STATISTICAL COMMISSION and UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)
CONFERENCE OF EUROPEAN STATISTICIANS

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (UNCTAD)

INTERNATIONAL TELECOMMUNICATION UNION (ITU)

UNESCO INSTITUTE FOR STATISTICS (UIS)

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES (Eurostat)

Joint UNECE/UNCTAD/UNESCO/ITU/OECD/Eurostat Statistical Workshop:
Monitoring the Information Society: Data, Measurement and Methods
(Geneva, 8-9 December 2003)

Event related to the World Summit on the Information Society

WORLD TELECOMMUNICATION DEVELOPMENT REPORT 2003

ACCESS INDICATORS FOR THE INFORMATION SOCIETY

EXECUTIVE SUMMARY

Keynote paper*

Mr. Michael Minges, Head, Telecommunication Data & Statistical Unit (TDS)
International Telecommunication Union (ITU)

---

*   Due to the late submission, this paper could neither be translated nor reproduced and has been posted on Internet as submitted by ITU.

WORLD TELECOMMUNICATION DEVELOPMENT REPORT 2003

Access Indicators for the Information Society

Executive summary

December 2003

INTERNATIONAL TELECOMMUNICATION UNION

Introduction

The 2003 ITU *World Telecommunication Development Report: Access Indicators for the Information Society* has been specially prepared for the first phase of the World Summit on the Information Society (WSIS) (Geneva, 10-12 December 2003). This year's report examines the specific issue of measuring access to information and communication technologies (ICTs). ITU has long been involved in analysing access to ICTs. As early as 1984, the Maitland Commission Report, known as *"The Missing Link"*, first drew international attention to the large inequities in telephone access across the world. ITU's 1998 *World Telecommunication Development Report*—on "universal access"—updated the *Missing Link* findings in light of technological and regulatory changes affecting the telecommunication industry.

Until recently, infrastructure had been considered as the main obstacle to improving access to ICTs. Existing indicators are therefore often infrastructure-based, measuring such variables as the number of main telephone lines, and typically use telecommunication operators' data. But there is growing evidence that other factors, such as affordability and knowledge, are an important part of the access picture. It is widely recognized that new indicators are needed. The new environment, with a growing emphasis on reducing the digital divide, requires access and usage indicators disaggregated by socio-economic categories such as age, gender, income and location. To measure the ICT picture in full, new multi-stakeholder partnerships will be required involving not only the statistical agencies that are traditionally responsible for conducting surveys, but also policy-makers, the private sector, civil society, multilateral organisations and others involved the ICT arena.

In 2003, nearly two decades after the Missing Link findings, this new edition of the *World Telecommunication Development Report* seeks to help meet this need by identifying relevant indicators for measuring access of the world's populations to ICTs— helping to measure the extent to which countries and communities worldwide have genuine access to the information society. The report has six chapters. The *first* puts the information society in context, describing why new indicators are needed to follow trends and make comparisons. The *second* chapter discusses indicators for measuring individual, household and community access to ICTs showing their relevance for different policy objectives such as universal service or access. Chapter *three* looks at measuring ICT access in the key sectors of businesses, government and schools, where ICT use is crucial for electronic commerce, efficient public administration, and to encourage youth to participate in the information society. Chapter *four* examines the interrelationship between ICT indicators and the Millennium Development Goals, which have attracted considerable attention as a standard for identifying and measuring global development objectives. Chapter *five* examines the need for a relevant and inclusive ICT index to measure country progress. In conclusion, chapter *six* offers recommendations for improving the availability of information society access indicators.

1. Accessing the Information Society

At the time this report was prepared, the draft World Summit on the Information Society (WSIS) Declaration of Principles described the information society as a society where "…*everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and people[s] to achieve their full potential and improve their quality of life in a sustainable manner*." New ICTs enable instantaneous exchange of information and the delivery of innovative applications, for example in government, commerce, education and health. But without access to ICTs, many people around the world are still excluded. How far is the world from realizing the vision of *everyone* having access to the information society?
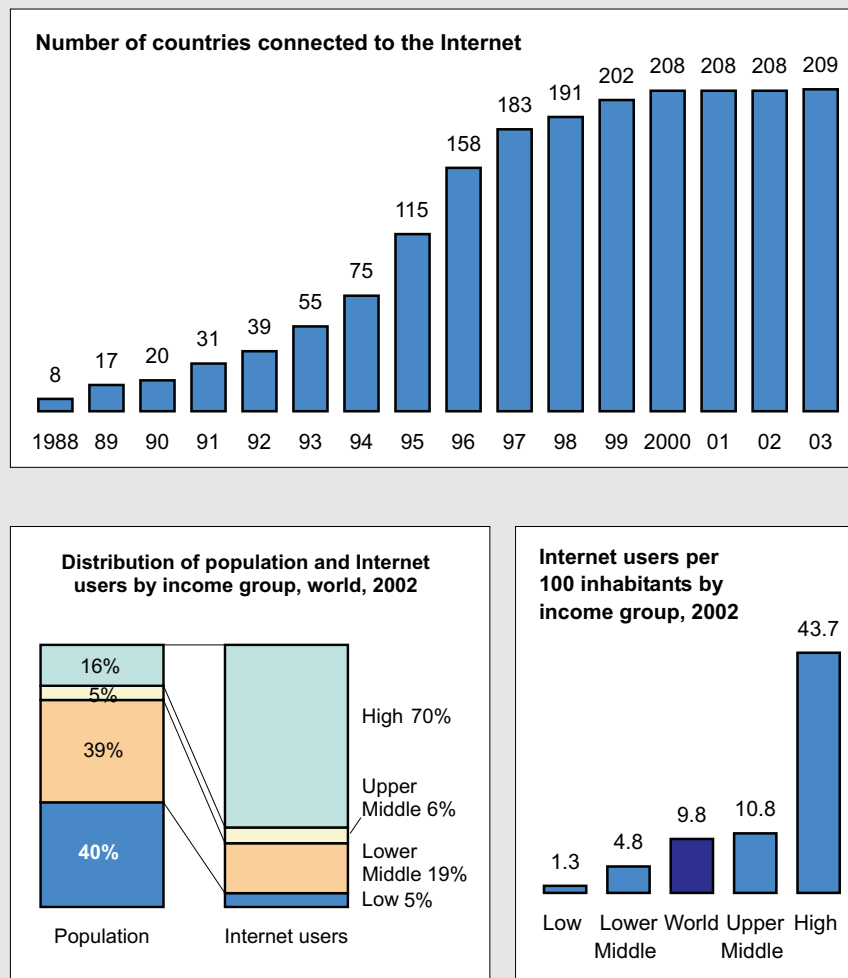
As we enter the new millennium, almost every country in the world has a direct connection to the Internet (Figure 1.1, top). Although this is an impressive achievement, ICT penetration levels vary among and within countries, creating a digital divide between those with high and those with low access levels (Figure 1.1, bottom). In order to move towards an inclusive information society, countries need meaningful data to identify disparities in access, to track progress and to make international comparisons. Only then can policy-makers and the private sector effectively target underserved segments of society. It is crucial to understand who has access, and where and how people use ICTs, in both developing and developed countries.

If it is time to measure the information society, it is also time to re-think traditional indicators. The convergence of ICT industries, and the new emphasis on addressing the digital divide, has led to the need for a set of policy-oriented information society statistics. Although a number of ICT indicators already exist, they are often inappropriate for policy analysis; few countries collect pragmatic indicators for measuring access, and even where they exist, international comparisons are often hampered by differences in definition and methodologies. They are also typically derived from administrative records rather than from purpose-built surveys. This statistical divide is as great as—or even greater than—the digital divide.

While some developed nations are racing ahead in measurement, tracking a multitude of factors such as ICT infrastructure, access, usage, volume and value, many developing nations are struggling to produce even basic ICT indicators. A globally relevant approach needs to concentrate on trends that can be measured to a comparable extent in *all* countries, not just those already collecting data. This report argues that *access* to ICTs is doubtless the most fundamental prerequisite for an inclusive information society. Measuring access is therefore a key priority for a set of indicators that are relevant to all countries of the world. This report explains the different ways of measuring access to ICTs and offers a middle way between too much and too little, between relevance for the majority of countries or only for a minority, between what is achievable within existing constraints and what would require a significant increase in resources.

Figure 1.1: All online, but a big divide

Number of countries with a direct connection to the Internet 1988-2003, and distribution and penetration of world population and Internet users by income group, 2002

Number of countries connected to the Internet

Year	Value
1988	8
89	17
90	20
91	31
92	39
93	55
94	75
95	115
96	158
97	183
98	191
99	202
2000	208
01	208
02	208
03	209

Distribution of population and Internet users by income group, world, 2002

Population:
- 16%
- 5%
- 39%
- 40%

Internet users:
- High 70%
- Upper Middle 6%
- Lower Middle 19%
- Low 5%

Internet users per 100 inhabitants by income group, 2002

Income group	Value
Low	1.3
Lower Middle	4.8
World	9.8
Upper Middle	10.8
High	43.7

Note: The US National Science Foundation Network (NSFNet), the Internet's first backbone, began accepting connections from overseas in 1998. Between 2000 and 2002, no new economies connected to the Internet. In September 2003, the Pacific island of Tokelau became the latest to connect to the global Internet.

Source: ITU World Telecommunication Indicators Database.

2. Measuring Access to ICTs

Picking the right indicator

Who has access to ICTs? Part of the answer depends on how ICTs are measured. The *conventional* way is to divide the number of access devices or services by the total population. While such *per capita* measures are convenient and useful for comparing general differences between and within countries, they can be misleading. This is because a per capita indicator does not reflect the socio-demographic composition of nations. For example, if there are 100 telephone lines in a country, all owned by the same person, then is that country better off than a country with 50 telephone lines owned by 50 different people? And is a country with fewer telephones but larger households worse off than a country with more telephones and smaller households? Per capita measures also fail to take into account the principles of sharing—of telephones in households or of computers in Internet cafés, for instance (Box 2.1). They also fail to take into account access to ICTs through the workplace, school or through government initiatives (see Chapter Three). The lack of detailed breakdown of data provided by per capita measures also make it impossible to set specific targets.

The fact that most ICT access analysis rely on such conventional indicators can often result in mistaken assumptions, as the following example illustrates (Figure 2.1). According to the conventional measure of telephone penetration, the number of fixed telephone lines per 100 inhabitants in Mexico is 14.7. From this it might be deduced that 85 per cent of the population does not have access to a telephone. But the figure does not take into account mobile telephone subscribers, nor does it include those that otherwise have access to the telephone service: 45 per cent of households have a fixed telephone, while 95 per cent of the population lives in communities with a public telephone service. In the case of the Internet too, Mexico's relatively low subscription penetration, two per cent, disguises the fact that almost 70 per cent of the population has access to the Internet through private or government-sponsored Internet cafés.

A more precise way of measuring access is to examine the availability of ICTs in households. *Universal service*—a fundamental regulatory concern—is quantified in this way, and is measured as a percentage. In most developing countries household penetration rates are low for newer ICTs. Therefore additional ways of analyzing access are needed, that focus more on overall availability.

Universal access indicators reflect the level of the population that is covered by ICTs. These indicators are typically expressed as the percentage of a country's inhabitants or households for which an ICT service is theoretically available. Universal access indicators are important because they help identify barriers to ICT use. A high level of ICT coverage but low level of use suggests that other barriers besides infrastructure are the bottleneck. Inhabitants may not use an ICT service for different reasons such as lack of interest or inability to pay. This should be a fundamental indicator for developing nations, yet few actively compile appropriate statistics on the level of universal access. Data from South Africa's 2001 census offer an example of how both universal service and access data can be captured in the same survey (Table 2.1).

The level of universal service for an ICT is dependent on a country's income. Countries with significant rural populations may want to pursue a two-pronged strategy: high levels of universal service in urban areas and widespread universal access in rural ones.

It is also useful to compile *usage* statistics. While the categories described above give an indication of the availability of infrastructure, the *number of users* measures the actual utilization of a given service.

Figure 2.1: Possession, access and use in Mexico
Fixed, mobile and Internet subscribers per 100 inhabitants; percentage of households with fixed telephone line and Internet access from the home; percentage of the population covered by fixed, mobile and Internet service, 2002
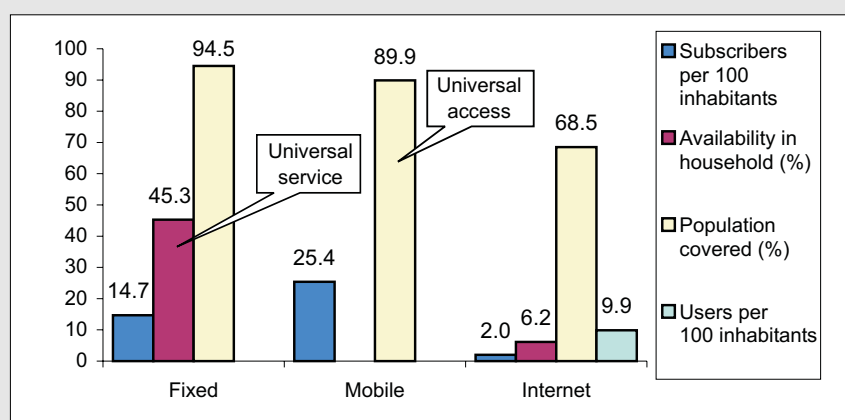
Note: Fixed and Internet coverage derived from localities with service.
Source: ITU World Telecommunication Indicators Database and Secretariat of Communications and Transport (SCT), Mexico.

Table 2.1: Measuring universal service and access
Telephone facilities available to households, per cent, 2001, South Africa

Telephone and cell-phone in dwelling	14.2%	**Universal Service = 42.4%**	
Telephone in dwelling	10.2%		**Universal Access = 94.0 %**
Cell-phone in dwelling	18.0%		
At a neighbour nearby	6.6%		
At a public telephone nearby	38.5%		
At another location nearby	3.2%		
At another location, not nearby	3.4%		
No access to a telephone	**6.0%**		
Total	**100.0%**		

Source: ITU adapted from Statistics South Africa, Census 2001.

What is an ICT?

The type of ICT devices and services useful for studying access to the information society include radios, televisions, fixed telephones, mobile telephones, personal computers (PC), and the Internet. The first three are often considered to be *old* ICTs while the latter three are considered *new*. This split between old and new is also reflected in statistical availability. Most developing nations tend to have data on the "older" ICTs, while most developed nations focus on the newer ones.
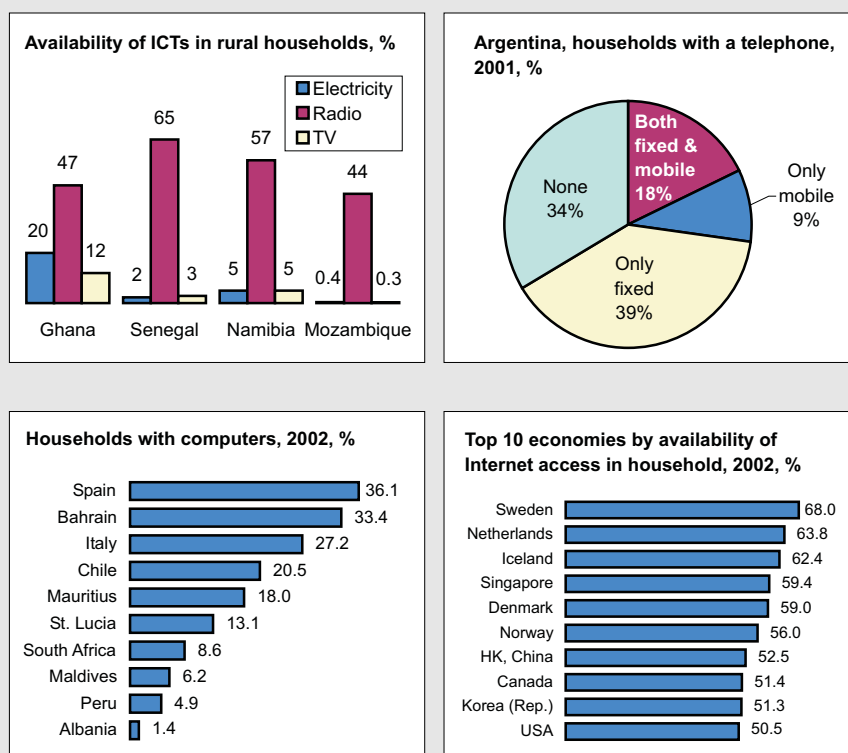
Radios increasingly fall into the category of having achieved universal service. In most developing nations, household radio ownership has surpassed the halfway mark. Televisions too are on the way to being ubiquitous in many countries. The biggest stumbling block to penetration of these ICTs in the lowest income nations appears to be electricity. Data from Africa show that while rural availability of radios—which require only batteries to operate—is relatively high, the level of household television ownership is tightly linked to the availability of electricity (Figure 2.2, top left). Newer ICTs also tend to be more dependent on the availability of energy or recharging facilities, suggesting that the *percentage of households with electricity* is a key indicator for measuring the potential for ICT access in developing nations.

The availability of telephones in homes has grown tremendously over the last decade, particularly through the large increase in mobile subscribers. Unfortunately though, few countries provide differentiated data on the number of households with *either* a fixed *or* mobile telephone. Argentina is one exception to this (Figure 2.2, top right). The wireless aspect of mobile telephony has given rise to a very useful new indicator for measuring universal telephone access. This is the *number of inhabitants within range of a mobile telephone signal.*

Access to a PC is important not only because is it an information device in its own right, but also because it is the main tool to enable Internet access. Most international comparisons of PC access are based on the stock available in the country, measured according to estimated data based on sales figures. This is usually not a very reliable or universally available statistic compared to those obtained through purpose-built surveys. There are a number of national statistical agencies that conduct surveys on the number of people that use a PC, and most developed nations compile data on the percentage of households with a computer. A growing number of developing nations are also compiling this statistic with emerging economies making strong progress (Figure 2.2, bottom left). A further useful indicator is the *percentage of households with Internet access from the home.* Most developed economies consider this a key indicator of the information society and almost all now compile it (Figure 2.2, bottom right).

Figure 2.2: ICTs in the home

Rural households with electricity, radio and television, per cent, various years, selected African countries (top left); households with mobile and fixed telephones, per cent, Argentina, 2001 (top right); households with computers, selected countries, 2002 (bottom left); and top ten countries by households with Internet access from the home, 2002, per cent (bottom right)

Availability of ICTs in rural households, %

- Electricity
- Radio
- TV

	Ghana	Senegal	Namibia	Mozambique
Electricity	20	2	5	0.4
Radio	47	65	57	44
TV	12	3	5	0.3

Argentina, households with a telephone, 2001, %

- Both fixed & mobile 18%
- Only mobile 9%
- Only fixed 39%
- None 34%

Households with computers, 2002, %

Country	%
Spain	36.1
Bahrain	33.4
Italy	27.2
Chile	20.5
Mauritius	18.0
St. Lucia	13.1
South Africa	8.6
Maldives	6.2
Peru	4.9
Albania	1.4

Top 10 economies by availability of Internet access in household, 2002, %

Country	%
Sweden	68.0
Netherlands	63.8
Iceland	62.4
Singapore	59.4
Denmark	59.0
Norway	56.0
HK, China	52.5
Canada	51.4
Korea (Rep.)	51.3
USA	50.5

Note: Data for Iceland and USA refer to 2001. Data for Sweden and Norway derived from population with access to Internet in the home.

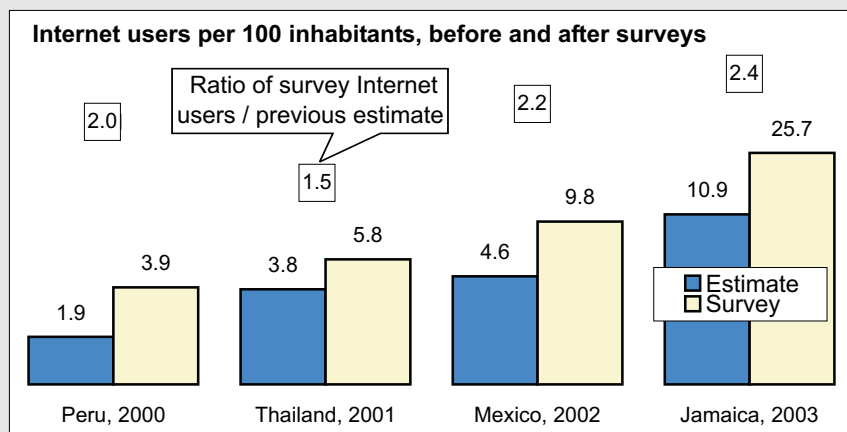*Source*: ITU adapted from national statistical offices.

Internet Users

Most references to the digital divide and the information society revolve around access to the Internet. Yet it is remarkable how little we know about the true extent of Internet access—particularly in developing nations. While most developed nations now have regular Internet user surveys, in developing nations estimating users is usually a matter of guesswork, often based on a multiple of the number of subscribers. However, with no benchmark reference, differing methodologies result in widely varying estimates.
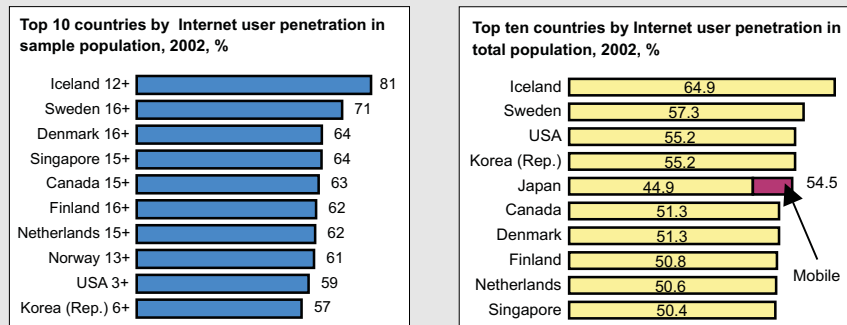
This method has also become less reliable due to the growing number of Internet cafés and Internet use in schools and universities, as well as the use of prepaid cards. In Togo, the incumbent telecommunication operator estimates the number of Internet users by surveying Internet cafés on the number of clients they receive. The resulting figure gives Togo the highest penetration rate among West African nations, even though its *per capita* income is among the lowest. The Internet user to subscriber ratio in Togo works out as 17, more than five times the figure commonly used. Either Togo is overestimating the number of users, or the other nations are underestimating. In another example, during the late 1990s the number of Internet users in Thailand was estimated based on the amount of domestic and international bandwidth. A January 2001 survey by the Thai National Statistical Office showed that there were some 3.5 million Internet users in the country compared to an estimated 2.3 million just a few months earlier.

A number of other countries that have started to carry out surveys have found that they had hitherto been underestimating the number of people who access the Internet. An Internet survey carried out in Jamaica in January 2003, for example, found that there were almost 675'000 users in the country, more than twice the figure suggested by previous estimates. A similar phenomenon occurred in Peru, with a November 2000 survey finding twice as many Internet users in the Capital (Lima) alone, than had been previously estimated for the entire country (Figure 2.3). Surprisingly perhaps, these findings suggest that the digital divide may not be as wide in some places as is assumed.

This evidence indicates that proper surveys are the only effective means to measure the number of Internet users. To that end, countries need to improve cooperation and agree on definitions of categories of Internet user. For instance, existing surveys often use differing age categories and frequency of individual Internet usage to define what constitutes an Internet user (Figure 2.4, left). Another question is whether a distinction should be made regarding the type of device used to access the Internet. In Japan, for example, some ten per cent of users access the Internet using their mobile phone only (Figure 2.4, right).

Figure 2.3: The shrinking Digital Divide?
Internet users per 100 inhabitants in Peru, Thailand, Mexico and Jamaica

Internet users per 100 inhabitants, before and after surveys

Ratio of survey Internet users / previous estimate

	Peru, 2000	Thailand, 2001	Mexico, 2002	Jamaica, 2003
Ratio	2.0	1.5	2.2	2.4
Estimate	1.9	3.8	4.6	10.9
Survey	3.9	5.8	9.8	25.7

Source: ITU adapted from OSIPTEL, INEI, NECTEC, COFETEL and JAMPRO.

Figure 2.4: Who is number one?
Top ten countries ranked by Internet users per 100 inhabitants in the survey age population and in the total population, 2002

Top 10 countries by Internet user penetration in sample population, 2002, %

Country	%
Iceland 12+	81
Sweden 16+	71
Denmark 16+	64
Singapore 15+	64
Canada 15+	63
Finland 16+	62
Netherlands 15+	62
Norway 13+	61
USA 3+	59
Korea (Rep.) 6+	57

Top ten countries by Internet user penetration in total population, 2002, %

Country	%
Iceland	64.9
Sweden	57.3
USA	55.2
Korea (Rep.)	55.2
Japan	44.9 / 54.5 Mobile
Canada	51.3
Denmark	51.3
Finland	50.8
Netherlands	50.6
Singapore	50.4

Note: The left chart shows the number of Internet users divided by the surveyed population (shown to the right of the country name). For example, data for Singapore refer to those aged 15 and over using the Internet divided by the total 15 and over population. The right chart shows the reported number of Internet users divided by the total population for country. For example, data for the Republic of Korea refer to those six years old and over using the Internet divided by the total population of the country. Data for Japan also includes users only accessing the Internet from mobile phones. Data for Canada, Netherlands and the United States are estimated.
Source: ITU adapted from national Internet user surveys and ITU estimates.

Box 2.1: Community access indicators

The majority of households in developing nations do not have newer information and communication technologies (ICTs) such as computers and the Internet. For the immediate future, the citizens of most developing nations will most likely gain access to ICTs through relatives or friends, work, school or in public places such as Internet cafés. This observation is borne out by surveys in developing countries, which show that, for many of their populations, Internet cafés are a primary location of Internet access.

This makes measuring access to community ICT facilities particularly important. In 2002, the ITU membership passed a Resolution calling on ITU to develop community access indicators. In October 2003, the ITU Workshop on Indicators for Community Access to ICTs proposed several indicators for measuring community access including: *the number of localities with public Internet access centres*, and the *number of users that use public Internet access centres*.

Mexico is keen to enhance nationwide access to ICTs. As a key element of its e-Mexico initiative, the nation plans to install some 50'000 digital community centres to enhance ICT access in underserved areas. It has carried out an analysis of the potential population that will have access; the methodology can serve as a reference for other nations (Box Figure 2.1).

Box Figure 2.1: DCCs in Mexico

Population to be reached by digital community centres (DCC), by locality size, Mexico
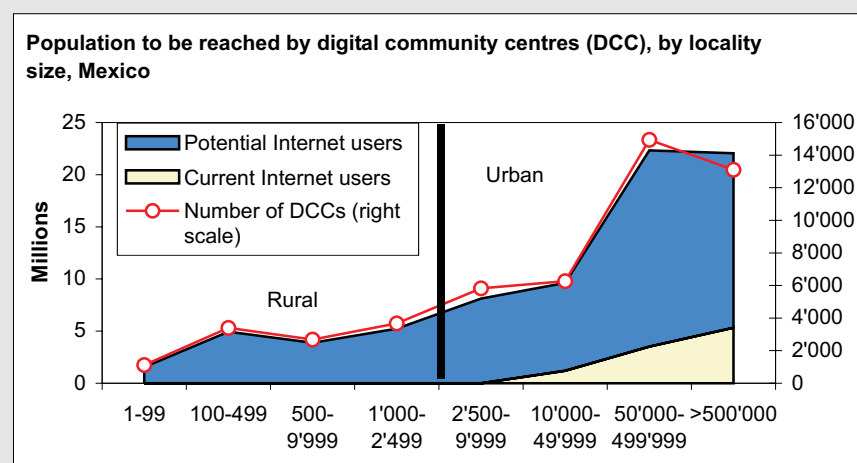
Note: The number of DCCs required is calculated by assumptions about the average number of users served based on hours of operation and frequency of use. Potential Internet users are all those aged six and over who can read and write.
Source: ITU adapted from COFETEL (Mexico).

3. ICTs in Business, Education and Government

While household access to ICTs forms one part of the picture, access to ICTs in business, education and government is particularly critical for development of the information society. Information technology in these sectors boosts efficiency and transparency, provides opportunities for the public and private sector and citizens to interact online, and offers access for those who do not have ICT access at home (Figure 3.1, top left).

Business use of ICTs raises productivity, helping to boost economic development. ICT infrastructure is a fundamental prerequisite for enterprises to carry out electronic transactions. The availability of ICTs in business also has a social dimension, with many workers developing ICT skills and obtaining access to the Internet through their workplace, which they can then use in other areas.

The best approach for collecting data on business usage involves surveying a representative sample of enterprises. Much of the work carried out in the domain of ICTs in the business sector has taken place in developed nations, including the design of model questionnaires to enhance international comparability. However, there are still some discrepancies between different surveys concerning the categories of company size that are used.

By contrast, few developing nations have carried out official surveys, although a number of specialized surveys have been carried out in these countries—particularly for small and medium sized enterprises. The available data suggest that the business digital divide is not so much between countries, but between different sizes of companies (Figure 3.1, top right).

Though a wide variety of indicators can be applied to measure business ICT penetration, a minimum set of indicators should ideally include the *percentage of businesses with personal computers*, *percentage of businesses with Internet access* and *percentage of business with a website*.

Education is a key component of a country's transformation towards actively and fully participating in the global information society. Surveys confirm that educational institutions can have an important role as Internet access locations. Research also seems to indicate that connecting schools and bringing students online in developing countries may have a major impact on raising the number of ICT users.

Unlike the business sector, the educational sector is generally centralized, which has the advantage that it is not always necessary to carry out surveys. The easiest way to collect statistics is through the existing channels between Ministries of Education and

the schools. Similarly to the business sector, developed countries have been at the forefront of collecting ICT statistics in the educational domain. The data collected is extensive, often reflecting qualitative as well as quantitative differences in infrastructure and use.

An overview of the existing data in developed and particularly in developing countries highlights the need to agree on a limited number of indicators that can both reflect global developments and include as many countries as possible. The two indicators that are the most appropriate are the *student to computer ratio*, as well as the *percentage of schools connected to the Internet* (Figure 3.1, bottom left). A common methodology and categorization of data are needed for international comparability, including a reflection of the policy of some countries in creating "magnet" ICT schools. An overall average may not reflect progress made, whereas a breakdown by percentiles of schools and into primary, secondary and tertiary schools, would.
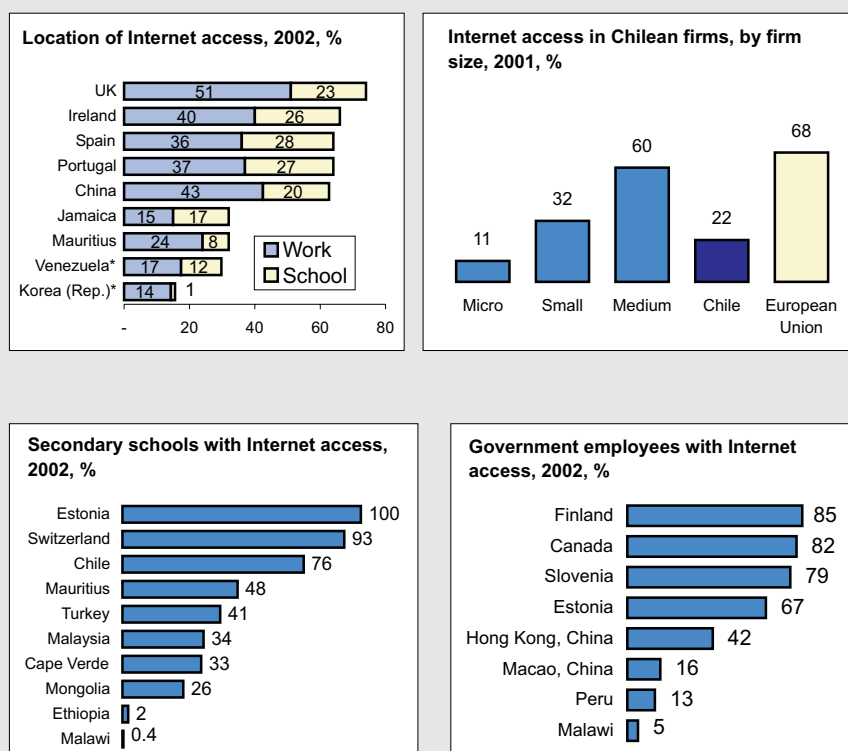
As shown in numerous country examples, expanding ICT use in **government** has a major impact on enhancing efficiency, accountability and transparency of processes in the public domain. But the ability to provide electronic government services depends on the level of ICT adoption. The availability of ICTs in public administration also has social implications, since government workers can develop ICT skills and access the Internet from the workplace.

Although the importance of government ICT indicators is not disputed, harmonized statistics are nevertheless difficult to obtain. This is because of the complexity of defining the unit of measurement. Government agencies include federal, regional and local entities, and the mix of these varies from country to country depending on the type of administration. In addition, very few developing countries compile statistics on ICT use in government.

Government ICT penetration can be measured by a wide number of variables, but a useful basis would be to include indicators on the *percentage of government offices connected to the Internet*, *percentage of government offices with a website* and *percentage of government employees who use the Internet in their job* (Figure 3.1, bottom right).

Figure 3.1: ICTs at work and school

Percentage of Internet users accessing the Internet from work or school, 2002, selected countries (top left); percentage of business with Internet access by firm size, 2001, Chile (top right); secondary schools with Internet access, 2002, per cent, selected countries (bottom left) and government employees with Internet access, 2002, per cent, selected economies (bottom right)

Location of Internet access, 2002, %

Country	Work	School
UK	51	23
Ireland	40	26
Spain	36	28
Portugal	37	27
China	43	20
Jamaica	15	17
Mauritius	24	8
Venezuela*	17	12
Korea (Rep.)*	14	1

Internet access in Chilean firms, by firm size, 2001, %

Micro	Small	Medium	Chile	European Union
11	32	60	22	68

Secondary schools with Internet access, 2002, %

Country	%
Estonia	100
Switzerland	93
Chile	76
Mauritius	48
Turkey	41
Malaysia	34
Cape Verde	33
Mongolia	26
Ethiopia	2
Malawi	0.4

Government employees with Internet access, 2002, %

Economy	%
Finland	85
Canada	82
Slovenia	79
Estonia	67
Hong Kong, China	42
Macao, China	16
Peru	13
Malawi	5

Note: In the top left chart, refers to multiple choices except for countries marked * which refer to the most frequent access location. In the top right chart, the size of Chilean firms is classified by turnover. EU refers to European Union. In the bottom left chart, data for Malaysia refers to 2000, for Ethiopia to 2001 and for Chile to 2003. In bottom right chart, data for Canada refers to 2001.

Source: ITU adapted from official national sources.

4. ICTs and the Millennium Development Goals

A turn of the century is often marked by reflection on the past and fresh aspirations for a better future. One way this has been addressed at the global level is through the **Millennium Declaration**, adopted by 189 Member States of the United Nations at its fifty-fifth General Assembly in September 2000.

As one of the eight Millennium Development Goals (MDG), the Declaration makes a commitment that the number of people who live on less than one dollar a day should be halved by the year 2015. The goals outline specific areas for achieving improvement in people's lives including in the areas of poverty reduction, education, gender, health and the environment. The last goal, developing a global partnership for development, proposes a means of achieving the first seven. Attached to the eight goals are 18 specific targets for achieving the MDGs (Table 4.1). A formal process for the systematic tracking and reviewing of progress on the path to achieving the MDGs is also foreseen. This monitoring activity aims to turn the goals and targets into widely recognized measures of international cooperation. Monitoring is based on 48 indicators formulated to measure the targets.

Significantly for the work of ITU, and for this report, the Millennium Declaration acknowledges that ICTs are an important tool to achieve its overall goals. ICTs can help alleviate poverty, improve the delivery of education and health care, make governments more accessible and accountable to the people, and much more. Target 18 of Goal 8 calls upon the Declaration's adherents to: "*In cooperation with the private sector make available the benefits of new technologies, specifically information and communications.*"

Three indicators were chosen to measure ICT availability in countries. These indicators are the *total number of telephone subscribers per 100 inhabitants*, *personal computers per 100 inhabitants* and *Internet users per 100 inhabitants*. They were selected because they are widely available, and cover many years and most countries.

Of all the different MDG targets, number 18 is the most open-ended (raising the questions of which ICTs should be made available, to whom and by when), but it is also the one where the most progress was made during the 1990s. All of the developing sub-regions of the world have grown their fixed and mobile telephone networks (total teledensity) to a greater extent since 1990 than in the entire period before that date (Figure 4.1). In the exceptional case of East Asia (which includes China), the level of total teledensity in 2002 was more than 35 times higher than ten years earlier, and in all cases, except the developing Pacific nations, total teledensity was at least five times higher in 2002 than it was in 1992.

Table 4.1: Eight Goals, 18 Targets, 48 Indicators
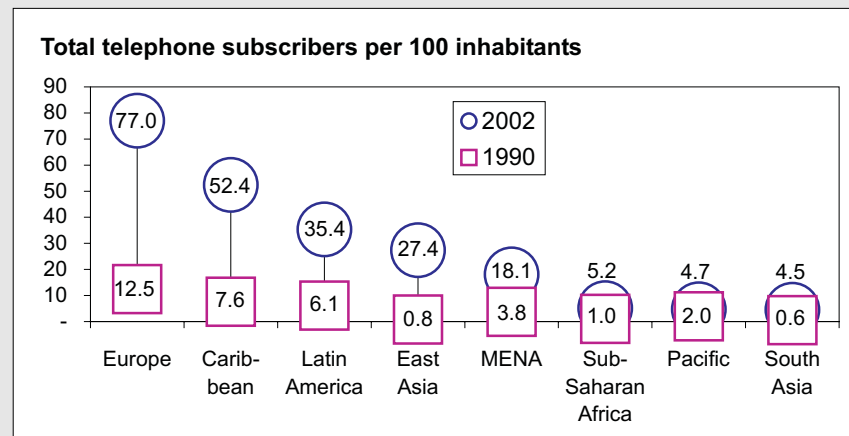*Millennium Development Goals and targets*

Goals	Targets
1. Eradicate extreme poverty and hunger	1. Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day
	2. Halve, between 1990 and 2015, the proportion of people who suffer from hunger
2. Achieve universal primary education	3. Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
3. Promote gender equality and empower women	4. Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015
4. Reduce child mortality	5. Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
5. Improve maternal health	6. Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio
6. Combat HIV/AIDS, malaria, and other diseases	7. Have halted by 2015 and begun to reverse the spread of HIV/AIDS
	8. Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
7. Ensure environmental sustainability	9. Integrate the principles of sustainable development into country policies and program and reverse the loss of environmental resources
	10. Halve, by 2015, the proportion of people without sustainable access to safe drinking water
	11. Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers
8. Develop a global partnership for development	12-17. Separate targets for developing trading and financial systems, addressing the special needs of LDCs, SIDS and land-locked countries, debt sustainability, youth employment, and providing affordable drugs
	18. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

Note: For a list of the 48 indicators see the Millennium Indicators Database at http://millenniumindicators.un.org/unsd/mi/mi_goals.asp.

Source: Adapted from UNDP *Human Development Report*, 2003.

Figure 4.1: A decade of ICT progress
Total telephone subscribers (main telephone lines and mobile subscribers) per 100 inhabitants, in 1992 and 2002, in developing regions

Total telephone subscribers per 100 inhabitants

Region	2002	1990
Europe	77.0	12.5
Caribbean	52.4	7.6
Latin America	35.4	6.1
East Asia	27.4	0.8
MENA	18.1	3.8
Sub-Saharan Africa	5.2	1.0
Pacific	4.7	2.0
South Asia	4.5	0.6

Note: Developed countries are excluded. Europe includes Central Asia.
MENA = Middle East and North Africa. For definitions of regions, see:
www.worldbank.org/data/countryclass/classgroups.htm.
Source: ITU World Telecommunication Indicators Database.

Although ICT growth in itself is widely taken to signify "progress", the impact of ICTs is less easy to measure and assess. While it is certain that ICTs are generating changes in the social, economic, cultural and political aspects of society, it is difficult to quantify their impact on these areas and to separate their influence from those of other factors. A shortage of micro-level studies to measure the impact makes analyses difficult.

There are numerous anecdotal accounts about ICTs dramatically improving and even saving lives. While useful for raising awareness, in order to provide a firm basis for evaluation these stories need to be translated into indicators to measure the impact of ICTs within and across countries. It is also often forgotten that, while the net effect of ICTs is generally perceived as positive, they can also have a downside with negative impacts on health and the environment, and can aggravate existing disparities.

One reason for the lack of compelling evidence is that MDG monitoring only started quite recently. Although researchers have identified the possible impacts of ICTs, the creation of indicators to actually measure this is in its infancy. The economic impact of ICTs is the easiest area to measure, with a number of studies showing how investment in information technology has a multiplier effect on economic growth. Box 4.1 discusses issues relevant to trying to quantify the impact of ICTs on Goal 3 of the MDGs, aimed at promoting gender equality and empowering women.

Box 4.1: ICTs and gender

There are two dimensions to the impact of information and communication technologies (ICTs) on gender. One is the gender composition of ICT access. The other is the influence that ICTs can have on reducing gender inequality.

Worldwide, there is only limited availability of gender-disaggregated statistics on ICT use. One indicator with some level of gender-disaggregated data is, however, available from surveys on Internet usage (Box Figure 4.1, left). For those economies where surveys are available, a simple average indicates that 43 per cent of Internet users are female. For those economies where historical data is available, the trend is towards an increasing proportion of female users over time (Box Figure 4.1, right). Unfortunately however, this data is mostly only available for developed nations.

Where women are limited to the more traditional roles of homemaker and mother, their ability to attend school or work can be inhibited. In some countries, social customs make it difficult for women to participate in activities that involve mixing with men. ICTs can promote gender equality therefore, by providing online opportunities to women that are not always available in the offline world. For example, telework, working from home through a telecommunication connection, allows women to participate in the workforce if they have to stay at home. Data from Ireland found that females who are part of a couple with at least one child under five years of age are the most likely to be teleworking. Like telework, ICT-based distance education allows women to study online from home. Studies have found that in many countries female participation in distance education is greater than that of men.

While female access to ICTs can have an impact on reducing the gender divide, one of the Millennium Development Goals (MDGs), there is also a reverse impact. Many studies have shown that education has a direct impact on the ability to use ICTs. So while ICTs can impact the MDGs, the MDGs can also impact ICTs.

Box Figure 4.1: Female Internet users

Source: ITU World Telecommunication Indicators Database, Spanish Internet Users Association.
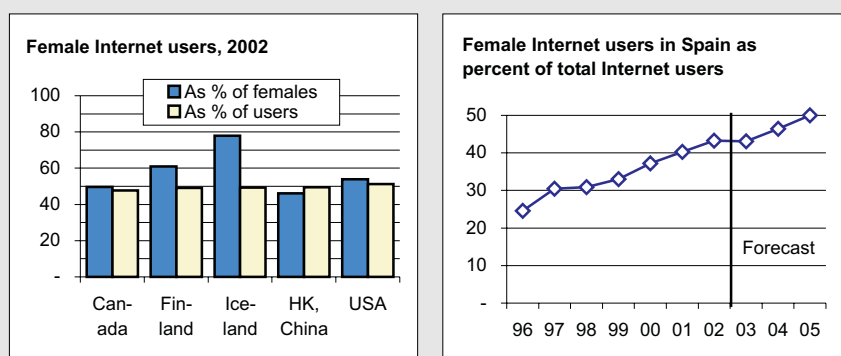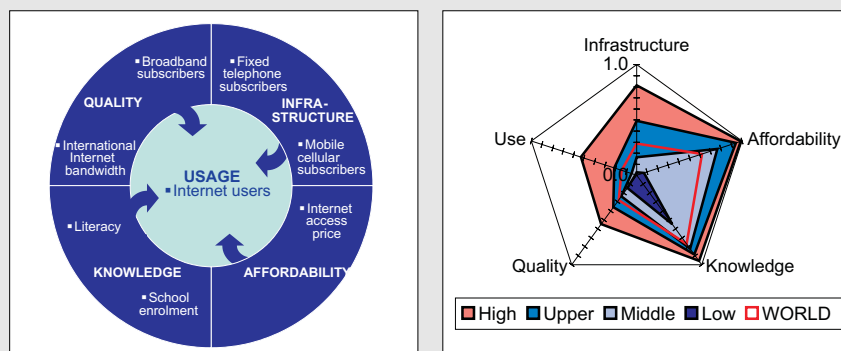
5.   The ITU Digital Access Index

This report has proposed a number of indicators for measuring access to the information society. Countries often want to compare their status with others, set targets and measure progress. However, no single indicator is sufficient to measure access to the information society. One solution is the creation of an index using a composite of indicators. Several organizations have developed indices for ranking countries in relation to their ICT capabilities. However none is completely satisfactory for measuring access to ICTs. The most serious drawback is that existing ICT indices are all limited in their country coverage. Most are not designed to specifically cover access to ICTs. Some have methodological weaknesses or subjective biases. Most indexes also use a large number of variables, inhibiting transparency.

The ITU's Digital Access Index (DAI) is a new index, which measures the overall ability of individuals in a country to access and use new ICTs. The DAI overcomes limitations of earlier indices in terms of its specific focus, wide country coverage and choice of variables. It is composed of a few considered variables in order to include the widest number of countries and enhance transparency.

The DAI is built around four fundamental factors that impact a country's ability to access ICTs: infrastructure, affordability, knowledge and quality. A fifth factor, actual usage of ICTs, is important for matching the theory of the index with the reality in a country (Figure 5.1). The inclusion of usage also captures other aspects not explicitly accounted for in the other four factors. Eight indicators are used to represent the five factors. Each indicator is divided by a "goalpost" the maximum value established for that indicator (Table 5.1). Each indicator is then summed to obtain an overall index score.

The DAI has been calculated for 178 economies (Table 5.2). They are classified according to high, upper, medium and low ICT access. The DAI allows countries to see how they compare to peers and their relative strengths and weaknesses. It also provides a transparent and globally measurable way of tracking progress towards improving access to ICTs.

Figure 5.1: Factors affecting ICT access

Indicators making up the Digital Access Index and values by DAI level, 2002

Source: ITU.

Table 5.1: DAI goalposts

Digital Access Index (DAI) maximum values

Indicator	Goal-post	Note
Fixed telephone subscribers per 100 inhabitants	60	Each has one half weight for infrastructure
Mobile subscribers per 100 inhabitants	100	
Adult literacy	100	Literacy has two-third weight and enrolment one-third weight for knowledge
Overall school enrolment (primary, secondary and tertiary)	100	
Internet access price (20 hours per month) as percent of per capita income	100	The inverse of this indicator is used
Broadband subscribers per 100 inhabitants	30	Each has one half weight for quality
International Internet bandwidth per capita	10'000	
Internet users per 100 inhabitants	85	

Note:　The following steps are used to calculate the DAI:
A) Each indicator is divided by its goalpost. B) The resulting values are multiplied by their weight and added to obtain a category index. For example, the infrastructure index is calculated as follows: [fixed telephone lines per 100 inhabitants / 60 * (1/2)] + [mobile subscribers per 100 inhabitants / 100 * (1/2)]. C) The overall DAI is obtained by multiplying each of the five category indices by 0.2 and adding them up.
Source: ITU.

Table 5.2: DAI results
Digital Access Index value, by access level, 2002

HIGH ACCESS		UPPER ACCESS		MIDDLE ACCESS		LOW ACCESS	
Sweden	0.85	Ireland	0.69	Belarus	0.49	Zimbabwe	0.29
Denmark	0.83	Cyprus	0.68	Lebanon	0.48	Honduras	0.29
Iceland	0.82	Estonia	0.67	Thailand	0.48	Syria	0.28
Korea (Rep.)	0.82	Spain	0.67	Romania	0.48	Papua New Guinea	0.26
Norway	0.79	Malta	0.67	Turkey	0.48	Vanuatu	0.24
Netherlands	0.79	Czech Republic	0.66	TFYR Macedonia	0.48	Pakistan	0.24
Hong Kong, China	0.79	Greece	0.66	Panama	0.47	Azerbaijan	0.24
Finland	0.79	Portugal	0.65	Venezuela	0.47	S. Tomé & Principe	0.23
Taiwan, China	0.79	United Arab Emirates	0.64	Belize	0.47	Tajikistan	0.21
Canada	0.78	Macao, China	0.64	St. Vincent	0.46	Equatorial Guinea	0.20
United States	0.78	Hungary	0.63	Bosnia	0.46	Kenya	0.19
United Kingdom	0.77	Bahamas	0.62	Suriname	0.46	Nicaragua	0.19
Switzerland	0.76	St. Kitts and Nevis	0.60	South Africa	0.45	Lesotho	0.19
Singapore	0.75	Poland	0.59	Colombia	0.45	Nepal	0.19
Japan	0.75	Slovak Republic	0.59	Jordan	0.45	Bangladesh	0.18
Luxembourg	0.75	Croatia	0.59	Serbia & Montenegro	0.45	Yemen	0.18
Austria	0.75	Bahrain	0.58	Saudi Arabia	0.44	Togo	0.18
Germany	0.74	Chile	0.58	Peru	0.44	Solomon Islands	0.17
Australia	0.74	Antigua & Barbuda	0.57	China	0.43	Uganda	0.17
Belgium	0.74	Barbados	0.57	Fiji	0.43	Zambia	0.17
New Zealand	0.72	Malaysia	0.57	Botswana	0.43	Myanmar	0.17
Italy	0.72	Lithuania	0.56	Iran (I.R.)	0.43	Congo	0.17
France	0.72	Qatar	0.55	Ukraine	0.43	Cameroon	0.16
Slovenia	0.72	Brunei Darussalam	0.55	Guyana	0.43	Cambodia	0.16
Israel	0.70	Latvia	0.54	Philippines	0.43	Lao P.D.R.	0.15
		Uruguay	0.54	Oman	0.43	Ghana	0.15
		Seychelles	0.54	Maldives	0.43	Malawi	0.15
		Dominica	0.54	Libya	0.42	Tanzania	0.15
		Argentina	0.53	Dominican Rep.	0.42	Haiti	0.15
		Trinidad & Tobago	0.53	Tunisia	0.41	Nigeria	0.15
		Bulgaria	0.53	Ecuador	0.41	Djibouti	0.15
		Jamaica	0.53	Kazakhstan	0.41	Rwanda	0.15
		Costa Rica	0.52	Egypt	0.40	Madagascar	0.15
		St. Lucia	0.52	Cape Verde	0.39	Mauritania	0.14
		Kuwait	0.51	Albania	0.39	Senegal	0.14
		Grenada	0.51	Paraguay	0.39	Gambia	0.13
		Mauritius	0.50	Namibia	0.39	Bhutan	0.13
		Russia	0.50	Guatemala	0.38	Sudan	0.13
		Mexico	0.50	El Salvador	0.38	Comoros	0.13
		Brazil	0.50	Palestine	0.38	Côte d'Ivoire	0.13
				Sri Lanka	0.38	Eritrea	0.13
				Bolivia	0.38	D.R. Congo	0.12
				Cuba	0.38	Benin	0.12
				Samoa	0.37	Mozambique	0.12
				Algeria	0.37	Angola	0.11
				Turkmenistan	0.37	Burundi	0.10
				Georgia	0.37	Guinea	0.10
				Swaziland	0.37	Sierra Leone	0.10
				Moldova	0.37	Central African Rep.	0.10
				Mongolia	0.35	Ethiopia	0.10
				Indonesia	0.34	Guinea-Bissau	0.10
				Gabon	0.34	Chad	0.10
				Morocco	0.33	Mali	0.09
				India	0.32	Burkina Faso	0.08
				Kyrgyzstan	0.32	Niger	0.04
				Uzbekistan	0.31		
				Viet Nam	0.31		
				Armenia	0.30		

Note: On a scale of 0 to 1 where 1 = highest access. DAI values are shown to hundreds of a decimal point. Countries with the same DAI value are ranked by thousands of a decimal point.
Source: ITU.

6.   Conclusions

The world is still a long way from agreeing upon a common set of information society access indicators with extensive and detailed coverage. In cases where data do exist, they are sometimes unreliable, incomplete, out of date or not internationally comparable. They are also often difficult to locate and compile. The problem is particularly acute for developing nations, some of which lack the technical expertise or resources to collect, compile and disseminate ICT statistics.

In an effort to standardize a minimum set of information society access indicators that every country should collect, ITU proposes its basket of *e-ITU indicators* (Table 6.1). In addition, the following recommendations are made to improve the collection of the required indicators and enhance international comparability:

- Model surveys exist for collecting data on business and individual and household use of ICTs. These should be followed to enhance international comparability. In cases where household or business surveys are already conducted by national statistical offices, efforts should be made to include ICT access questions.

- Developed nations and multilateral agencies should assist developing nations to compile ICT indicators by providing technical assistance and material resources. Developing economies that have already conducted ICT surveys could assist other countries with methods and questionnaire construction. International assistance should be provided to get more national statistical offices online.

- ICT policy-makers should liaise with their statistical offices to ensure the required data are collected—preferably through purpose-built surveys. There is also a need to make available data more visible. Countries should identify a prominent website location for information society statistics. At the international level, a portal for information society indicators could be created, containing links to national statistics as well as model questionnaires and other methodological information.

- Good statistical practice is important; transparency, clarity, timeliness and relevance are critical. Some countries provide regional breakdowns but do not provide a country total, and sometimes dates to which the data pertain are not clear. Terms such as access, subscriber and user are often loosely employed though they mean different things. Surveys should be conducted on a regular basis, and at least annually.

A partnership between international organizations, national statistical agencies and ICT policy-makers can help achieve the objective of a core set of information society access indicators for a large number of countries. The second phase of the World Summit on the Information Society (WSIS), scheduled to take place in Tunis, Tunisia, in 2005, is a particularly appropriate deadline for this. If this can be achieved, the world will have taken a giant step towards better measuring and understanding the information society.

Table 6.1: e-ITU indicators

Indicator	Category
1. Percentage of households with electricity	Universal service
2. Percentage of households with a radio	Universal service
3. Percentage of households with a television	Universal service
4. Percentage of households with a telephone *	Universal service
5. Percentage of households with a personal computer	Universal service
6. Percentage of households with Internet access **	Universal service
7. Percentage of population covered by mobile telephony	Universal access
8. Percentage of population that use a computer	Universal access
9. Percentage of population with access to the Internet	Universal access
10. Percentage of businesses with computers	Business §
11. Percentage of businesses with Internet access	Business
12. Percentage of businesses with a website	Business
13. Student to computer ratio	Education §
14. Percentage of schools with Internet access	Education
15. Percentage of government offices with Internet access	Government §
16. Percentage of government offices with a website	Government
17. Percentage of government employees with Internet access ***	Government
18. Fixed telephone subscribers per 100 inhabitants	DAI §§
19. Mobile cellular subscribers per 100 inhabitants	DAI
20. Internet access tariff (20 hours per month) as percentage of per capita income	DAI
21. International Internet bandwidth per inhabitant	DAI
22. Broadband subscribers per 100 inhabitants	DAI
23. Internet users per 100 inhabitants	DAI

Note :   * Fixed and mobile. ** From the home. *** From the office. § Broken down by size of business (small, large, etc.), type of school (e.g. primary, secondary, etc.) and administration level (central, local, etc.). §§ Digital Access Index.
Source: ITU.

Box 6.1: Sources and analysis of ICT data

ITU is endeavouring to enhance ICT analysis by expanding from compiling indicators from administrative records to include survey data also. One problem has been that traditional data correspondents, usually the telecom regulators, often have scarce contact with national statistical offices. ITU has therefore carried out new work by locating and analysing census and household surveys.

National statistical offices that have websites have provided a useful starting point. Some provide the results of surveys online, including data on ICTs when available. However, where online data are lacking or difficult to locate, gathering such information is difficult.

One solution to finding official data is the use of regional reports. In Europe, governmental ICT statistical publications are available for the Baltic and Nordic countries. The European Union, for example, disseminates some ICT data on its existing and prospective members. The Organisation for Economic Co-operation and Development (OECD) also publishes household ICT data for its member countries.

Another solution is the use of websites featuring electronic libraries of household surveys, or that compile data from these. The World Bank's Africa Household Survey Databank for example, has electronic versions of census and survey documents for countries in that region, many of which do not have individual websites. The Demographic and Health Surveys website provides data for many developing countries on households with television, radio and telephone that have likewise been culled from official statistics.

While few countries are able to provide a complete set of ICT indicators, even fewer analyse available data in any detail. There are however some exceptions, where either the national statistical office or the government agency responsible for ICTs publishes reports analysing the data. In Latin America for instance, both Chile and Peru have compiled in-depth reports on the use of ICTs in their countries. In East Asia, the Republic of Korea produces what is perhaps the most comprehensive analysis of computer and Internet use anywhere, covered in a number of government publications. Hong Kong, China and Singapore produce analytical reports on the use of ICTs in households. In Africa and the Middle East however, there are few ICT surveys let alone in-depth analysis of access. One notable exception is Mauritius, which publishes surveys on household ICTs.

While many nations are becoming increasingly aware about the importance of access to ICTs, very few developing country governments actually compile and analyse the data needed to assess and improve the situation. As long as this situation persists, so too will the digital divide, since meaningful policies for enhancing access to ICTs cannot be designed without detailed statistics. Alternatively, we may be bridging the divide without knowing about it!