Gauging ICT potential around the world

ITU releases the first global Digital Access Index*

Access to information and communication technologies (ICT) is doubtless the most fundamental prerequisite for an inclusive information society. At least this is one of the key messages as the first phase of the World Summit on the Information Society gets under way in Geneva in December 2003.

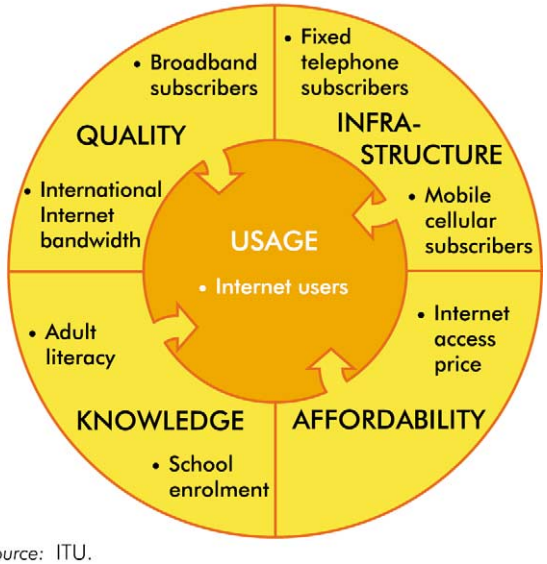
The DAI: A new tool for measuring access to the information society

In the new environment, with a growing emphasis on reducing the digital divide, countries often want to compare their status with others, set targets, and measure progress. Now they can, thanks to ITU's new "Digital Access Index" (DAI). This is the first global index to rank ICT access, covering a total of 178 economies. It is designed to help measure the overall ability of individuals in a country to access and use ICTs. Filling out the top ten slots in the DAI are: Sweden, Denmark, Iceland, the Republic of Korea, Norway, the Netherlands, Hong Kong (China), Finland, Taiwan (China) and Canada.

The DAI forms an integral part of the 2003 *ITU World Telecommunication Development Report: Access Indicators for the Information Society,* which has been specially prepared for the first phase of the World Summit on the Information Society. It classifies countries into one of four digital access categories — high, upper, medium and low — allowing them to see how they compare to peers and their relative strengths and weaknesses (see *ICT access categories* on pages 14–17). The DAI has turned up some surprises. For example, Slovenia ties with France. And the Republic of Korea, usually not among the top ten in international rankings, came in fourth. Apart from Canada, ranked 10th, the top ten economies are exclusively Asian and European. Results of the ITU survey suggest that English is no longer a decisive factor in quick technology adoption, especially as more content is made available in other languages.

Figure 1 — Factors affecting ICT access

Indicators making up the Digital Access Index



Source: ITU.

* This entire section is based on the 2003 edition of the ITU *World Telecommunication Development Report: Access Indicators for the Information Society,* coordinated by the ITU Telecommunication Development Bureau.

What makes the DAI so different from other indices? One major difference is its global scope, spanning 178 countries, and its carefully chosen indicators. The DAI is built around four fundamental factors that impact a country's ability to access ICTs namely: infrastructure, affordability, knowledge and quality. Until now, limited infrastructure has often been regarded as the main barrier to bridging the digital divide. But ITU research now indicates that affordability and education are equally important factors. A fifth factor, actual usage of ICTs, is key in matching the theory of the index with the reality in a country. The DAI combines eight indicators, covering these five factors (see Figure 1), to provide an overall country score. Box 1 gives an example of how the DAI is constructed.

A selection of indicators — usually compiled into an index such as the DAI — gives a far better overview than any single indicator. Moreover, an index produces results that tell a wider, more complete story about the economy of a country than can be gleaned from a single indicator. For example, measuring per capita computer numbers or mobile phone penetration alone provides only a partial, and potentially misleading, glimpse of a country's situation.

True, several organizations have developed indices for ranking countries in relation to their ICT capabilities. But none is completely satisfactory for measuring access to ICTs. Almost

Box 1 — Digital Access Index Technical Note

The Digital Access Index (DAI) measures the overall ability of individuals in a country to access and use information and communication technologies. It consists of eight variables organized into five categories. Each variable is converted to an indicator with a value between zero and one by dividing it by the maximum value or "goalpost". Each indicator is then weighted within its category and the resulting category index values are averaged to obtain the overall DAI value.

Category	Variable	Values for Hong Kong, China		Goalpost		Indicator		Weight		Category index	
1. Infrastructure	1. Fixed telephone subscribers per 100 inhabitants	56.6	÷	60	=	0.94	x	(1/2)	=	0.47	= 0.93
	2. Mobile cellular subscribers per 100 inhabitants	91.6	÷	100	=	0.92	x	(1/2)	=	+ 0.46	
2. Affordability	3.1– (Internet access price as percentage of Gross National Income per capita) x100	99.8	÷	100	=	0.998	x	1	=	0.998	
3. Knowledge	4. Adult literacy	93.5	÷	100	=	0.94	x	(2/3)	=	0.62	= 0.83
	5. Combined primary, secondary and tertiary school enrolment level	63.0	÷	100	=	0.63	x	(1/3)	=	+ 0.21	
4. Quality	6. International Internet bandwidth (bits) per capita	1867	÷	10 000	=	0.88[a]	x	(1/2)	=	0.44	= 0.68
	7. Broadband subscribers per 100 inhabitants	14.6	÷	30	=	0.49	x	(1/2)	=	+ 0.24	
5. Usage	8. Internet users per 100 inhabitants	43.0	÷	85	=	0.51	x	1	=	0.51	
Digital Access Index (Average of 5 categories above)										**0.79**	

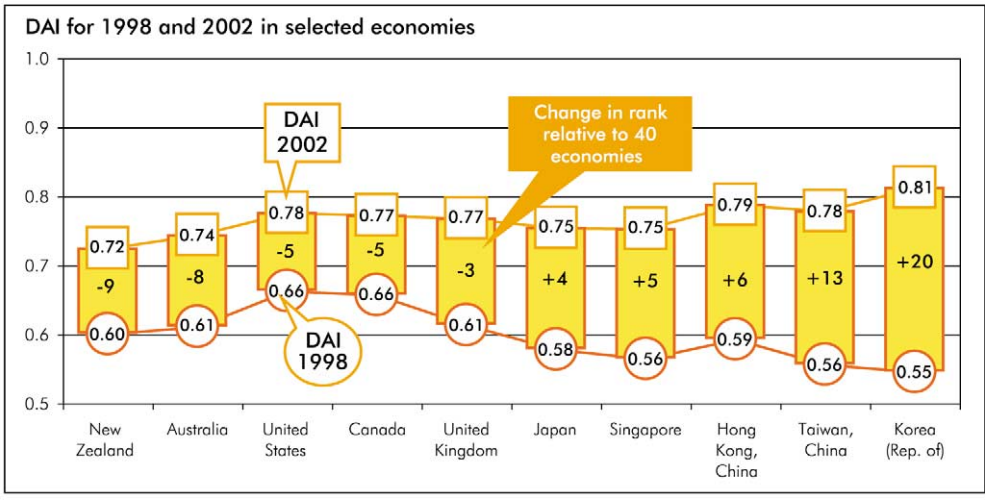
Note: a) Because of the large spread of values among economies, a logarithm is used to calculate this value: (LOG (1867) – LOG (0.01)) / (LOG (10 000) – LOG (0.01))

Box 2 — Reversal of fortune

One of the most important uses for the DAI will be to measure progress over time. While monitoring future change is important, it is also insightful to extend the index into the past to analyse the historical performance of nations. One drawback is that time series for Internet access prices and international Internet bandwidth are lacking for many countries. When the former are available, they often have not been calculated using the same methodology as the DAI, making comparisons difficult.

Comparable data for 1998 have been obtained for 40 economies covering most developed and major developing nations. Despite the short time span of four years (1998 compared to 2002) there were noteworthy differences in relative DAI rankings, illustrating how rapid technological diffusion has been. The most striking development is the improvement of Asian economies particularly the Republic of Korea and Taiwan, China. The Republic of Korea improved its rank the most, moving up 20 places among the 40 economies examined. Taiwan, China was next, moving up 13 places. Korea's rapid progress reflects strong government commitment to ICTs with the payoff noticeable in high levels of broadband connectivity and Internet usage. Taiwan, China's jump shows the effect of telecommunication liberalization, particularly in the mobile sector, moving the economy to the number one position in the world in terms of penetration. Several predominantly English-speaking nations dropped in the rankings. This may mark a turning point in the internationalisation of ICTs with English becoming less of an advantage than it was in the past. Indeed, one observation from the Asian economies that have improved their rankings is the growth of digital content. The development of local content in non-Latin scripts, such as Chinese, Korean and Japanese, has progressed at a fast pace. These three languages make up 11 per cent of Internet content — a higher figure than either French or Spanish.

Reversal of fortune



Source: ITU.

all existing indices concentrate primarily on developed economies and some include qualitative variables that are subject to interpretation. Hence the need for a global approach to concentrate on trends that can be measured to a comparable extent in *all* countries.

The DAI provides a transparent and globally measurable way of tracking progress towards improving access to ICTs. It will be a vital reference for governments, international development agencies, non-governmental organizations and the private sector to assess national conditions in ICT. Hopefully, the DAI will also contribute towards an improvement in data. While most of the data for the variables are widely available, there are some for which the quality is uncertain. There are three areas where additional work on the DAI would be useful: national indices, gender disaggregated indices and the construction of time series (see Box 2). ■

A closer look at infrastructure, affordability, knowledge, quality and usage

Infrastucture

The infrastructure category contains variables that proxy overall network development, namely: the number of fixed telephone subscribers and mobile cellular subscribers. Fixed and mobile telephones provide the means for voice, text and data communications. Dial-up Internet access is the prevalent means of Internet access in most countries. In others, where broadband access is growing, digital subscriber line (DSL) technology also uses the conventional telephone line. In order to enhance comparability, fixed telephone subscribers is used. This means that integrated services digital network (ISDN) *subscribers* rather than *channels* are included. This adjusts for the fact that ISDN channels do not result in an increase in actual physical telephone lines.

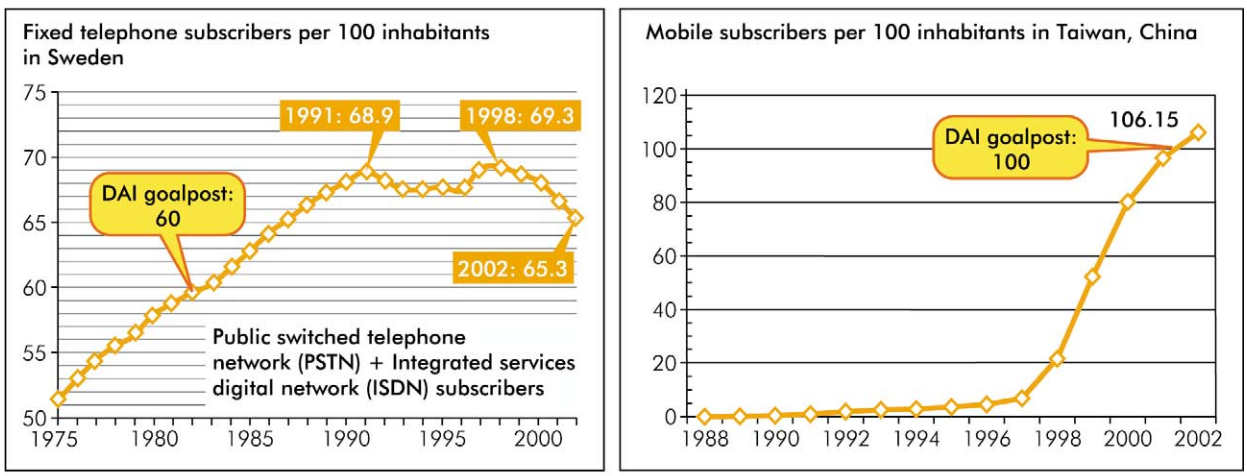
The goalpost for fixed telephone subscribers per 100 inhabitants has been set at 60, a value exceeded by only four countries around the world at the end of 2002. The highest value for this indicator was 69.3, reached by Sweden in 1998. Since then, fixed telephone subscribers have been declining because of mobile substitution, as well as less need for second lines due to broadband (see Figure 2, left chart). The goalpost for mobile cellular subscribers has been set at 100, a threshold that has already been reached by two economies. One is Luxembourg and the other is Taiwan, China, which now has the highest mobile penetration rate in the world at 106 per 100 inhabitants (see Figure 2, right chart). A mobile penetration rate of 100 implies that each adult in a nation would have at least one mobile phone. Fixed telephone subscribers and mobile cellular subscribers are given equal weight in the infrastructure category.

Knowledge

The knowledge level of a country has a significant impact on the ability to use new technologies and, consequently, on its ICT take-up. Adult literacy and overall school enrolment are used as proxies for the capacity of the population to use ICTs.

The United Nations Development Programme (UNDP) defines adult literacy as: "The percentage of people aged 15 and above who can, with understanding, both read and write a short,

Figure 2 — Infrastructure trends



Source: ITU World Telecommunication Indicators Database.

simple statement related to their everyday life." Overall school enrolment refers to the gross rate and is defined as the number of students in primary, secondary and tertiary school divided by the population of that school age. The figure can exceed 100 due to those repeating the same class or those older or younger than the official school age being enrolled. These data are from the UNDP and are used in its Human Development Index (HDI). The goalposts (both 100) and weighting (two-thirds for literacy and one-third for school enrolment) correspond to the HDI methodology.

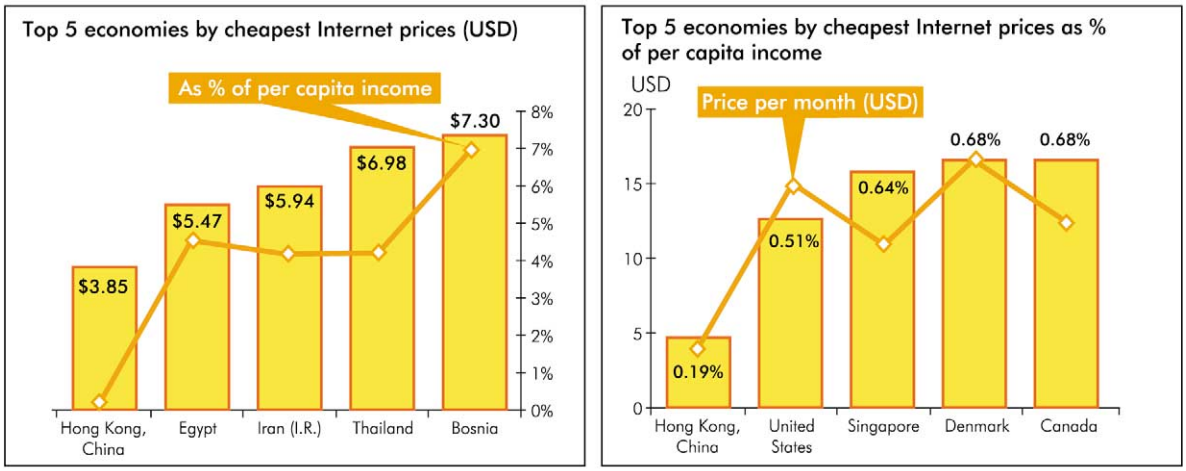
Affordability

Although infrastructure may be widely available, it must also be affordable if it is to be used by the greatest number of people. Affordability is measured by the price of Internet access as a percent of per capita income. The relative rather than absolute prices are considered since per capita incomes vary around the world (see Figure 3). Internet access prices generally reflect prevailing tariffs for other methods of access such as Internet cafés or leased lines. The dial-up price would also include telephone usage charges if applicable, serving as a proxy to some extent for telephone service charges. Internet access prices used in the DAI assume a usage factor of one hour per working day.

Subtracting the proportion of monthly income that Internet tariffs consume from one and multiplying by 100 creates an affordability indicator. The logic behind this conversion is to create an indicator where a high value is desirable so that it is consistent with the other indicators. The goalpost for this indicator is 100, a situation where the Internet would be free. On the other hand, where the affordability indicator is negative (e.g. prices are more than per capita income), no points are awarded since a person cannot spend more on Internet access than they earn.

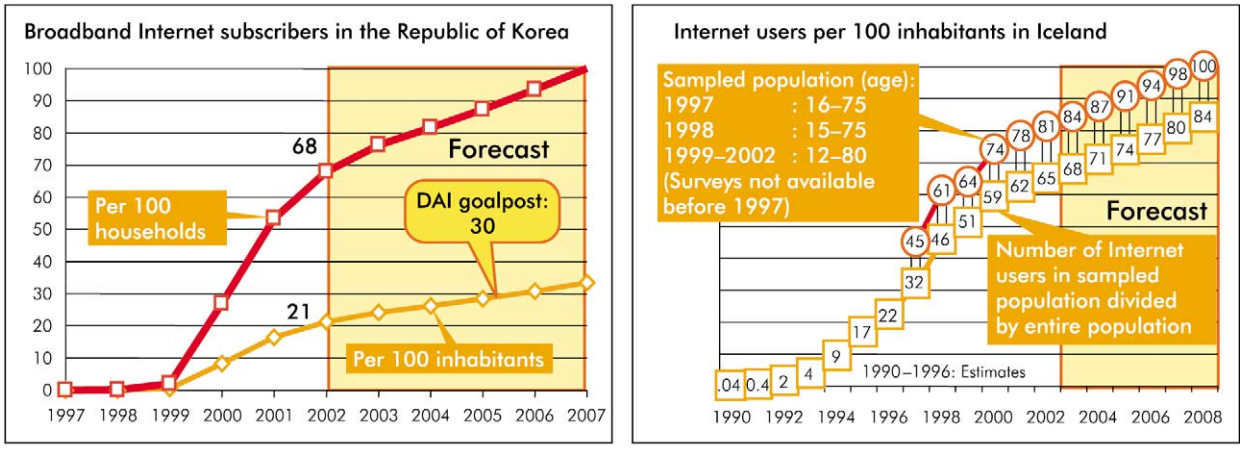
Figure 3 — Absolute and relative Internet pricing

Top five economies by lowest 20 hour per month Internet access price and by lowest 20 hour per month Internet access price as a percentage of per capita income



Source: ITU World Telecommunication Indicators Database.

Figure 4 — Where the Internet is headed



Source: ITU World Telecommunication Indicators Database.

Quality

The *quality* category deals with the impact that the experience of using ICTs has on access. If the experience is poor because of slow speed, then either people will not use ICTs, or they will not be able to use them effectively and creatively. This category also allows for greater distinction to be introduced in the index. For example, many developed nations have high values for infrastructure, affordability and education. The inclusion of a quality category allows for finer granularity.

One popular variable selected for quality is *bits per capita*, the amount of international Internet bandwidth (measured in Mbit/s) used by a country divided by the population. In many developing countries, most Internet access is to sites abroad and therefore the amount of international bandwidth has a major impact on performance.

In most developed countries, the majority of access is to domestic sites. Here, international bandwidth is not as important as the speed of the local connection. The indicator to measure this is the number of broadband subscribers per 100 inhabitants. Broadband is defined as access technologies faster than 128 kbit/s in at least one direction. This includes DSL, cable modem and wireless technologies.

The goalpost for bits per capita is set at 10 000 — a level that has already been exceeded in three countries, most notably Denmark where the value is more than twice the goalpost. The goalpost for broadband subscribers per 100 inhabitants is set at 30, a value implying that all households would have a connection (see Figure 4, left chart). Each indicator is given equal weight in the category.

Usage

The number of Internet users is selected as the variable to gauge the extent of a country's ICT utilization. In addition to capturing usage, the variable also incorporates aspects of access not easily captured by the other categories or where additional variables would have been necessary. For example, Internet users can proxy for the number of computers as well as the prevalence of Internet cafés. If a country has many users accessing the Internet from Internet cafés and other public locations, this would be reflected in the number of users.

The *usage* index consists of Internet users per 100 inhabitants and the goalpost is set at 85. This is because it would be unrealistic to assume that all inhabitants will use the Internet. Although some surveys compile the number of Internet users from the age of two, it is questionable whether very young children can use the Internet effectively. Also, the limit of the number of Internet users per 100 inhabitants will vary depending on the age structure of the country (see Figure 4, right chart). The goalpost of 85 is an estimate of the average percentage of the worldwide population aged ten and over. ■

Box 3 — "Lies, Damned Lies and Statistics"

"We may quote to one another with a chuckle the words of the Wise Statesman, lies, damned lies and statistics, still there are some easy figures which the simplest must understand but the astutest cannot wriggle out of." — Leonard Henry Courtney, British economist and politician (1832–1918).

The Republic of Korea is well-advanced in information and communication technologies (ICT). It leads the world in broadband Internet access, is ranked fourth in overall access to the Internet and was one of the first countries to launch third-generation mobile Internet services. Related to the high level of ICT development is the fact that Koreans rank high in literacy and overall educational achievement. Yet on international ICT rankings, Korea is not in the top ten (see left chart below). Why the discrepancy between the statistics and the rankings?

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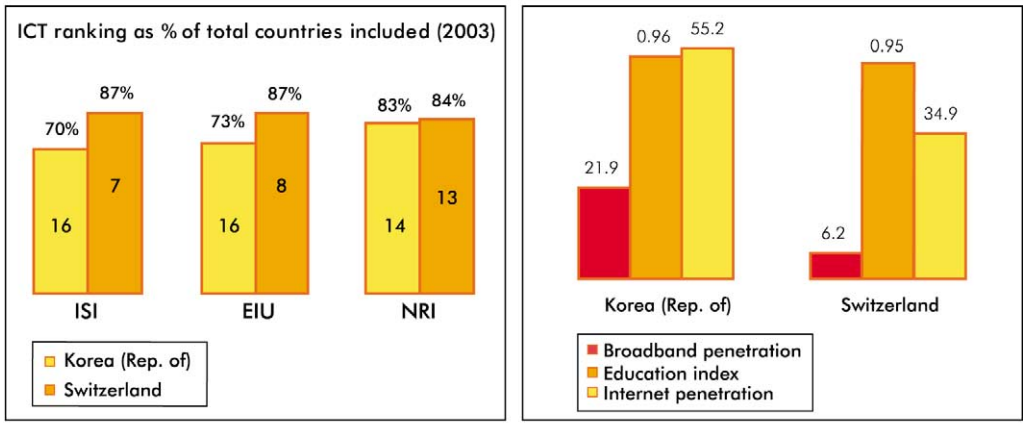
For one thing, there is often a bias of quantity over quality. The rankings are typically designed to favour a common denominator of widely available indicators, rate high per capita values without adjusting for methodological discrepancies, and do not include adjustments for qualitative differences. The inaccuracies of such an approach can easily be illustrated by comparing Korea and some usually higher ranked countries, for example Switzerland. Like many European nations, Switzerland includes integrated services digital network (ISDN) channels in the number of main lines — a common indicator in all of the indices, which effectively inflates the figure. Korea, on the other hand, does not include ISDN channels. A similar situation exists for mobile cellular subscriber figures that include prepaid cards. These statistics

Re-comparing the Republic of Korea and Switzerland

These two countries rank in three ICT indices and UNDP Education index, broadband subscribers per 100 inhabitants and Internet users per 100 inhabitants (2002)



Sources: ITU World Telecommunication Indicators Database, United Nations Development Programme (UNDP), World Economic Forum (WEF), International Data Corporation (IDC) and the Economist Intelligence Unit (EIU).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can be distorted because not all prepaid cards are active. As Switzerland has a high proportion of prepaid cards, it appears to rank higher than Korea in mobile penetration. Korea, on the other hand, has few mobile prepaid subscribers and consequently has a more realistic, but relatively lower, figure for total mobile penetration.

Another methodological weakness is that many surveys use the number of Internet hosts per capita to measure Internet usage. This is misleading since host computers can be located anywhere and are not necessarily in the country of their domain name. On a per capita basis, the number of Internet host computers in Korea — based only on the .KR domain name — is relatively low, affecting its ranking. On the other hand, Korea's high level of Internet and broadband penetration is rarely reflected in the standings (see right chart on page 12).

Global rankings also appear to be biased in favour of theoretical perceptions of competitiveness rather than actual achievement. In general, few Asian nations rank among the top ten. Hypothetical assumptions appear to have more weight with the rankings often focused on the means rather than the end. For example, a nation that supposedly allows a greater degree of competition than another would be ranked higher even though the latter might have a far greater level of infrastructure. Another shortcoming is that the rankings tend to weight per capita income highly. In the case of Korea, it is doing exceedingly well in ICTs despite a relatively low per capita income. If anything, Korea's ranking should be raised because of this fact. The case of Korea suggests that these scorecards are not very useful in accurately measuring ICT achievements in some countries.


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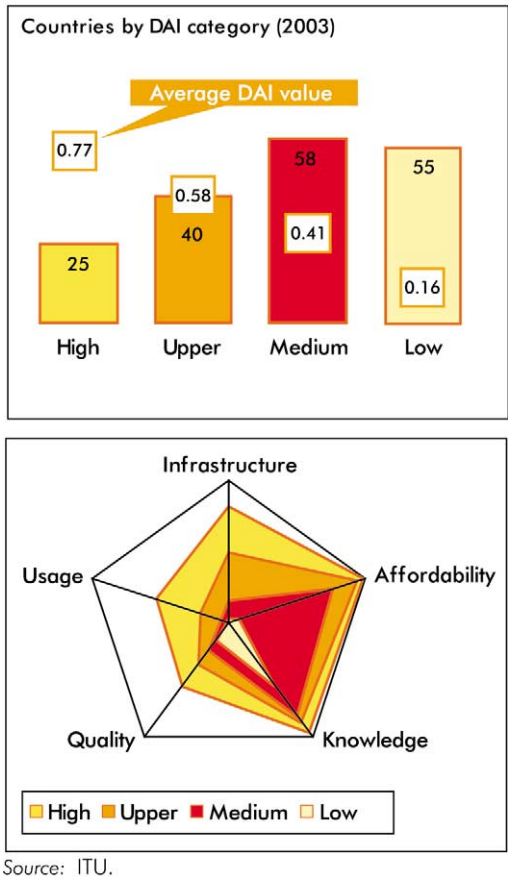
ICT access categories:
How are economies around the world doing?

High-access economies

Economies in this category have achieved a high level of access to digital technologies for a majority of their inhabitants. There is sufficient infrastructure, prices are affordable, knowledge levels are high and efforts are being placed on enhancing quality through the provision of faster access. The main criterion that distinguishes economies in this category is usage. This often seems be more related to the social-cultural characteristics of the population than any of the DAI factors. For example, why is Iceland's Internet penetration highest in the world when it is not top-ranked in any of the other DAI categories? The individual rankings for economies in this group are so close that minor changes in calculation can shift a country's ranking a few notches. The statistical calculations are based on general assumptions that sometimes do not reflect the underlying realities of individual countries, adversely affecting their score. For example, countries such as Canada, the Republic of Korea, Japan and the United States score relatively low on international Internet bandwidth per capita. One reason is that they have extensive domestic content so there is less need for users to access overseas sites. The usage category is most susceptible to comparability since Internet user surveys differ in measurement of age ranges and the frequency of use.

Of note is the select group of countries that have a DAI value of above 0.800. These are mainly Nordic countries like Sweden, Denmark and Iceland. Their presence at the top reflects that region's traditional emphasis on equitable access, affinity for technology and top-notch infrastructure. The Republic of Korea is ranked fourth in the DAI, and this should not come as a surprise since it is the world leader in broadband penetration with 21 broadband subscriptions per 100 inhabitants at year-end 2002. It was also the first

Figure 5 — The digital divide through the DAI



Source: ITU.

High-access (0.7 and above)

Sweden	0.85
Denmark	0.83
Iceland	0.82
Korea (Rep. of)	0.82
Norway	0.79
Netherlands	0.79
Hong Kong, China	0.79
Finland	0.79
Taiwan, China	0.79
Canada	0.78
United States	0.78
United Kingdom	0.77
Switzerland	0.76
Singapore	0.75
Japan	0.75
Luxembourg	0.75
Austria	0.75
Germany	0.74
Australia	0.74
Belgium	0.74
New Zealand	0.72
Italy	0.72
France	0.72
Slovenia	0.72
Israel	0.70

Note: On a scale of 0 to 1 where 1 = highest access. DAI values are shown to hundreds of a decimal point. Economies with the same DAI value are ranked by thousands of a decimal point. This note applies to all tables in this section (pages 14–17).

nation to launch third-generation mobile.

The group of high DAI economies is homogenous, almost all emanating from the developed regions of Western Europe, North America, East Asia and the Pacific. The International Monetary Fund classifies them all as advanced economies. The one exception is Slovenia, a Central European nation, which has been an early adopter of technology. It connected to the Internet back in 1992 and government-sponsored Internet access encouraged many Slovenes to go online in the mid-1990s. Mobile phone growth has also been rapid and literacy and school enrolment levels are close to those of European Union members. The establishment of a Ministry of Information Society and ongoing liberalization of the telecommunication industry suggest that Slovenia could raise its level of digital access even higher in the years to come.

Upper-access economies

Countries in this group have achieved an acceptable level of access for a majority of their inhabitants. What often sets this group apart from the high DAI group is the imbalance in a specific category.

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Upper-access (0.5 – 0.69)

Ireland	0.69
Cyprus	0.68
Estonia	0.67
Spain	0.67
Malta	0.67
Czech Republic	0.66
Greece	0.66
Portugal	0.65
United Arab Emirates	0.64
Macao, China	0.64
Hungary	0.63
Bahamas	0.62
St. Kitts and Nevis	0.60
Poland	0.59
Slovak Republic	0.59
Croatia	0.59
Bahrain	0.58
Chile	0.58
Antigua and Barbuda	0.57
Barbados	0.57
Malaysia	0.57
Lithuania	0.56
Qatar	0.55
Brunei Darussalam	0.55
Latvia	0.54
Uruguay	0.54
Seychelles	0.54
Dominica	0.54
Argentina	0.53
Trinidad and Tobago	0.53
Bulgaria	0.53
Jamaica	0.53
Costa Rica	0.52
St. Lucia	0.52
Kuwait	0.51
Grenada	0.51
Mauritius	0.50
Russia	0.50
Mexico	0.50
Brazil	0.50

For example, some countries in this group may have a high level of infrastructure availability but score low in affordability. Analysing the separate category values can be useful for policy-makers seeking to find out where their countries are weak in access to the information society.

For the most part, this upper DAI group consists of countries from Central and Eastern Europe, the Caribbean, Gulf States and emerging Latin American nations. Many of these countries have a strong interest in ICTs as a development enabler. In Central and Eastern Europe, this is reinforced by European Union trends and ICT objectives for candidate countries. The potential of ICT industries to generate economic growth is a focus among Caribbean nations. They are particularly keen on offshore software development and ICT services support, which are viewed as complementary to the island states location, English-speaking population, knowledge levels and good quality infrastructure. Other upper DAI governments are committed to major ICT projects such as the *Dubai Internet City* in the United Arab Emirates (the highest ranked Arab nation in the DAI), the *Multimedia Super Corridor* in Malaysia (the highest ranked developing Asian nation) and the *Cyber City* in Mauritius (along with Seychelles, the highest ranked African nation).

This is a competitive collection of countries, with many aiming to graduate to a higher level of digital readiness. Some are eager to accomplish this through ambitious government projects while others are hoping market liberalization will provide the impetus. Most are combing the two. It is clear that this is one group where complacency risks falling behind. The DAI will provide a useful yardstick for measuring their progress over the coming years.

Middle-access economies


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The biggest barrier to higher levels of digital access in this group is a shortage of infrastructure. Nations in this group are primarily Latin American and South East Asian, along with some from Africa (including North Africa) and the Middle East. They would benefit from greater liberalization of their ICT markets to make them attractive for investors.

The presence of three least developed countries (LDC) in this group is notable (Cape Verde, Maldives and Samoa), with the first two having partly privatized their telecommunication operators, resulting in increased access to networks. In Cape Verde, over 90 per cent of the country is covered by mobile cellular whereas in the Maldives, all inhabitants are within walking distance of a telephone. What these countries need to do is to leverage their infrastructure accomplishments into higher levels of digital access. This includes increasing training and awareness and launching innovative services to attract a larger portion of the population online.

Peru ranks high despite a relatively low level of infrastructure. It is positioned between two countries that have twice the level of telephone penetration. The explanation is Peru's high level of Internet access compared to other countries in this group. This is due to the widespread availability of Internet cafés. This raises Peru's level of usage, helping to compensate for low values in other categories.

Other countries in this group are attempting to replicate Peru's success with mass Internet access. For example "free" Internet access was introduced in Egypt in January 2002. Instead of Internet access provider charges, users now only pay a nominal rate for dial-up telephone usage. As a result, Egypt now has among the lowest Internet access prices in the world, reflected in the affordability category of its DAI. In Tunisia, all tertiary and secondary schools are connected to the Internet and there are plans to connect all primary schools. There are also 280 public access facilities. The government is hoping that expansion of public access facilities will lift the number of Internet users by a factor of six, from half a million at year-end 2002 to three million by the end of 2006. This would boost Tunisia's DAI to just below the upper level. Perhaps with an extra effort, Tunisia could reach that level when it hosts phase two of the World Summit on the Information Society in 2005.


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Middle-access (0.3-0.49)

Belarus	0.49
Lebanon	0.48
Thailand	0.48
Romania	0.48
Turkey	0.48
TFYR Macedonia	0.48
Panama	0.47
Venezuela	0.47
Belize	0.47
St. Vincent	0.46
Bosnia	0.46
Suriname	0.46
South Africa	0.45
Colombia	0.45
Jordan	0.45
Serbia and Montenegro	0.45
Saudi Arabia	0.44
Peru	0.44
China	0.43
Fiji	0.43
Botswana	0.43
Iran (I.R.)	0.43
Ukraine	0.43
Guyana	0.43
Philippines	0.43
Oman	0.43
Maldives	0.43
Libya	0.42
Dominican Rep.	0.42
Tunisia	0.41
Ecuador	0.41
Kazakhstan	0.41
Egypt	0.40
Cape Verde	0.39
Albania	0.39
Paraguay	0.39
Namibia	0.39
Guatemala	0.38
El Salvador	0.38
Palestine	0.38
Sri Lanka	0.38
Bolivia	0.38
Cuba	0.38
Samoa	0.37
Algeria	0.37
Turkmenistan	0.37
Georgia	0.37
Swaziland	0.37
Moldova	0.37
Mongolia	0.35
Indonesia	0.34
Gabon	0.34
Morocco	0.33
India	0.32
Kyrgyzstan	0.32
Uzbekistan	0.31
Viet Nam	0.31
Armenia	0.30

Low-access economies

Countries in this category are the poorest in the world and most are LDCs. They have a minimal level of access to the information society. Their lack of digital access is one more deprivation along with poverty and hunger and shortages of basic human needs such as good shelter, clean water and adequate health care. Apart from low levels of communications infrastructure, one factor almost all countries in this group have in common is relatively high access prices. In most of these nations, an hour a day of Internet access exceeds the average daily income. There is little hope of them joining the information society unless prices are dramatically reduced. This should be a primary focus of development assistance, particularly since greater use of ICTs in these countries could help achieve the United Nations Millennium Development Goals.

One cause for the high Internet access prices in this group of economies is the relatively steep prices they pay for wholesale international Internet connections. This stems from having to pay the full cost of the connection although the country on the other end of the link benefits. Other contributory factors to the high prices are constrained domestic competition, lack of traffic exchanges and small economies of scale. Landlocked countries are at an even greater disadvantage since their international connectivity options are restricted to satellite.


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Low-access (0.29 and below)

Zimbabwe	0.29
Honduras	0.29
Syria	0.28
Papua New Guinea	0.26
Vanuatu	0.24
Pakistan	0.24
Azerbaijan	0.24
S. Tome and Principe	0.23
Tajikistan	0.21
Equatorial Guinea	0.20
Kenya	0.19
Nicaragua	0.19
Lesotho	0.19
Nepal	0.19
Bangladesh	0.18
Yemen	0.18
Togo	0.18
Solomon Islands	0.17
Uganda	0.17
Zambia	0.17
Myanmar	0.17
Congo	0.17
Cameroon	0.16
Cambodia	0.16
Lao P.D.R.	0.15
Ghana	0.15
Malawi	0.15
Tanzania	0.15
Haiti	0.15
Nigeria	0.15
Djibouti	0.15
Rwanda	0.15
Madagascar	0.15
Mauritania	0.14
Senegal	0.14
Gambia	0.13
Bhutan	0.13
Sudan	0.13
Comoros	0.13
Côte d'Ivoire	0.13
Eritrea	0.13
D.R. Congo	0.12
Benin	0.12
Mozambique	0.12
Angola	0.11
Burundi	0.10
Guinea	0.10
Sierra Leone	0.10
Central African Rep.	0.10
Ethiopia	0.10
Guinea-Bissau	0.10
Chad	0.10
Mali	0.09
Burkina Faso	0.08
Niger	0.04


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Although this group has the common factor of high communication charges, there are significant variations among other DAI categories, notably knowledge. Indeed, the major factor having an impact on a country's rank among this group is its level of literacy and school enrolment. This suggests that there is significant potential for countries with high knowledge levels if other barriers could be overcome. For example, contrast Syria and Zimbabwe, two of the highest ranked economies of this group. Zimbabwe's Internet penetration is more than three times higher than Syria's. One reason is that Zimbabwe has a high knowledge level — its literacy rate is the highest in Africa — an important precondition for achieving a higher level of digital access. If Zimbabwe had Syria's level of infrastructure, it would be in the medium DAI category. Conversely, if Syria had Zimbabwe's literacy level, it too would be in the medium category. Hence the DAI helps to identify different solutions for these two different countries to raising their level of digital access. ■