THE DIGITAL OPPORTUNITY INDEX: A USERS' GUIDE
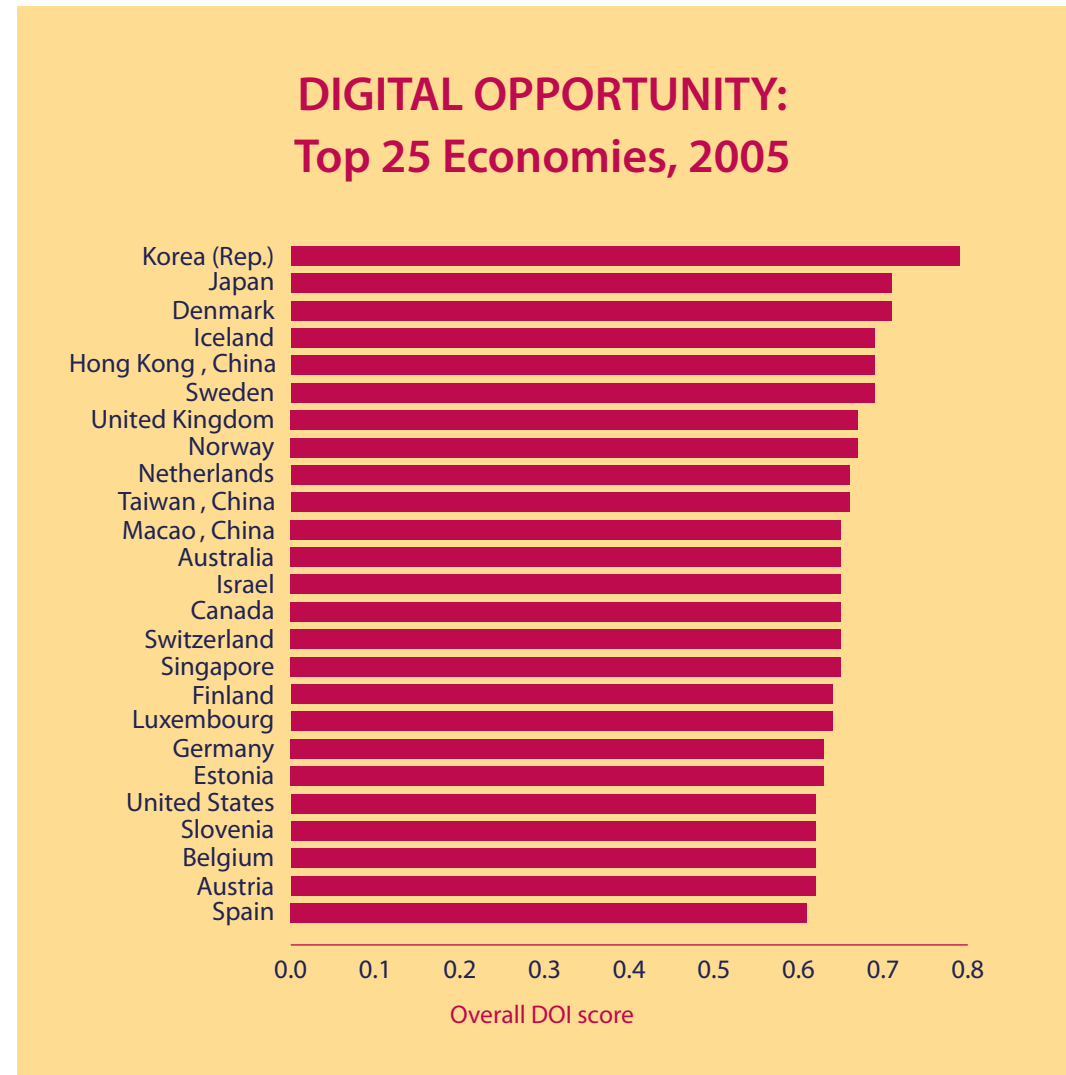
Contents

DIGITAL OPPORTUNITY:
Top 25 Economies, 2005

Source: ITU/KADO Digital Opportunity Platform.

BACKGROUND

This guide, "The Digital Opportunity Index: A Users' Guide", has been prepared by the International Telecommunication Union (ITU), in collaboration with its partners in the Digital Opportunity Platform, the Korea Agency for Digital Opportunity and Promotion (KADO) and the Ministry of Information and Communication of the Republic of Korea (MIC).

These partners recently formulated the Digital Opportunity Index (DOI) to track progress and chart the growth of the Information Society worldwide. The DOI measures digital opportunity and the take-up of ICTs for 180 economies worldwide, using the most recently available data for 2004/2005. This guide is intended to help governments, policy-makers, statisticians, analysts and other researchers from government, academia and the IT sector in preparing and compiling the DOI. This Users' Guide sets out the standard definitions and methodology that should be used in calculating the DOI to ensure that the data and Index are measured in a standard and comparable way, guaranteeing consistency and comparability of results across different economies. Applying the definitions and methodology specified in the guidelines given below will ensure that the DOI gives accurate and insightful results into the growth of the Information Society in any given economy.

More information about the DOI can be found at the DOI website. The most recent version of the DOI was published in the World Information Society Report (WISR). More information about the Digital Opportunity Platform can be found at the Platform's website.

1. INTRODUCTION

At the World Summit on the Information Society (WSIS), held in Geneva in 2003 and Tunis in 2005, governments and world leaders made a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all, where everyone can access, utilize and share information and knowledge.

During the first phase of the WSIS, government leaders committed themselves to a set of bold targets to broaden access to ICTs and bridge the digital divide. According to the WSIS outcome documents, one of the most important priorities is to design national e-strategies in accordance with local and national development needs. This requires an understanding of the situation in each country with regard to ICTs and the setting of future targets. It is important to track progress against the benchmarks set out in the WSIS final outcome documents. To meet these needs, the partners involved in the Digital Opportunity Platform have created the

"A realistic international performance evaluation and benchmarking (both qualitative and quantitative), through comparable statistical indicators and research results, should be developed to follow up the implementation of the objectives, goals and targets in the Plan of Action, taking into account different national circumstances".

Geneva Plan of Action, paragraph 28.

Digital Opportunity Index (DOI) to measure digital opportunity for 180 economies for 2004/2005. This report uses the DOI to provide insights and guidelines for policy-makers, especially in developing countries, in mobilizing resources and setting their national strategy for building the Information Society.

"We are fully committed to turning this digital divide into a digital opportunity for all, particularly for those who risk being left behind and being marginalised".

Geneva Declaration of Principles, paragraph 10.

2. Digital Opportunity Index

The Digital Opportunity Index (DOI) is a composite index that measures "digital opportunity" or the possibility for citizens of a particular country to benefit from access to information that is "universal, ubiquitous, equitable and affordable" (WSIS Tunis Commitment, para 10). It uses a range of indicators, including data on services prices and the take-up of latest ICTs, to assess countries' performance and prospects to measure progress in building the Information Society in 180 economies worldwide. It is based on a set of eleven internationally-agreed core ICT indicators established by the Partnership on Measuring ICT for Development.

It has a flexible modular structure, based on three categories (Figure 1):

- **Opportunity** measures the basic access and affordability needed to participate in the Information Society in mobile population coverage, Internet access prices and mobile prices.

- **Infrastructure** includes measures of different networks (fixed lines, mobile cellular subscribers and household Internet access) and devices (households with a computer and mobile Internet).

- **Utilization** evaluates ICT usage in Internet users and broadband subscribers (fixed and mobile).

It can be used to enrich policy and inform policy-makers of the latest trends and impact analysis of ICT policies to identify successful policies and replicate them elsewhere.

Figure 1: Structure of the DOI

1 Percentage of population covered by mobile cellular telephony

2 Internet access tariffs as a percentage of per capita income

3 Mobile cellular tariffs as a percentage of per capita income

OPPORTUNITY

4 Proportion of households with a fixed line telephone

5 Proportion of households with a computer

6 Proportion of households with Internet access at home

7 Mobile cellular subscribers per 100 inhabitants

8 Mobile Internet subscribers per 100 inhabitants

INFRASTRUCTURE

9 Proportion of individuals that used the Internet

10 Ratio of fixed broadband subscribers to total Internet subscribers

11 Ratio of mobile broadband subscribers to total mobile subscribers

UTILIZATION

DIGITAL OPPORTUNITY INDEX

Figure 2: The DOI Worldwide, 2005

less than 0.1 | 0.1 - 0.2 | 0.2 - 0.3 | 0.3 - 0.4 | 0.4 - 0.5 | 0.5 - 0.6 | 0.6 - 0.7 | 0.7 - 0.8
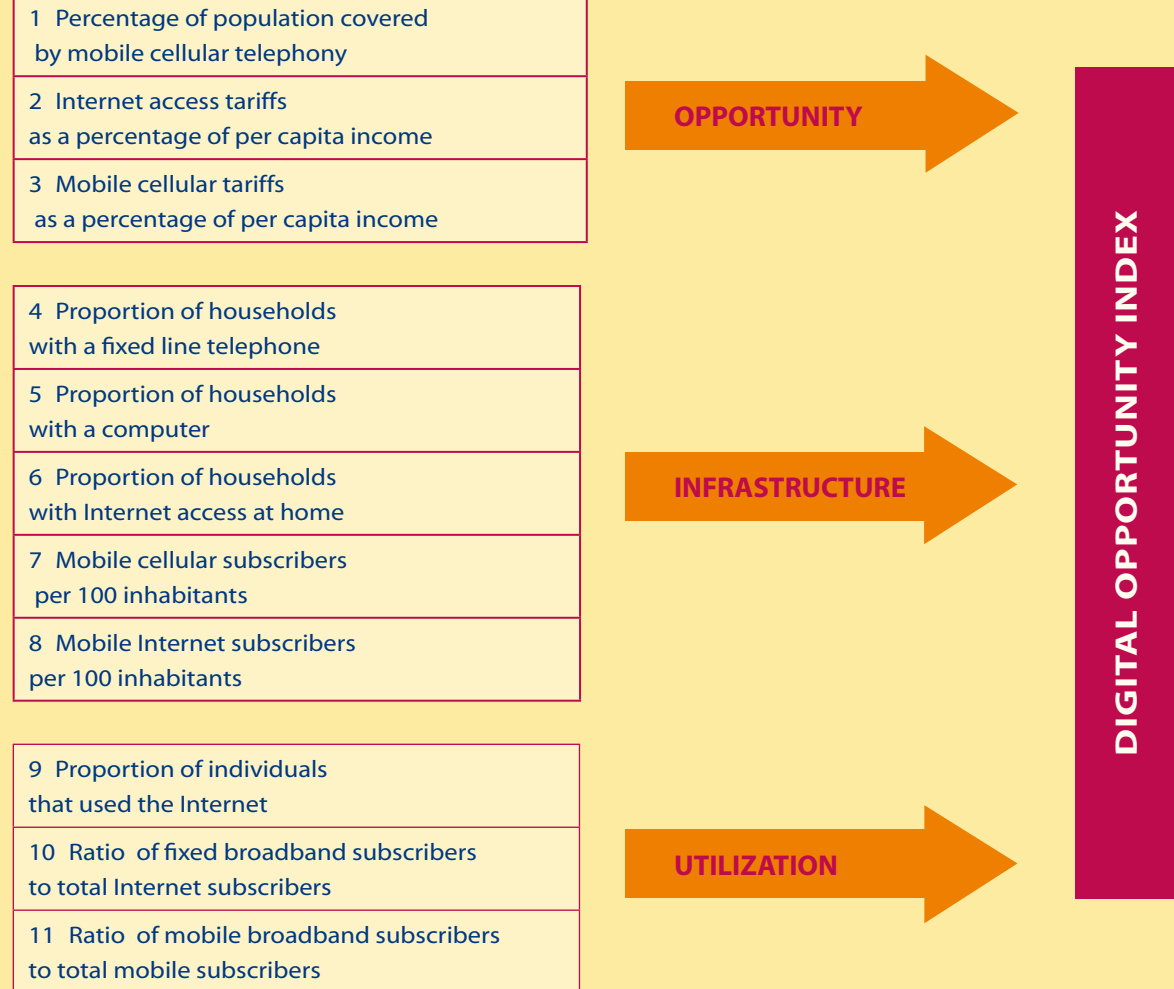
Source: World Information Society Report, ITU/KADO Digital Opportunity Platform

Table 1: Digital Opportunity index 2005, World : country scores and world ranks

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	D OI 2004/2005	World Rank 2004/2005
1	**Albania**	0.90	0.17	0.01	0.36	97
2	**Algeria**	0.91	0.15	0.12	0.39	82
3	**Angola**	0.60	0.02	0.00	0.21	135
4	**Antigua & Barbuda**	0.94	0.37	0.05	0.45	56
5	**Argentina**	0.96	0.30	0.15	0.47	51
6	**Armenia**	0.70	0.15	0.02	0.29	120
7	**Australia**	0.98	0.63	0.35	0.65	12
8	**Austria**	0.99	0.54	0.34	0.62	24
9	**Azerbaijan**	0.90	0.15	0.02	0.36	99
10	**Bahamas**	0.97	0.45	0.33	0.58	30
11	**Bahrain**	0.99	0.49	0.20	0.56	33
12	**Bangladesh**	0.60	0.01	0.00	0.20	139
13	**Barbados**	0.96	0.47	0.14	0.52	38
14	**Belarus**	0.92	0.24	0.07	0.41	76
15	**Belgium**	0.99	0.50	0.38	0.62	23
16	**Belize**	0.77	0.18	0.04	0.33	104
17	**Benin**	0.48	0.02	0.00	0.17	147
18	**Bhutan**	0.59	0.02	0.01	0.21	136
19	**Bolivia**	0.79	0.11	0.01	0.30	113
20	**Bosnia**	0.93	0.27	0.05	0.42	75
21	**Botswana**	0.92	0.12	0.01	0.35	102
22	**Brazil**	0.87	0.24	0.16	0.42	71
23	**Brunei Darussalam**	0.93	0.46	0.09	0.49	47
24	**Bulgaria**	0.96	0.34	0.22	0.51	46
25	**Burkina Faso**	0.36	0.02	0.00	0.13	163
26	**Burundi**	0.27	0.01	0.00	0.09	170
27	**Cambodia**	0.36	0.02	0.02	0.13	161
28	**Cameroon**	0.59	0.03	0.00	0.21	137
29	**Canada**	0.98	0.55	0.43	0.65	14
30	**Cape Verde**	0.80	0.15	0.04	0.33	107
31	**Central African Rep.**	0.34	0.01	0.00	0.11	166
32	**Chad**	0.03	0.01	0.00	0.01	180
33	**Chile**	0.96	0.31	0.29	0.52	40
34	**China**	0.89	0.25	0.11	0.42	74
35	**Colombia**	0.88	0.19	0.08	0.38	88
36	**Comoros**	0.40	0.02	0.00	0.14	157
37	**Congo**	0.39	0.05	0.01	0.15	154
38	**Costa Rica**	0.89	0.25	0.14	0.43	69
39	**Cote d'Ivoire**	0.54	0.01	0.00	0.19	144
40	**Croatia**	0.97	0.44	0.10	0.51	45
41	**Cuba**	0.76	0.04	0.00	0.27	126
42	**Cyprus**	0.99	0.50	0.16	0.55	35
43	**Czech Republic**	0.98	0.42	0.13	0.51	43
44	**D.R. Congo**	0.46	0.05	0.00	0.16	150
45	**Denmark**	0.99	0.75	0.37	0.71	3
46	**Djibouti**	0.74	0.04	0.00	0.26	130
47	**Dominica**	0.88	0.32	0.14	0.45	61
48	**Dominican Rep.**	0.91	0.13	0.13	0.39	87
49	**Ecuador**	0.89	0.16	0.02	0.36	100
50	**Egypt**	0.94	0.17	0.02	0.38	90
51	**El Salvador**	0.90	0.14	0.09	0.37	92
52	**Equatorial Guinea**	0.73	0.05	0.00	0.26	129
53	**Eritrea**	0.07	0.01	0.00	0.03	178
54	**Estonia**	0.98	0.47	0.44	0.63	20
55	**Ethiopia**	0.26	0.01	0.00	0.09	173
56	**Fiji**	0.78	0.14	0.03	0.32	110
57	**Finland**	0.99	0.60	0.34	0.64	17
58	**France**	0.99	0.49	0.31	0.60	27
59	**Gabon**	0.86	0.11	0.01	0.33	108
60	**Gambia**	0.53	0.08	0.01	0.21	138

Digital Opportunity Index * www.itu.int/doi

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	D OI 2004/2005	World Rank 2004/2005
61	**Georgia**	0.92	0.12	0.13	0.39	84
62	**Germany**	0.99	0.64	0.27	0.63	19
63	**Ghana**	0.47	0.03	0.01	0.17	148
64	**Greece**	0.99	0.47	0.07	0.51	42
65	**Grenada**	0.90	0.29	0.15	0.45	62
66	**Guatemala**	0.77	0.11	0.02	0.30	118
67	**Guinea**	0.47	0.01	0.00	0.16	151
68	**Guinea-Bissau**	0.10	0.02	0.01	0.04	177
69	**Guyana**	0.72	0.13	0.01	0.29	121
70	**Haiti**	0.43	0.02	0.00	0.15	153
71	**Honduras**	0.68	0.07	0.01	0.25	131
72	**Hong Kong, China**	1.00	0.70	0.38	0.69	5
73	**Hungary**	0.98	0.43	0.24	0.55	34
74	**Iceland**	0.99	0.72	0.37	0.69	4
75	**India**	0.80	0.04	0.04	0.29	119
76	**Indonesia**	0.89	0.06	0.04	0.33	105
77	**Iran (I.R.)**	0.89	0.16	0.03	0.36	95
78	**Ireland**	0.99	0.55	0.18	0.58	31
79	**Israel**	0.98	0.57	0.40	0.65	13
80	**Italy**	0.99	0.54	0.24	0.59	28
81	**Jamaica**	0.93	0.30	0.18	0.47	52
82	**Japan**	0.99	0.69	0.46	0.71	2
83	**Jordan**	0.94	0.22	0.07	0.41	77
84	**Kazakhstan**	0.94	0.17	0.02	0.38	89
85	**Kenya**	0.34	0.03	0.01	0.13	164
86	**Korea (Rep.)**	0.99	0.74	0.64	0.79	1
87	**Kuwait**	0.99	0.40	0.06	0.49	49
88	**Kyrgyzstan**	0.55	0.09	0.01	0.22	134
89	**Lao P.D.R.**	0.40	0.02	0.01	0.14	156
90	**Latvia**	0.97	0.33	0.17	0.49	48
91	**Lebanon**	0.96	0.18	0.05	0.40	81
92	**Lesotho**	0.65	0.03	0.00	0.23	133

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	D OI 2004/2005	World Rank 2004/2005
93	**Libya**	0.92	0.12	0.01	0.35	101
94	**Lithuania**	0.99	0.38	0.32	0.56	32
95	**Luxembourg**	0.99	0.65	0.27	0.64	18
96	**Macao, China**	1.00	0.66	0.30	0.65	11
97	**Madagascar**	0.38	0.01	0.00	0.13	162
98	**Malawi**	0.23	0.01	0.00	0.08	174
99	**Malaysia**	0.98	0.22	0.15	0.45	59
100	**Maldives**	0.84	0.20	0.22	0.42	73
101	**Mali**	0.30	0.01	0.00	0.10	167
102	**Malta**	0.99	0.48	0.28	0.58	29
103	**Mauritania**	0.36	0.05	0.00	0.14	159
104	**Mauritius**	0.98	0.41	0.06	0.48	50
105	**Mexico**	0.93	0.22	0.13	0.43	66
106	**Moldova**	0.68	0.14	0.07	0.30	115
107	**Mongolia**	0.74	0.09	0.06	0.30	117
108	**Morocco**	0.87	0.12	0.23	0.41	78
109	**Mozambique**	0.26	0.02	0.01	0.09	169
110	**Myanmar**	0.10	0.01	0.02	0.04	176
111	**Namibia**	0.85	0.10	0.01	0.32	109
112	**Nepal**	0.55	0.01	0.00	0.19	143
113	**Netherlands**	0.99	0.67	0.32	0.66	9
114	**New Zealand**	0.98	0.57	0.25	0.60	26
115	**Nicaragua**	0.60	0.07	0.06	0.24	132
116	**Niger**	0.05	0.01	0.00	0.02	179
117	**Nigeria**	0.41	0.03	0.00	0.15	155
118	**Norway**	0.99	0.66	0.34	0.67	8
119	**Oman**	0.97	0.21	0.03	0.40	79
120	**Pakistan**	0.73	0.05	0.00	0.26	128
121	**Palestine**	0.63	0.21	0.02	0.29	122
122	**Panama**	0.90	0.16	0.10	0.39	86
123	**Papua New Guinea**	0.50	0.02	0.01	0.18	145
124	**Paraguay**	0.80	0.09	0.02	0.30	114

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	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	D OI 2004/2005	World Rank 2004/2005
125	Peru	0.86	0.10	0.21	0.39	85
126	Philippines	0.93	0.13	0.03	0.36	94
127	Poland	0.98	0.39	0.19	0.52	39
128	Portugal	0.98	0.45	0.12	0.52	41
129	Qatar	0.98	0.42	0.12	0.51	44
130	Romania	0.93	0.26	0.20	0.46	53
131	Russia	0.96	0.25	0.13	0.45	60
132	Rwanda	0.22	0.01	0.00	0.08	175
133	S.Tomé & Principe	0.32	0.05	0.04	0.14	158
134	Samoa	0.71	0.09	0.01	0.27	125
135	Saudi Arabia	0.96	0.27	0.04	0.42	72
136	Senegal	0.72	0.06	0.14	0.30	112
137	Serbia and Montenegro	0.95	0.30	0.03	0.42	70
138	Seychelles	0.97	0.32	0.10	0.46	54
139	Sierra Leone	0.26	0.01	0.00	0.09	172
140	Singapore	1.00	0.68	0.27	0.65	16
141	Slovak Republic	0.98	0.39	0.23	0.53	37
142	Slovenia	0.98	0.63	0.26	0.62	22
143	Solomon Islands	0.26	0.02	0.00	0.09	171
144	South Africa	0.90	0.18	0.05	0.38	91
145	Spain	0.99	0.54	0.30	0.61	25
146	Sri Lanka	0.90	0.06	0.03	0.33	106
147	St. Kitts and Nevis	0.90	0.26	0.13	0.43	65
148	St. Lucia	0.93	0.30	0.05	0.43	68
149	St. Vincent	0.89	0.32	0.15	0.45	55
150	Sudan	0.51	0.05	0.02	0.19	142
151	Suriname	0.71	0.26	0.03	0.33	103
152	Swaziland	0.80	0.09	0.01	0.30	116
153	Sweden	0.99	0.74	0.35	0.69	6
154	Switzerland	0.99	0.63	0.33	0.65	15
155	Syria	0.91	0.15	0.01	0.36	98
156	Taiwan, China	0.99	0.69	0.29	0.66	10

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	D OI 2004/2005	World Rank 2004/2005
157	Tajikistan	0.53	0.05	0.01	0.20	140
158	Tanzania	0.35	0.02	0.00	0.12	165
159	TFYR Macedonia	0.92	0.35	0.04	0.43	63
160	Thailand	0.95	0.18	0.07	0.40	80
161	Timor-Leste	0.28	0.01	0.00	0.10	168
162	Togo	0.48	0.03	0.02	0.17	146
163	Tonga	0.93	0.13	0.02	0.36	96
164	Trinidad & Tobago	0.97	0.30	0.07	0.45	57
165	Tunisia	0.96	0.16	0.05	0.39	83
166	Turkey	0.97	0.30	0.08	0.45	58
167	Turkmenistan	0.72	0.07	0.00	0.26	127
168	Uganda	0.45	0.01	0.00	0.15	152
169	Ukraine	0.91	0.17	0.02	0.37	93
170	United Arab Emirates	0.99	0.49	0.14	0.54	36
171	United Kingdom	0.99	0.68	0.33	0.67	7
172	United States	0.98	0.55	0.34	0.62	21
173	Uruguay	0.96	0.24	0.09	0.43	64
174	Uzbekistan	0.83	0.06	0.03	0.31	111
175	Vanuatu	0.52	0.04	0.01	0.19	141
176	Venezuela	0.93	0.18	0.18	0.43	67
177	Vietnam	0.76	0.06	0.02	0.28	123
178	Yemen	0.78	0.06	0.00	0.28	124
179	Zambia	0.39	0.01	0.00	0.13	160
180	Zimbabwe	0.42	0.05	0.03	0.17	149
	WORLD	0.77	0.23	0.11	0.37	90.5
	Africa	0.52	0.06	0.02	0.20	139.0
	Americas	0.86	0.23	0.12	0.40	78.9
	Asia	0.81	0.23	0.10	0.38	88.6
	Europe	0.97	0.46	0.22	0.55	38.4
	Oceania	0.71	0.21	0.09	0.33	103.3

Source: ITU/KADO Digital Opportunity Platform.

1) Opportunity

1.1 Mobile Coverage

This indicator is vital in measuring potential access to communications. In order to be able to access telecommunication services, users must have access to infrastructure. This indicator measures the potential usage of telecom services that could be achieved, if users had a mobile phone and subscription. It is widely available, with data for this published by many mobile operators.

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In the few countries where mobile population coverage data are not available, the percentage of the urban population is used as a proxy indicator, on the basis that it is less costly to install infrastructure in urban areas and they have a greater number of potential clients that can afford service. The percentage mobile population coverage is indexed as a proportion of full 100% coverage to give the index (Box 1.1). The goalpost is set at 100%, the point at which mobile cellular service is available to all citizens of a country. A number of economies have achieved full coverage of 100%. This indicator is included in the Opportunity category, weighted at 33%.

Mobile coverage is a basic determinant of access to telecommunications. It depends on the geography, terrain and distribution of the population within a country, but its cheapness and ease of installation mean that mobile coverage is growing rapidly in many countries, as illustrated by Bangladesh, where mobile coverage has grown from 36% in 2003 to a planned 85% coverage by the end of 2005 (see Figure 3).

Box 1.1: Calculating the Sub-Index for Population Coverage of Cellular Networks (i271pop)

Definition:

The mobile population coverage measures the percentage of inhabitants that are within range of a mobile cellular signal, whether or not they subscribe to mobile cellular services (note that this is NOT the same as the mobile subscription density or penetration). This is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population.

Where there are two or more operators, allowance should be made for the extent of overlapping mobile population coverage (e.g. in the capital and major cities), which must be deducted from their total.

Calculation:

In Sierra Leone, 35% coverage of the population had been achieved by Millicom in 2004, so the index is = (35/100) = 0.35

Figure 3: Growth in mobile coverage in Bangladesh
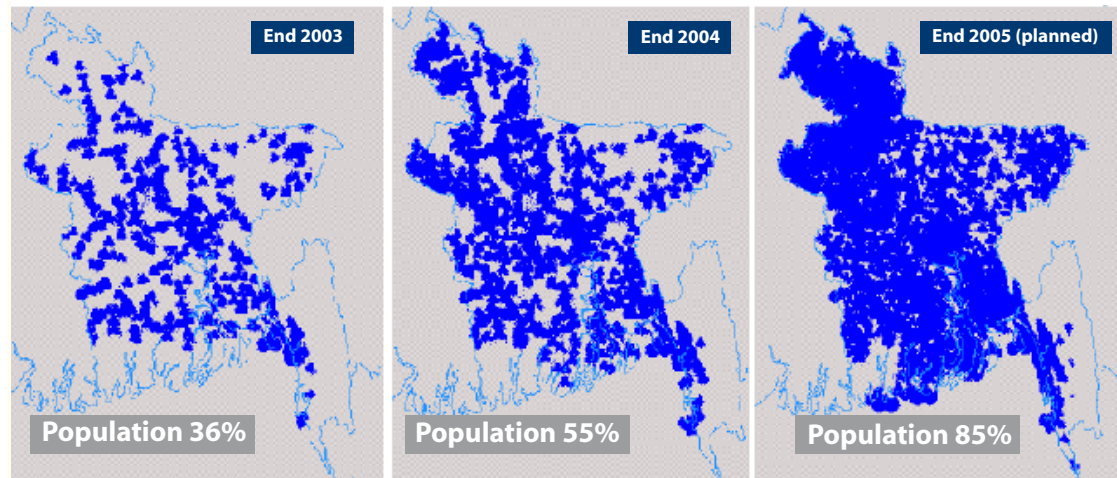
Source: World Information Society Report, ITU/KADO Digital Opportunity Platform

Digital Opportunity Index * www.itu.int/doi

1.2 Internet Access Tariffs

Affordability is essential for the effective demand for and use of ICT services, but there are difficulties in measurement, relating to the different types of Internet access, priced in different ways for a range of speeds (e.g., flat-rate or time-based subscriptions for dial-up, broadband, wireless Internet access).

The use of 20 hours of use per month for measurement is a popular yardstick. The European Union includes 20 hours in its Indicator access cost *e*Europe indicator, the OECD used 20 hours of use in its analysis. This indicator is calculated based on the cheapest package available for each country for at least twenty hours of use (spread over peak and off-peak times). The calculation does not include telephone line rental charges (for dial-up), but does include telephone usage charges where they apply. For cable modem access, the monthly subscription charge is included. Flat-rate pricing is growing in popularity, especially for broadband, as well as for some dial-up packages; in this case, the monthly subscription charge is taken, assuming that consumers use at least 20 hours. The Internet tariff is divided by 2004 monthly Gross National Income per capita to obtain the percentage of per capita income (from the World Bank). The indicator is adjusted by the goalpost and 'inverted' or subtracted from 100% to be consistent (since for affordability, low values are most desirable in contrast to other indicators, where high values are the most desirable). For countries where the cost of twenty hours' Internet access is comparatively expensive and greater than average monthly income, the resultant score is automatically capped at zero (e.g. the Republic of Congo). This indicator is included in the Opportunity category, weighted at 33%.

Box 1.2: Calculating the Sub-Index for Internet Access Tariffs (i4213_t20)

Definition:

This indicator refers to the lowest price for 20 hours of Internet usage per month. It includes the tariff components of monthly line rental, line usage charge and Internet access charge, plus any tax that may be levied (as this is a service used by both residential and business consumers).

The tariff chosen for a particular country would be the package for 20 hours per month that is the cheapest, widely available (or, in the case of regional service providers, is available in the capital city) and available to the general public without restriction (e.g., excluding in-company or limited time offers, and excluding offers that are bundled with some other service).

For dial-up packages, this is assumed to include:

- 10 one-hour sessions with peak-rate local call charges and 10 sessions at off-peak local rate (also called night or weekend) rate.
- This also includes twenty sets of connection/session initiation fees, on the basis of twenty one-hour sessions;
- Additional ISP charges may apply – again, these are assumed to include 10 hours at peak ISP rate and 10 hours at off-peak ISP rate.

Calculation:

For example, calculation of 20 hours' cost of Internet access for Bulgaria is the residential Fee Access 20 Hour prepaid package. This includes:

- the monthly subscription fee of 9.6 leva;
- Ten hours' of peak-rate ISP charge (0.01 st. per minute);
- Ten hours' of off-peak ISP charge (0.01 st. per minute);
- Zero dial-up connection fee for twenty sessions' log-in fees.

This gives a total Internet access cost of 11.52 leva or $7.32 or 3.2% of average monthly income.

The index calculation is therefore

$$= (100-3.2)/100 = 0.968 = 0.97$$

1.3 Mobile Access Tariffs

Now that mobile has outnumbered fixed lines to become the dominant form of voice communications (Figure 5), mobile tariffs are a key measure of affordability for consumers (fixed lines remain more important for businesses). However, there is a multitude of tariffs and pricing packages available, which makes comparisons difficult. For example, mobile tariffs differ for on-net (within the mobile network of the same operator) and off-net calls (outside an operator's mobile network).

Mobile access tariffs are based on prepaid tariffs (the main form of access in most developing countries). The indicator used is the OECD low-user basket methodology for prepaid tariffs (Table 2). The OECD basket for low usage includes 37 minutes and 30 text messages per month. Connection charges are excluded from the basket, due to problems of determining their true level (since they are often discounted or bundled with other services). The cost of the basket is then divided by monthly Gross National Income per capita to create an affordability indicator. The indicator is adjusted by the goalpost and 'inverted' or subtracted from 100% to be consistent (since for other indicators, high values are the most desirable). For countries with OECD low-user basket in excess of average monthly per capita income, the resultant score is automatically zero. This indicator is included in the Opportunity category, weighted at 33%.

Box 1.3: Calculating the Sub-Index for Mobile Access Tariffs

Definition:

This indicator refers to the cost of a basket of mobile usage per month as defined by the OECD for the profile of a low-user (Table 1). It includes approximately fourteen minutes of calls at peak rate, nearly thirteen minutes of calls at off-peak rate and just over ten minutes of calls at the weekend rate (where applicable), plus thirty SMS and any taxes that may be levied. Unlike the Internet access tariffs, it is not necessarily specified as the cheapest package on offer in an economy, merely a package that is representative and widely available (e.g. it is available in the capital city). It excludes in-company or promotional offer with an end-date.

In order to calculate the OECD low-user basket, it is necessary to know:
- ON-NET call charges (peak, off-peak and weekend, per minute local call tariff);
- OFF-NET call charges (peak, off-peak and weekend, per minute local call tariff);
- call charges to a fixed line from a mobile (peak, off-peak and weekend, per minute local call tariff);
- the price of a SMS.

Table 2: OECD Low-User Basket

Minutes	Fixed	On-net	Off-net	Total
Peak	6.38	5.32	2.39	14.10
Off-peak	5.88	4.90	2.21	12.99
Weekend	4.54	3.78	1.70	10.02
Calls	25	per month		
SMS	30	per month		

Source: Adapted from OECD. This data is regularly compiled by the ITU for 180 economies.

Table 3: Calculating the OECD Low-User Basket

Minutes duration	Call rate
6.38 x	Calls to a fixed line at the peak per minute local call tariff
5.88 x	Calls to a fixed line at the off-peak per minute local call tariff
4.54 x	Calls to a fixed line at the weekend per minute local call tariff
5.32 x	ON-NET call at the peak per minute local call tariff
4.90 x	ON-NET call at the off-peak per minute local call tariff
3.78 x	ON-NET call at the weekend per minute local call tariff
2.39 x	OFF-NET call at the peak per minute local call tariff
2.21 x	OFF-NET call at the off-peak per minute local call tariff
1.70 x	OFF-NET call at the weekend per minute local call tariff
30 x	Cost of a local SMS
TOTAL	**OECD Low-user basket**

Source: Adapted from OECD. This data is regularly compiled by the ITU for 180 economies.

Calculation:

For example, in the Czech Republic, Eurotel offers a package GO Original with a flat-rate of 7.5 koruna per minute. The calculation of the OECD low-user mobile for the Czech Republic therefore includes:

- 14.10 minutes at the peak rate of 7.5 koruny per minute;
- 12.99 minutes at the off-peak rate of 7.5 koruny per minute;
- 10.02 minutes at the weekend rate of 7.5 koruny per minute;
- 30 SMS at 3.7 koruna each.

This gives a total mobile basket of 389 koruny or $16.78 or 2.2% of average monthly income.

The index calculation is therefore

$= (100-2.5)/100 = 0.978 = 0.98$

2) Infrastructure

2.1 Fixed Lines

Fixed telephone lines are one of the oldest statistics used to analyze the telecommunication sector. Although they have been eclipsed by mobile, fixed telephone lines are nevertheless a major form of voice communications. Service charges for fixed lines tend to be cheaper than for mobile, making fixed lines more attractive. Fixed telephone lines are also the basis for Internet access in most economies, whether through dial-up, ISDN (Integrated Services Digital Network) or higher-speed DSL (Digital Subscriber Line) services.

The proportion of households with a fixed line telephone is used as the indicator on the basis that fixed lines tend to be associated with a household, rather than with an individual. These data are based on survey data. Several high-income countries do not conduct household surveys. Some other countries report the number of households with a telephone, without specifying whether it refers to fixed or mobile phones (or both). A substitute for this indicator is the number of residential telephone lines, which can be used to derive fixed-lines per 100 households. One shortcoming with this approach is that it does not account for second lines, although this is declining as households replace them with ISDN or DSL. This indicator is included in the Infrastructure category, weighted at 20%.

Box 2.1: Calculating the Sub-Index for Households with Fixed Lines (i112hp)

Definition:

This indicator measures the proportion of households with fixed lines. A fixed line is a telephone line connecting the subscriber's terminal equipment to the public switched network and which has a dedicated port in the telephone exchange equipment. This term is synonymous with the term main station or Direct Exchange Line (DEL) that are commonly used in telecommunication documents. It may not be the same as an access line or a subscriber. (Note: Some countries include the number of ISDN channels; if so, this should be specified in a note). Fixed wireless subscribers should also be included.

Calculation:

In Ghana, 5% of households had a fixed telephone in 2005, so the index is

$= (5/100) = 0.05$

In 2004, 50.2% of households in the Slovak Rep. had a telephone, so the index is

$= (50.2/100) = 0.502 = 0.50$

Source: p. 20, "Towards an African e-index 2005", LINK Centre Policy Research Paper No. 4 and EUROSTAT.

2.2 Computers

Computers are fundamental building-blocks in the information society. They can be used to boost productivity through word processing, spreadsheets, presentations and dozens of other applications. They are also important as the interface between users and the Internet. This indicator uses the generic *computer*, rather than Personal Computer (PC). The DOI uses the household penetration of computers on the basis that, in many developing countries with large average family sizes, household penetration reflects more accurately the true extent of access to ICTs and is always higher than individual per capita penetration.

Figure 4: Trends in Household Penetration
Trends in household penetration worldwide, percentage, 2003-2005.

Source: ITU.

Digital Opportunity Index * www.itu.int/doi
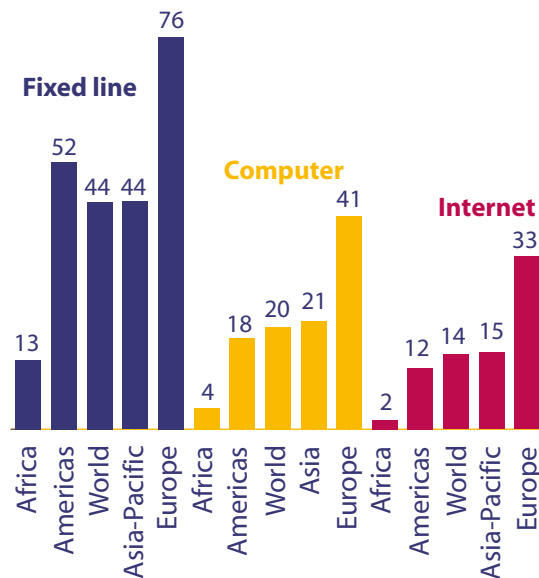
In addition to mini- and mainframe computers, this indicator should also include other devices that have a processor and computer-like components such as screens and keyboards. This indicator thus includes devices such as laptops computers, Personal Digital Assistants (PDAs) and smart phones. Virtually all statistics on the stock of computers for countries is based on PCs (generally, but not always, including laptops). Technological innovation poses growing difficulties for the definition of this indicator - the stock of computers should not generally include Internet-enabled phones, which can perform similar tasks to PCs, but for mobile networks. This indicator is included in the Infrastructure category, weighted at 20%.

2.3 Internet Access

Internet subscriptions give an indication of the number of households accessing the Internet through paid services and is a useful indicator of overall Internet infrastructure. A growing number of countries collect data on households with Internet access at home, through censuses and household or specialized ICT surveys. For countries that do not currently collect this data, a proxy indicator can be used, based on the number of residential Internet subscribers. If that is not available, then the percentage of homes with Internet access can be estimated, based on global averages for the share of residential Internet subscribers among total Internet subscribers. The goalpost for this indicator is set at 100% and it is assigned a weight of 20% within the infrastructure category.

Box 2.3: Calculating the Sub-Index for Households with Internet Access (i4213hp)

Definition

This indicator measures the proportion of households with access to Internet service, including dial-up, leased lines and broadband. This will generally be based on survey data and is generally expected to be based on household subscription to Internet service.

Calculation:

In South Africa, 4% households have Internet access, so calculation of the index gives:

= (4/100) = 0.04

Source: p. 137, "Towards an African e-index 2005", LINK Centre Policy Research Paper No. 4, LINK Centre, Witwatersrand Institute, South Africa.

Figure 5: Household Internet Penetration
Measurements of household access to Internet for Europe, percentage, 2004.

Source: EUROSTAT.
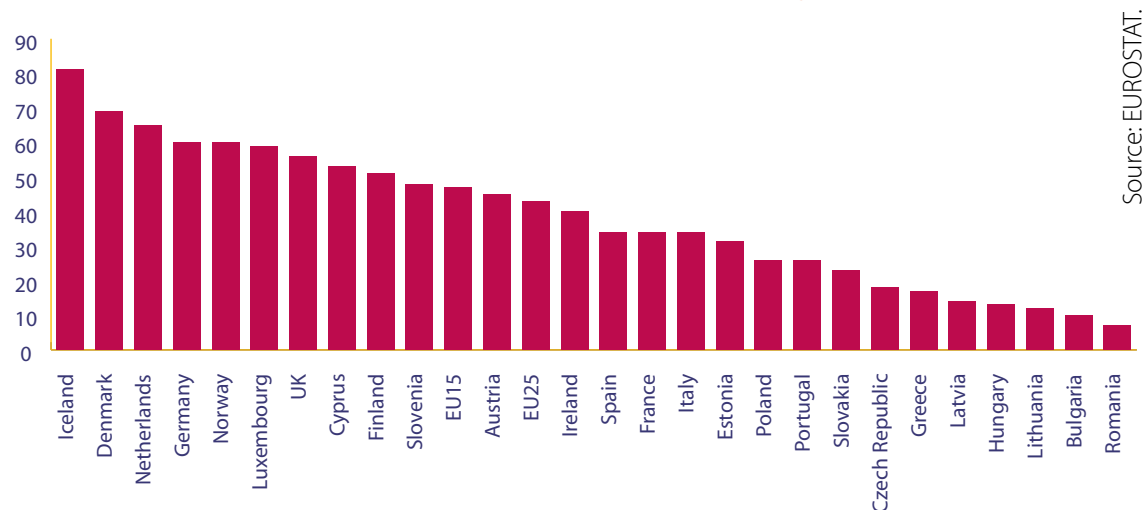
2.4 Mobile Cellular Subscribers

Mobile has become the main form of voice communications in most economies (Figure 6) and is a key indicator of a country's ICT development. Data on the number of mobile subscribers suffer from comparability problems. The number of mobile subscribers can include inactive prepaid users, while operators vary in the length of time after which a subscriber is considered inactive. In addition, some customers have two or more subscriptions, due to cheaper on-net calls within certain networks or other reasons (e.g., work number versus personal number, enhanced roaming capability, car phones etc.). As a result, mobile cellular subscribers per 100 inhabitants can exceed 100 (initially reached by three countries in 2003, and twenty-five in 2005). This implies that there are already more mobile phones than inhabitants, which is likely to become the case as we approach ubiquitous network societies in which computer and communication capabilities are embedded into the environment and objects around is. A goalpost of 100 is used, with countries where mobile subscriptions exceed this capped at 100.

Figure 6: Trends in Worldwide Voice Subscribers
Growth in mobile and fixed subscribers worldwide, millions, 1995-2005.

Source: ITU.
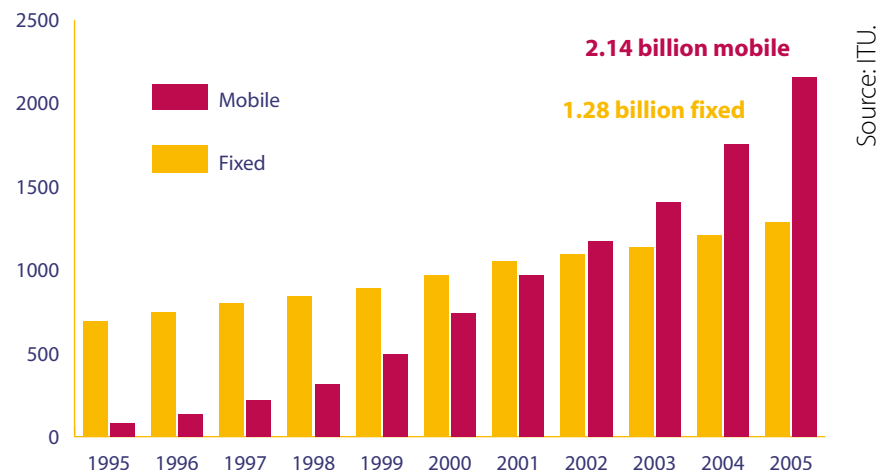
2.5 Mobile Internet

Mobile Internet access promises all the services of Internet access, combined with the flexibility and convenience of mobile telephony, and is a strong growth market for voice communications (Figure 6). However, there are a number of issues posed by the definition and measurement of mobile Internet subscribers. Since mobile Internet access is relatively recent, most countries do not compile subscriber data. Some operators report the number of high-speed subscriptions (e.g., GPRS, 3G) as an equivalent for mobile Internet subscribers, regardless of whether the user actually accesses the Internet. Likewise, other operators report the number of subscriptions to mobile portal services (e.g., i-mode, Vodafone Live, etc.), regardless of whether users actually use the service. Some subscribers use mobile cellular networks to access the Internet using laptop computers; indeed, access to some 3G networks is often initially only possible through datacards connected to computers. It is not clear whether datacard users should be considered fixed or mobile Internet subscribers.

In general, either the number of Wireless Access Protocol (WAP), General Packet Radio Service (GPRS) or mobile portal subscribers is used. In the absence of data, estimates are based on the number of post-paid subscribers, the availability of mobile data networks (e.g., GPRS, EDGE, CDMA2000 or WCDMA) and regional trends. On the basis that it is desirable everyone should have access to mobile Internet services, mobile Internet subscribers are measured per capita, as a proportion of population, and indexed as a proportion of full penetration. Therefore a goalpost of 100 is established for this indicator, which is given a weight of 20% within the Infrastructure category.

Box 2.5: Calculating the Sub-Index for Mobile Internet Subscribers (i271l and i271m)

Definition

Mobile Internet subscribers includes subscribers to low and medium speed mobile networks (e.g., GPRS, WAP, CDMA 1x, iMode etc), regardless of whether they are actually using multimedia services, only of their potential for data communications over the Internet. In this context, "low and medium-speed mobile" implies a speed that is less than 256 kbit/s in both directions, including:

-General Packet Radio Service (GPRS) is a 2.5G mobile standard typically adopted by GSM operators as a migration step towards 3G (W-CDMA).

-Wireless Application Protocol (WAP) is a free, unlicensed protocol for wireless communications that allows Internet access from a mobile telephone.

-i-Mode is a packet-based means of wireless data transfer using Compact Wireless Markup Language (CWML) for data display.

-CDMA 2000 1x is the core CDMA2000 wireless air interface standard. Although capable of higher data transmission rates, most network deployments have limited the peak data rate to 144 kbit/s.

Calculation:

In the Rep. of Korea, 52.2% of the population were mobile Internet subscribers in 2004, so the index is
$= (52.2/100) = 0.522 = 0.52$

Source: The Ministry of Information and Communication of Rep. of Korea.
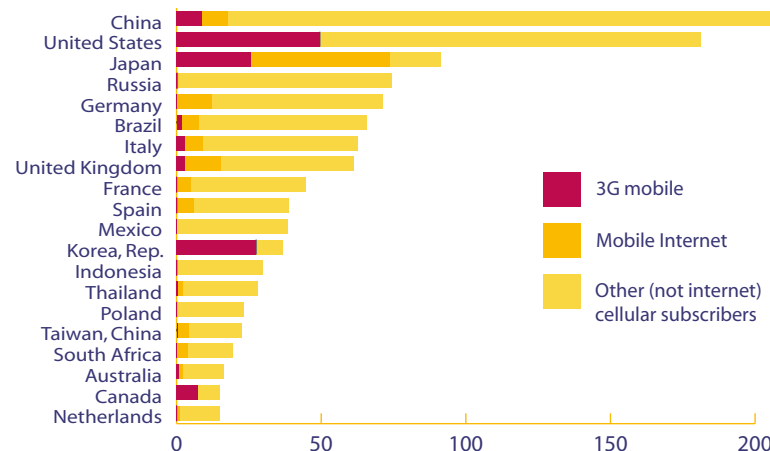
Figure 7: Mobile Internet Subscribers
Top Twenty Largest Economies with Mobile Internet Subscribers, millions, end 2004.

Source: World Information Society Report, ITU.

3) Utilization

3.1 Internet Users

The proportion of individuals that use the Internet (over the last 12 months) is a vital measure of the access of citizens to the rich information processing, storage and communication services offered by the world's most powerful communications tool.

The proportion of the population using the Internet should be based on country-based survey data; however, this introduces comparability issues with this indicator, as all countries use the same time span to measure Internet use. Where surveys have been conducted, the age ranges surveyed often vary. Many countries do not carry out surveys on the number of Internet users, so data must be estimated from subscriber counts. This indicator is included in the Utilization category, weighted at 33 per cent.

Box 3.1: Calculating the Sub-Index for Internet Users (14212)

Definition

The estimated number of Internet users. A growing number of countries are measuring this through regular surveys. The precise definition of this indicator is flexible, according to the survey definition used, but it should include users who have accessed the Internet over the last twelve months, and exclude users who have not accessed the Internet since one year previously. Surveys usually indicate a percentage of the population for a certain age group (e.g., 15-74 years old). The total number of Internet users in this age group should be used, and not the percentage of Internet users in this age group multiplied by the entire population. In situations where surveys are not available, an estimate can be derived based on the number of subscribers.

Calculation:

In Lao PDR, 1.5% of the population used the Internet in 2004, so the index is
$= (1.5/100) = 0.015 = 0.02$

3.2 Ratio of Fixed Broadband Subscribers

Many of the most advanced applications are only possible through broadband access. ITU defines broadband as services offering speeds of at least 256 kbit/s or more. However, operators in many countries consider services (e.g., DSL, cable modem) as broadband even when they offer speeds less than 256 kbit/s. Most data cover "fixed" broadband access (e.g., DSL, cable modem, fixed wireless, fibre optic, Ethernet LAN, etc.) and do not include broadband mobile cellular network subscribers.

In the Utilization category of the DOI, this indicator measures the proportion of fixed Internet subscribers that subscriber to broadband services. This indicator is all the more important, given the growth in broadband availability and speed that has taken place over recent years, with the result that disparities between countries and social groups in quality of access are becoming more important (Figure 8). This indicator is included in the Utilization category, weighted at 33%.

Figure 8: Growth in Broadband Availability and Speeds, 2003-2005

Number of countries with broadband, 2002-2006

Growth in maximum advertised speed, 2003-2006
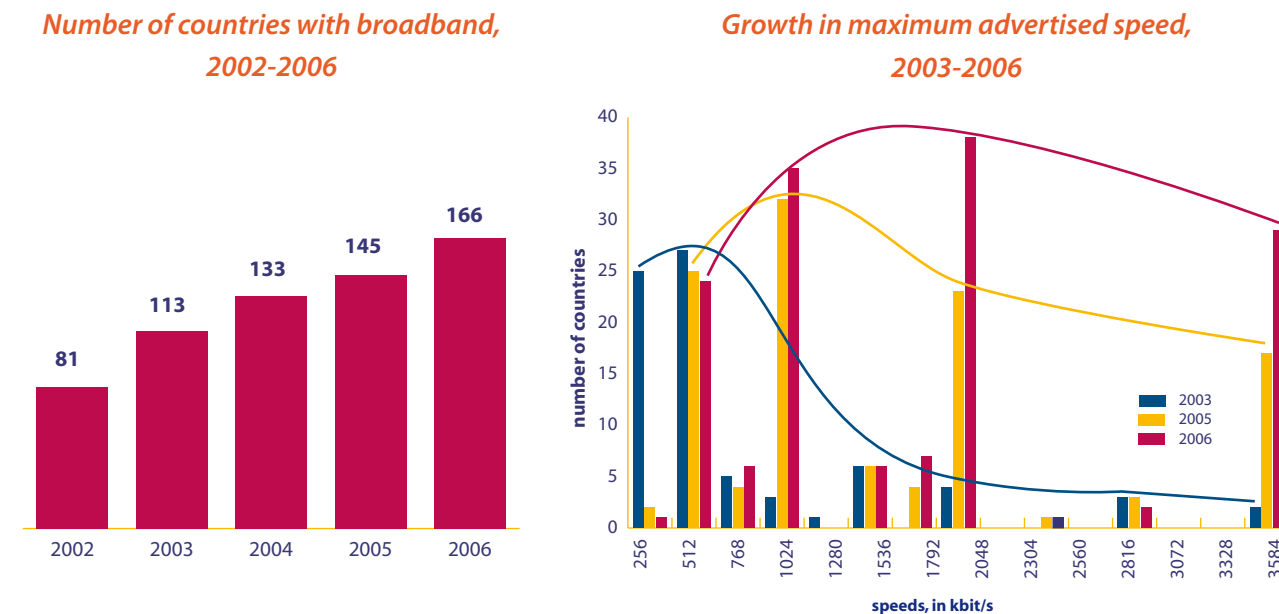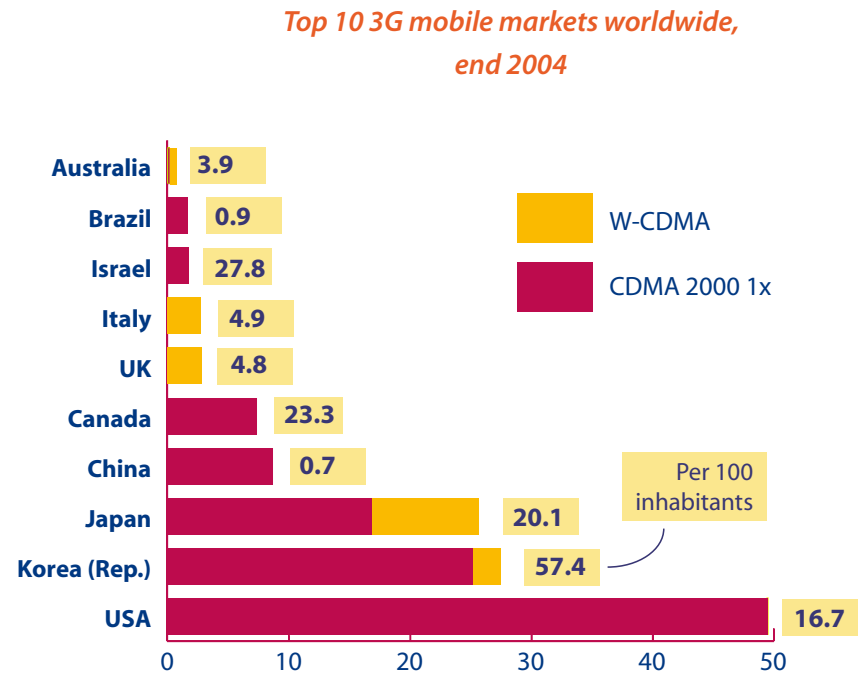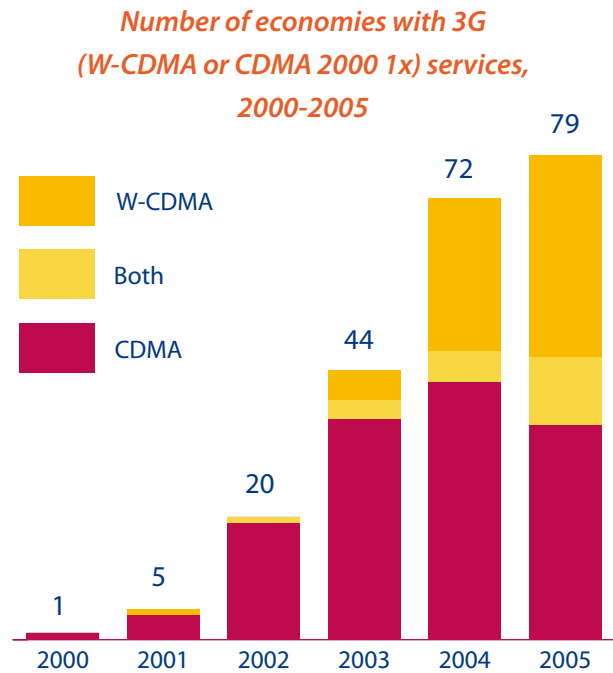
Source: World Information Society Report, ITU.

3.3 Ratio of Mobile Broadband Users

This indicator measures the proportion of mobile users that use mobile broadband services. Mobile broadband refers to the number of subscribers to mobile cellular networks offering speeds of at least 256 kbit/s in one direction. So far, only two 3G technologies (W-CDMA and CDMA EV-DO) fulfil this requirement. One caveat is that mobile broadband is unlike fixed broadband, where users subscribe because they want the higher speed. With mobile, users often subscribe to a network because of reasons other than broadband access *per se*. Broadband mobile often offers considerable advantages in terms of quality. A goalpost of 100 is thus established for mobile broadband. This makes it consistent with the goalpost for mobile cellular subscribers per 100 inhabitants, implying that ideally all mobile subscriptions should eventually have access to broadband speeds to meet the highest level of quality. It is given a weight of 33% within the Utilization category.

Figure 9: 3G Economies

Number of economies with 3G (W-CDMA or CDMA 2000 1x) services, 2000-2005

Top 10 3G mobile markets worldwide, end 2004

Source: World Information Society Report, ITU.

Box 3.3: Calculating the Sub-Index for Mobile Broadband Subscribers (i271G/i271)

Definition

This indicator measures the number of mobile broadband subscribers (i271G) as a proportion of total cellular mobile subscribers (i271). The number of mobile broadband subscribers includes all subscribers to IMT-2000 (3G) high-speed mobile networks (e.g., CDMA2000 1X, WCDMA, CDMA2000 1xEV-DO, etc.) regardless of whether they are using multimedia services, but only of whether they have the capacity for data communications over the Internet. In this context, "high-speed mobile" implies a speed that is equal to, or greater than, 256 kbit/s in at least one direction, including:

· 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 kbps and up to 2 Mbps when fully implemented. Known as Universal Mobile Telecommunications System (UMTS) in Europe.

· CDMA2000 1xEV-DO is an IMT-2000 3G mobile network technology, based on CDMA, that delivers packet switched data transmission speeds of up to 2.4 Mbps.

· Enhanced Data rates for GSM Evolution (EDGE) is an intermediate technology that brings second-generation GSM closer to third-generation capacity for handling data speeds up to 384 kbits/s.

· High-Speed Downlink Packet Access (HSPDA) aims to achieve peak data rates of 14.4 Mbps.

Calculation:

In France, approximately 25,000 or 0.01% of mobile Internet subscribers were mobile broadband subscribers in 2004, so the index can be calculated as:

= (0.01/100) = 0.001 = 0.00

4) Example calculation of the DOI

China's scores for the DOI, its sub-indices and the 11 individual indicators, 2005

	Indicator	%	Value	DOI	Rank
OPPORTUNITY	1 Percentage of population covered by mobile cellular telephony	80.0%	0.8	0.89	96th
	2 Internet access tariffs as a percentage of per capita income	9%	0.91		
	3 Mobile cellular tariffs as a percentage of per capita income	3%	0.97		
INFRASTRUCTURE	4 Proportion of households with a fixed line telephone	68%	0.68	0.25	69th
	5 Proportion of households with a computer	20%	0.2		
	6 Proportion of households with Internet access at home	9%	0.09		
	7 Mobile cellular subscribers per 100 inhabitants	26%	0.26		
	8 Mobile Internet subscribers per 100 inhabitants	1%	0.01		
UTILIZATION	9 Proportion of individuals that used the Internet	7%	0.07	0.11	66th
	10 Ratio of fixed broadband subscribers to total Internet subscribers	27%	0.27		
	11 Ratio of mobile broadband subscribers to total mobile subscribers	0%	...		
	DIGITAL OPPORTUNITY INDEX			**0.42**	**74th**

Note: The indicators are averaged within each category and categories are averaged to obtain the Digital Opportunity Index value.

Source: ITU/Korea Digital Opportunity Platform.

3. Further Uses of the DOI

The DOI has been used to assess Digital Opportunity for regions, towns and provinces within a country, nation and state, **to assess different levels of access within an economy (e.g.** Brazil **and** Egypt**).** Measurements of the DOI within a country can also be used to track the domestic digital divide or urban/rural disparities in access – not just in levels of access (where it is usually assumed that urban access will always be greater than rural access, e.g. Egypt), but in types of access, with mobile or satellite technologies often used for more remote rural areas, in preference to fixed line infrastructure. The fixed/mobile split within the DOI means that the DOI can be readily used to assess differences in the type of access (e.g. the use of mobile services in Africa and the development of mobile services in Indonesia). A series of evaluations over time can be used to monitor the evolution of the digital divide within a country of region, or to compare a country to its neighbours (e.g. India, Pakistan and Tunisia).

Paragraph 28a of the Geneva Plan of Action calls for performance evaluation and benchmarking, including gender analysis. The DOI can be used to assess and monitor differences in access to ICTs by gender (e.g. for the Czech Republic). Household and tariff data cannot be disaggregated by gender (it is assumed that all members of the household can access the telephone, whether male or female, and tariffs are the same for all). However, studies in some countries have shown different levels of access for male and female Internet users and mobile phone users. The DOI can be compared for different groups within society to take into account and evaluate differences in access (e.g. for youth access to ICTs in Bulgaria).

As part of the further work to be carried out on developing the DOI, it is also planned to carry out sensitivity analysis, for instance to see the effect of using purchasing power parities instead of US$ exchange rates, or using real tariff values rather than tariffs as a proportion of GNI per capita.

It is hoped that this Users' Guide will enable policy-makers and researchers to use and apply the DOI for their own policy analysis. An interactive spreadsheet has been prepared to facilitate further research, which can be obtained by contacting spumail@itu.int.

Annex 1: Methodological note

The definitions of the core indicators used to compile the DOI are available from the **Partnership on Measuring ICT for Development**. The latest available data (2005) was used, except where noted otherwise. Where 2005 data were not available, later data was used for tariffs while for other indicators, earlier data was used or an estimate was made.

This section identifies the methodology used to compile the indicators for this version of the DOI, including the time period of the data, and where necessary, the estimation technique.

Indicator	Core code	Note
Percentage of population covered by mobile cellular telephony	A-7	The base year is 2005. This data is generally available from many mobile network operators. If national data are not available from an official source, the figure for the largest operator is used. In rare instances, this may understate actual coverage since different operators could cover different sections of the country. In the absence of data for a few countries, the percentage of the urban population is used on the assumption that it is less costly to install infrastructure in those areas and they have a greater number of potential clients that can afford service.
Internet access tariffs (20 hours per month) as a percentage of per capita income	A-8	The base year is 2006 since this is the latest year for which a complete set of comparable data is available. Data are based on the cheapest available package for 20 hours of use per month and do not include telephone line rental. The basket is divided by 2004 Gross National Income per capita (from the World Bank).
Mobile cellular tariffs as a percentage of per capita income	A-9	The base year is 2005, since this is the latest year for which a complete set of comparable data is available. A monthly charge is compiled based on a basket of peak and off-peak and on-net, off-net and fixed calls. The basket is divided by 2004 Gross National Income per capita (from the World Bank).
Proportion of households with a fixed line telephone	HH-3	This indicator, which is based on 2005 data, should ideally be compiled from a household survey. If not available, administrative records can be used for the number of residential telephone lines divided by the number of households.
Proportion of households with a computer	HH-5	This indicator, which is based on 2005 data, should be compiled from a household survey. If not available, data on the number of computers in the country could be used, adjusted for the estimated amount in homes. If that data is not available, then the data are estimated based on the per capita income of regional peers.
Proportion of households with Internet access at home	HH-7	This indicator, which is based on 2005 data, should be compiled from a household survey. I not available, data on the number of Internet subscriptions, adjusted for the estimated amount in homes, can be used. If that data is not available, then the data are estimated based on the per capita income of regional peers.

Indicator	Core code	Note
Mobile cellular subscribers per 100 inhabitants	A-2	The base year is 2005. Data are universally available for this indicator.
Mobile Internet subscribers	A-4†	The base year is 2005. Since mobile Internet access is relatively recent, many countries either do not report data on the number of subscribers or definitions vary. There are a variety of indicators used to reflect mobile Internet use. Some operators report the number of high-speed subscriptions and others report the number of subscriptions to their mobile portal services. Some users utilize mobile cellular networks to access the Internet using laptop computers. There is little consensus as to whether these types of users should be considered fixed Internet subscribers or mobile Internet subscribers. Finally, the concept of Internet access is seriously challenged when including mobile, since the users' experience is entirely different and many so-called mobile Internet users are not actually surfing websites per se but downloading logos and ring tones or sending picture messages. In general, either the number of Wireless Access Protocol (WAP), General Packet Radio Service (GPRS) or mobile portal subscribers is used. In the absence of data, estimates are based on the number of post-paid subscribers, the availability of mobile data networks (e.g., GPRS, EDGE, CDMA2000 or WCDMA) and regional trends.
Proportion of individuals that used the Internet	HH-8	The base year is 2005. A growing number of countries have carried out surveys. In the absence of survey data, national estimates are used. If these are lacking, then estimates are derived from the number of subscribers.
Proportion of fixed broadband subscribers to total Internet subscribers	A-5†	The base year is 2005. There is a growing consensus that a service should be considered broadband only if it offers speeds of at least 256 kbit/s in at least one direction. Note that this indicator refers to 'fixed' type of broadband access such as DSL, cable modem, Ethernet LAN, fibre optic and Fixed Wireless Access. This data set is generally complete for most countries that have broadband service.
Proportion of mobile broadband subscribers to total mobile subscribers	A-5†	The base year is 2005. Mobile broadband subscribers refer to users of mobile networks providing speeds of at least 256 kbit/s in at least one direction. This data set is generally complete for countries that have mobile broadband service.

Note: † Derivation of core indicator.

Source: ITU/KADO.

Annex 2: Data series used to compile the DOI

	Code*	Data series	In DOI indicator
1	i61	Total population	1,7,8,9
2	i62	Number of households	4,5,6
3	i632$	Per capita income	2,3
4	i271pop	Number of inhabitants within range of a mobile cellular signal	1
5	i4213_t20	Internet Access Tariffs (20 hours)	2
5a	i153$	Cost of a 3-min. local call (**peak rate**) (US$)	2
5b	i153o$	Cost of a 3-min. local call (off-**peak and/or weekend rate**) (US$)	2
5c	**	Connection/session initiation fees	2
5d	i4213p	Per minute ISP rate at peak (if additional ISP charges apply)	2
5e	i4213po	Per minute ISP rate at off-peak (if additional ISP charges apply)	2
6	**	OECD low-user basket (prepaid mobile)	3
6a	i153p$	Per min local call charges over mobile network (prepaid) at the peak (on-net, off-net and to fixed line)	3
6b	i153po$	Per min local call charges over mobile network (prepaid) at the off-peak and/or weekend (on-net, off-net and to fixed line)	3
6c	i153psms	Price of (local) sms	3
7	i112hp	Number of households with fixed line (and/or ISDN channels, and fixed wireless subscribers)	4
8	i422hp	Number of households with computer	5
9	i4213hp	Number of households with internet	6
10	i271	Number of mobile cellular subscribers	7,11
11	i271m	Number of mobile internet subscribers	8
12	14212	Number of internet users	9
13	i4213tb	Number of broadband subscribers	10

14	i 4213	Total number of internet subscribers	10
15	i 271G	Number of mobile broadband subscribers	11
16	i652	Average annual exchange rate	2,3
Proxy Indicators*			
17	i6111	Urban population (in per cent)	4
18	i1111c	Residential fixed lines per 100 households	1

* code in the ITU World Telecommunication Indicators database

** code to be assigned imminently

*** see the methodological note (Annex 1) for details.