1.7 * (i) + 6.38 * (j) + 5.88 * (k) + 4.54 * (l) + 30 * (m)		2.75	4.06
(s)	US$ (r) / (o)	0.09		
Fixed broadband sub-basket				
(t)	(((1-(ni))*(nii))+(n))		8.87	13.09
(u)	US$ (t) / (o)	0.30		
ICT Price Basket***				
	[(q) + (s) + (u)] / 3	**0.23**		

Note: * If data transmission is limited to less than 1GB per month, the price per additional GB is used to compute the monthly fee of 1 GB of data per month.
** World Bank Atlas Method.
*** If the % value of any of the sub-baskets (i.e. (q), (s) or (u)) is above 100%, it is capped to a maximum value of 100%.

Source: ITU.

Endnotes

1 See World Bank, ICT at a Glance Definitions and Sources, at: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20460697~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419~isCURL:Y,00.html

2 On-net refers to a call made to the same mobile network, while off-net and fixed line refer to calls made to other (competing) mobile networks and to a fixed telephone line, respectively.

3 25 outgoing calls are equivalent to a total of 37.1 minutes. For more details on the OECD/Teligen methodology, see http://www.teligen.com/publications/oecd.pdf and http://www.oecd.org/dataoecd/56/26/41049548.pdf

4 ITU's mobile broadband data refers to subscribers with access to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (here defined as greater than or equal to 256 kbit/s in one or both directions)* such as WCDMA, HSDPA, CDMA2000 1xEV-DO, CDMA 200 1xEV-DV.

Annex 3: Statistical tables of indicators used to compute the IDI

Access indicators

	Economy	Main (fixed) telephone lines per 100 inhab.		Mobile cellular subscriptions per 100 inhab.		International Internet bandwidth Bit/s per Internet user		Proportion of households with computer		Proportion of households with Internet	
		2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
1	Albania	9.6	10.9	74.1	99.9	1'461	*1'956*	9.5	12.0	7.8	8.8
2	Algeria	9.1	*9.6*	81.4	*92.7*	*961*	*1'593*	8.3	*9.5*	6.8	*8.4*
3	Angola	0.5	0.6	28.3	37.6	582	*596*	5.0	*5.6*	3.5	*4.4*
4	Argentina	24.1	24.4	102.3	116.6	8'943	*21'959*	36.4	*37.6*	27.5	*29.9*
5	Armenia	20.3	20.3	61.1	100.0	*453*	*1'257*	8.3	*9.5*	4.4	6.1
6	Australia	46.8	44.5	101.9	105.0	*8'042*	*10'855*	72.6	74.9	64.0	66.6
7	Austria	41.0	39.4	119.3	129.7	30'369	*75'952*	71.0	76.0	59.6	68.9
8	Azerbaijan	14.5	15.0	52.4	75.0	3'955	4'189	10.1	14.6	9.3	13.9
9	Bahrain	26.8	28.4	146.9	185.8	7'660	*11'020*	87.0	87.0	*46.5*	*48.0*
10	Bangladesh	0.8	0.8	21.8	27.9	1'284	*2'273*	1.9	*2.2*	1.3	*1.9*
11	Belarus	37.8	38.4	71.6	84.0	911	*2'332*	23.2	28.5	11.4	*15.6*
12	Belgium	44.3	42.1	102.0	111.6	37'702	*54'706*	67.0	70.0	60.2	63.6
13	Benin	1.3	1.8	22.7	39.7	1'033	*2'063*	1.9	*2.1*	0.1	*0.1*
14	Bhutan	4.4	4.0	22.1	36.5	1'125	1'000	*3.6*	4.2	*1.8*	2.8
15	Bolivia	7.1	*7.1*	34.2	*49.8*	*398*	2'082	*18.0*	*21.0*	3.3	*3.7*
16	Bosnia and Herzegovina	28.2	27.3	64.9	84.3	1'896	*1'778*	25.2	28.3	10.9	*12.6*
17	Botswana	7.2	7.4	60.9	77.3	810	3'525	4.5	*4.9*	0.1	*1.0*
18	Brazil	20.7	21.4	63.6	78.5	3'398	5'617	26.5	31.2	20.1	23.8
19	Brunei Darussalam	*19.9*	*19.5*	*90.7*	*95.8*	*2'954*	2'857	66.6	*72.6*	61.7	*65.2*
20	Bulgaria	30.1	28.8	129.5	138.3	27'231	108'449	23.3	28.6	19.0	25.3
21	Burkina Faso	0.8	*0.9*	*10.9*	*16.8*	1'955	*1'955*	1.6	*1.8*	0.0	*0.0*
22	Cambodia	0.3	0.3	18.0	29.1	3'857	*7'216*	4.1	*5.1*	2.4	*3.0*
23	Cameroon	1.0	1.0	*24.3*	32.3	371	214	4.1	*4.5*	1.2	*1.3*
24	Canada	55.5	*54.9*	61.5	66.4	22'250	*30'786*	78.4	*80.0*	72.7	*75.1*
25	Cape Verde	14.6	14.4	*31.0*	55.7	1'670	1'508	11.6	*13.6*	*4.1*	*4.5*
26	Chad	*0.1*	*0.1*	*8.6*	*16.6*	67	*67*	2.0	*2.8*	*1.8*	*2.0*
27	Chile	20.8	21.0	83.9	88.1	13'136	*36'462*	*36.4*	*40.0*	*22.1*	*23.8*
28	China	27.5	25.5	41.2	47.9	1'735	2'149	*29.0*	*31.8*	16.4	*18.3*
29	Colombia	17.9	17.9	76.5	91.9	4'213	5'801	*18.6*	22.8	10.2	15.5
30	Comoros	3.3	3.5	*10.2*	14.9	317	*317*	4.3	*5.2*	*1.2*	*1.5*
31	Congo	*0.6*	*0.6*	*36.3*	*50.0*	*10*	*10*	5.0	*6.3*	1.4	*1.9*
32	Congo (Dem. Rep.)	0.0	0.1	10.5	14.4	239	190	0.3	*0.3*	0.2	*0.2*
33	Costa Rica	32.2	31.8	33.8	41.7	2'181	2'654	31.2	34.4	11.7	14.8
34	Côte d'Ivoire	*1.6*	1.7	37.1	*50.7*	1'798	*1'518*	1.3	*1.4*	0.5	*1.0*
35	Croatia	41.7	42.5	113.7	133.0	8'150	31'488	49.5	52.9	40.6	*45.3*
36	Cuba	9.3	9.8	1.8	3.0	162	208	3.3	3.3	0.4	0.5
37	Cyprus	44.9	45.1	115.8	117.9	4'209	*9'793*	53.0	56.3	38.9	*42.9*
38	Czech Republic	23.4	21.9	128.8	133.5	14'641	*35'146*	43.0	52.4	35.1	45.9
39	Denmark	51.9	45.6	115.8	125.7	42'534	*94'863*	83.0	85.5	78.1	81.9
40	Djibouti	1.7	1.8	8.3	13.3	5'862	5'862	8.8	10.6	7.0	*8.0*
41	Dominican Rep.	9.2	9.9	56.2	72.4	6'505	6'520	12.5	*14.2*	5.1	*5.6*
42	Ecuador	13.7	14.1	74.5	85.6	2'221	1'538	18.0	22.8	6.8	7.0
43	Egypt	14.1	14.6	37.6	50.6	1'262	1'995	10.5	13.1	9.5	12.9
44	El Salvador	17.7	17.6	100.5	113.3	281	296	8.7	10.9	3.1	4.5
45	Eritrea	0.8	0.8	*1.8*	2.2	100	120	0.3	*0.3*	0.2	*0.2*
46	Estonia	36.9	37.1	147.6	188.2	18'739	191'418	57.0	59.6	52.9	58.1
47	Ethiopia	1.1	1.1	1.5	2.4	842	*1'386*	0.2	*0.5*	0.1	*0.1*
48	Fiji	14.5	*15.3*	63.2	71.1	1'379	*1'379*	18.2	*21.1*	11.5	*13.4*
49	Finland	32.9	31.1	115.1	128.8	21'798	*51'171*	74.0	75.8	68.8	72.4
50	France	56.4	56.4	89.7	93.4	46'351	*65'017*	62.0	68.4	49.2	62.3
51	Gabon	1.9	*1.8*	82.2	*89.8*	2'439	*3'333*	4.3	*5.2*	3.6	*4.1*
52	Gambia	3.0	2.9	49.5	70.2	618	*618*	4.1	*4.5*	*1.7*	*2.0*
53	Georgia	12.8	14.3	59.7	64.0	9'103	*5'358*	12.6	*15.4*	2.4	*3.0*
54	Germany	64.7	62.5	116.9	128.3	35'394	*55'302*	79.0	81.8	70.7	74.9
55	Ghana	1.6	0.6	33.2	49.6	565	2'021	5.1	*6.4*	0.3	*0.3*
56	Greece	56.2	53.7	110.6	123.9	15'133	*18'658*	40.0	44.0	25.4	31.0
57	Guatemala	10.6	10.6	89.1	109.2	1'518	*1'640*	13.6	*14.9*	2.3	*2.4*
58	Guinea	0.2	*0.2*	20.8	*39.1*	27	22	2.1	*2.1*	*1.8*	*2.0*
59	Guinea-Bissau	0.3	0.3	19.2	31.7	59	59	3.6	*4.9*	1.0	*1.0*
60	Haiti	1.1	*1.1*	25.7	*32.4*	172	*172*	4.0	*5.7*	1.8	*2.1*
61	Honduras	11.5	11.3	58.3	84.9	1'930	*2'524*	10.1	11.1	2.5	4.2
62	Hong Kong, China	59.4	58.7	154.7	165.9	483'383	817'848	74.0	74.6	70.1	70.9
63	Hungary	32.4	30.9	109.9	122.1	9'272	10'216	54.0	58.8	38.4	48.4
64	Iceland	60.6	61.3	106.3	108.6	7'943	*12'752*	89.0	91.9	83.7	87.7
65	India	3.4	3.2	20.1	29.4	777	*1'485*	3.7	*4.4*	3.0	*3.4*
66	Indonesia	8.7	13.4	41.6	61.8	606	1'515	5.9	*6.4*	1.3	*1.4*
67	Iran (I.R.)	32.9	33.8	41.1	58.7	417	472	13.0	*14.1*	8.6	*9.5*
68	Ireland	51.4	49.7	118.4	120.7	26'775	*60'763*	65.0	70.4	57.3	63.0
69	Israel	*44.4*	45.7	128.4	127.4	4'310	*5'914*	68.9	70.9	59.3	63.3
70	Italy	37.8	35.6	151.4	151.6	26'940	31'097	53.0	56.0	43.4	46.9
71	Jamaica	13.7	11.7	99.6	100.6	1'333	1'299	17.2	*18.0*	12.7	*13.4*
72	Japan	41.1	38.0	82.7	86.7	5'041	7'677	85.0	85.9	77.4	79.8
73	Jordan	9.4	8.5	80.3	86.6	788	2'893	25.1	39.3	10.4	13.2
74	Kazakhstan	21.0	22.3	80.0	96.1	3'226	6'444	*15.6*	*18.4*	13.9	*17.0*
75	Kenya	0.7	0.6	30.1	42.1	112	247	5.5	*6.3*	2.2	*2.5*
76	Korea (Rep.)	46.7	44.3	90.7	94.7	1'374	5'975	80.5	80.9	94.1	94.3
77	Kuwait	*18.6*	*18.5*	97.3	*99.6*	2'577	*3'390*	34.1	*35.2*	29.1	*29.7*
78	Kyrgyzstan	9.0	9.1	40.6	62.7	796	702	2.1	*2.5*	1.8	*2.0*
79	Lao P.D.R.	1.6	2.1	24.3	32.6	1'880	1'517	6.7	*7.0*	1.8	*2.1*
80	Latvia	28.4	*28.5*	97.7	*98.9*	6'394	*16'692*	49.0	56.7	50.5	52.8

	Economy	Main (fixed) telephone lines per 100 inhab.		Mobile cellular subscriptions per 100 inhab.		International Internet bandwidth Bit/s per Internet user		Proportion of households with computer		Proportion of households with Internet	
		2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
81	Lebanon	16.8	17.9	30.3	*34.0*	1'192	*1'327*	*26.3*	27.6	*16.0*	*20.0*
82	Lesotho	*2.9*	*3.2*	*22.4*	28.3	114	136	*4.1*	*4.5*	0.9	*1.0*
83	Libya	*15.7*	*16.4*	*72.9*	*76.7*	1'064	*1'440*	6.3	*7.0*	4.3	*4.8*
84	Lithuania	23.8	23.6	146.4	151.2	9'462	17'927	46.0	52.0	44.4	50.9
85	Luxembourg	52.2	54.2	144.1	147.1	9'428'981	9'043'063	80.0	82.8	74.6	80.1
86	Macao, China	34.7	33.4	154.8	177.2	18'718	*17'201*	*68.1*	*68.6*	57.5	*57.9*
87	Madagascar	0.7	0.9	11.6	25.3	1'240	490	2.3	*2.5*	*0.9*	*1.0*
88	Malawi	1.2	1.2	7.3	12.0	480	*480*	4.0	*7.6*	1.4	*1.7*
89	Malaysia	16.4	15.9	87.9	102.6	2'778	4'254	31.3	38.7	15.2	21.1
90	Maldives	11.0	15.4	104.3	142.8	13'139	11'319	*28.9*	*30.2*	9.0	*9.7*
91	Mali	0.6	0.6	20.4	27.1	2'130	3'270	*2.0*	*2.4*	*0.9*	*1.0*
92	Malta	56.7	59.2	90.7	94.6	12'737	15'644	63.0	62.6	53.9	59.0
93	Mauritania	1.3	2.4	*45.0*	65.1	4'889	4'083	*2.0*	*2.5*	*0.9*	*1.0*
94	Mauritius	28.4	28.5	73.1	80.7	1'111	1'638	27.8	30.0	19.1	20.2
95	Mexico	18.4	19.0	61.9	69.4	836	1'285	22.1	25.7	12.0	13.5
96	Moldova	29.4	30.7	51.3	66.7	4'724	*6'087*	5.5	*8.0*	*4.8*	*6.0*
97	Mongolia	6.2	6.2	35.1	37.8	938	994	12.5	14.0	*2.7*	2.9
98	Montenegro	*57.7*	*58.2*	*113.2*	*118.1*	2'679	*2'679*	19.8	*20.0*	14.9	*16.7*
99	Morocco	7.7	9.5	64.1	72.2	3'761	2'407	17.2	*27.0*	*10.0*	*13.7*
100	Mozambique	0.4	0.3	15.1	19.7	360	*609*	3.8	*4.0*	0.9	*0.9*
101	Myanmar	1.4	1.6	0.5	0.7	2'747	8'957	1.8	*2.6*	1.8	*2.2*
102	Namibia	6.6	*6.6*	38.3	49.4	554	*554*	11.2	*12.7*	3.3	*3.4*
103	Nepal	2.5	2.8	11.6	14.6	350	*350*	*2.8*	3.2	1.0	*1.0*
104	Netherlands	45.0	44.3	117.2	124.8	92'184	*149'693*	86.0	87.7	82.9	86.1
105	New Zealand	41.7	41.4	101.4	109.2	6'569	*10'424*	75.7	*81.2*	*65.9*	*67.5*
106	Nicaragua	*4.5*	*5.5*	44.7	54.8	4'741	*6'962*	*7.2*	*8.1*	*0.6*	*0.7*
107	Niger	*0.2*	*0.4*	*6.4*	*12.9*	2'826	*2'826*	0.3	0.4	0.1	0.1
108	Nigeria	1.1	0.9	27.3	41.7	69	*65*	5.1	12.0	*3.6*	6.0
109	Norway	42.1	39.8	106.7	110.2	34'646	*52'722*	82.0	85.8	77.6	84.0
110	Oman	9.8	9.8	91.7	115.6	2'748	4'470	37.2	*39.2*	20.9	*21.9*
111	Pakistan	2.8	2.5	36.4	49.7	404	*487*	8.1	*9.8*	1.1	*1.2*
112	Panama	14.8	15.4	90.0	115.2	71'616	*160'714*	16.9	*18.0*	8.9	*9.3*
113	Papua New Guinea	0.9	*0.9*	4.7	*9.1*	104	*104*	*3.0*	*3.2*	*1.7*	*1.9*
114	Paraguay	6.4	7.9	76.6	95.5	1'886	3'355	11.2	13.9	3.0	5.8
115	Peru	9.4	10.0	54.1	72.7	10'775	*28'210*	13.8	16.5	5.6	*8.2*
116	Philippines	4.4	4.5	64.6	75.4	1'887	*8'393*	18.3	*21.0*	12.3	*13.8*
117	Poland	27.5	*25.5*	108.5	*115.3*	6'225	*9'352*	54.0	58.9	41.0	47.6
118	Portugal	39.5	38.5	126.4	139.6	12'053	*31'022*	48.3	49.8	39.6	46.0
119	Qatar	20.9	20.6	111.1	131.4	6'624	*14'702*	*65.7*	71.0	*50.0*	63.0
120	Romania	19.8	23.6	95.2	114.5	21'950	31'640	34.0	37.8	22.2	30.4
121	Russia	31.2	31.8	120.6	141.1	2'325	*4'712*	35.0	40.0	25.0	30.0
122	Rwanda	0.2	0.2	6.7	13.6	780	890	0.3	*0.3*	0.1	*0.1*
123	Saudi Arabia	16.2	16.3	115.1	142.9	1'936	3'887	43.2	*47.8*	35.6	*41.5*
124	Senegal	2.3	1.9	30.5	44.1	2'079	2'843	4.1	*4.5*	0.9	*1.0*
125	Serbia	30.4	31.4	86.0	*97.8*	7'193	10'037	34.0	*35.8*	26.3	*27.6*
126	Seychelles	27.3	26.6	92.7	111.5	1'375	2'198	20.0	*25.0*	10.0	*13.0*
127	Singapore	41.5	40.2	132.1	138.1	33'671	*66'578*	79.0	80.0	74.0	76.0
128	Slovak Republic	21.3	20.3	112.5	102.2	9'880	*42'492*	55.0	63.2	46.1	58.3
129	Slovenia	42.6	50.1	95.9	102.0	12'658	*18'963*	66.0	65.1	57.6	58.9
130	South Africa	9.2	*8.9*	86.0	90.6	852	*2'380*	14.8	*15.9*	4.8	*5.2*
131	Spain	45.8	45.4	109.9	111.7	21'559	*31'802*	60.4	63.6	44.6	51.0
132	Sri Lanka	13.8	17.2	40.2	55.2	3'072	3'291	8.2	*9.5*	2.4	*3.0*
133	St. Vincent and the Grenadines	21.0	20.9	101.4	119.2	526	455	*33.0*	47.0	25.0	*34.0*
134	Sudan	0.9	0.9	20.3	29.0	3'800	3'167	4.3	4.8	1.0	*1.0*
135	Swaziland	*3.8*	*3.8*	*33.0*	*45.5*	*450*	450	12.8	13.5	6.0	*6.5*
136	Sweden	60.1	57.8	111.1	118.3	62'174	*109'928*	83.0	87.1	78.5	84.4
137	Switzerland	65.6	64.1	109.3	118.0	40'877	*65'290*	78.1	*80.6*	77.5	*78.9*
138	Syria	16.8	17.1	30.4	33.2	304	589	35.0	*38.5*	30.0	*31.2*
139	Tajikistan	4.4	4.2	31.7	53.7	516	*516*	*1.7*	*2.0*	0.1	*0.1*
140	Tanzania	0.4	0.3	20.2	30.6	250	*581*	2.3	*2.5*	0.6	*0.6*
141	TFYR Macedonia	22.7	22.4	95.4	*122.6*	61	*8'472*	*33.7*	45.6	*22.0*	29.4
142	Thailand	10.5	*10.4*	79.1	92.0	1'645	3'422	*17.0*	19.6	7.3	8.6
143	Togo	1.6	2.2	18.9	24.0	84	140	3.5	*4.9*	1.0	*1.1*
144	Trinidad & Tobago	23.1	*23.0*	113.7	*112.9*	4'229	*4'780*	43.6	*50.0*	18.0	*18.3*
145	Tunisia	12.6	12.2	77.9	84.6	1'843	4'114	9.6	13.1	3.4	5.0
146	Turkey	24.9	23.7	84.9	89.1	4'642	8'128	28.5	37.7	18.9	25.4
147	Turkmenistan	9.2	*9.5*	7.7	22.5	3'414	*3'414*	*5.0*	*7.0*	*2.0*	*4.0*
148	Uganda	0.5	0.5	*13.7*	27.0	306	148	1.2	*1.6*	*0.1*	*0.2*
149	Ukraine	27.9	28.7	119.3	121.1	3'154	*5'477*	11.5	21.2	5.0	10.3
150	United Arab Emirates	31.7	33.6	177.2	208.6	8'718	13'333	58.5	74.0	48.7	66.4
151	United Kingdom	55.5	54.2	121.2	126.3	55'259	*77'179*	75.0	78.0	66.7	71.1
152	United States	51.3	49.6	85.2	86.8	15'341	*21'403*	70.2	*72.5*	61.7	*62.5*
153	Uruguay	28.9	28.6	90.0	104.7	3'102	*4'083*	28.3	35.4	15.8	20.8
154	Uzbekistan	7.0	6.8	20.9	46.8	180	334	3.0	*3.2*	0.8	*0.9*
155	Venezuela	18.8	22.4	86.1	96.3	3'016	*5'478*	14.6	*15.3*	5.7	*6.8*
156	Viet Nam	33.1	*34.0*	27.6	*80.4*	704	2'403	8.7	*10.2*	5.0	*6.5*
157	Yemen	*4.7*	*4.9*	*15.4*	*16.1*	1'969	*2'932*	2.6	*3.3*	2.0	*2.2*
158	Zambia	0.7	0.7	21.4	28.0	62	143	*1.9*	*2.1*	0.6	*1.4*
159	Zimbabwe	2.8	2.8	9.8	13.3	42	85	*3.5*	*4.0*	2.0	2.5

Note: Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Use indicators

	Economy	Internet users per 100 inhabitants		Fixed broadband Internet subscribers per 100 inhabitants		Mobile broadband subscriptions per 100 inhabitants	
		2007	2008	2007	2008	2007	2008
1	Albania	*15.0*	23.9	0.3	2.0	0.0	0.0
2	Algeria	10.3	*11.9*	0.8	*1.4*	0.0	0.0
3	Angola	2.8	3.1	0.1	*0.1*	0.2	0.8
4	Argentina	25.9	28.1	6.6	8.0	0.4	1.9
5	Armenia	*6.0*	6.2	*0.1*	0.2	0.0	0.0
6	Australia	68.6	72.0	*23.2*	*24.4*	32.7	53.7
7	Austria	66.9	71.2	*19.5*	20.7	29.7	42.7
8	Azerbaijan	18.0	*28.0*	0.2	0.7	0.0	0.0
9	Bahrain	32.9	51.9	9.7	14.2	10.1	25.2
10	Bangladesh	0.3	*0.3*	0.0	*0.0*	0.0	0.0
11	Belarus	28.9	32.1	*1.7*	4.9	0.0	0.0
12	Belgium	66.8	68.9	25.8	28.0	5.4	12.0
13	Benin	1.8	1.8	0.0	*0.0*	0.0	0.0
14	Bhutan	5.9	6.6	0.0	0.3	0.0	0.4
15	Bolivia	*10.5*	*10.8*	0.4	0.7	0.0	0.1
16	Bosnia and Herzegovina	27.9	34.7	2.2	5.0	0.0	0.0
17	Botswana	5.3	6.2	0.2	0.5	0.0	0.0
18	Brazil	30.9	37.5	4.0	5.3	1.1	1.8
19	Brunei Darussalam	*48.8*	*55.3*	2.9	*3.6*	30.4	37.6
20	Bulgaria	30.8	34.9	8.2	11.1	8.7	16.8
21	Burkina Faso	0.7	0.9	*0.0*	0.0	0.0	0.0
22	Cambodia	*0.5*	*0.5*	0.1	0.1	0.0	1.0
23	Cameroon	2.9	*3.8*	*0.0*	*0.0*	0.0	0.2
24	Canada	72.8	*75.4*	27.5	29.6	1.5	4.6
25	Cape Verde	8.3	20.6	0.8	1.5	0.0	1.0
26	Chad	0.8	1.2	0.0	0.0	0.0	0.0
27	Chile	*31.0*	*32.5*	7.8	8.5	0.8	2.4
28	China	*16.0*	22.3	5.0	6.2	0.0	0.0
29	Colombia	27.8	38.5	2.7	4.2	0.0	1.0
30	Comoros	3.4	*3.5*	0.0	0.0	0.0	0.0
31	Congo	2.8	4.3	0.0	*0.0*	0.0	0.0
32	Congo (Dem. Rep.)	0.4	0.5	0.0	0.0	0.0	0.0
33	Costa Rica	30.3	32.3	2.4	2.4	0.0	0.0
34	Côte d'Ivoire	2.2	3.2	*0.0*	*0.0*	0.0	0.0
35	Croatia	44.7	50.6	8.7	11.9	9.7	20.7
36	Cuba	11.7	12.9	0.0	*0.0*	0.0	0.0
37	Cyprus	38.1	38.8	11.4	16.4	11.3	25.6
38	Czech Republic	48.6	58.4	14.6	17.1	6.5	13.1
39	Denmark	81.4	83.9	35.9	37.1	12.7	27.3
40	Djibouti	1.7	2.3	*0.0*	*0.0*	0.0	0.0
41	Dominican Rep.	17.1	21.6	1.6	2.3	0.4	0.6
42	Ecuador	*15.0*	*28.8*	*0.2*	0.3	0.2	0.3
43	Egypt	14.8	16.6	0.6	0.9	0.2	4.9
44	El Salvador	*7.0*	*11.0*	1.5	2.0	0.0	0.0
45	Eritrea	2.5	4.1	0.0	0.0	0.0	0.0
46	Estonia	63.6	66.2	20.7	23.7	3.3	14.9
47	Ethiopia	0.4	*0.4*	0.0	0.0	0.0	0.0
48	Fiji	*10.9*	*12.2*	1.4	*1.8*	0.0	0.1
49	Finland	79.1	82.6	30.6	30.5	15.3	24.3
50	France	63.6	68.2	25.2	28.5	13.8	23.6
51	Gabon	*5.8*	6.2	0.1	*0.2*	0.0	0.0
52	Gambia	6.2	6.9	0.0	0.0	0.0	0.0
53	Georgia	8.3	*23.8*	1.1	2.2	2.3	9.5
54	Germany	72.4	75.3	23.8	27.5	15.1	21.8
55	Ghana	3.8	4.3	0.1	0.1	0.0	1.8
56	Greece	30.2	43.5	9.2	13.5	22.5	45.7
57	Guatemala	*12.3*	*14.3*	*0.4*	*0.6*	0.4	0.7
58	Guinea	0.8	0.9	0.0	0.0	0.0	0.0
59	Guinea-Bissau	2.2	2.4	0.0	0.0	0.0	0.0
60	Haiti	9.3	*10.1*	0.0	0.0	0.0	0.0
61	Honduras	*12.5*	*13.1*	0.0	0.0	0.0	0.0
62	Hong Kong, China	65.0	67.0	27.3	28.1	31.6	42.8
63	Hungary	51.6	58.7	14.2	17.5	7.9	15.5
64	Iceland	89.9	90.6	31.8	32.9	0.0	0.0
65	India	3.9	4.4	0.3	0.4	0.0	0.0
66	Indonesia	5.8	*7.9*	0.1	0.2	1.5	3.5
67	Iran (I.R.)	17.9	31.4	*0.3*	0.4	0.0	0.0
68	Ireland	57.0	62.5	17.4	20.1	24.9	32.4
69	Israel	*48.1*	*49.6*	22.1	23.9	26.0	34.4
70	Italy	38.3	41.9	17.1	18.9	41.4	48.8
71	Jamaica	55.6	56.9	3.4	3.6	0.4	0.9
72	Japan	74.3	75.4	22.2	23.7	65.4	75.5
73	Jordan	20.0	26.0	1.5	2.2	0.0	0.0
74	Kazakhstan	4.0	11.0	1.8	4.3	0.0	0.0
75	Kenya	7.9	8.7	0.0	0.0	1.0	1.0
76	Korea (Rep.)	75.5	76.5	30.7	32.1	48.8	70.7
77	Kuwait	31.6	*34.3*	*1.2*	*1.4*	0.6	2.1
78	Kyrgyzstan	14.0	15.7	0.1	*0.1*	0.0	0.0
79	Lao P.D.R.	1.6	8.5	0.1	0.1	0.0	0.0
80	Latvia	55.5	60.6	6.4	8.9	2.4	6.4

	Economy	Internet users per 100 inhabitants 2007	Internet users per 100 inhabitants 2008	Fixed broadband Internet subscribers per 100 inhabitants 2007	Fixed broadband Internet subscribers per 100 inhabitants 2008	Mobile broadband subscriptions per 100 inhabitants 2007	Mobile broadband subscriptions per 100 inhabitants 2008
81	Lebanon	*18.7*	22.5	4.8	*5.0*	0.0	0.0
82	Lesotho	3.4	3.6	0.0	0.0	0.0	0.0
83	Libya	4.7	*5.1*	*0.2*	*0.2*	8.7	28.6
84	Lithuania	49.5	55.0	15.1	17.8	2.0	3.5
85	Luxembourg	78.1	80.5	27.1	29.8	42.4	82.6
86	Macao, China	46.4	*49.2*	21.5	23.1	9.0	43.7
87	Madagascar	0.7	1.7	0.0	0.0	0.0	0.0
88	Malawi	1.0	2.1	0.0	*0.0*	0.0	0.0
89	Malaysia	55.7	55.8	3.8	4.9	3.4	9.0
90	Maldives	16.5	23.5	3.5	5.2	0.7	2.5
91	Mali	0.8	1.6	0.0	0.0	0.0	0.0
92	Malta	45.3	48.8	20.2	24.8	6.9	11.2
93	Mauritania	1.4	1.9	*0.1*	0.2	0.6	2.2
94	Mauritius	*20.2*	22.0	4.8	7.2	3.1	4.0
95	Mexico	*20.8*	21.7	4.2	7.0	0.5	1.7
96	Moldova	20.5	23.4	1.3	3.2	0.0	5.2
97	Mongolia	12.3	*12.5*	0.3	0.6	*1.0*	3.0
98	Montenegro	45.1	*47.2*	*7.1*	*10.0*	3.0	8.3
99	Morocco	21.4	33.0	1.5	1.5	0.3	2.2
100	Mozambique	0.9	1.6	0.0	0.0	0.0	0.0
101	Myanmar	0.2	0.2	0.0	0.0	0.0	0.0
102	Namibia	4.8	5.3	0.0	*0.0*	0.0	0.0
103	Nepal	1.4	*1.7*	0.0	*0.0*	0.0	0.0
104	Netherlands	84.4	86.5	33.5	35.1	12.6	25.0
105	New Zealand	*69.8*	*72.0*	20.3	21.6	27.9	45.2
106	Nicaragua	*3.0*	*3.3*	*0.5*	*0.6*	0.0	0.4
107	Niger	0.4	0.5	*0.0*	*0.0*	0.0	0.0
108	Nigeria	6.8	15.9	0.0	0.0	0.1	2.4
109	Norway	77.5	82.6	30.4	33.3	13.3	20.9
110	Oman	16.7	*20.0*	0.7	1.1	1.9	5.3
111	Pakistan	10.1	10.5	0.0	0.1	0.0	0.0
112	Panama	22.3	27.5	4.5	5.8	0.0	0.0
113	Papua New Guinea	*1.8*	*1.8*	0.0	0.0	0.0	0.0
114	Paraguay	8.7	*14.3*	0.8	1.4	0.0	0.3
115	Peru	*24.6*	*24.7*	2.0	2.5	0.0	0.0
116	Philippines	6.0	*6.2*	0.6	1.2	2.8	7.0
117	Poland	44.1	49.0	10.9	12.6	7.8	15.8
118	Portugal	39.6	41.9	14.2	15.3	24.5	40.5
119	Qatar	30.9	34.0	6.2	8.1	2.8	7.6
120	Romania	24.4	29.0	9.1	11.7	8.0	21.6
121	Russia	24.7	32.0	3.5	6.6	0.0	0.6
122	Rwanda	*2.1*	*3.1*	0.0	0.0	0.0	0.0
123	Saudi Arabia	25.8	30.8	2.5	4.2	3.2	9.4
124	Senegal	6.9	8.4	0.3	0.4	0.0	0.0
125	Serbia	29.9	*33.5*	3.3	4.6	2.6	7.6
126	Seychelles	38.4	40.4	4.2	4.1	0.0	0.3
127	Singapore	*69.2*	*73.0*	20.0	21.7	42.8	65.3
128	Slovak Republic	56.3	66.0	8.8	11.2	3.6	10.5
129	Slovenia	53.3	55.9	17.1	21.2	11.6	26.3
130	South Africa	8.1	8.4	0.8	0.9	2.6	5.0
131	Spain	52.0	56.7	18.3	20.2	22.8	38.9
132	Sri Lanka	3.9	5.8	0.3	0.5	0.8	2.4
133	St. Vincent and the Grenadines	52.3	60.5	7.3	8.6	0.0	0.0
134	Sudan	8.7	10.2	0.1	0.1	0.2	0.4
135	Swaziland	4.1	6.9	0.0	0.1	0.0	0.0
136	Sweden	80.0	87.8	30.4	41.2	24.7	35.5
137	Switzerland	72.3	77.0	31.5	34.2	19.3	28.3
138	Syria	16.9	16.8	0.0	0.1	0.0	0.0
139	Tajikistan	7.2	8.8	0.1	*0.1*	0.3	0.7
140	Tanzania	1.0	1.2	*0.0*	*0.0*	0.2	0.4
141	TFYR Macedonia	*27.3*	41.5	4.9	8.9	0.0	0.5
142	Thailand	20.0	23.9	1.4	*1.4*	0.0	0.5
143	Togo	5.4	*5.4*	0.0	0.0	0.0	0.0
144	Trinidad & Tobago	*16.0*	*17.0*	2.7	*4.6*	8.0	13.8
145	Tunisia	17.1	27.5	1.0	2.2	0.0	0.0
146	Turkey	*30.1*	34.4	6.5	7.8	0.0	0.0
147	Turkmenistan	1.4	*1.5*	*0.1*	*0.1*	0.0	0.0
148	Uganda	3.7	7.9	0.0	0.0	0.0	0.7
149	Ukraine	6.5	10.6	1.7	*3.5*	0.9	1.8
150	United Arab Emirates	51.8	65.2	8.7	12.4	17.4	40.3
151	United Kingdom	71.9	76.2	25.6	28.2	20.5	33.9
152	United States	*71.8*	*74.0*	22.7	23.5	17.0	26.3
153	Uruguay	29.0	40.0	7.3	7.3	0.3	1.4
154	Uzbekistan	7.5	9.1	0.1	0.2	0.0	0.5
155	Venezuela	20.7	25.5	3.1	4.7	5.1	8.5
156	Viet Nam	20.8	23.9	1.5	2.4	0.0	0.0
157	Yemen	1.4	*1.6*	0.0	0.0	0.0	0.0
158	Zambia	4.9	5.5	*0.0*	0.0	0.0	0.0
159	Zimbabwe	10.9	11.4	0.1	0.1	0.0	0.0

Note: Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

Skills indicators

		Gross enrolment ratio				Adult literacy rate	
		Secondary		Tertiary			
	Economy	2007	2008	2007	2008	2007	2008
1	Albania	80.8	82.0	31.3	36.7	99.0	99.0
2	Algeria	83.2	85.0	23.9	25.4	75.4	75.4
3	Angola	21.7	22.7	3.8	5.1	67.4	67.4
4	Argentina	85.3	84.6	69.8	71.6	97.6	97.6
5	Armenia	89.8	88.1	34.2	36.0	99.5	99.5
6	Australia	147.9	146.8	75.0	74.8	99.0	99.0
7	Austria	99.9	100.3	50.3	51.0	99.0	99.0
8	Azerbaijan	88.8	105.6	15.2	15.8	99.5	99.5
9	Bahrain	96.5	96.3	29.2	28.5	88.8	88.8
10	Bangladesh	44.1	43.6	7.0	7.3	53.5	53.5
11	Belarus	95.3	89.3	68.4	70.6	99.7	99.7
12	Belgium	109.5	101.9	62.7	63.3	99.0	99.0
13	Benin	36.3	38.6	5.9	6.0	40.5	40.5
14	Bhutan	48.4	56.3	5.2	5.7	52.8	52.8
15	Bolivia	81.8	81.0	38.3	38.3	90.7	90.7
16	Bosnia and Herzegovina	89.1	90.2	33.5	34.3	96.7	96.7
17	Botswana	80.2	80.9	5.8	6.2	82.9	82.9
18	Brazil	100.1	98.3	30.0	32.5	90.0	90.0
19	Brunei Darussalam	96.9	96.7	15.4	16.0	94.9	94.9
20	Bulgaria	105.2	107.1	49.7	51.9	98.3	98.3
21	Burkina Faso	15.7	18.4	2.5	3.1	28.7	28.7
22	Cambodia	40.4	45.3	5.4	7.0	76.3	76.3
23	Cameroon	37.3	38.7	7.2	7.8	67.9	67.9
24	Canada	101.3	100.0	65.5	66.6	99.0	99.0
25	Cape Verde	81.3	82.8	9.6	11.9	83.8	83.8
26	Chad	19.0	20.4	1.9	2.3	31.8	31.8
27	Chile	90.6	91.6	52.1	54.6	96.5	96.5
28	China	74.0	76.1	22.1	24.6	93.3	93.3
29	Colombia	89.1	90.6	33.0	35.4	92.7	92.7
30	Comoros	45.8	48.4	2.8	2.9	75.1	75.1
31	Congo	48.0	50.3	3.8	3.8	87.5	88.3
32	Congo (Dem. Rep.)	32.2	34.8	5.1	5.4	67.2	67.2
33	Costa Rica	87.5	89.2	25.3	26.9	95.9	95.9
34	Côte d'Ivoire	33.7	35.5	8.4	8.8	48.7	48.7
35	Croatia	93.6	94.9	47.0	49.6	98.7	98.7
36	Cuba	92.6	91.4	108.7	121.5	99.8	99.8
37	Cyprus	97.8	98.0	36.2	38.9	97.7	97.7
38	Czech Republic	95.0	94.9	54.3	59.3	99.0	99.0
39	Denmark	119.2	117.7	80.3	84.2	99.0	99.0
40	Djibouti	25.4	29.5	2.6	3.2	72.1	73.0
41	Dominican Rep.	76.1	74.9	34.0	34.2	89.1	89.1
42	Ecuador	69.6	63.0	35.3	35.3	84.2	84.2
43	Egypt	80.1	80.6	34.1	35.9	66.4	66.4
44	El Salvador	64.4	63.6	23.9	24.5	82.0	82.0
45	Eritrea	34.1	35.8	0.5	0.4	64.2	64.2
46	Estonia	99.7	100.4	65.0	65.6	99.8	99.8
47	Ethiopia	32.1	33.4	3.6	3.6	35.9	35.9
48	Fiji	82.4	82.6	15.4	15.4	94.9	95.1
49	Finland	111.3	108.5	93.8	95.7	99.0	99.0
50	France	113.3	114.5	54.7	54.9	99.0	99.0
51	Gabon	54.8	55.2	6.6	6.6	86.2	86.2
52	Gambia	51.4	51.2	1.2	1.3	44.9	46.1
53	Georgia	89.0	90.0	37.0	34.3	99.5	99.5
54	Germany	100.6	100.7	46.2	46.2	99.0	99.0
55	Ghana	52.6	54.1	6.2	7.0	65.0	65.0
56	Greece	101.8	103.3	90.8	96.7	97.1	97.1
57	Guatemala	55.6	58.3	17.7	20.1	73.2	73.2
58	Guinea	36.5	35.8	6.4	7.9	29.5	29.5
59	Guinea-Bissau	12.5	11.6	6.4	7.9	47.4	48.7
60	Haiti	29.3	29.3	1.2	1.2	56.5	57.3
61	Honduras	63.8	64.5	17.1	18.7	83.6	83.6
62	Hong Kong, China	83.1	83.5	34.3	35.0	95.0	95.0
63	Hungary	96.7	96.0	67.2	72.8	98.9	98.9
64	Iceland	110.0	109.7	78.6	84.6	99.0	99.0
65	India	57.0	59.0	13.5	14.2	66.0	66.0
66	Indonesia	75.8	79.4	18.0	18.5	92.0	92.0
67	Iran (I.R.)	76.1	79.7	31.4	34.6	82.3	82.3
68	Ireland	113.4	114.6	61.2	62.8	99.0	99.0
69	Israel	91.5	91.0	60.4	61.1	96.5	96.7
70	Italy	99.9	100.2	67.1	69.8	98.9	98.9
71	Jamaica	90.2	91.3	20.0	20.2	86.0	86.0
72	Japan	100.7	100.4	57.9	59.4	99.0	99.0
73	Jordan	86.3	86.2	37.7	39.5	91.1	91.1
74	Kazakhstan	92.7	92.0	51.1	46.9	99.6	99.6
75	Kenya	51.7	58.3	3.5	3.6	73.6	73.6
76	Korea (Rep.)	97.5	98.5	96.1	98.0	99.0	99.0
77	Kuwait	88.7	89.2	16.7	15.8	94.5	94.5
78	Kyrgyzstan	86.2	86.0	42.8	44.3	99.6	99.6
79	Lao P.D.R.	44.0	43.9	11.5	13.4	72.7	72.7
80	Latvia	114.5	119.2	69.2	69.6	99.8	99.8

		Gross enrolment ratio				Adult literacy rate	
		Secondary		Tertiary			
	Economy	2007	2008	2007	2008	2007	2008
81	Lebanon	82.4	81.6	49.0	51.5	89.6	*89.6*
82	Lesotho	39.9	*41.4*	*4.1*	*4.6*	*82.2*	*82.2*
83	Libya	*93.5*	*90.8*	*62.4*	*64.2*	86.8	*86.8*
84	Lithuania	99.1	*98.5*	75.9	*79.2*	99.7	*99.7*
85	Luxembourg	95.4	*95.2*	*9.6*	*9.2*	99.0	99.0
86	Macao, China	97.1	91.8	54.7	56.5	*93.5*	*93.5*
87	Madagascar	27.4	30.1	3.5	3.4	*70.7*	*70.7*
88	Malawi	27.7	29.4	*0.4*	*0.4*	71.8	*71.8*
89	Malaysia	*69.1*	*69.8*	*24.9*	*24.3*	91.9	*91.9*
90	Maldives	*83.7*	*87.8*	0.2	*0.2*	97.0	*97.0*
91	Mali	30.9	34.8	4.2	5.4	*26.2*	*26.2*
92	Malta	*99.5*	*101.1*	*42.2*	*47.2*	92.4	*92.4*
93	Mauritania	*24.5*	*25.2*	3.8	*4.0*	55.8	*55.8*
94	Mauritius	88.7	87.6	*18.5*	13.7	87.4	*87.4*
95	Mexico	87.4	*89.5*	26.3	*27.3*	92.8	*92.8*
96	Moldova	86.1	83.1	40.7	39.9	99.2	*99.2*
97	Mongolia	92.2	95.1	47.7	49.8	97.3	*97.3*
98	Montenegro	87.9	*88.1*	*29.8*	*29.8*	97.0	*97.0*
99	Morocco	55.8	*59.3*	11.3	*11.5*	55.6	*55.6*
100	Mozambique	18.3	20.6	*2.2*	*2.7*	44.4	*44.4*
101	Myanmar	49.3	*51.2*	10.7	10.5	*89.9*	*89.9*
102	Namibia	64.7	65.8	*6.3*	8.9	88.0	*88.0*
103	Nepal	42.9	48.4	9.0	*10.1*	56.5	*56.5*
104	Netherlands	119.5	*119.2*	60.1	*61.0*	99.0	99.0
105	New Zealand	120.4	*121.5*	79.1	*81.3*	99.0	99.0
106	Nicaragua	69.1	67.9	*19.2*	*19.5*	*78.0*	*78.0*
107	Niger	10.5	11.0	1.0	1.2	*28.7*	*28.7*
108	Nigeria	30.5	*30.6*	*11.2*	*11.6*	72.0	*72.0*
109	Norway	112.5	*112.6*	75.9	*76.4*	99.0	99.0
110	Oman	89.0	88.1	25.8	*29.0*	84.4	*84.4*
111	Pakistan	32.4	32.9	5.2	5.2	*54.2*	*54.2*
112	Panama	70.2	71.2	45.0	*45.5*	93.4	93.6
113	Papua New Guinea	*22.7*	*22.7*	*15.4*	*15.4*	57.8	*57.8*
114	Paraguay	*65.9*	*65.7*	*26.7*	*26.9*	94.6	*94.6*
115	Peru	97.6	*99.5*	*35.3*	*36.2*	89.6	*89.6*
116	Philippines	81.4	*81.7*	*27.3*	*26.8*	93.4	*93.4*
117	Poland	99.8	*99.2*	66.9	*68.8*	99.3	*99.3*
118	Portugal	101.3	*100.0*	56.9	*57.6*	94.9	*94.9*
119	Qatar	95.1	93.2	11.2	11.0	93.1	*93.1*
120	Romania	87.5	*88.0*	58.3	*65.8*	97.6	*97.6*
121	Russia	84.0	*82.3*	75.0	*77.1*	99.5	*99.5*
122	Rwanda	19.9	21.9	*2.6*	4.0	*64.9*	*64.9*
123	Saudi Arabia	94.0	94.6	*32.6*	*35.2*	85.0	*85.0*
124	Senegal	26.8	30.6	6.4	8.0	*41.9*	*41.9*
125	Serbia	87.9	88.5	*29.8*	47.8	*97.0*	*97.0*
126	Seychelles	*117.8*	*119.2*	*1.8*	*1.8*	*91.8*	*91.8*
127	Singapore	*74.1*	*74.1*	*43.8*	*43.8*	94.4	*94.4*
128	Slovak Republic	92.8	*93.7*	50.1	*54.7*	*99.0*	*99.0*
129	Slovenia	93.5	*91.1*	85.5	*89.8*	99.7	*99.7*
130	South Africa	95.1	*96.6*	*15.6*	*15.8*	88.0	*88.0*
131	Spain	119.1	*120.4*	68.5	*69.8*	97.9	*97.9*
132	Sri Lanka	*88.8*	*89.5*	*5.3*	*5.3*	*90.8*	*90.8*
133	St. Vincent and the Grenadines	*89.3*	108.2	*53.1*	*57.0*	*96.0*	*96.0*
134	Sudan	31.8	33.5	*5.9*	*5.9*	*60.9*	*60.9*
135	Swaziland	53.3	*55.9*	*4.4*	*4.3*	83.8	*83.8*
136	Sweden	103.1	*96.4*	74.5	*74.4*	99.0	99.0
137	Switzerland	95.7	*96.3*	47.2	*48.6*	99.0	99.0
138	Syria	71.9	74.0	*15.7*	*15.7*	83.1	*83.1*
139	Tajikistan	83.7	84.4	19.8	20.2	99.6	*99.6*
140	Tanzania	*5.8*	*5.8*	1.5	*1.7*	72.3	*72.3*
141	TFYR Macedonia	84.2	*84.3*	35.5	*37.6*	97.0	*97.0*
142	Thailand	83.5	*86.9*	49.5	*51.4*	94.1	*94.1*
143	Togo	41.3	*42.2*	5.3	*5.4*	*65.0*	*65.0*
144	Trinidad & Tobago	87.3	*89.8*	*11.8*	*12.6*	98.7	*98.7*
145	Tunisia	90.2	*92.5*	31.6	*33.6*	77.7	*77.7*
146	Turkey	82.1	*82.0*	37.1	*40.3*	88.7	*88.7*
147	Turkmenistan	*100.3*	*102.3*	21.7	*21.7*	99.5	*99.5*
148	Uganda	22.9	*23.9*	*5.3*	*5.9*	73.6	*73.6*
149	Ukraine	94.2	94.4	76.4	79.4	99.7	*99.7*
150	United Arab Emirates	93.8	*97.7*	22.9	*22.9*	*90.0*	*90.0*
151	United Kingdom	97.4	*96.3*	59.0	*58.2*	99.0	99.0
152	United States	94.3	*94.7*	81.6	*82.2*	99.0	99.0
153	Uruguay	92.0	*89.4*	64.3	*71.2*	97.9	*97.9*
154	Uzbekistan	102.4	*104.9*	9.9	*9.2*	*96.9*	*96.9*
155	Venezuela	79.4	81.1	*57.1*	*61.9*	95.2	*95.2*
156	Viet Nam	69.6	*69.6*	*11.8*	12.2	93.7	93.8
157	Yemen	45.7	*45.7*	*9.2*	*9.0*	58.9	*58.9*
158	Zambia	43.9	51.8	*2.4*	*2.4*	70.6	*70.6*
159	Zimbabwe	41.0	*41.0*	*2.6*	*2.3*	91.2	*91.2*

Note: Data in italics refer to ITU estimates.
Source: ITU World Telecommunication/ICT Indicators database.

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