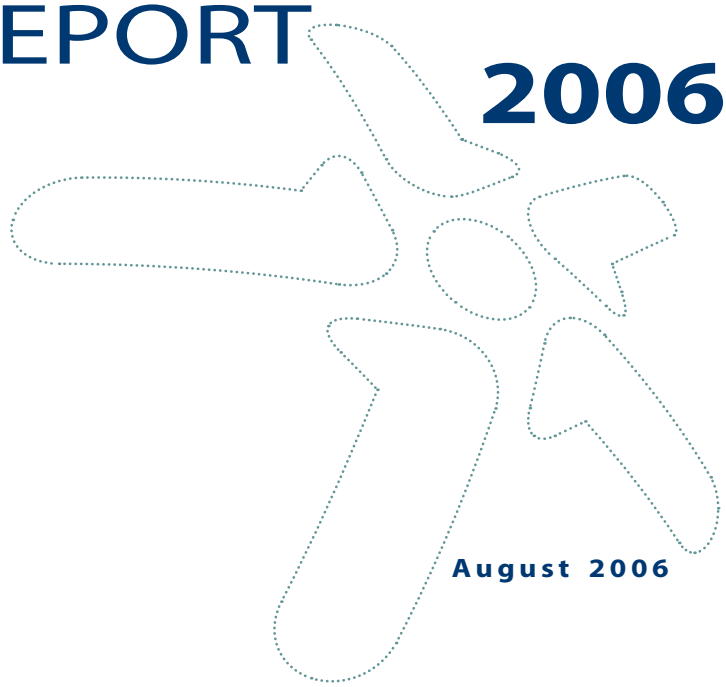
International Telecommunication Union

WORLD INFORMATION SOCIETY REPORT 2006



August 2006

MIC KADO ITU International Telecommunication Union

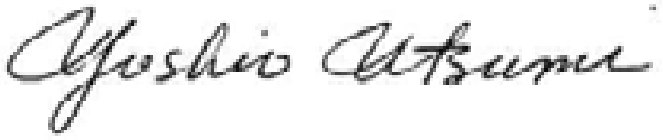
Foreword

The World Summit on the Information Society (WSIS) was held in two phases: in Geneva, from 10-12 December 2003 and in Tunis, from 16-18 November 2005. The Summit set out a vision of a future Information Society in which Information and Communication Technologies (ICTs) are available anywhere, anytime and to anyone. The Tunis phase focused on the challenge of realising this vision, by turning principles into actions. It is in accepting this challenge, and in implementing the WSIS outcomes, that our work continues today.

Based on the unique multi-stakeholder approach adopted at WSIS, new responsibilities were taken on by all stakeholders –governments, business entities, civil society and international organisations– for implementing the WSIS *Plan of Action* adopted in Geneva. The Summit identified the need for an effective follow-up mechanism, including a methodology for evaluation of the WSIS implementation. With the launch of this new series of *World Information Society Reports*, ITU and its partners are providing a new tool for monitoring progress in building the Information Society.

This inaugural edition presents the **Digital Opportunity Index** (DOI) as a composite index, which was endorsed by WSIS as part of the approved evaluation methodology. It has been designed to assess progress in creating digital opportunity and bridging the digital divide. The DOI shows how mobile connectivity is transforming telecommunications in many developing countries around the world, while broadband and mobile Internet access continue to grow steadily. The Index can be used to inform and enrich policy-making through benchmarking and analysis of performance. It can be used for comparisons within regions, within countries, and also to analyse the experience of different groups within society in sharing in an inclusive Information Society.

The Report also highlights some of the important implementation that is underway in support of the commitments made during the Summit and recognises the valuable work being carried out in different parts of the world. It is my hope that this Report will focus attention and maintain the momentum of WSIS, as we work together to fulfill the pledge we made at the World Summit – a pledge to turn the digital divide into digital opportunity for all.



Yoshio UTSUMI

Secretary-General of the World Summit on the Information Society (WSIS)
Secretary-General of the International Telecommunication Union (ITU)

Acknowledgements

This inaugural edition of the *World Information Society Report* was prepared by a team led by ITU's Strategy and Policy Unit (SPU) including Phillippa Biggs, Tim Kelly and Youlia Lozanova from ITU, Michael Minges of Telecommunication Management Group, Inc. and Lilia Perez-Chavolla of the National Regulatory Research Institute at the Ohio State University. The cover was designed by Youlia Lozanova. The maps were done by Youlia Lozanova and Paul Hamilton.

This Report introduces the **Digital Opportunity Index** (DOI), which has been developed by the Digital Opportunity Platform, whose members currently include ITU, United Nations Conference on Trade and Development (UNCTAD), the Korea Agency for Digital Opportunity and Promotion (KADO) and the Ministry of Information and Communication of the Republic of Korea. The authors are particularly grateful to Dr. C. M. Cho of KADO for his vision and insights into early iterations of the DOI and to Dr. Mongi Hamdi of UNCTAD for his support. The Digital Opportunity Platform is an open multi-stakeholder partnership that welcomes new partners.

Some of the data contained in this Report is taken from the ITU World Telecommunication Indicators Database maintained by the ITU. The database is available on CD-ROM or over the Internet as a subscription service. All of ITU's indicators, reports and databases are available for purchase at www.itu.int/indicators. More information on ITU's Reports can be obtained from www.itu.int/publications.

The main text of the report and the executive summary are available, free of charge, online at www.itu.int/wisr. Printed copies, including the detailed statistical annex, are available for purchase from the ITU Publication Sales Office at [www.itu.int/publications, Fax: +41 22 730 51 94, email: sales@itu.int], with discounts for ITU Member States and Sector Members, purchasers from Least Developed Countries (LDCs) and university libraries.

The views expressed in this Report are those of the authors and do not necessarily reflect the opinions of ITU or of its membership.

ISBN: 28974

CONTENTS

Chapter One: A Summit for Building the Information Society

Chapter Two: Measuring the Information Society

Chapter Three: Information Society Trends

Chapter Four: From Measurement to Policy-Making

Chapter Five: Beyond WSIS - Making a Difference Globally

Chapter Six: Towards an Information Society for All

List of Boxes

List of Box Figures

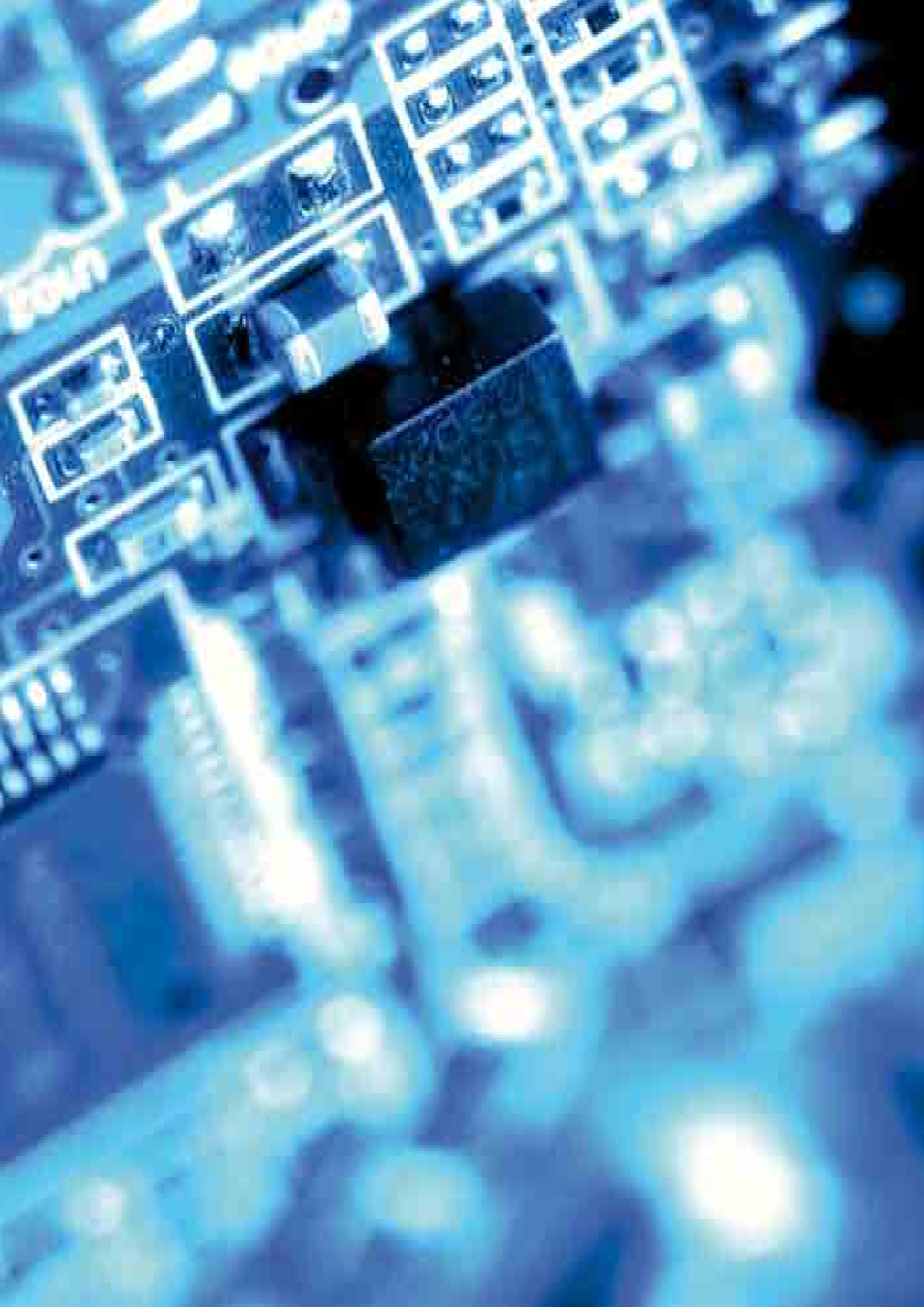
List of Tables

List of Figures

List of Annexes

List of Acronyms

ADSL	Asymmetric Digital Subscriber Line
APC	Association for Progressive Communication
ARPU	Average Revenue Per User
ATM	Asynchronous Transfer Mode
BRIC	Brazil, Russia, India and China
B2B	Business-to-business
B2G	Business-to-Government
CDMA	Code Division Multiple Access
CDMA EV-DO	CDMA Evolution – Data Optimised
CDMA EV-DV	CDMA Evolution – Data and Voice
CIDA	Canadian International Development Agency
CIS	Commonwealth of Independent States
CMC	Community Multimedia Centre
DAI	Digital Access Index
DOI	Digital Opportunity Index
DSL	Digital Subscriber Line
ECLAC	UN Economic Commission for Latin American and the Caribbean
EIU	Economist Intelligence Unit
FOSS	Free and Open Source Software (see also OSS)
FTTH	Fibre To The Home
FTTP	Fibre To The Premises
FTTx	Fibre To The X (e.g., to the home, premises, curb)
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
GSM	Global System for Mobile (Communications)
GSO	Geo-Synchronous Orbit (satellite)
HDI	UNDP Human Development Index
HSDPA	High-Speed Downlink Packet Access
ICT-OI	ICT Opportunity Index
ICTs	Information and Communication Technologies
ILO	International Labour Organisation
IMT-2000	International Mobile Telecommunications-2000 (3G)
IP	Internet Protocol
IPTV	Internet Protocol Television
ISP	Internet Service Provider
ITC	International Trade Centre
IXP	Internet Exchange Point
ITU	International Telecommunication Union
KADO	Korea Agency for Digital Opportunity and Promotion
LDCs	Least Developed Countries
MDGs	Millennium Development Goals
MSP	Multi-Stakeholder Partnership
NGN	Next-Generation Network
NGO	Non-Governmental Organisation
NSO	National Statistical Office
OECD	Organisation for Economic Cooperation and Development
PC	Personal Computer
PDA	Personal Digital Assistant
PPP	Public/Private Partnership
RFID	Radio-Frequency IDentification
Rs	Rupee (Indian currency)
SMS	Short Message Service
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access
TRA	Telecommunication Regulatory Authority (or Agency)
TV	Television
UMTS	Universal Mobile Telecommunications System
UNCDF	United Nations Capital Development Fund
UNCTSD	United Nations Commission on Science and Technology for Development
UNCTAD	United Nations Conference in Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDL	Universal Networking Digital Language
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGIS	UN Group on the Information Society
UNIDO	United Nations Industrial Development Organization
UNIFEM	United Nations Development Fund for Women
USD	United States Dollar
VSAT	Very Small Aperture Terminal (satellite)
WAP	Wireless Access Protocol
W-CDMA	Wideband Code Division Multiple Access
WEF	World Economic Forum
WHO	World Health Organization
Wi-Fi	Wireless Fidelity
WiMAX	Worldwide Interoperability for Microwave Access
WSIS	World Summit on the Information Society
3G	Third-Generation (mobile)
2G	Second Generation (mobile)



CHAPTER ONE

A Summit for Building the Information Society

1.1 The World Summit on the Information Society (WSIS)

The *World Information Society Report* is the inaugural edition of an annual series of reports charting the development of the Information Society worldwide. In particular, this new series will chart progress towards the implementation of the outcomes of the World Summit on the Information Society (WSIS). This United Nations Summit was held in two phases:

- The Geneva Phase, 10-12 December 2003, resulted in the adoption of the *Geneva Declaration of Principles* and *Geneva Plan of Action*;
- The Tunis Phase, 16-18 November 2005, resulted in the adoption of the *Tunis Commitment* and the *Tunis Agenda for the Information Society*.[1]

1.1.1 The WSIS vision

The four outcome documents of the Summit challenge the world community to build an Information Society that is 'people-centred, inclusive and development-oriented' and where 'everyone can create, access, utilize and share information and knowledge' (*Geneva Declaration*, para 1). Furthermore, the *Geneva Declaration* contains a commitment to turn the 'digital divide into a digital opportunity for all' (para 10) and to provide access to Information and Communication Technology (ICT) infrastructure and services that is 'universal, ubiquitous, equitable and affordable' (para 21).

World Summits often present bold commitments and there is sometimes a discrepancy between their ambitious goals and actual reality. But the WSIS was different from other Summits in a number of ways:

- The WSIS was planned, right from the start, as a multi-stakeholder partnership in which the private sector, civil society and international organisations would work alongside governments in converting words into actions;
- During the first phase of the WSIS, government leaders committed themselves to a series of ten ambitious targets to broaden access to ICTs, including connecting all the world's villages, and linking schools, hospitals, libraries, etc. to the global network (*Geneva Plan of Action*, para 6)[2]. These targets are to be achieved by 2015, at the latest.
- The WSIS, uniquely, was organised as a single Summit in two phases. This meant that the vision developed in Geneva could be developed into an agenda for action in Tunis. In particular, the Tunis phase of the Summit was able to develop a multi-stakeholder implementation mechanism (*Tunis Agenda*, para 108-111 + Annex)[3] and an agreed methodology for evaluation (para 112-120).

1.1.2 The World Information Society Report

If the ambitious goal of building a global Information Society is to be realised, it is important to track progress against the indicative targets set out in the WSIS final outcome documents. One of the key elements is the bridging of the digital divide. This is a measure of the gap in access to ICTs between different countries, or between different regions within a country. A further element is to examine the progress of the different multi-stakeholder partnerships that have been established during the WSIS process. There is a sense in which the WSIS has created a learning community, in which policy-makers and regulators can learn from best practice experiences of their neighbours and peers in other parts of the world.

This Report is intended to provide guidelines for policy-makers, in particular in developing countries, in the context of mobilizing resources and developing their own strategies for building the Information Society. In this regard, the Report covers the main elements of the Information Society and provides a new tool for measuring progress towards building it, through the Digital Opportunity Index (DOI).

The mandate for the *World Information Society Report* comes from the *Geneva Plan of Action*, which calls for a report on the development of Information and Communication Technologies (ICTs) to be published 'annually or every two years' to report on 'a composite ICT development (digital opportunity) index' (*Plan of Action*, Para 28a). According to the *Plan of Action*, 'The Index could show the statistics while the report would present analytical work on policies and their implementation' (para 28a). Furthermore, the *Plan of Action* calls for 'appropriate indicators and benchmarking … [to] clarify the magnitude of the digital divide in both its domestic and international dimensions' (para 28b), and calls upon stakeholders to 'develop and launch a website on best practices and success stories, based on a compilation of contributions from all stakeholders' (para 28e).

The different chapters of this inaugural *World Information Society Report* respond to these challenges set out above:

- **Chapter two,** *Measuring the Information Society*, presents a new tool, the Digital Opportunity Index, for measuring progress in building the Information Society and bridging the digital divide;
- **Chapter three,** *Trends in the Information Society,* tracks the changing dynamics and major trends shaping our society. It uses the DOI as an analytical tool to show the trajectories that different countries are following;
- **Chapter four,** *From measurement to policy-making,* is addressed to policy-makers and regulators. It shows how the DOI can be used to inform the policy-making process in critical areas, such as universal access, gender, and the development of broadband networks;
- **Chapter five,** *Beyond WSIS: Making a Difference Globally*, looks at life beyond WSIS, and in particular how multi-stakeholder partnerships are finding new solutions to old problems. This chapter draws upon the stocktaking of WSIS-related activities undertaken by stakeholders towards building the Information Society.
- **Chapter six,** *Towards an Information Society for All*, is the concluding chapter and summarises the main findings emerging from this Report's review of digital opportunity worldwide.

1.1.3 WSIS implementation between the Geneva and Tunis Summit Phases

Between the first and second phases of the Summit, from 2003 to 2005, much work was done on implementation and monitoring:

- Based on the work of an inter-agency *Partnership on Measuring ICT for Development*[4], a core set of indicators for measuring the Information Society was defined[5] (this work was noted in paragraph 114 of the *Tunis Agenda)*.
- A number of different composite indices were launched, two of which were noted in the *Tunis Agenda for the Information Society*: namely, the *ICT Opportunity Index*[6] and the *Digital Opportunity Index*[7] (para 115).
- A stocktaking of WSIS-related activities has been carried out, with the first report published at the Summit in Tunis. The database and website portal continue to be updated and currently have more than 3'000 separate listings for activities undertaken by WSIS stakeholders in the stocktaking database.[8]
- New projects announced at the Summit in Tunis were collated in a separate database and published in a report entitled the 'WSIS Golden Book', in February 2006. The Golden Book contains more than 380 new commitments worth a minimum value of € 3.2 billion (US$3.9 billion).[9]
- A selection of the projects entered in the stocktaking and the Golden Book has been used to create an ICT success stories website, maintained by ITU (www.itu.int/ICT_stories). Some of these success stories are highlighted in Chapter five of this report.

Previously, there had been no agreed, comprehensive statistical framework for measuring the Information Society[10]. The endorsement by WSIS of the use of composite indices, as part of an agreed methodology for the periodic evaluation of the WSIS outcomes, provides a solid statistical grounding for the implementation process, which is expected to last until at least 2015.

1.1.4 WSIS implementation in the post-Tunis phase

Although the UN flag at Kram PalExpo in Tunis was lowered on 18 November 2005, the WSIS process is far from over. Indeed, in his closing remarks, Mr Yoshio Utsumi, the Secretary-General of the WSIS, said:

'...the road does not end here in Tunis. Even as we close the Summit, we face the critical challenge to continue by our actions and leadership to advance towards achieving the goals and objectives we committed to in Geneva and in Tunis[11]. '

At the conclusion of the World Summit in Tunis, all stakeholders committed themselves to remain fully engaged—nationally, regionally and internationally—to ensure sustainable implementation and follow-up of the outcomes and commitments of the WSIS.[12] They also committed to working towards achieving the indicative targets, set out in the *Geneva Plan of Action*, for improving connectivity and universal, ubiquitous, equitable, non-discriminatory and affordable access to, and use of, ICTs, to be achieved by 2015.[13] The *Tunis Agenda for the Information Society* invites three UN agencies—ITU, UNESCO and UNDP—to serve as the lead agencies in the multi-stakeholder implementation process, which is to be organised along the eleven action lines of the *Plan of Action*.[14] To this end, a Consultation Meeting of action line moderators/facilitators was held in Geneva on 24 February 2006, and Facilitation Meetings are planned for the other action lines, many of them grouped around the newly-designated World Information Society Day on 17 May each year.[15]

1.2 Why a Digital Opportunity Index?

The WSIS outcome documents acknowledge the scale of the digital divide, both within and between countries. Nevertheless, WSIS makes a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all people16. With regard to the implementation of the Geneva Plan of Action, a key goal is to design national e-strategies in accordance with

local and national development priorities[17]. This needs an understanding and analysis of the current situation in each country with regard to ICTs and the setting of future targets. For that purpose, ICT stakeholders need information and benchmarks to evaluate what they have achieved, as well as what is achievable in the future.

In order to set benchmarks, it is necessary to develop a frame of reference. There are several different methods:

- Frequently, a regional framework is used. However, there are often large differences in the level of development within regions (e.g., the Asia-Pacific region contains both high-income and Least Developed Countries) and even between neighbours (for instance, between South Africa and Zimbabwe, or between Greece and Albania);
- Alternatively, a frame of reference might be based on countries with similar levels of wealth (measured by GDP per capita) or population size. But again, such comparisons among peers can be distorted by factors that have little to do with ICTs. For instance, an oil-rich country might have a misleading GDP per capita, while a country whose currency is undervalued may have low apparent wealth.
- The most preferable frame of reference for benchmarking the Information Society is one based directly on ICT indicators, because then policy-makers can compare performance, like-with-like, and can use one country's experience with ICT development as a possible model for other countries' own chosen strategies, at a later date.

Using a single indicator (e.g., teledensity or revenue per subscriber) is problematic because it fails to capture the many different development paths that economies may choose to follow. There is a growing body of evidence to suggest that ICT development trajectories are shifting, and that those economies realising a rich and mature Information Society in the current decade will follow quite a different path than those that did so at an earlier time. The good news is that developing economies are now going through the 'teledensity transition'—passing from 10 to 30 phones per 100 inhabitants—much more rapidly using mobile networks than their predecessors did using fixed line networks a decade or so earlier (see Box 1.1). While fixed-line teledensity would be a good indicator of the development path used in the 1980s, it would not be a good measure of telecommunication development in the new millennium.

For these reasons, a composite index, based on a basket of individual ICT indicators, is preferable to a single indicator, and a global index is superior to a regional one. Furthermore, an index which allows for tracking changes over time—both changes in absolute scores, as well as changes in rankings relative to other economies—provides the most useful tool for measuring progress in narrowing the international digital divide between countries.

Box 1.1: Accelerating the 'teledensity transition'

'Teledensity', or the number of phones per 100 inhabitants, is one of the more useful measures of an economy's ICT infrastructure, even though it is now more often mobile phones, rather than fixed line telephones, that are measured. As the majority of economies now have more mobile phones than telephones, the preferred measure used by ITU is 'effective teledensity', which is defined as fixed lines or mobile phones per 100 inhabitants, whichever is greater.

In general, due to the close relationship between ICT development and general economic development, a country's effective teledensity will increase only as its general economic wealth increases. However, there are a growing number of examples of countries that have succeeded in growing their teledensity at a much faster rate than would be predicted by their level of wealth: for instance, as a result of changes in government policy towards the sector, or through higher rates of investment. In such cases, more intensive use of ICTs can act to speed up general economic growth, as well as *vice versa*.

In the early 1990s, ITU carried out research on the progress of Asia-Pacific economies in achieving the 'teledensity transition' in their fixed-line networks (see left chart). The 'teledensity transition' may be defined as passing from a teledensity of 10 lines per 100 inhabitants to 30 per 100. Below a teledensity of 10, access to telecommunications is restricted to a small part of the population and few businesses and therefore the impact of telecommunications on the economy and society is limited. With a teledensity above 30 per 100, access to telecommunications is available to a majority of households and virtually all businesses. Thus, the use of telecommunications can be expected to have a comparatively greater impact on the economy and society.

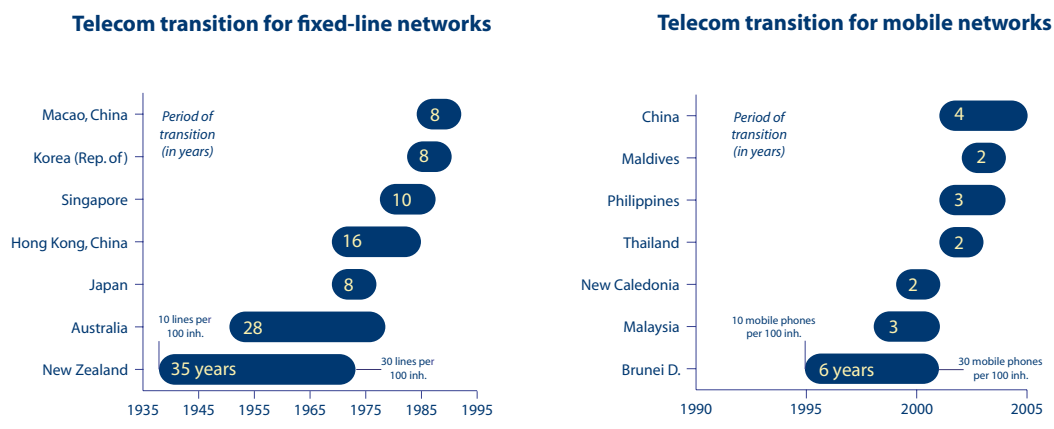
For the developed economies in the Asia-Pacific region, it took between 8 and 35 years (average 16 years) to make the transition between 1935 and 1995, with a progressive acceleration over time. However, for a sample of developing economies in the same region, it took only between 2 and 6 years (average 3 years) to make the transition between 1995 and 2006 (see right chart).

The main difference between the two charts is that the developed countries made the transition using *fixed-line* networks, whereas the developing economies have invariably made the transition using *mobile* networks. Mobile networks can generally be rolled out much more quickly, and more cheaply, and are more convenient for users (e.g., through pre-paid cards). Furthermore, mobile networks are relatively 'development-neutral', in the sense that developed economies made the mobile teledensity transition only marginally more quickly (2.6 years) than developing ones (3.1 years).

A second reason why the teledensity transition is accelerating is policy and regulatory reform. As a generalisation, most of the countries making the earlier transition did so with state-owned monopolies, while those making the transition more recently have benefited from market competition in mobile networks, as well as private sector participation.

The overall message is that it is now possible to make much more rapid progress in telecommunications than at any time in the past, thanks to technological and policy changes. This is especially good news for those countries that are now approaching the start of the transition, such as India (2005 mobile teledensity = 11.4) or Sri Lanka (2005 mobile teledensity = 16.2).

Box Figure 1.1: The accelerating telecom transition in selected Asia-Pacific economies



Source: ITU analysis based on ITU World Telecommunication Indicators Database. The left chart first appeared in ITU 'Asia-Pacific Telecommunication Indicators, 1993'.

1.2.1 Which composite index?

Indices are used in economics as a way of measuring complex concepts comprising different aspects. For instance, the 'consumer price index' is an aggregate measure of different prices within an economy that are summed together to give an idea of the overall prices paid by average consumers. Similarly, stock market indices, such as the Dow Jones Index or the FTSE 100, group together trends in individual stocks to provide an index of overall market performance. One of the best-known composite indices is the Human Development Index (HDI) published annually by the United Nations Development Programme (UNDP). It measures each economy's average achievements in three basic clusters of human development: *longevity, knowledge* and *standard of living*. Each of the clusters can be broken down into individual indicators: for instance, *knowledge* comprises measures of adult literacy and school enrolment.

Having decided to develop a measurement approach based on a composite index, the next question is, 'Which index to choose?' A number of alternative indices are available and each one is optimised for different purposes. In order to refine the choice for a suitable index, a multi-stakeholder partnership has been established—the *Digital Opportunity Platform*—between the ITU, the Government of the Republic of Korea (through the Ministry of Information and Communications and the Korea Agency for Digital Opportunity and Promotion (KADO), and the United Nations Conference on Trade and Development (UNCTAD)). The *Platform* is open to other partners among WSIS stakeholders.

A preliminary workshop was held in Busan, Korea, September 10-11, 2004[18], where the indices existing at that time were reviewed.[19] A summary of some of the main composite ICT indices is shown in Table 1.1.

Table 1.1: Summary of the main composite indices for measuring Digital Opportunity

Name of index (organisation)	Number of economies	Number of indicators	Latest data	Comments
Digital Opportunity Index (ITU/UNCTAD/KADO)[20]	180	11	2004/05	Three clusters: *Utilization, Infrastructure* and *Opportunity* (see Chapter two).
ICT Opportunity Index (ORBICOM/ITU)[21]	139	17	2003	Compares '*Infostates*', '*Infodensity*' and '*InfoUse*' against an imaginary economy called 'Hypothetica'.
ICT Development Index (UNCSTD)[22]	180	8	2003	Four clusters: *Access, Connectivity, Usage* and *Policy.*
Informational Society Index (IDC)[23]	52	15	2004	Only sparse methodological data is disclosed.
E-Readiness Index (EIU/IBM)[24]	68	31	2004/05	Six clusters: *Connectivity, Business environment, Adoption, Legal and policy environment, social and cultural environment, Supporting e-services*. Uses a mix of quantitative and survey data.
Network Readiness Index (*Info*Dev/WEF/INSEAD)[25]	102	48	2003	Three clusters: *Environment, Readiness, Usage*. Uses a mix of survey, qualitative and quantitative data.
Digital Access Index (ITU)[26]	179	8	2002	Five clusters: *Infrastructure, Affordability, Knowledge, Quality, Usage.*
Mobile/Internet Index (ITU)[27]	171	26	2001	Three clusters: *Infrastructure, usage, market conditions.*
Technology Achievement Index (UNDP)[28]	71 (full data)	8	1998-2000	Four clusters: *Creation of technology, Diffusion of recent innovations, Diffusion of old innovations, Human skills*.

Source: ITU Research.

These indices vary according to a number of dimensions:

- The number of economies covered and the number of indicators used. As a rough rule of thumb, the more indicators that are used, the fewer economies can be covered, in a 'depth' versus 'breadth' trade-off.
- The timeliness of the data used and whether or not a historical time-series is available. Many of the indices are produced as 'one-off' studies for a particular purpose, while others continue to evolve over time. An example of a one-off index would be the UNDP's 'Technology Achievement Index', while the EIU index has been compiled between 2000 and 2006.
- The number and nature of the 'clusters' of indicators, which range between two and six.
- The methodology used for producing the average score. Most indices are based on some variation on the UNDP's Human Development Index methodology, in which the combined score is an average of the individual clusters, without weighting the indicators, although the ICT Opportunity Index and Network Readiness Index both use a different methodology.
- Whether the index focuses solely on the ICT sector or not. For instance, the EIU e-readiness index covers a number of general economy-wide measures (such as political stability) while other indices, such as the Mobile/Internet index, focus solely on one segment of the ICT industry.

Of the indices listed in Table 1.1, only two are specifically endorsed by the WSIS (*Tunis Agenda*, para 115) for use in the approved evaluation methodology: the ICT Opportunity Index (ICT-OI) and the Digital Opportunity Index (DOI).[29]

- The **ICT Opportunity Index (ICT-OI)** is an index which predates WSIS, having been developed by the Canadian NGO, Orbicom, and presented first in 2003. It was subsequently updated for 2003 year-end data and presented again in November 2005.
- The **Digital Opportunity Index (DOI)** is closely related, in methodological terms, to the ITU's earlier Digital Access Index, but covers the core set of ICT indicators defined by the *Partnership*. It was announced in February 2005, at the WSIS Thematic Meeting on Measuring the Information Society.[30] Subsequently, an initial report on methodology was developed based on 40 leading economies, and presented to the WSIS Thematic Meeting on Multi-stakeholder Partnerships for Bridging the Digital Divide, held in Seoul, 23-24 June 2005. The Index was further revised and formally launched during the Tunis Phase of WSIS, in November 2005. The full index, extended to 180 economies using 2004/05 data, is launched in this Report.

The two indices are explored in more detail in Table 1.2. Although both indices measure a similar phenomenon, there is actually relatively little overlap. Only one indicator (mobile cellular subscribers per 100 inhabitants) appears in both indices.

In the context of WSIS evaluation, a key difference between the two indices is their relationship to the 'common set of core ICT indicators' established by the *Partnership on Measuring ICT for Development* (see the *Tunis Agenda*, paras 114-115). All eleven of the DOI indicators are within the common set, whereas six out of seventeen of the ICT-OI are from the *Partnership* list.

For these reasons, the two indices can be used for different purposes. The ICT-OI is more useful as a measure of older ICTs, such as fixed lines and TV, with 8 of the 17 indicators used in the ICT-OI corresponding to these older ICTs. The DOI has been designed to measure newer ICTs and uses the latest data available for mobile phones, broadband users and convergent technologies, measured for instance in the number of users of mobile Internet.

This difference is reflected in the rankings of individual countries. Three out of the top five (and 8 of the top 20) economies in the DOI are from the Asia-Pacific region, which is the leader in the newer ICTs. By contrast, for the ICT-OI, none of the top five (and only 4 of the top 20) are from the Asia-Pacific. Similarly, in the DOI, there are six non-OECD countries in the top 20 compared with two in the ICT-OI.

1.2.2 Using an index to measure Digital Opportunity

There are a number of features of the DOI which make it ideal for benchmarking progress in building the Information Society:

- It covers a large number of economies. In the edition of the DOI published in this report, some 180 economies in total are covered with data for 2004/05. As shown in Table 1.1, the DOI has the widest coverage of any of the existing indices, which makes it the index of choice for a report such as this, which is concerned, *inter alia*, with digital inclusion.
- It has a modular structure, which means that the DOI can easily be combined with other indices for analytical purposes. For instance, it can be compiled with the UNDP's Human Development Index or the UN e-government readiness index[31] as a fourth cluster. The modular structure also makes it possible to break the index down by gender or by regions within a country.
- The DOI has a straightforward methodology. The raw ingredients of the index are the 11 separate indicators. As these can be measured relatively easily, policy-makers and other interested parties can check and update the data for their country and can also use 'what-if' projections and scenario-planning to measure the impact of policies. This ease of comparison is particularly important for the price data, as it enables operators to compare their prices with their peers, at similar levels of ICT development.
- The DOI is 'development-friendly', in the sense that it does not discriminate against economies that are following mobile-based network development trajectories. By contrast, many existing indices tend to measure indicators that are already well-established in the developed countries. Furthermore, because the DOI includes measures of technological

Table 1.2: Digital Opportunity Index or ICT Opportunity Index: What's the difference?

Variation	*ICT Opportunity Index*	*Digital Opportunity index*
Methodology	Compiles each country's index in relation to the average of all of the other countries.	Compiles each country's index in relation to the maximum value achievable in each indicator (usually full penetration at 100%).
Number of economies	139 economies.	180 economies.
Time series	Country index values provided for 1996-2003.	Full country coverage for 2004 and 2005 data. 40 leading economies have 2001-2005 data.
Indicators used	**Networks:** 1. Main telephone lines per 100 inhabitants * 2. Waiting lines / main lines 3. Digital lines / main lines 4. Mobile phones per 100 inhabitants *+ 5. Cable TV subscriptions per 100 inhabitants 6. Internet hosts per 100 inhabitants 7. Secure servers / internet hosts 8. International bandwidth (kbit/s per inhabitant) * **Skills:** 9. Adult literacy rates 10. Gross enrolment ratios (at primary, secondary and tertiary levels) **Uptake:** 11. TV equipped households per 100 HH * 12. Residential phone lines per 100 HH 13. PCs per 100 inhabitants * 14. Internet users per 100 inhabitants **Intensity:** 15. Broadband users/Internet users * 16. Int'l outgoing minutes of telephone traffic per capita 17. Int'l incoming minutes of telephone traffic per capita	**Opportunity:** 1. Percentage of population covered by mobile telephony * 2. Internet access tariffs as a % of per capita income * 3. Mobile cellular tariffs as a % of per capita income * **Infrastructure:** 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 * **Utilisation:** 9. Proportion of individuals that have used the internet * 10. Ratio of fixed-broadband subscribers to total internet * 11. Ratio of mobile-broadband subscribers to total internet *
Top ten economies (with rank in the other index shown in brackets)	1. Denmark (3) 2. Sweden (6) 3. Switzerland (15) 4. Netherlands (9) 5. Norway (8) 6. Canada (14) 7. United States (21) 8. Finland (17) 9. Hong Kong, China (5) 10. Iceland (4)	1. Republic of Korea (17) 2. Japan (19) 3. Denmark (1) 4. Iceland (10) 5. Hong Kong, China (9) 6. Sweden (2) 7. United Kingdom (14) 8. Norway (5) 9. Netherlands (4) 10. Taiwan, China (n.a.)

Note: * Indicators that appear in the common set of core indicators, defined by the Partnership.
\+ Indicator that appears in both indices.
HH households

Source: ITU Research.

advancement as ratios (e.g., broadband subscribers as a percentage of total internet subscribers) rather than as absolute numbers, this will tend to advantage those developing countries that are following a path of 'technological leapfrogging'. One particular feature of the DOI is that is can be broken down into separate scores for an economy's mobile sector and its fixed-line sector, so both can be compared separately with other countries.

- The DOI is based on objective criteria and measurable indicators (e.g., number of subscribers, price of services), rather than opinion and other subjective data. The use of opinion surveys introduces bias, particularly when the objective data differ from the perspective of those being interviewed. Subjective data are often associated with regulatory information which are difficult to quantify. Regulatory components can, nevertheless, be added to the DOI as a separate cluster, providing for extra flexibility (see Chapter four).[32]

- The DOI is based on standardized indicators, as defined by the *Partnership for Measuring ICT for Development*.[33] The *Partnership* currently comprises 11 different international and regional organisations, including ITU, UNCTAD, UNESCO, OECD, Eurostat and the UN Regional Commissions. The WSIS Thematic Meeting held in Geneva 7-9 February 2005 developed a first set of core indicators[34]. These are the basis indicators used to compile the DOI. A sub-set of the core indicators is currently used in the DOI. This is because some of the indicators are only available for a few economies (e.g., enterprise data).The DOI could be extended in the future to include other core indicators, once they become available for a wider number of countries.

- Finally, the DOI allows for tracking the progress of a country over time. Since the index uses consistent values for normalizing country data, it is possible to track both an individual economy's rate of growth (or decline) in the DOI and also to track its progress compared to the rankings of other economies, over time. Time-series data from 2001-2005 are currently available for 40 leading economies and time-series data, for all economies, will be added in future editions of this report.

1.3 Conclusions

This report introduces the Digital Opportunity Index, as a tool for policy-makers and regulators, to track progress in implementing the WSIS outcomes and to provide greater insight into ICT trends and policy within each country. It uses the DOI to evaluate the major trends driving the growth of the Information Society today, as well as its future development, and shows how the DOI can yield real insights into policies and their impact in the areas of regional development, urban/rural divide and gender analysis. The DOI is a practical and powerful tool for enriching policy and the development of the Information Society in a just and equitable way, as envisaged in the WSIS outcome documents.

Endnotes

[1] The WSIS outcome documents can be found at: www.itu.int/wsis/promotional/outcome.pdf. For more information about the WSIS itself, see www.itu.int/wsis.

[2] For an analysis of the WSIS commitments, their relationship to the UN Millennium Development Goals, and the possibilities of achieving them by the target date of 2015, see: ITU (2004) 'ICTs and the Millennium Development Goals', available at: www.itu.int/ITU-D/ict/publications/wtdr_03/material/Chap4_WTDR2003_E.pdf. This originally appeared as chapter four in ITU (2003) 'World Telecommunication Development Report: Digital Access Indicators'. A more recent analysis appears in Minges, Michael (2006) 'Tracking ICTs: WSIS Targets', chapter six, pp 125-146 in World Bank (2006) *Information and Communication for Development*, The World Bank, Washington, 303pp.

[3] For more information on the multistakeholder implementation of WSIS outcomes, see: www.itu.int/wsis/implementation.

[4] More information on the work of the *Partnership* can be found at: www.itu.int/ITU-D/ict/partnership/index.html.

[5] The common set of core indicators can be found at: www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.

[6] More detail on the ICT Opportunity Index can be found at www.orbicom.uqam.ca/projects/ddi2005/index_ict_opp.pdf.

[7] More detail on the Digital Opportunity Index can be found at: www.itu.int/doi.

[8] The stocktaking website portal can be found at: www.itu.int/wsis/stocktaking. The first report is available in six languages at: www.itu.int/wsis/documents/doc_multi.asp?lang=en&id=2167|0.

[9] The WSIS Golden Book and database can be found at: www.itu.int/wsis/goldenbook/index.html.

[10] Guide to Measuring the Information Society, OECD, DSTI/ICCP/IIS(2005)6/FINAL, 08 Nov 2005.

[11] 'WSIS Closing Statement', Yoshio Utsumi, 18 November 2005.

[12] *Tunis Agenda for the Information Society*, para. 83.

[13] Ibid. para. 90.

[14] Ibid. paras. 108-110.

[15] For further details on the multi-stakeholder implementation of the WSIS *Plan of Action*, based on the 11 action lines, see at www.itu.int/wsis/implementation.html.

[16] Similar language to this effect is used in the opening paragraphs of both the *Geneva Declaration of Principles* and the *Tunis Commitment*.

[17] *Tunis Agenda for the Information Society* para 90 a).

[18] 'ITU/KADO Symposium on Building Digital Bridges', 10-11 September 2006. For more information, see: www.itu.int/digitalbridges.

[19] 'International Benchmarking for the Information Society', September 2004, presented by George Sciadas, available at: www.itu.int/osg/spu/ni/digitalbridges/docs/background/BDB-intl-indices.pdf.

[20] For more information on the Digital Opportunity Index, see: www.itu.int/doi.

[21] For more information on the ICT Opportunity Index, see: www.itu.int/ITU-D/ict/publications/dd/material/index_ict_opp.pdf.

[22] See CSTD website at: http://stdev.unctad.org/themes/ict/dd.html.

[23] See IDC at: www.idc.com/groups/isi/main.html.

[24] See Economist Intelligence Unit at: www.eiu.com/.

[25] See InfoDev website at: www.infodev.org/files/839_file_GITR2003.pdf.

[26] See ITU (2003) 'World Telecommunication Development Report: Digital Access Indicators', at: www.itu.int/ITU-D/ict/dai/index.html.

[27] See ITU (2002) 'ITU Internet Reports: Internet for a Mobile Generation', available at: www.itu.int/mobileinternet.

[28] See UNDP website and 2001 Human Development Report, at: http://hdr.undp.org/reports/global/2001/en/pdf/techindex.pdf.

[29] *Tunis Agenda for the Information Society*, para 115, states 'We also note the launch of the ICT Opportunity Index and the Digital Opportunity Index, which will build upon the common set of core ICT indicators as they were defined within the *Partnership on Measuring ICT for Development*'.

[30] See the ITU presentation 'Indicators for implementing the WSIS *Plan of Action*', at: http://measuring-ict.unctad.org/QuickPlace/measuring-ict/Main.nsf/h_Index/DEE9DD6058CE41D6C1256F9F003EDE27/?OpenDocument.

[31] For more information, see: www.unpan.org.

[32] See, for instance, Minges, Michael (2006), 'The Digital Opportunity Index', and Dr. C. M. Cho (2006), 'Application of the DOI for Policy Development', powerpoint presentations delivered at ITU/LBS conference on 'Digital Transformations in the Information Society', available at: www.itu.int/osg/spu/dtis/documents/presentations/. In the presentations, the ECTA Regulatory Scorecard is proposed as an additional cluster that could be added to the DOI.

[33] More information on the work of the Partnership can be found at: www.itu.int/ITU-D/ict/partnership/index.html.

[34] The first set of core ICT indicators can be found at: www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.

CHAPTER TWO

Measuring the Information Society

2.1 Overview

The first Phase of the World Summit on the Information Society called for the creation of a composite Digital Opportunity Index. In considering what such an index should comprise, it is useful to think about what digital opportunity means. In an ideal world, digital opportunity would mean:

- The whole population having easy access to ICTs at affordable prices;
- All homes equipped with ICT devices;
- All citizens having mobile ICT devices; and
- Everyone using broadband.

This chapter examines how progress towards such ideals can be monitored using the Digital Opportunity Index (DOI). Its starting point is the set of internationally-endorsed core ICT indicators agreed by the '*Partnership on Measuring ICT for Development*', comprising international organizations and national statistical agencies.[1]

This chapter overviews the core indicators chosen to create the DOI. The DOI adopts a fresh approach. Most ICT indices are based on a set of indicators selected by the index creator, while the DOI has been created from the set of internationally-agreed indicators.

The DOI is structured around three categories:

- The first is **Opportunity.** In order to participate in the Information Society, consumers must have accessibility to ICTs and must be able to afford them. The percentage of the population covered by mobile cellular telephony represents basic accessibility, while two tariff indicators, Internet access tariffs (as a percentage of per capita income) and mobile cellular tariffs (as a percentage of per capita income) measure affordability.
- The next category is **Infrastructure,** which includes the network indicators of proportion of households with a fixed line telephone, mobile cellular subscribers per 100 inhabitants, proportion of households with Internet access at home and mobile Internet subscribers per 100 inhabitants. It also includes the devices that provide the interface between the user and the network: here, this is represented by the proportion of households with a computer.
- **Utilization** shows the extent of ICT usage and includes the proportion of individuals that use the Internet. Quality is reflected in access with advanced degrees of functionality in the ratio of broadband subscribers among Internet subscribers (for both fixed and mobile technologies).

This classification is sequential, with each category building on the previous one (see Figure 2.1). In order to have access to infrastructure, users must be covered by the service and be able to afford it. Utilization depends on having both infrastructure and an access device. Finally, given all the prerequisites for connectivity, users may then aspire to higher levels of quality through broadband access.

The popularity of mobile communications and introduction of high-speed 2.5G and 3G (third generation) services make wireless technology a key component of the Information Society. Almost all the indicators chosen for the DOI have a mobile component. Mobile coverage and mobile subscribers explicitly relate to mobile, while others are embedded in indicators such as computers (e.g., smart phones, Personal Digital Assistants (PDAs)) or Internet subscriptions (which can include mobile Internet subscriptions). The DOI can thus be split into fixed technologies versus mobile (see Figure 2.2). This allows analysis of each country's path towards the Information Society. Evidence from country case studies and the trend toward ubiquity[2] suggest that countries should not sacrifice one path at the expense of the other, but that both should be pursued simultaneously.

Figure 2.1: Classifying the DOI

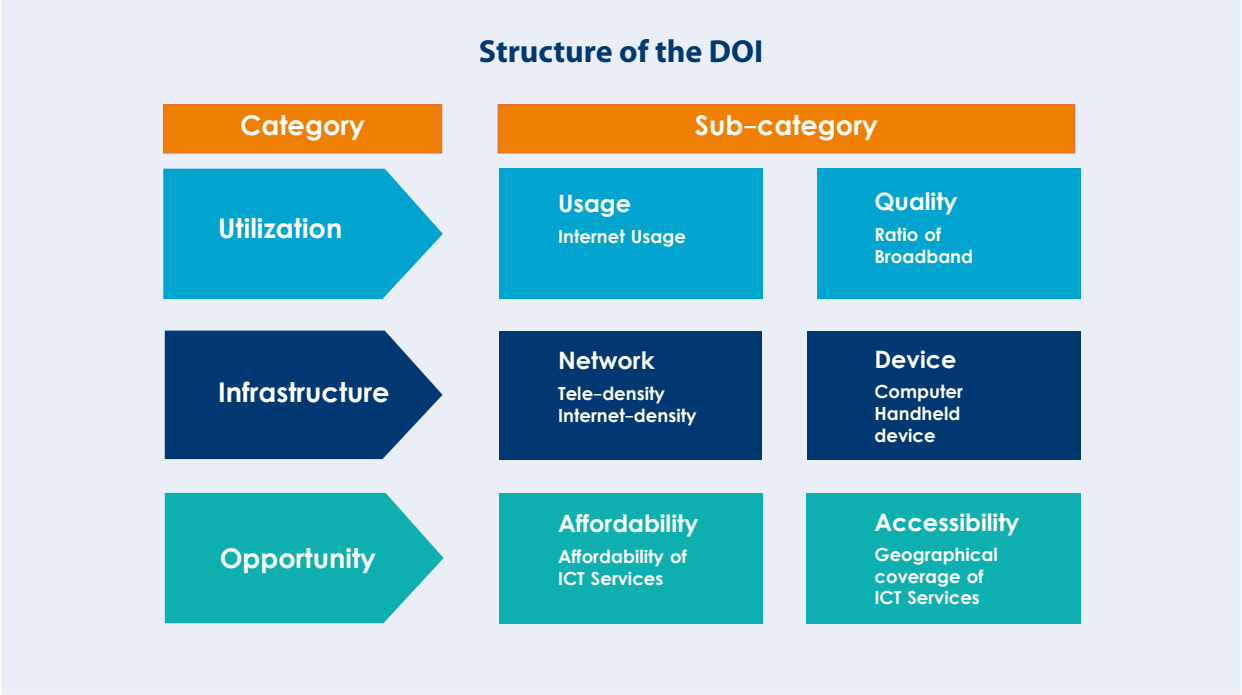
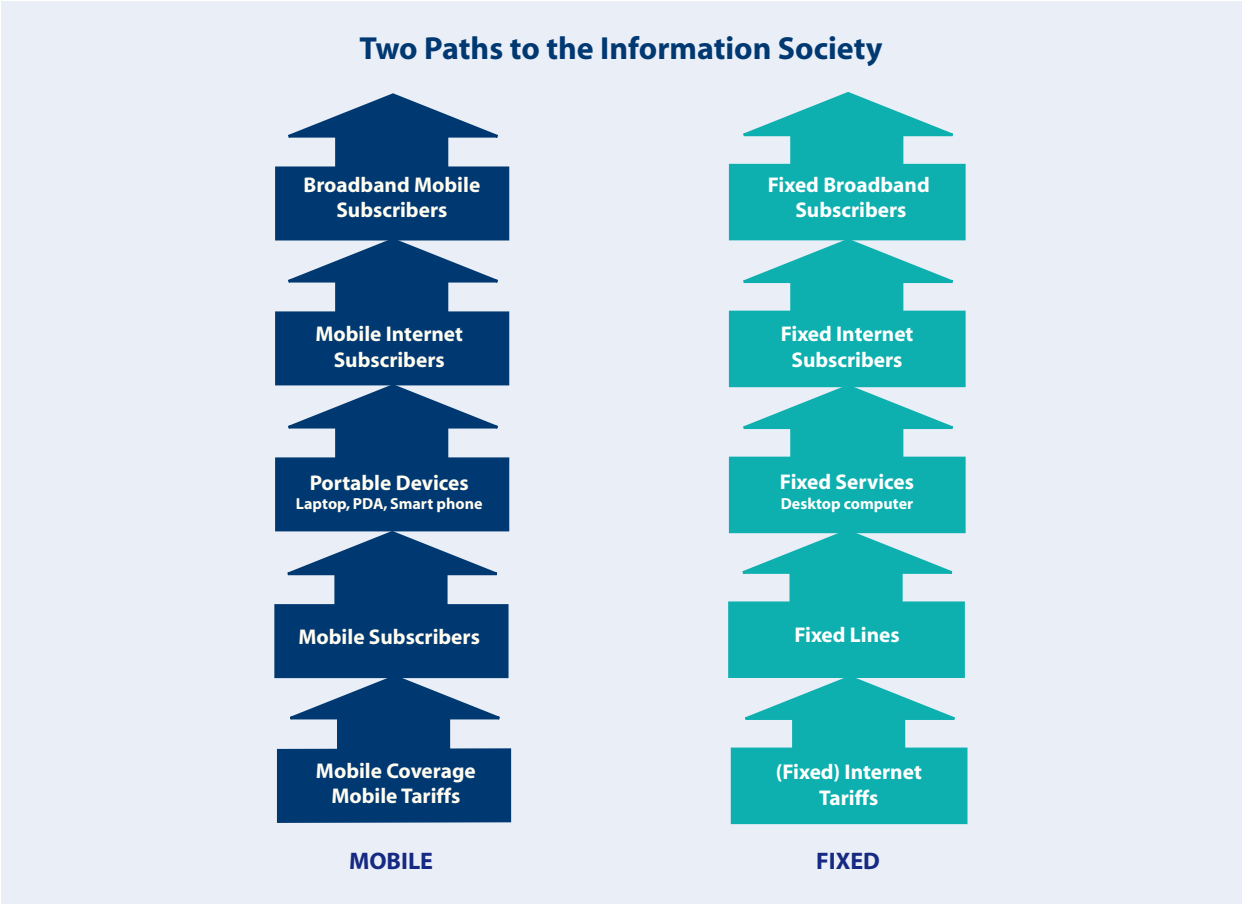


Figure 2.2: Fixed and mobile paths to the Information Society



Source: Adapted from C. M. Cho (upper chart); ITU/Korea Digital Opportunity Platform (lower chart).

2.2 Exploring the DOI

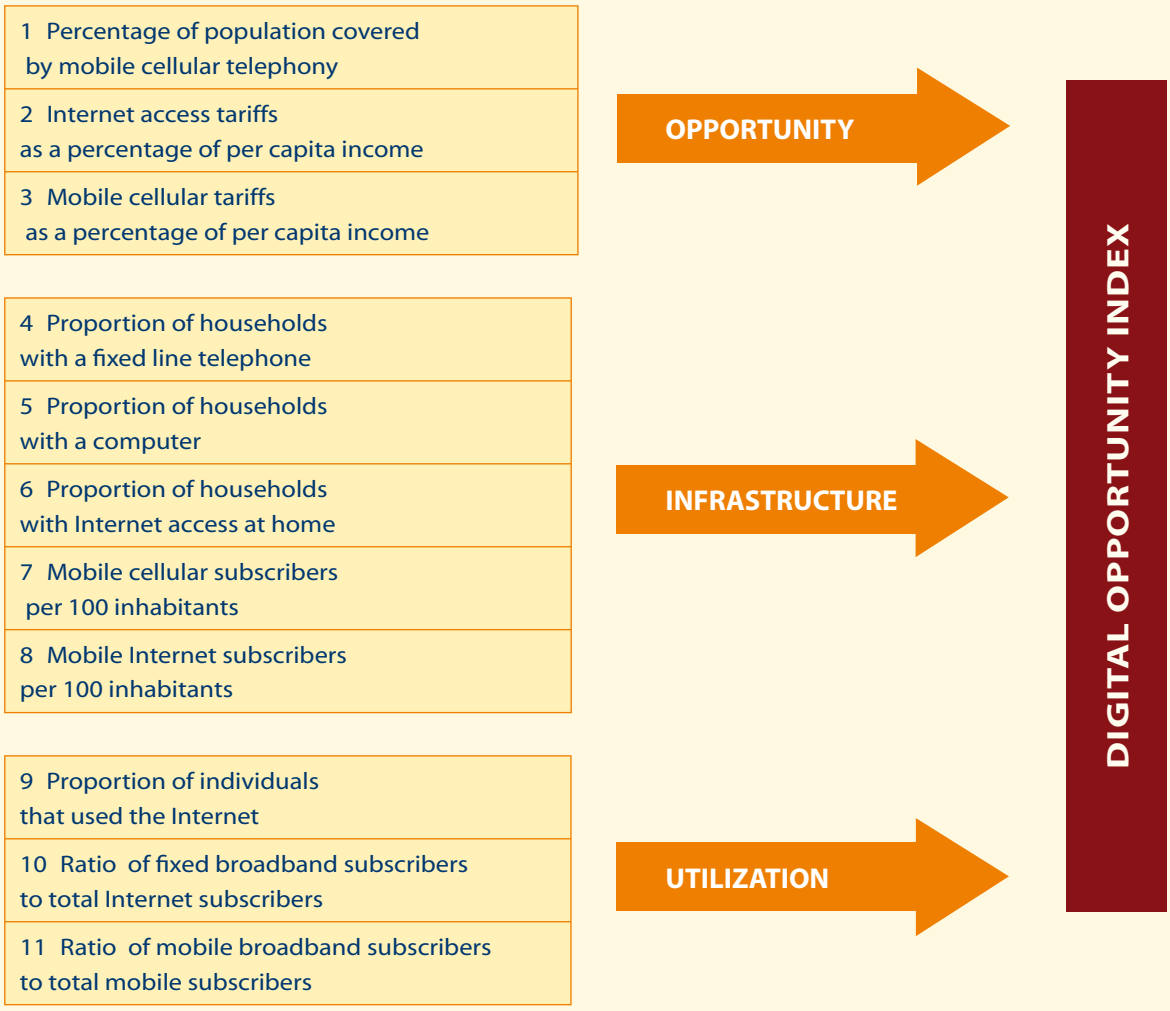
The core ICT indicators represent international agreement on the main statistics to be used for analyzing the Information Society. Eleven indicators—of which six have a fixed line orientation and five are geared to mobile—have been selected for the DOI (see Figure 2.3). The next sections review the choice of indicators, give real world examples and illustrate how the indicators are used in different countries to monitor Information Society development.

An example of applying the DOI to the West Asia sub-region is given in Figure 2.4.

2.3 Opportunity

The starting point for an Information Society is ensuring that citizens live within easy distance of ICTs and can afford them. Basic opportunity is an essential platform for developing higher levels of access. Access and affordability are key measures of the opportunity to use ICTs, as shown below.

Figure 2.3: The DOI indicators



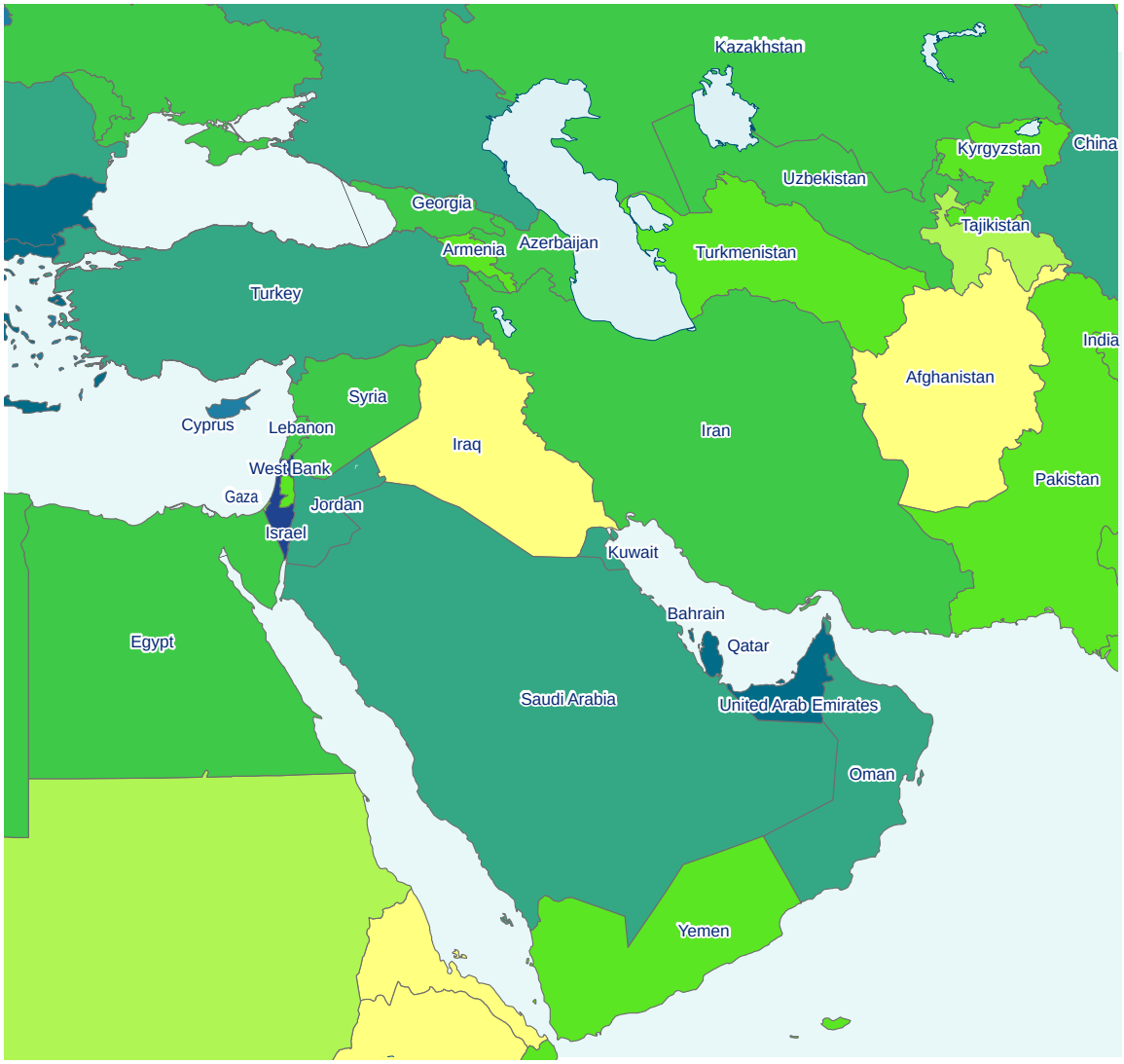
Note: The indicators are averaged within each category and categories are averaged to obtain the Digital Opportunity Index value.

Source: ITU/Korea Digital Opportunity Platform.

2.3.1 Access

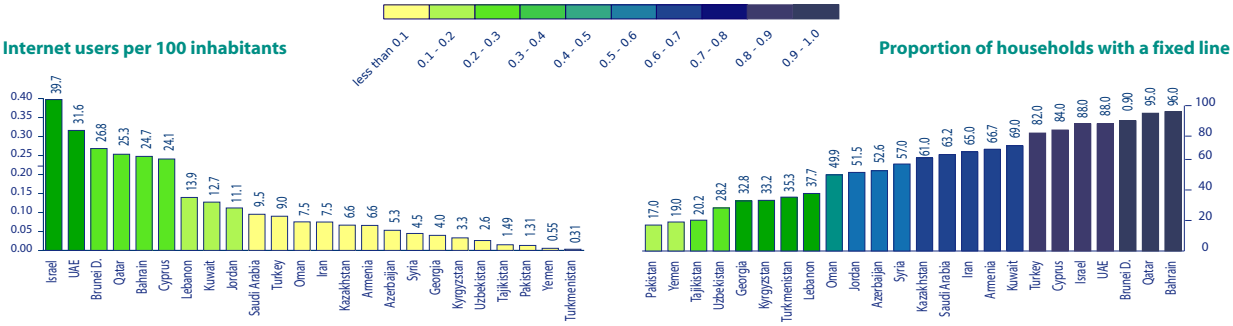
Policy-makers have historically measured universal access to communications in terms of fixed telephone lines, requiring subjective decisions about users' access in terms of distance or time from a fixed line. Take distance, for example, where universal access policies might call for citizens to be within two kilometers of a telephone. People have different ways and abilities of getting to a phone: while two kilometers may not seem far to a healthy young person, it may seem much

Figure 2.4: Digital Opportunity in West Asia



Source: ITU/KADO Digital Opportunity Platform

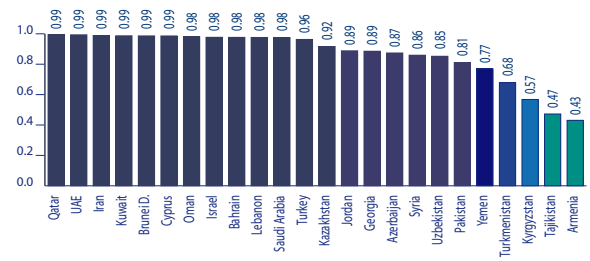
Denominations and classifications employed in these maps do not imply any opinion on the part of the ITU concerning the legal or other status of any territory or any endorsement or acceptance of any boundary.



Internet users per 100 inhabitants

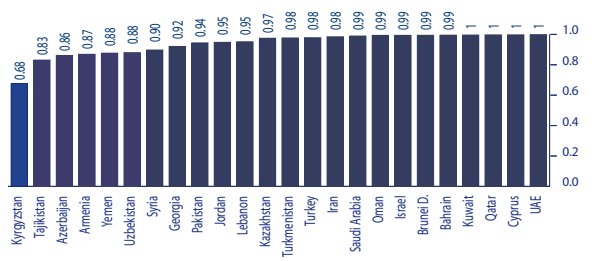
Proportion of households with a fixed line

Internet affordability (1 = affordable; 0 = not affordable)



Note: 0.00 means that the price of 20h Internet use is in excess of average montly GNI per capita

Mobile affordability (1 = affordable; 0 = not affordable)



Note: 0.00 means that the price of lower-user call basket is in excess of average montly GNI per capita

further for a senior citizen. Time is also relative. The length of time it takes a person to reach a telephone depends on their transport. Someone walking to a telephone will take much longer than someone riding a motorcycle.

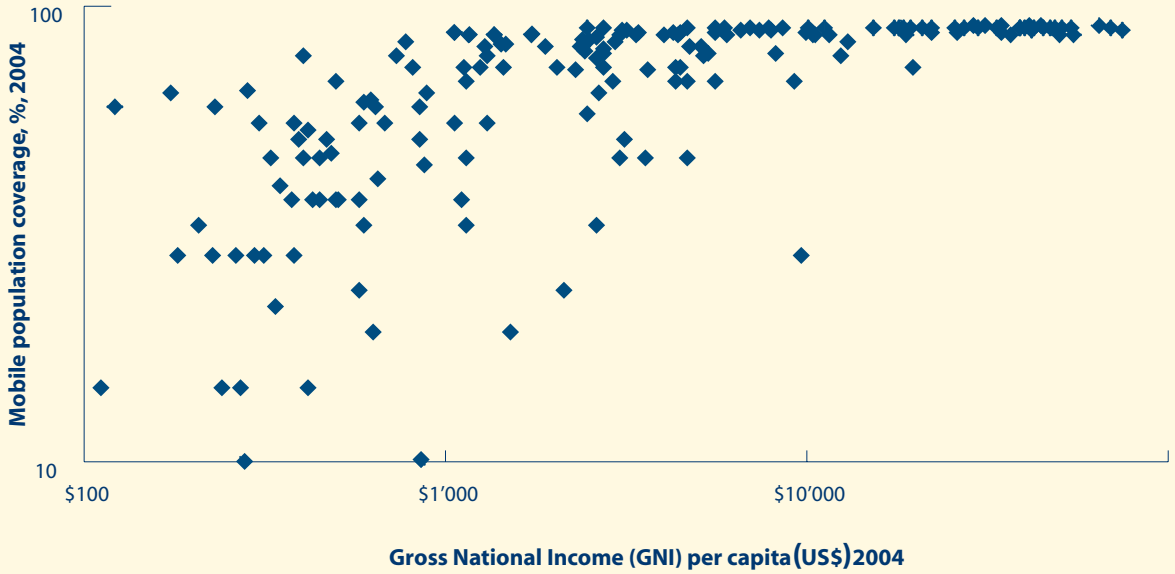
The percentage of population covered by mobile cellular telephony is an ideal indicator for measuring potential access to communications. The radio-based technology of mobile networks dispenses with the need to go to physically go to a certain location to use a telephone. Radio waves permeate through space, so people can use mobile phones anywhere, as long as there is coverage. For those who do not have a subscription, entrepreneurs are willing to provide a mobile public phone service. Examples range from Village Phones in Bangladesh (also Uganda and more recently, Rwanda),[3] to 'umbrella people' in Nigeria.[4]

Mobile phone coverage also offers much more than simple access to voice telephony. Today's mobile networks offer text messaging and Internet access, while new cell phones are capable of supporting a multitude of ICTs—handheld phones or Personal Digital Assistants are becoming the equivalent of mini-PCs and can also be used as radios or TVs.

Mobile coverage is reported by many operators, sometimes through maps showing service availability on roads and future expansion plans. Coverage often has important regulatory implications, since many mobile licenses are contingent upon fulfilling coverage obligations. All developed nations have achieved high levels of digital mobile coverage (see Figure 2.5), as have a number of middle-income developing nations. In this group of countries, the focus is on intensifying indoor coverage in locations such as offices, apartment buildings and subway stations. Coverage is also spreading rapidly in lower income nations. For example, growing competition in Bangladesh has increased mobile population coverage from 35 per cent of the population in 2003 to a projected 85 per cent at the end of 2005 (see Box 3.1 in Chapter three). One especially promising development for developing nations, particularly those with large rural populations, is the commercialization of low frequency mobile technologies. These enable wider coverage with fewer base stations and hence reduce the cost of mobile infrastructure significantly (see Figure 2.6).

However, countries cannot afford to be complacent about mobile coverage, due to constant innovation and the continual improvement of cellular technology. As one mobile technology is superseded by the next, this affects, and can reduce, coverage. While today's second generation mobile technology has wide coverage, the focus is now on third generation (3G) systems. Many governments have included coverage requirements in the license obligations of 3G mobile operators. In Sweden, the regulator notes that the country's

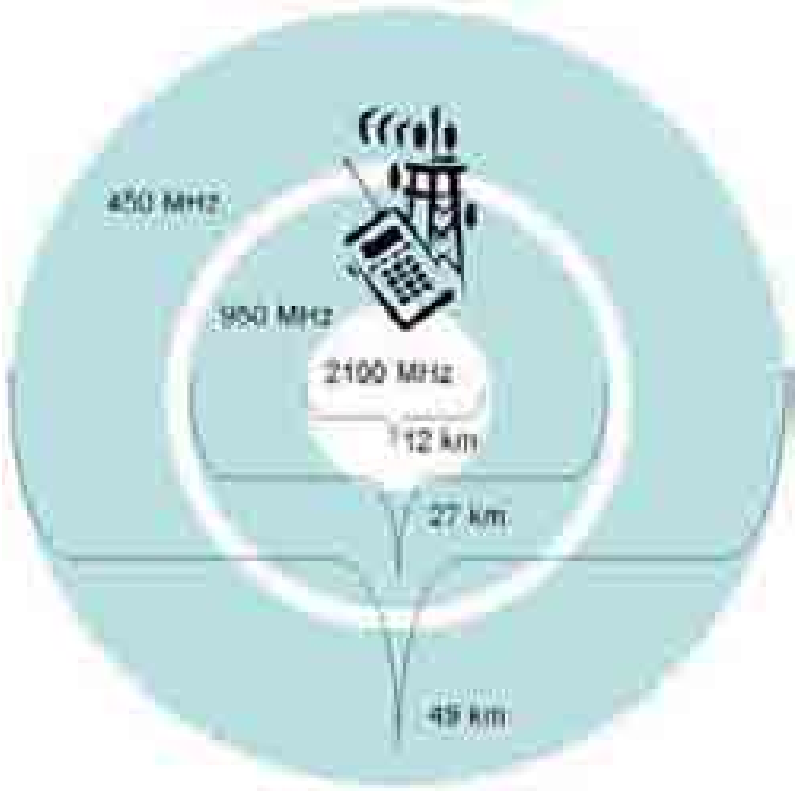
Figure 2.5: Mobile coverage and income



Note: Logarithmic scale used in both axes

Source: ITU/Korea Digital Opportunity Platform.

Figure 2.6: Radio-frequency and coverage

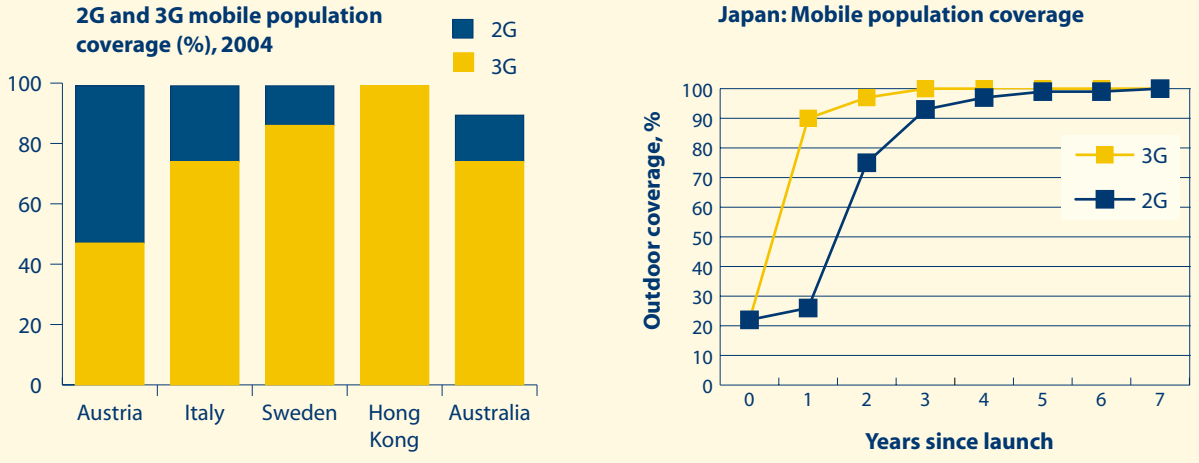


Note: The Figure shows the relative cell areas of different radio frequencies.

Source: Adapted from International 450 Association.

high 3G population coverage (85 per cent at end 2004) is due to regulatory obligations, with roll-out faster than purely commercial conditions would have dictated (see Figure 2.7, left).[5] Nevertheless, the regulator remained concerned that the 3G mobile operators had not met levels of coverage by the date stipulated in their license conditions. There are signs that 3G networks can be rolled out more rapidly since they can leverage on existing infrastructure. Japan took eight years to achieve 100 per cent coverage with second generation mobile networks, but this was accomplished in just four years for 3G (see Figure 2.7, right).

Figure 2.7: 2G and 3G mobile coverage, 2004



Source: Adapted from Hutchison Whampoa and DoCoMo.

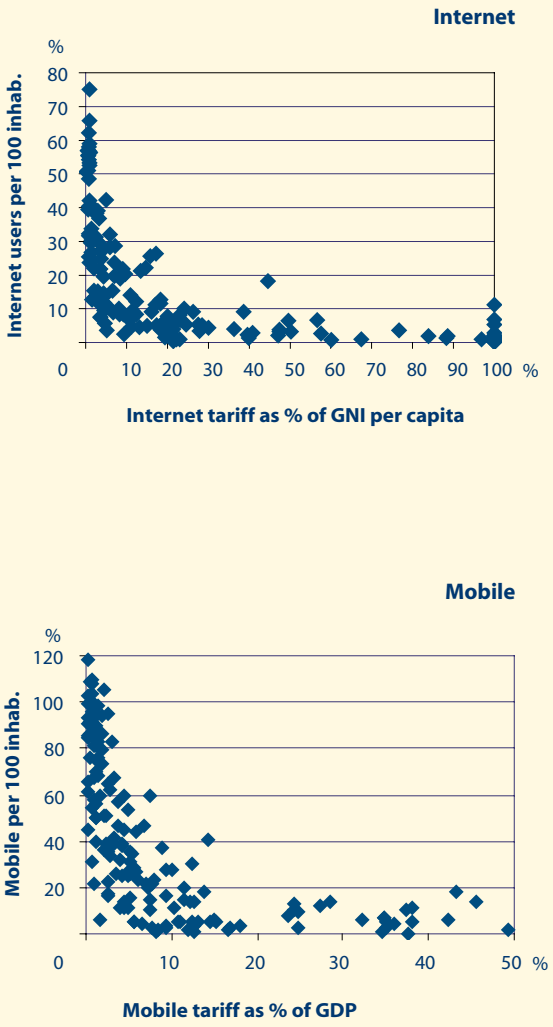
2.3.2 Affordability

Two indicators in the DOI measure affordability: Internet access tariffs as a percentage of income and mobile cellular tariffs as a percentage of per capita income. Affordability is a vital determinant of access to ICT services. As a general rule, high penetrations of mobile and Internet services are only achieved when tariffs are less than 10 per cent of per capita income (see Figure 2.8). Service affordability alone is not the only factor determining ICT use. As Figure 2.8 shows, there are a number of countries with affordable tariffs, but where usage is relatively low. Take the Islamic Republic of Iran, for instance, where Internet and mobile service charges are relatively low (less than two per cent of per capita income), but where Internet and mobile penetration rates are relatively low. In the case of Internet, the high cost of PCs is a barrier to greater usage in Iran. In contrast, for mobile, existing capacity is insufficient to meet demand.

Although affordability is a key component of opportunity, it is surprising how few governments monitor Internet and mobile tariffs, partly because the variety of tariffs in many markets makes comparisons difficult. Tariff baskets standardize a common set of usage criteria, such as number of hours of Internet use or number of mobile calls, to allow prices to be compared. For Internet tariffs, 20 hours of Internet access per month is a popular yardstick. The European Union monitors 20 hours in its Internet access cost eEurope indicator[6], the OECD used 20 hours of use in its analysis[7] and the ITU featured the same amount of use in the Digital Access Index. Since affordability is the main concern, the cheapest package providing at least twenty hours of use (spread over peak and off-peak times) is used to derive this indicator. For dial-up packages, telephone usage charges need to be included.

Given that mobile is now the main form of voice communications, mobile tariffs are a key measure of affordability for consumers. The DOI is based on pre-paid tariffs, the main form of payment in most developing nations, and uses the OECD low user basket methodology with prepaid tariffs.[8] The OECD basket is based on 37 minutes of use and 30 text messages per month (see Table 2.1). Basket values are divided by monthly Gross National Income per capita to assess affordability.

Figure 2.8: Tariffs and affordability, 2005



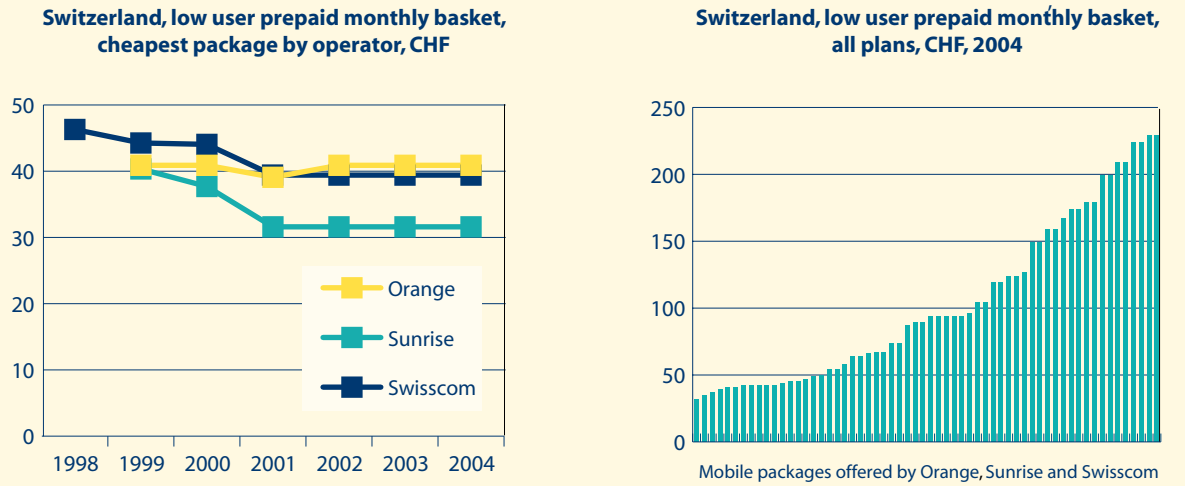
Source: ITU/Korea Digital Opportunity Platform.

Table 2.1: OECD Basket Methodology

Minutes	Fixed	On-net	Off-net	TOTAL
Peak	6.4	5.3	2.4	14.1
Off-peak	5.9	4.9	2.2	13.0
Weekend	4.5	3.8	1.7	10.0
Calls	25	per month		
SMS	30	per month		

Source: Adapted from OECD.

Figure 2.9: Mobile baskets in Switzerland

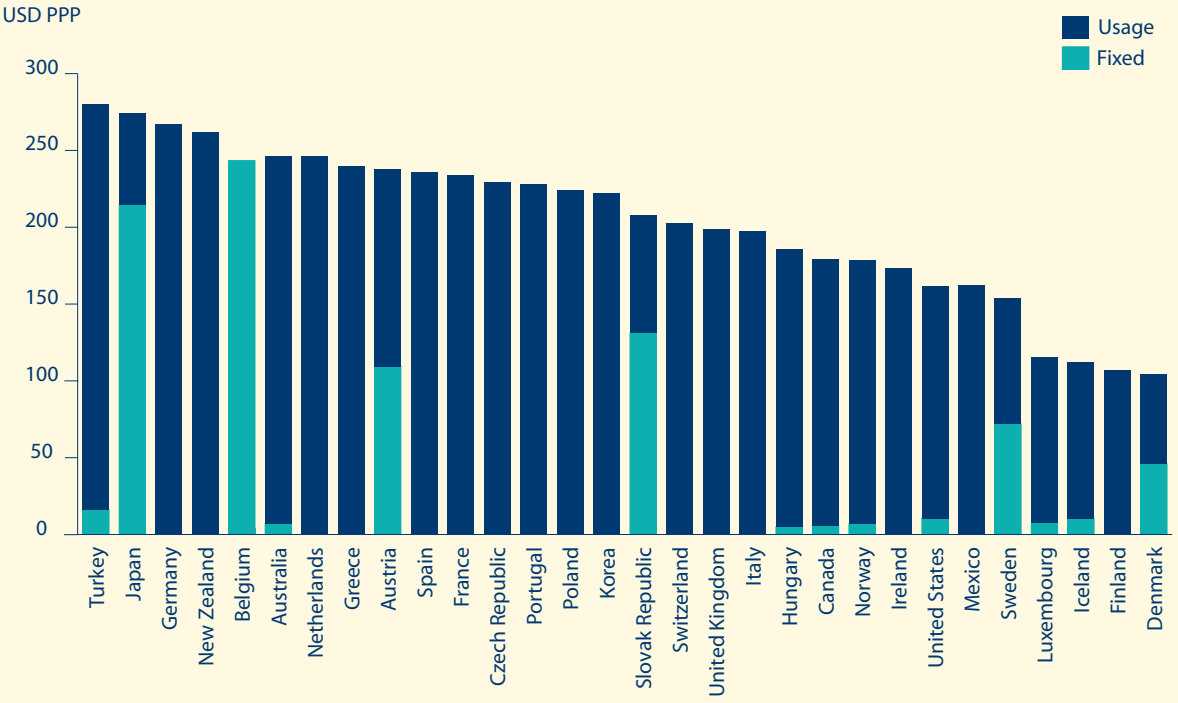


Source: The Swiss telecom regulatory agency OFCOM.

The regulatory authority in Switzerland tracks the data necessary for compiling both Internet and mobile baskets. It has monitored the decline in the cost of mobile baskets since the introduction of competition in 1998 (see Figure 2.9, left). In 2004, there were 60 plans on the Swiss market for which the regulator computed tariff baskets (see Figure 2.9, right).[9] International and regional organizations such as the OECD and the EU also track prices using baskets for their members (see Figure 2.10).

Most developing countries do not track pricing. One reason is that mobile and Internet services are often outside the scope of tariff regulation. However, given the major impact of affordability on countries' progress towards an Information Society and how the growth of mobile telephony promises to reduce the digital divide, this should be revisited. Price movements can be very useful in illustrating the impact of policy changes. For example, the regulator in India illustrates

Figure 2.10: OECD basket of low user mobile telephone charges, August 2004



Source: OECD.

StatLink: http://dx.doi.org/10.1787/621056451217

the impact of several policy changes on mobile prices, which have declined significantly and today, cost about the same as a fixed line call (see Figure 2.11).

2.4 Infrastructure

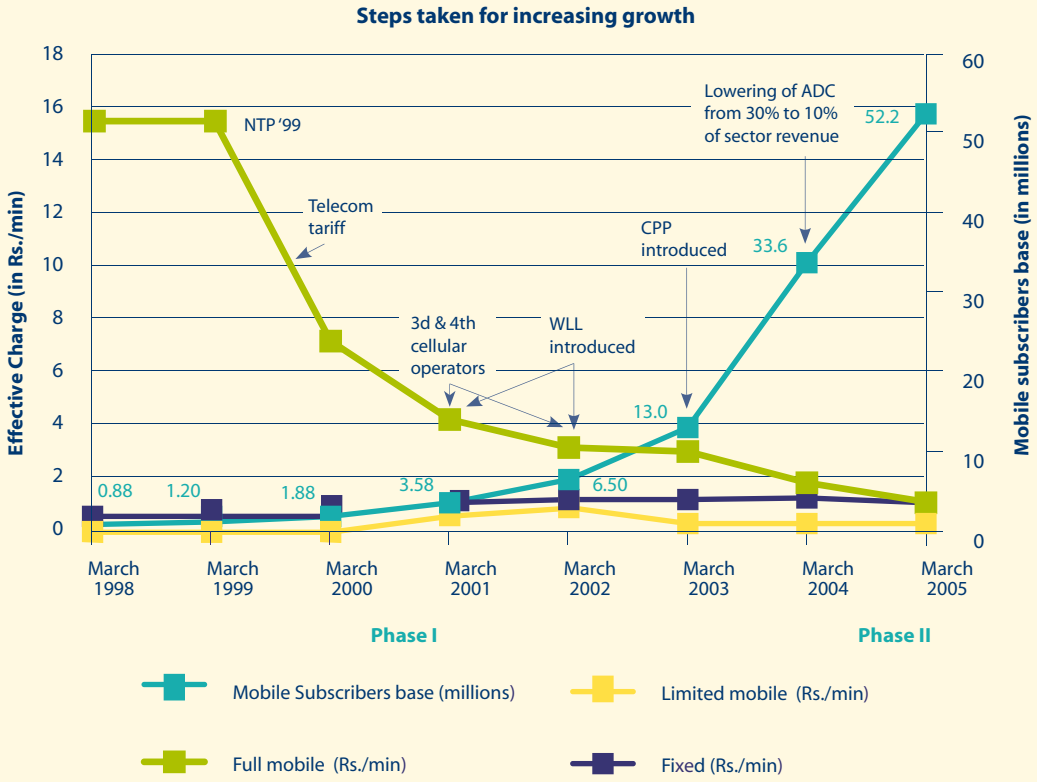
The availability of access to fixed and mobile telecommunications networks and terminal devices is fundamental for accessing electronic information and for participating in the Information Society.

Therefore, the percentage of homes with a fixed line is also an indicator of possible limits to Internet access.

With the emergence of the Information Society, the concept of universal service has evolved to include the proportion of households with a computer and the proportion of households with Internet access from their home. Europe tracks citizens' access to the Internet using the key policy indicator of the percentage of households with access to the Internet at home (see Figure 2.12). European officials are concerned about the European digital divide, noting: 'There are wide disparities in connectivity between Member States, and these have not reduced since 2001. The central aim of eEurope is 'the Information Society for all', but this latest benchmarking evidence shows there has been little convergence between Member States.'[10]

Figure 2.11: Mobile prices in India

Mobile growth and effective charge per minute (in Rupees)



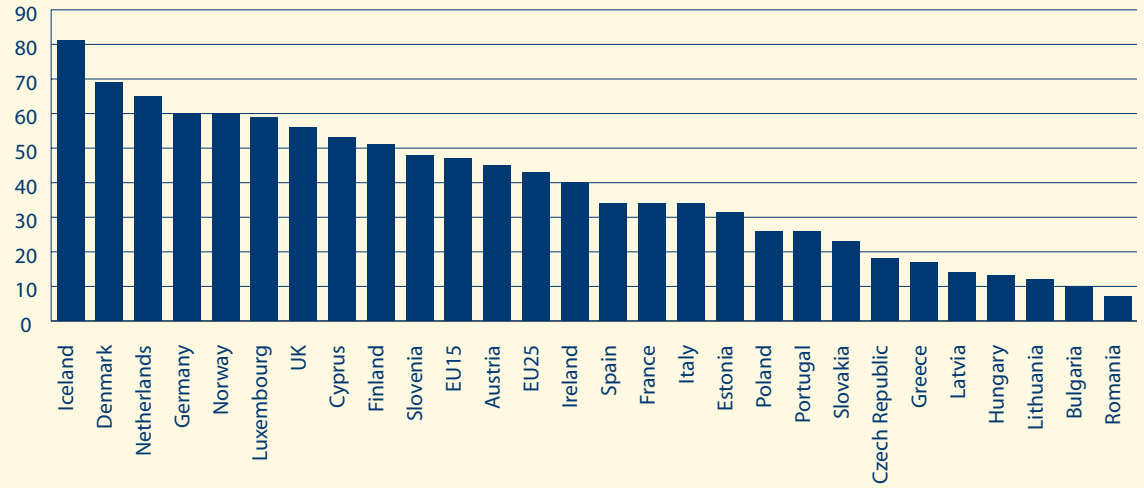
Note: NTP '99 = India's New Telecom Policy 1999.
WLL = Wireless Local Loop
CPP = Calling Party Pays
ADC = Access Deficit Charge

Source: Telecommunications Regulatory Authority of India.

2.4.1 Universal service

The percentage of households with a fixed telephone has been the traditional definition of universal service in the telecommunication sector. In many developed countries, this indicator has been tracked for policy purposes to monitor progress towards universal service goals. A fixed telephone line is also a fundamental building block of the Information Society, as dial-up and broadband via Digital Subscriber Lines (DSL) remain the most prevalent forms of Internet access.

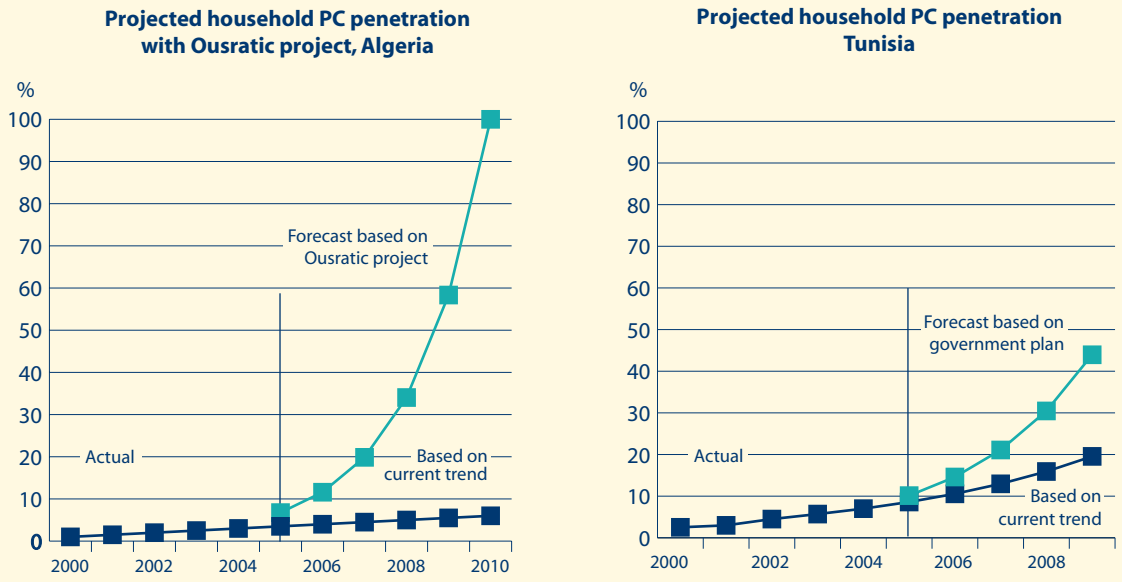
Figure 2.12: Households with Internet access, Europe, 2004



Source: EUROSTAT.

Universal service in ICTs is not only a policy prerogative of developed nations. In July 2005, Algeria announced its OUSRATIC programme (literally 'family ICT' programme) of 'one PC per household', to be reached by 2010 (see Figure 2.13, left).[11] This target aims to increase the number of computers by some five million. Tunisia has a similar programme for family computers. Less ambitious than Algeria, it calls for favorable financing of PCs for families in order to reach one million household PCs by 2009, or a penetration rate twice that of what would be reached under current trends (see Figure 2.13, right).[12] Egypt has a similar programme. All of these projects will need close monitoring to ensure they stay on track to meet their goals. The DOI is useful for this monitoring that these countries are undertaking, as it tracks household PC penetration.

Figure 2.13: Household PC projections for North Africa, 2000-2010



Source: ITU estimate (left chart); ITU estimate from Tunisian Ministry of Communications Technology data (right chart).

2.4.2 Individual access

Mobile phones are personal in nature. The sheer variety of cell phones emphasizes individuality. There are now cell phones targeted exclusively for children[13] and fashion phones by popular designers (see Figure 2.14).[14] These developments have revolutionized universality concepts. Universal access refers to access at public facilities, while universal service refers to having ICTs in the home. The mobile phone does not fit either of these categories. It is thus appropriate to measure individual access to mobile telephony. The infrastructure category of the DOI includes two indicators that do so: mobile cellular subscribers per 100 inhabitants and mobile Internet subscribers per 100 inhabitants.

The status of mobile phones as the preferred form of communications was confirmed when they surpassed fixed lines in number in 2002. By the end of 2005, there were only a handful of countries where there were still fewer mobile subscribers than fixed telephone lines. The percentage of mobile cellular subscribers in the population can exceed 100 (achieved by two countries in 2002, three in 2003, nine in 2004 and 26 in 2005; see Table 2.2) due to double-counting of lapsed subscriptions, as well as some users having more than one subscription. This implies that there are already more mobile phones than inhabitants in some countries, which is likely to be the case as we approach ubiquitous network societies in which computer and communication capabilities will become embedded in the environment and objects around us. Nevertheless, survey-based data confirm the trend towards ubiquity of mobile phones. In Finland, 99 per cent of the population between the age of 15 and 40 has a mobile phone; in the population as a whole, 94 per cent own a mobile phone (See Table 2.3).[15]

Figure 2.14: A mobile for every taste

Source: Firefly, Samsung.

Table 2.2: Countries with mobile penetration greater than 100, 2002-2005

2002	2003	2004	2005	Rank 2005
Luxembourg	Hong Kong, China	Czech Republic	Austria	11
Taiwan, China	Luxembourg	Hong Kong, China	Bahrain	12
	Taiwan, China	Iceland	Cyprus	21
		Israel	Czech Republic	7
		Italy	Denmark	18
		Luxembourg	Estonia	10
		Norway	Finland	17
		Sweden	Greece	13
		United Kingdom	Iceland	20
			Ireland	15
			Israel	5
			Italy	3
			Hong Kong, China	4
			Jamaica	16
			Lithuania	2
			Luxembourg	1
			Macao, China	6
			Netherlands	22
			Norway	25
			Portugal	9
			Singapore	19
			Spain	23
			Sweden	24
			Taiwan, China	26
			United Arab Emirates	14
			United Kingdom	8

Source: ITU/Korea Digital Opportunity Platform.

Table 2.3: Percentage of persons with a mobile phone, Finland, 2005

	Age group, %				
	<40	40 - 49	50 - 59	60 - 74	All
Men	99	97	94	89	96
Women	99	95	92	74	91
Total	99	96	93	81	94

Source: Statistics Finland.

While one mobile phone per person is the norm in developed nations, developing countries are also moving in this direction. There are signs that the rapid growth of mobile telephony means that these countries are reaching the milestone of one mobile per person more quickly than in the past. In Algeria, for example, mobile penetration has jumped from less than 1 to over 40 in just five years. The dream of an individual mobile phone for all may even be realizable in the Least Developed Countries (LDCs), where cellular phone subscriptions are skyrocketing. After all, mobiles first exceeded fixed telephones in an LDC (Cambodia in 1993). Today, 96 per cent of all of telephone subscribers in Cambodia use a mobile phone, the second-highest ratio in the world. The highest ratio of mobile phone users in the world is the Democratic Republic of the Congo, where the fixed line network is virtually non-existent.

Achieving a telephone penetration of one was often used as a lofty target for LDCs: by 2005, there were only three LDCs that did not have a mobile penetration above one. In Bangladesh, where mobile penetration was less than one in 2000, it had risen to 5.7 by 2005 and is forecast to reach 20 by 2010. For one fifth of the population of a country - where the average citizen lives on just over a dollar a day - to subscribe to mobile phones in less than a decade is both amazing and inspiring. This may still be a far cry from the universal rate of over 100 experienced in some developed nations, but nevertheless, it is an astounding feat in a country where it took over one hundred years to reach a fixed line penetration of one.

Given the transition from fixed to mobile as the most popular method of communications, it follows that Internet access over mobile networks is an important means of bridging the digital divide and enhancing digital opportunity. Many applications available in a 'fixed-line' Internet access mode are also available in a miniaturized mobile mode. Examples of mobile data applications that are improving public administration, enhancing livelihoods, facilitating financial transactions, as well as providing entertainment, include:

- In Senegal, Manobi has created a mobile-based agricultural pricing system. The system has received much praise and recognition, and won the World Summit Award for the best e-content and the African ICT Achievers' Award for the most innovative company. Over 3'000 Senegalese farmers and traders receive product prices on their mobile phones (see Figure 2.15, left). One farmer reported making 30 per cent more from selling cabbages by using the system.[16]

- In the Philippines, the Civil Service Commission receives between 1'000-1'500 queries and complaints each month by text messages sent from mobile phones by citizens.[17]

- Celpay in Africa provides a mobile payment service using mobile phones. Celpay received a Wall Street Journal Europe Innovation Award for the service, which is operational in Zambia and the Democratic Republic of the Congo. Given that traditional consumer banking is virtually non-existent in Africa, Celpay has great potential. For example, the

Figure 2.15: Mobile phones at work and play

Source: Manobi, T-Mobile.

Democratic Republic of the Congo only has around 20,000 active bank accounts, but over two million mobile subscribers.[18]

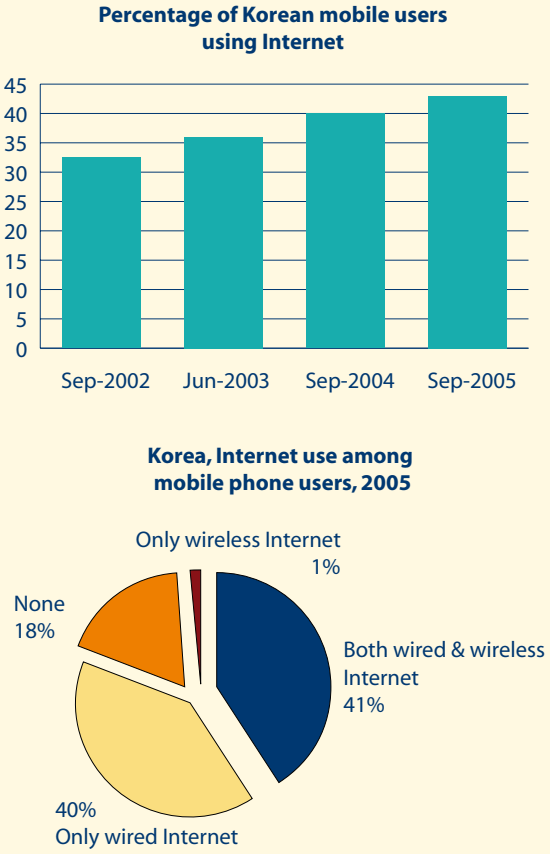
- The German mobile operator T-Mobile broadcasts 2006 World Cup matches to customers' cell phones in Austria, Croatia, Czech Republic, Germany, Hungary, Slovakia and the UK (see Figure 2.15, right).[19]

The number of mobile Internet subscribers can also be used to track the usage of 'm-applications'. Data availability is not as robust as it might be and the statistics that are available carry different definitions and concepts. Such teething problems are not surprising, given the novelty of the service. However, mobile Internet subscribers are a crucial indicator to monitor, given the growing impact that the mobile Internet will have in the future.

Some economies analyze information about mobile Internet use, especially the leaders in Internet access from mobile phones. For example, the Republic of Korea publishes a detailed report on mobile Internet use based on a multitude of indicators: the percentage of mobile phone users using the wireless Internet stood at 43 per cent in 2005 (see Figure 2.16, upper chart).[20] In the Republic of Korea, the vast majority of mobile users who use the wireless Internet also use the wired Internet, with only 1 per cent using the wireless Internet exclusively (see Figure 2.16, lower chart).

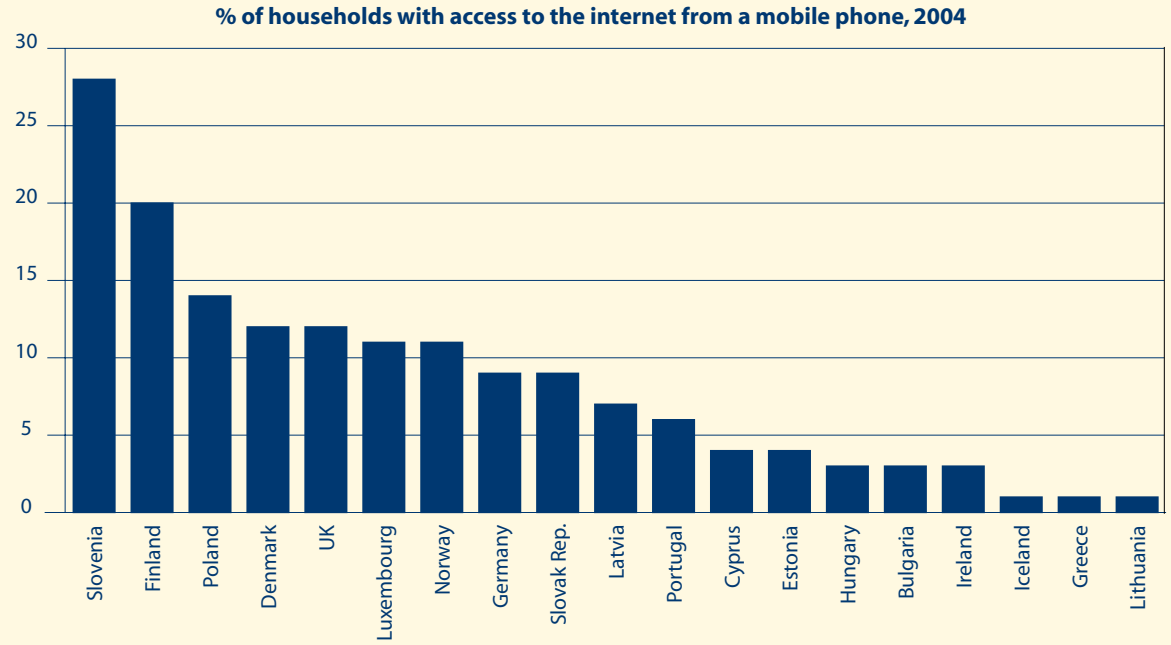
One interesting aspect of mobile Internet usage is the wide variation in access among countries of similar economic or geographic circumstances. In Europe, almost a third of Slovenian households and one fifth of Finnish households use mobile phones to access the Internet, while in other countries, less than five per cent of households use mobile phones to access the Internet (see Figure 2.17).

Figure 2.16: Mobile Internet in the Republic of Korea, 2002-2005



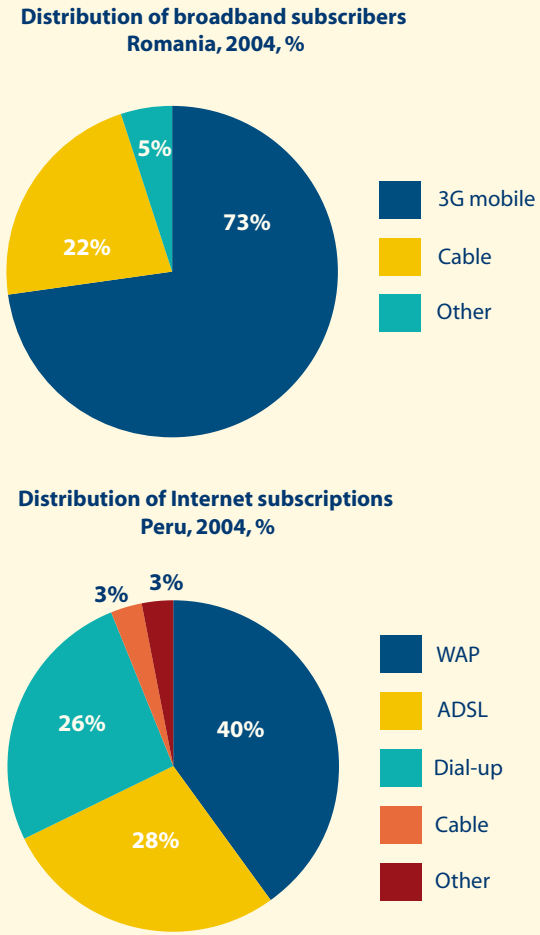
Source: NIDA.

Figure 2.17: Mobile Internet in Europe



Source: EUROSTAT.

Figure 2.18: Mobile Internet in Romania and Peru



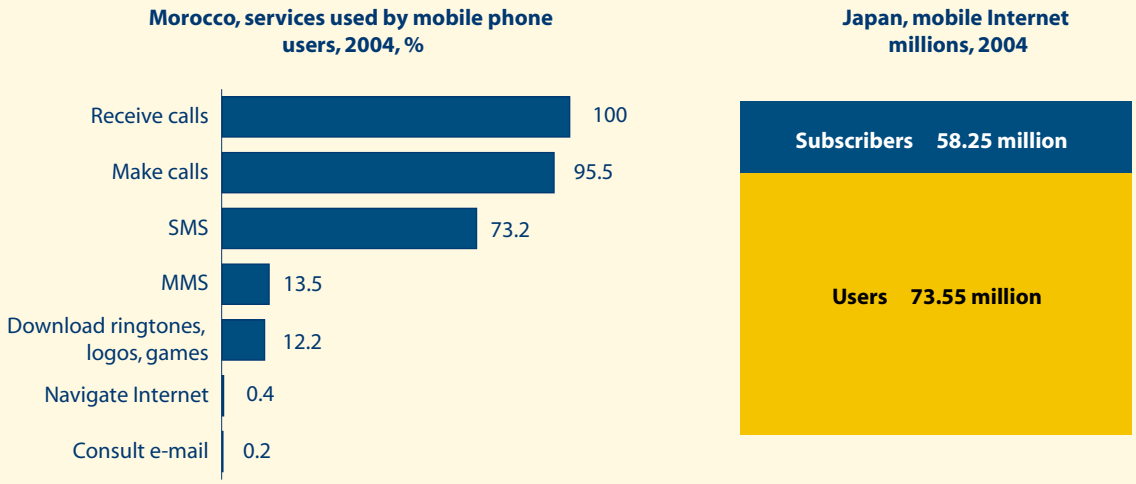
Source: Adapted from ANRC and OSIPTEL.

There is a growing number of developing nations where mobile Internet statistics are being compiled. In Romania, the majority of broadband connections are from mobile (see Figure 2.18, upper chart). In Peru, the telecommunication regulator includes Wireless Access Protocol (WAP) subscribers with its Internet subscription statistics. In that country, WAP is the main method of Internet subscription, ahead of dial-up and broadband (see Figure 2.18, lower chart).

Surveys offer interesting insights into mobile Internet use. In Morocco, an ICT survey asked mobile users about how they used their phones. While all Moroccan mobile users used their cell phones to receive calls, only 0.4 per cent used them to access the Internet (see Figure 2.19, left). Surveys also contrast with the often exuberant and confusing figures published by operators for mobile Internet use. For example, although Japan has the world's highest ratio of mobile Internet subscribers per 100 inhabitants, a survey by the Ministry of Internal Affairs and Communications indicates that not all subscribers are actually using their mobiles to access the Internet (see Figure 2.19, right).

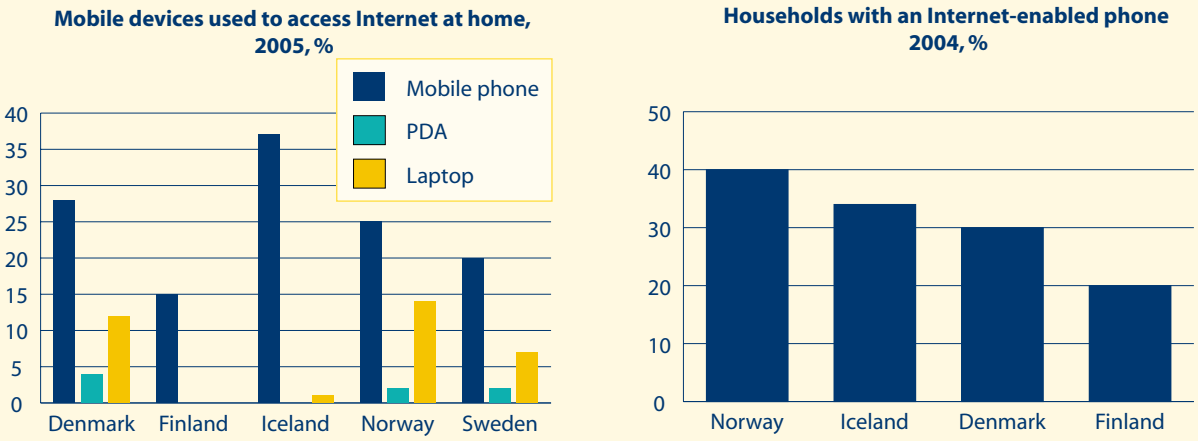
The proportion of households with computers is an 'Infrastructure' indicator in the DOI. It would be useful to have a counterpart indicator for mobile. There are a number of Internet access mobile devices such as mobile phones, laptops, PDAs and smartphones. There is good data from the Nordic countries on the prevalence of each. While 40 per cent of Icelanders access the Internet using a laptop computer at home, they hardly use mobile phones or PDAs to do so. In contrast, over 10 per cent of Danes and Norwegians use mobile phones to access the Internet (see Figure 2.20, left). What is puzzling is why Icelanders do not use the mobile Internet more widely, since they have the second-highest ratio of Internet-enabled phones, after Norwegians (see Figure 2.20, right).

Figure 2.19: Mobile Internet use in Morocco and Japan



Source: ANRT (Morocco), Ministry of Internal Affairs and Communications (Japan).

Figure 2.20: Mobile devices in the Nordic countries



Source: Nordic Information Society Statistics, EUROSTAT.

2.5 Utilization

2.5.1 Internet access

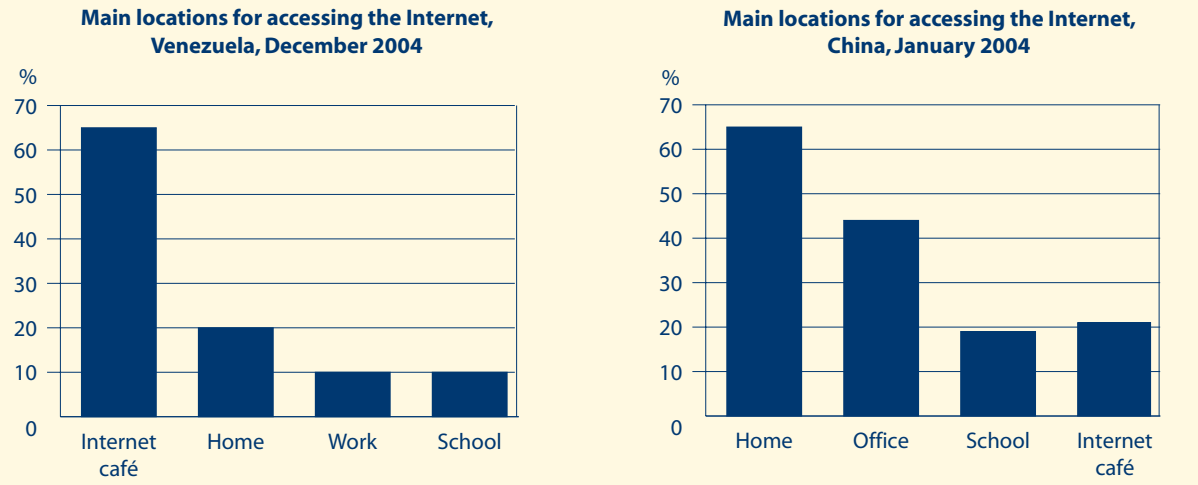
The most popular indicator when discussing the Information Society is the proportion of the population using the Internet. As more and more countries conduct surveys on Internet usage, our understanding about how many people are accessing the Internet is improving. Coordinated efforts in Europe and East Asia have proved especially successful at measuring Internet usage.

The most reliable source of data for this indicator is through a survey. Many developing countries have yet to conduct such surveys, so other methods are used to estimate the number of users. Non-survey estimates are typically based on the number of Internet Service Provider (ISP) subscribers, with assumptions about the number of users per subscriber. However, this method can underestimate the number of users accessing the Internet from Internet cafés. In many developing countries, Internet cafés are the main way of accessing the Internet. A survey from Venezuela found that 66 per cent of Internet users frequent Internet cafés, while in China, only 20 per cent of Internet users visit cafés (see Figure 2.21).

Where accurate, then the percentage of Internet users is a good indicator. Even if people use the Internet from public facilities, they will be included as users. Indeed, the indicator is crucial for measuring the success of government policies in providing public Internet facilities.

In keeping with the DOI's ability to track both fixed and mobile development, it would be ideal to have a breakdown of whether Internet users are fixed or mobile. Few countries

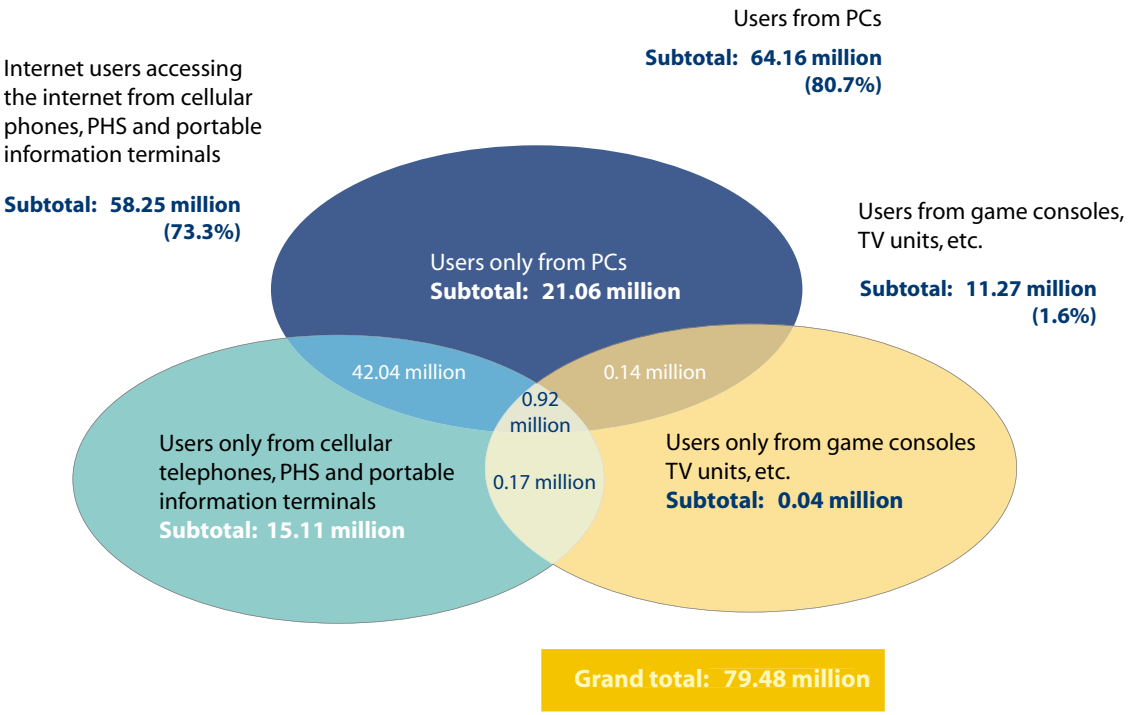
Figure 2.21: Are we being counted?



Note: Multiple choices were possible, so totals exceed 100 per cent. Ranked in order of preference.

Source: Cavecom-e, CHNIC.

Figure 2.22: Distribution of Internet users by device, Japan, 2004



Note: Figures in parantheses indicate the ratio 'Aged 6 or older' to the total number of Internet users. The total of the figures in parantheses may not be 100, because the number of internet users is rounded, so the total of breakdowns may not necessarily tally with the overall total.

Source: 'Communications Usage Trend Survey in 2004 Compiled', Ministry of Internal Affairs and Communications (Japan).

currently provide this breakdown. Data from Japan show that some 15 million users or almost 20 per cent of users only access the Internet from their mobile phones (see Figure 2.22).

2.5.2 Broadband

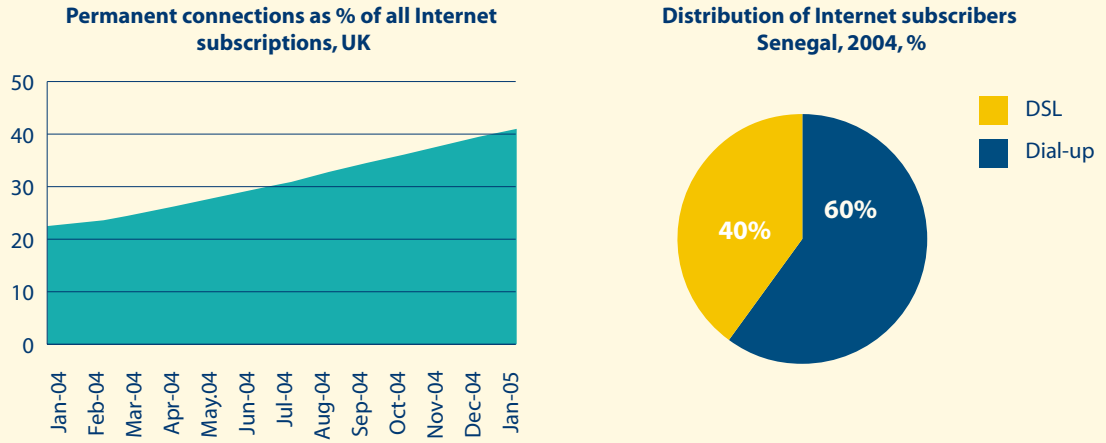
Many of the most desirable applications envisioned for the Information Society are only possible through broadband access. This has made the availability of high-speed Internet service a key policy objective in both developed and developing nations: Colombia promotes the 'massification' or widespread adoption of broadband;[21] India recognizes '… the potential of ubiquitous broadband service in growth of GDP and enhancement in quality of life…';[22] and Nigeria notes that 'broadband is an accelerator of social and economic development in the modern world.'[23]

Two indicators are included in the DOI to measure broadband: the ratio of fixed broadband subscriptions (e.g., Digital Subscriber Lines, access over cable television networks, etc.) to total Internet subscriptions and the ratio of mobile broadband subscriptions to total mobile subscriptions. Since these ratios reflect quality of usage rather than sheer penetration, developing countries are less disadvantaged by these indicators.

The proportion of fixed broadband subscriptions is used in both developed and developing countries as a policy indicator. For example, the UK regularly monitors Internet subscriptions and the distribution between dial-up and, always-on (i.e., broadband) Internet subscriptions (see Figure 2.23, left).[24] In Senegal, the regulator also publishes the share of broadband in total Internet subscriptions (see Figure 2.23, right).[25] Both sets of statistics show a rising trend towards broadband subscriptions. Given the right mix of policy and regulatory encouragement, it is possible that all Internet subscriptions could eventually migrate to broadband.

One barrier to the growth of broadband in developing nations is the lack of the necessary underlying wired infrastructure, such as copper telephone lines and coaxial television cable. Wireless seems the most feasible short-term solution to spreading broadband in developing nations. Wi-Fi has proven popular as a way to connect computers to the Internet, but it is limited by its range. A related technology, WiMAX, is being promoted as a solution for high-speed access, as it can cover large distances. If WiMAX enjoys commercial success, it could prove a broadband solution for many developing countries. Since WiMAX provides another high-speed alternative, it can

Figure 2.23: Broadband ratios in the UK and Senegal



Source: Adapted from National Statistics (UK, left chart); Agence de régulation de télécommunications (Senegal, right chart).

also intensify competition among DSL and cable television providers and lead to lower broadband prices.

Mobile broadband refers to the number of subscribers to mobile cellular networks offering speeds of 256 kbit/s or more. Three 3G technologies (CDMA EV-DO, W-CDMA and TD-SCDMA) meet this definition.[26] However, mobile broadband differs from fixed broadband (where users subscribe mainly for higher speed access) in that users may subscribe for a variety of reasons other than broadband access per se. Broadband mobile offers considerable advantages in capabilities and quality. Ideally, all mobile subscriptions should eventually have access to broadband speeds to meet the highest level of quality and provide the option of high-speed Internet access.

One methodological complication with wireless broadband is whether it should be classified as a fixed or mobile service. Arguably, users carrying a laptop computer or a PDA accessing a Wi-Fi network could be perceived as mobile users. However, users must go to a hot spot to access the Internet, carrying the connotation of being 'fixed'. On the other hand, some users of broadband mobile networks only access them from laptops.

2.6 Conclusions

In line with the WSIS goals, many nations are designing their strategy for the creation of the Information Society and the role of ICTs in their economic and social development, taking into account the specific needs and circumstances of each country. Monitoring implementation is essential to ensure that countries promote a broad-based take-up of ICTs and build an inclusive Information Society. Monitoring and measurement using indices helps identify the full impact of policies, so policy-makers can learn from more successful policies and avoid ineffective measures.

The Digital Opportunity Index is the only e-index based solely on internationally agreed ICT indicators. This makes it a valuable tool for benchmarking the most important indicators for measuring the Information Society. The DOI is a standard tool that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries.

The core infrastructure and use of ICTs by households and individuals indicators selected for constructing the DOI lend themselves to various analytical possibilities. On one hand, the index can be deconstructed along categories such as opportunity, infrastructure and utilization. This assists analysts in determining where countries are relatively strong and weak and focusing attention on priority areas. On the other hand, the DOI lends itself to a fixed/mobile de-aggregation, useful for analyzing the degree to which each is impacting the path countries are taking towards becoming an Information Society. The next chapter shows how the DOI can be used to track countries' progress and analyze changes in the digital divide.

Annex: Methodological Note

The definitions of the core indicators used to compile the DOI are available from the Partnership.[27] 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. If 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.
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.

Endnotes

[1] *Partnership on Measuring ICT for Development*, Core ICT Indicators, November 2005, available at: www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.

[2] See, for instance, the research conducted for the ITU New Initiatives workshop on Ubiquitous Network Societies, held in Geneva on 6-8 April 2005, at www.itu.int/osg/spu/ni/ubiquitous/ and the presentations made at the WSIS Thematic Meeting on Ubiquitous Network Societies, held 16-17 May 2005, in Tokyo, at www.wsis-japan.jp.

[3] 'GrameenTelecom', available at: www.grameen-info.org/grameen/gtelecom.

[4] www.ncc.gov.ng/speeches_presentations/EVC's%20Presentation/Powerpoint/NCC%20CEO%20Presentation%20on%20Overview%20of%20Nigerian%20Telecoms%20Industry.ppt#458,25,Positive Developments Dividends of Full Liberalization – continued, and ITU: 'Regulators cite paradigm shift in their approach to universal access': Competitive markets an imperative to bridging the digital divide', available at: www.itu.int/itunews/manager/display.asp?lang=en&year=2004&issue=01&ipage=paradigm&ext=html.

[5] PTS (2005), 'UMTS - 3G rollout - final report 2004', at www.pts.se/Dokument/dokument.asp?ItemId=4211.

[6] Commission of the European Communities (2002), *eEurope 2005: Benchmarking Indicators*. http://europa.eu.int/information_society/eeurope/2002/news_library/documents/benchmarking05_en.pdf.

[7] www.oecd.org/dataoecd/43/5/2767166.xls.

[8] The OECD mobile basket methodology was originally developed as part of a series of tariff comparison baskets in the late 1980s; see OECD (1990) 'Performance Indicators for Public Telecommunication Operators'. The methodology has been revised over time: a recent explanation can be found in Commission of the European Communities, December 2004, *Commission Staff Working Paper Volume II. Annex to the European Electronic Communications Regulation and Markets 2004 (10th Report),* available at: http://europa.eu.int/information_society/topics/ecomm/all_about/implementation_enforcement/annualreports/10threport/index_en.htm.

[9] OFCOM. *Coûts des services de téléphonie mobile: Comparatif et évolution*. November 2004. www.ccig.ch/images/pdf/Co%C3%BBt%20mobile%202005.pdf.

[10] *Information Society Benchmarking Report,* available at: http://europa.eu.int/information_society/eeurope/i2010/docs/benchmarking/051222%20Final%20Benchmarking%20Report.pdf.

[11] 'Towards an Algerian Information Society: Operation OUSRATIC', available at: www.ousratic.dz/pdf/ALGERIA.pdf.

[12] Ministère des Technologies de la Communication, « PC Familial', available at: www.infocom.tn/index.php?id=14.

[13] www.fireflymobile.com.

[14] Samsung, 'Anna Sui by Samsung: Top Designer Communicates Glam Rock, Vintage Sensibilities In Latest Creative Collaboration', *Press Release,* Feb 22, 2005. Available at: www.samsung.com/au/presscenter/pressrelease/australianews_20050222_0000101458.asp .

[15] The proportion of individuals with use of a mobile telephone is one of the extended core indicators (HH-11).

[16] www.manobi.net.

[17] Emmanuel C. Lallana (2004), 'eGovernment for Development, mGovernment Case Study No.3. TXT CSC: SMS Service for the Philippines Civil Service Commission', available at: www.egov4dev.org/txtcsc.htm.

[18] FirstRand. 'FirstRand Expands Further In Africa. Group commits to Africa focused Private Equity Fund and acquires mobile payments operations in Zambia and DRC', available at: www.firstrand.co.za/default.asp?action=54&ID=98&a=1.

[19] 'T-Mobile Germany will be the first mobile operator to broadcast the 2006 FIFA World Cup™ live to its customers' mobile phones', March 8, 2006, available at www.t-mobile-international.com/CDA/tmd_cebit_wm,20,,newsid-4559,en.html?w=1280&h=632.

[20] National Internet Development Agency of Korea, *2005 Survey on the Wireless Internet Use*, available at: www.apira.org/download/NIDA/2005/Survey%20on%20the%20Wireless%20Internet%20Use(2005.10)-summary.pdf.

[21] Comisión de Regulación de Telecomunicaciones (CRT, Colombia), 'Masificación y promoción de Banda Ancha' web page, available at: www.crt.gov.co/Paginas/ActividadesRegulatorias/PR_Banda%20Ancha.htm.

[22] Department of Telecommunications, *Broadband Policy 2004*, available at: www.dotindia.com/ntp/broadbandpolicy2004.htm.

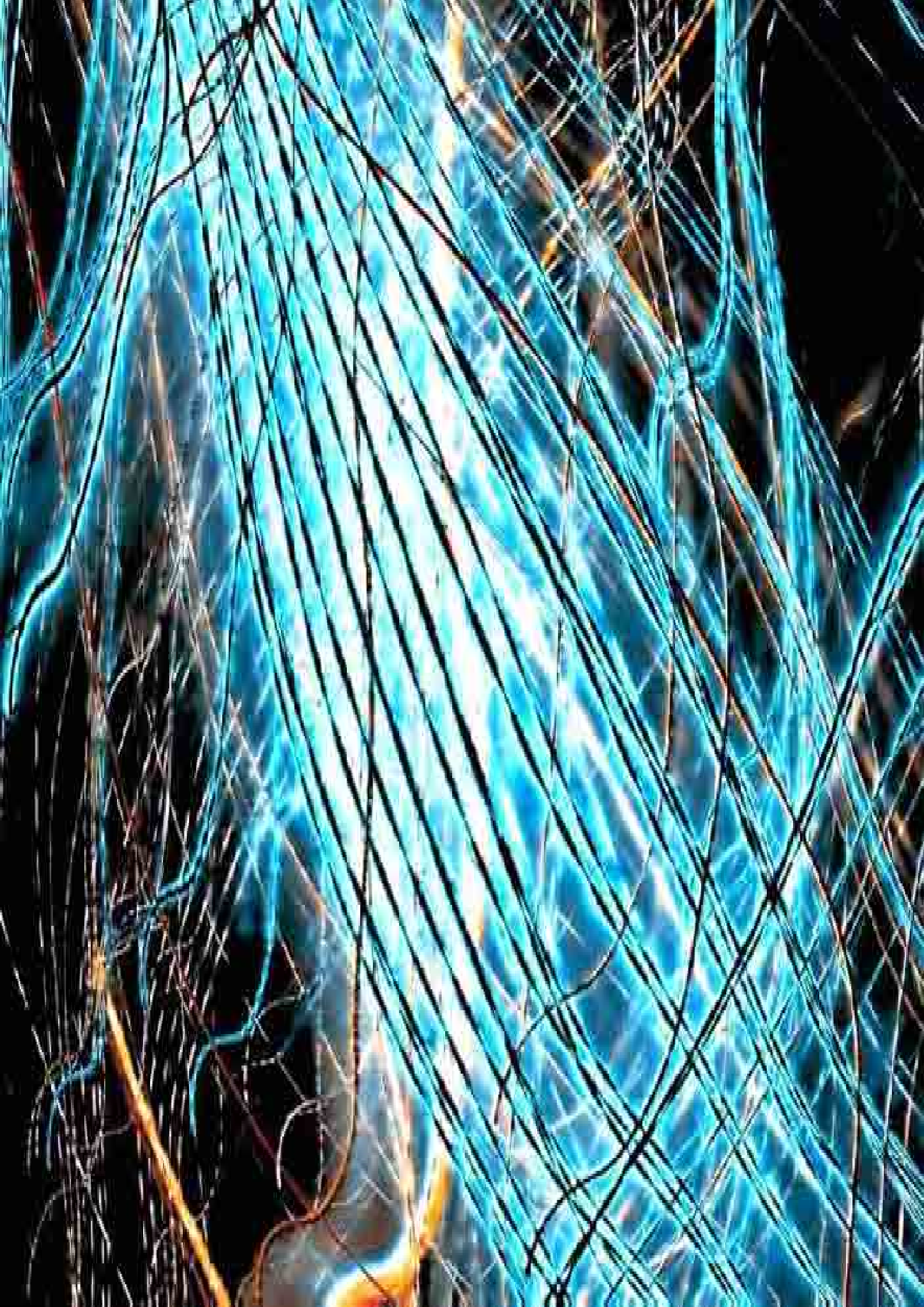
[23] Ernest Ndukwe (2005). 'Making ICT Available, Accessible and Affordable', available at: www.ncc.gov.ng/speeches_presentations/EVC's%20Presentation/Powerpoint/Making%20ICT%20Available%20and%20Affordable%20ICT%20Infrastructure.ppt%20-%20170505.ppt.

[24] National Statistics (UK), *Internet connectivity, December 2005*, February 21, 2006, available at: www.statistics.gov.uk/pdfdir/intc0206.pdf.

[25] Agence de régulation de télécommunications (ART, Sénégal), 'Le marché de l'Internet » web page, available at: www.art-telecom-senegal.org/marche_internet.html.

[26] TD-SCDMA has yet to be commercially launched. High Speed Downlink Packet Access (HSDPA), an upgrade to W-CDMA, provides a theoretical peak downlink rate of 14.4 Mbps, although this peak rate is unlikely to be supported by commercial handsets.

[27] www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.



CHAPTER THREE

Trends in the Information Society

3.1 Overview

As explained in chapter two, the DOI has been designed to explore the trends in each economy's infrastructure, opportunity and usage that are shaping the new Information Society[1]. The DOI can be used to track progress, not only since the start of the new millennium in 2000, but also looking ahead, in the adoption of new technologies such as broadband and mobile Internet. This chapter identifies explores some of these trends, at the global level, as well as their likely impact on the evolution of the digital divide. In particular, the DOI can be used to monitor the transformation of the telecommunication sector towards Next-Generation Networks (NGN) that are all-digital, primarily based on an IP platform, and which increasingly use the airwaves rather than fixed lines.

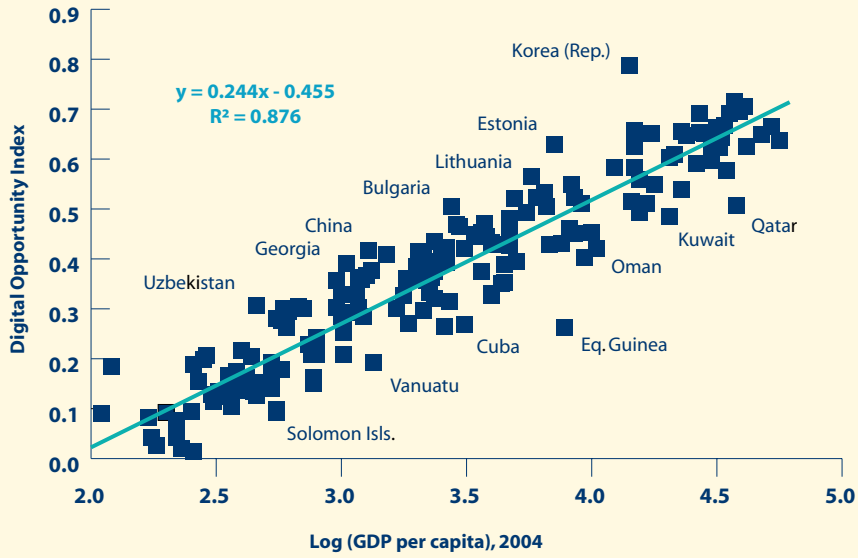
The main insights from the DOI are that many parts of the developing world are making strong gains in mobile telephony and, to a lesser extent, Internet access. Average prices of telecommunications are falling rapidly worldwide. Meanwhile, however, developed countries are forging ahead with new technologies and ever-faster access. The nature of the digital divide is therefore changing: from a disparity in the availability of ICTs towards differences in the quality of the user experience. Strategies to promote ICT development and digital inclusion must take these trends into account, as the next chapter shows.

3.2 ICTs and Income

Much has been written about ICTs as key drivers of national economic performance and the relationship between the DOI and income per capita is evident (see Figure 3.1). High income countries are associated with greater digital opportunity (and vice versa), suggesting that some countries have established virtuous circles, with high GDP per capita

Figure 3.1: How Digital Opportunity relates to national economic performance

The chart shows the relationship between DOI and national wealth, as indicated by GDP per capita, using a logarithmic scale.



Source: ITU/KADO Digital Opportunity Platform.

facilitating investment in ICTs, whilst ICT-intensive industries generate further income. However, it is difficult to identify the precise mechanics of the relationship between ICTs and improved economic performance, prove causation, or isolate the influence of other endogenous variables[2].

Positive and negative outliers fall around this trend line—economies that fare better and worse in the DOI than would be predicted on the basis of their level of wealth. The Republic of Korea, China and certain economies of the former Soviet Union achieve higher DOI scores than their income would suggest (Figure 2.4), while some of the Gulf States, Cuba and Equatorial Guinea have lower DOI scores than predicted by their national income (Figure 3.1). As shown in Chapter one, the DOI measures growth in new and innovative technologies, as well as 'technological leapfrogging'. Some of the positive outliers may be explained by high ratios of broadband to Internet subscribers, as discussed later. Some of the negative outliers may be explained by the fact that their GDP per capita is high as a result of oil production and other natural resources.

The average DOI score worldwide in 2004/05 is 0.37. However, there are big disparities in economies' prospects, with low income economies averaging less than half of this at 0.16. By contrast, the average DOI score for high-income economies is nearly four times the low-income score at 0.61 (see Figure 3.2, right). Europe is the most advanced region (0.55), followed by the Americas (0.4). DOI scores show that basic telecom access and affordability are the main areas of achievement for most countries (the dark blue area in Figure 3.2). In low-income countries, digital opportunity mostly derives from access to cellular service and affordable telecoms. Meanwhile, high-income countries are successfully realising digital opportunity through high-performance infrastructure (e.g., broadband) and the use of advanced technologies.

3.3 Digital Opportunity around the world

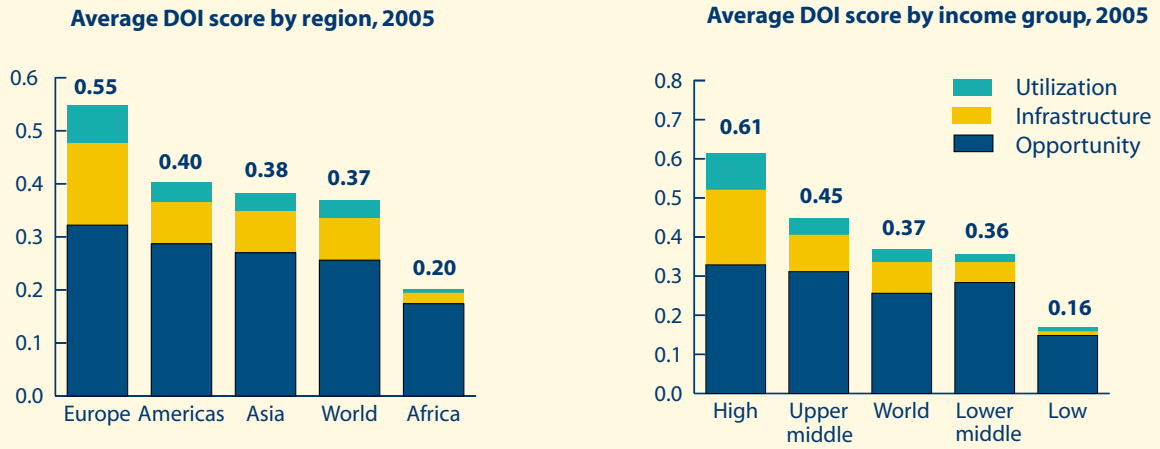
DOI scores are also sharply differentiated according to region (see Figure 3.2, left). Europe, the Americas and Asia all have average DOI scores higher than the world average of 0.37, while Africa has an average DOI score of 0.20, mainly due to limited Utilization and fixed line infrastructure. Economies can be divided into three different categories:

3.3.1 High DOI scores (0.45 and above)

These economies are mostly developed economies from Europe, North America, East Asia and the Pacific. They include all the OECD member states, except Turkey and Mexico. These economies provide good digital opportunity for most of their inhabitants, with extensive infrastructure, generally low prices and widespread use of new technologies. Seychelles and Mauritius are the highest-ranking African economies. Chile is the highest-ranking Latin American country at 40th, followed by Argentina at 51st. Several of the Arab States achieve notably good rankings, such as Bahrain at 33rd place, the United Arab Emirates at 35th place and Qatar in 44th place. Caribbean states also generally do well in the DOI. This may be due to an 'island effect', where small islands may specialise in ICT-intensive offshore industries reliant on telecommunications. Barbados, Jamaica and Antigua and Barbuda all have high DOI scores. However, this is not so apparent in the Pacific, where island effects appear to be countered by the fact that many small island developing states have only small local markets and thus lack economies of scale and are not served by submarine fibre optic cables. Most High-DOI economies have an Opportunity score far in excess of 0.95 (Hong Kong, Macao and Singapore have the greatest opportunity, due to full mobile coverage and affordable prices). High-DOI economies also have good infrastructure, with an average Infrastructure index of 0.51.

Figure 3.2: The Digital Opportunity Index worldwide

The different make-up of the DOI worldwide, world average and by income region.



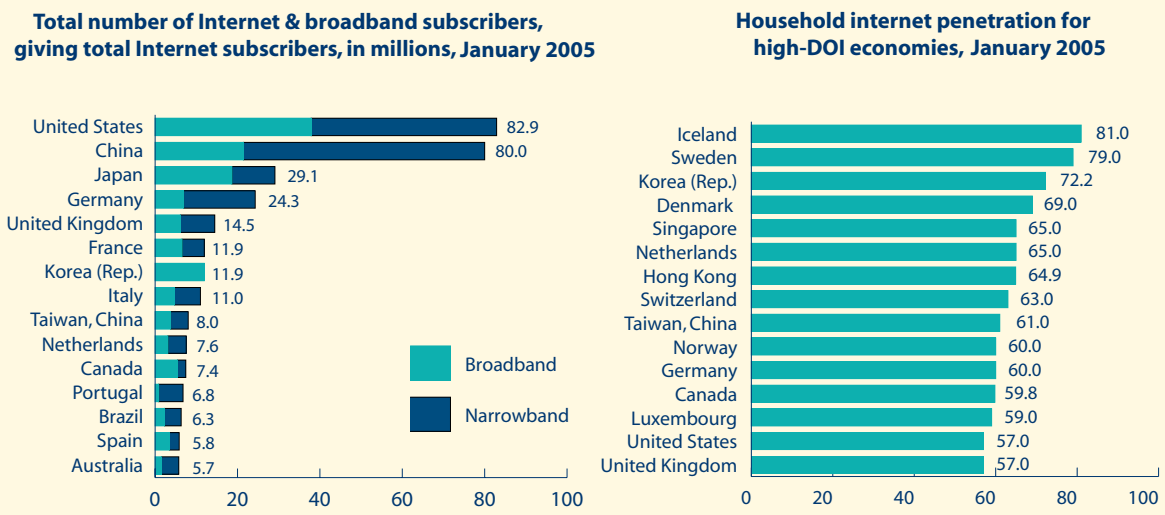
Source: ITU/KADO Digital Opportunity Platform.

The factor that really sets these countries apart, however, is their high Utilization averaging 0.25, due to their high Internet and broadband subscriber penetrations. The Republic of Korea stands out with an overall DOI score of 0.79 ahead of Japan at 0.71 and Denmark at 0.70. This is partly due to its pioneering take-up of 3G mobile technology (see Figure 3.9) and leading broadband penetration in 2004 (see Figure 3.3, left). The Asian Tigers and Scandinavian countries lead in Internet subscriptions, with around a third of their population subscribing to the Internet, but only half of these subscribed to broadband services. This is in contrast to the Rep. of Korea, where virtually all Internet users are broadband subscribers, with access to faster, advanced services such as video, teleconferencing, multiplayer gaming and triple play. These different profiles of Internet usage could result in the development of more varied skill sets and contrastingrates of innovation and, over the longer term, may shape the Information Society differently, according to the type, speed and capacity of Internet access available.

and usage. For example, some countries have good levels of infrastructure, but score somewhat lower in usage.

It is rare for an economy to have higher Utilization than Infrastructure (as would be predicted from the sequence of sub-indices). Utilization exceeds Infrastructure in only six countries: Maldives, Morocco, Peru, Myanmar, Senegal and Venezuela. Apart from Myanmar, these are medium-DOI countries and they all have DOI scores above expectations based on income (see Figure 3.1). These countries are leveraging their investments in infrastructure well to yield more advanced forms of usage. Morocco and Peru rank highly despite their weak Infrastructure scores, due to their high ratios of broadband subscribers as a proportion of Internet subscribers. This is an example of technological 'leapfrogging'.

Figure 3.3: Different profiles of the Information Society in High-DOI economies



Source: ITU/KADO Digital Opportunity Platform.

3.3.2 Medium DOI scores (0.30-0.45)

This group consists of diverse economies from Latin America, the Caribbean, Asia and North Africa. The upper middle income African states of South Africa, Botswana and Gabon feature in this category, as well as Namibia and Senegal. Poorer European countries generally also have medium DOI scores (e.g. Albania, Belarus, Turkey and Ukraine). Malaysia is the highest-ranked developing country from Asia in the group. Medium-DOI countries also include the developing giants of China, Brazil and Indonesia, but interestingly, not India. These countries have high average Opportunity, at around 0.90, due to good mobile coverage and relatively low prices. What distinguishes this group from the low DOI economies is reasonable infrastructure and some use of advanced technologies, but only at levels around a third of those achieved by high DOI economies. Within this group, economies often differ in their balance of infrastructure

3.3.3 Low DOI scores (0.30 and less)

Digital opportunity in these countries is still mostly expressed in terms of potential access to the Information Society, that has not yet been realized. These countries are among some of the poorest in the world, with low levels of infrastructure, limited availability of the Internet and broadband and high prices as a proportion of local incomes. An hour's Internet access per day exceeds the average daily income in most of these countries.

India and Swaziland stand out in this category due to their high Opportunity scores of 0.80. India is enjoying strong and sustained reductions in the price of telecommunications, as measured by the Telecommunication Regulatory Authority of India (see Figure 2.11 in Chapter 2). India also has a relatively high Utilization index, with rapidly growing cellular and Internet users. However, its large and growing population

means that strong gains in the number of subscribers translate into relatively small increases in penetration and infrastructure. Nicaragua has a comparatively high usage index, due to its relatively high proportion of broadband subscribers from Internet subscribers, at around 15 per cent. However, it has no mobile broadband. What many of these economies share in common is relatively expensive telecommunication services, as a proportion of income. In order for these countries to fully participate in the Information Society, prices must be dramatically reduced so that telecom services become more affordable.

3.4 Tracking the Mobile Revolution

The communication technology offering the strongest potential for developing countries is arguably cellular telephony. The DOI can track the transformation of the telecom industry and shows the rapid expansion of mobile telephony. This makes it a useful and development-orientated tool that can be used by developing countries to chart their own path towards the Information Society and to adapt national policies to their own needs and national circumstances, as called for by Paragraph 28 of the *Geneva Plan of Action*[3].

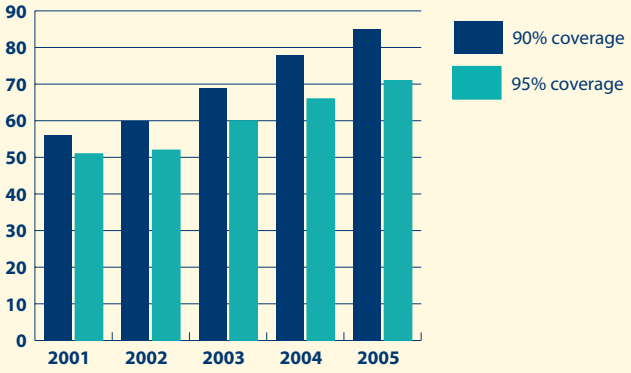
Worldwide, mobile telephony continues to grow explosively. By the end of 2000, there was a total of 740 million mobile subscribers. Just five years later, at the end of 2005, the number of mobile subscribers had reached 2.14 billion, over one third of the world's population. In other words, the market had almost tripled in size in just five years. Meanwhile, mobile telephony is growing in coverage (see Box 3.1) and capabilities, with rapid growth in mobile Internet access and 3G services (see Figure 3.9).

As shown in Figure 2.2 in Chapter two, the DOI has been constructed so it can be split into separate fixed and mobile components. In this way, the relative contributions of the fixed and mobile sectors within a country can be compared. This has the advantage of allowing developing countries to

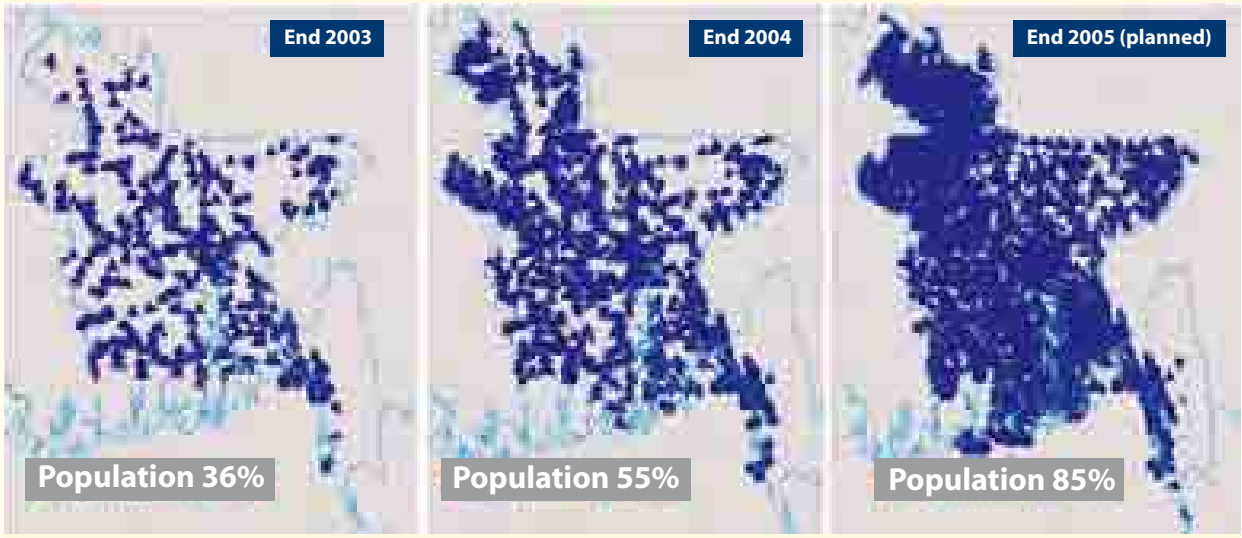
Box 3.1: Growth in mobile coverage

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. Around the world, 51 countries had achieved 95% mobile coverage of their population by end 2001. By 2005, 71 had achieved 95% (or near universal) coverage.

Box Figure 3.1a: Number of economies reaching 90% and 95% mobile population coverage

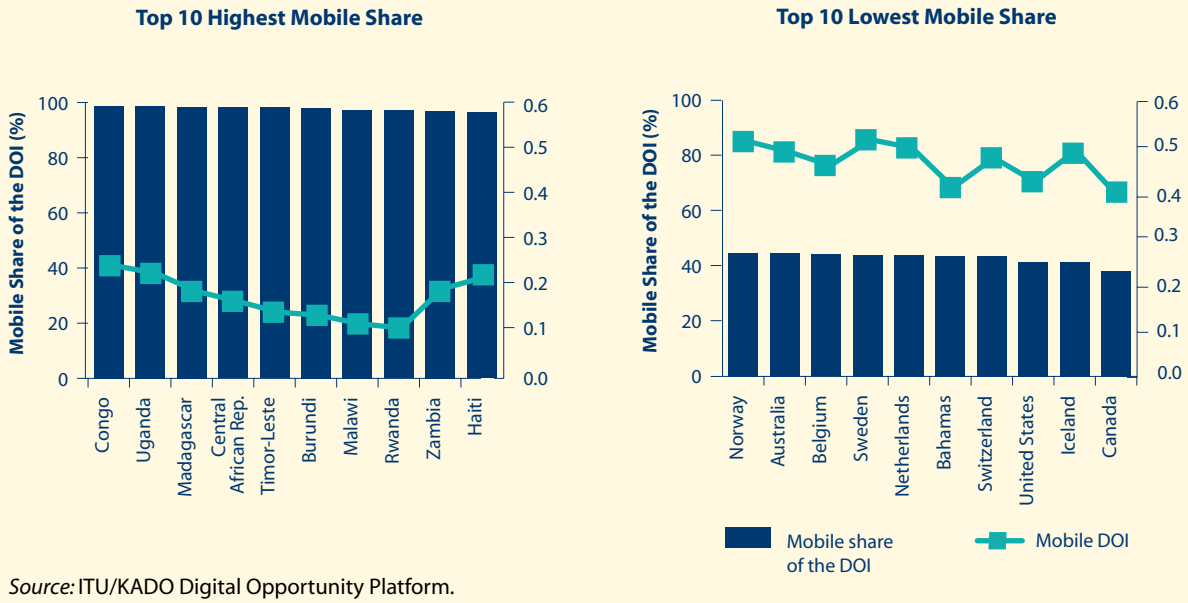


Box Figure 3.1b: Mobile coverage of population in Bangladesh, 2003, 2004 and 2005.



Source: ITU/KADO Digital Opportunity Platform and GrameenPhone, Bangladesh.

Figure 3.4: Tracking the Mobile Revolution



Source: ITU/KADO Digital Opportunity Platform.

be assessed according to their strengths in mobile telephony, rather than by their relative weaknesses in the area of fixed-line infrastructure. It also means that a country's telecom sector can be analysed over time, to assess the evolution of the two sectors. For many developing countries, wireless communications are indeed driving digital opportunity. Analysis of the mobile components of the DOI shows that the economies where mobile components contribute the highest share towards the overall DOI score are mostly African countries, where the mobile sector accounts for nearly all digital opportunity, although mobile DOI scores overall remain low at around 0.2 (see Figure 3.4, left chart). For Africa as a whole, the mobile components of the DOI contribute between 80-90 per cent of digital opportunity (see Figure 4.1 in Chapter four). The African strong-performers of Mauritius, the Seychelles and North African countries (Morocco, Algeria, Tunisia and Egypt) have mobile contributions of around 70 per cent, with some 25-30 per cent of the DOI score from fixed-line components. Their higher overall DOI score reflects the role that both fixed and mobile play in a balanced Information Society. By contrast, mobile communications account only for around 40 per cent of the overall DOI score in the countries with the smallest mobile contribution, which are mostly OECD member states (see Figure 3.4, right chart).

3.5 Trends over time in Digital Opportunity[4]

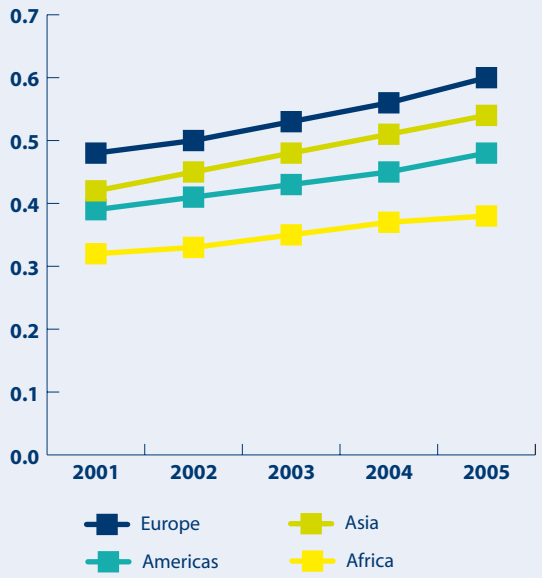
Scores in the Digital Opportunity Index are increasing rapidly, in line with the explosive growth of the telecom sector (see Figure 3.5). The major gainers in the DOI include the 'BRIC' giants of Brazil, Russia, India and China, as well as Egypt (see the Table in Figure 3.5). Gainers in the DOI come from virtually every region: Asia, Latin America, Africa, Europe and the CIS. Improvements in DOI score over time for the regions are shown in Figure 3.5. The scores for Egypt, China and Russia coincide closely, as do Poland and Chile, demonstrating that it is possible for nearly any country to show dramatic improvements in digital opportunity, despite the different profiles of their Information Societies. There are, however, very different drivers underlying these gains.

Analysis of the DOI over time shows that countries are gaining in strength in different areas. Some countries, such as Brazil and Peru, have succeeded in promoting a balanced development in all three aspects of digital opportunity - Opportunity, Infrastructure and Utilization. In high-DOI countries, such as Japan and the Republic of Korea that generally already have high Opportunity, national broadband strategies are successfully boosting Infrastructure and Utilization[5]. These economies are not complacent about ICT take-up, but are following coordinated action plans to boost just and equitable ICT development, promote innovation and facilitate a ubiquitous Information Society.

China's meteoric rise in the DOI since 2001 derives from its strong gains in Infrastructure, in part due to universal access obligations defined by China's State Council in 2000, as well as central and local government plans for infrastructure roll-out.[6] The Government has committed significant resources to the 'Cun-Cun Tong' programme to extend connectivity to rural areas and connect villages with basic telecom services.[7] Egypt has also experienced similar strong gains in infrastructure under its Masterplan I (covering 2000-2004, now extended by Masterplan II for 2004-7), which aimed to provide nationwide connectivity via an integrated telecom backbone[8]. Egypt pioneered the 'Free Internet Plan', which abolished separate Internet Service Provider (ISP) charges under a revenue-sharing agreement between Telecom Egypt and ISPs and radically slashed the cost of Internet access. These initiatives have been supplemented by the programme, 'A PC for Every Household', which offers subsidies on PCs

Figure 3.5: Gainers in the DOI, 2001-2005

Trends in regional average DOI score for the top 15 economies among those countries for which data are available, 2001-2005



Note: Data availability means that regions are not wholly representative.

Major gainers in the Digital Opportunity Index, 2001- 2005

	Economy	DOI 2001	DOI 2005	Change 2001-2005	Drivers (+.0.2)
1	India	0.17	0.29	73%	O
2	China	0.29	0.42	46%	I
3	Russia	0.32	0.44	41%	I
4	Hungary	0.40	0.55	37%	I, U
5	Peru	0.28	0.38	37%	O, I, U
6	Indonesia	0.24	0.33	36%	O
7	Brazil	0.32	0.43	35%	O, I, U
8	Poland	0.39	0.52	34%	I, U
9	Japan	0.54	0.71	33%	U
10	Venezuela	0.32	0.43	33%	U
11	Chile	0.40	0.52	32%	U
12	Egypt	0.29	0.38	32%	I
13	Rep. of Korea	0.60	0.78	31%	U, I
14	Israel	0.50	0.66	31%	U
15	Spain	0.47	0.61	28%	U
	Average	**0.37**	**0.50**	**37%**	
	40 economies	**0.43**	**0.54**	**27%**	

Note: O = Opportunity; I = Infrastructure; U = Utilization sub-index. A driver is defined as a sub-index where there is an improvement of score of 0.2 or more over the period 2001-2005.

Source: ITU/KADO Digital Opportunity Platform.

for Egyptian families, as well as a Universal Service Fund to promote universal access in telephone services.[9] These programmes have had some success in developing the fixed-line network outside Cairo. Although state roll-out plans can prove inflexible and carry risks of misallocation of resources, at lower levels of infrastructure, plans to extend fixed-line connectivity will generally never prove misguided.

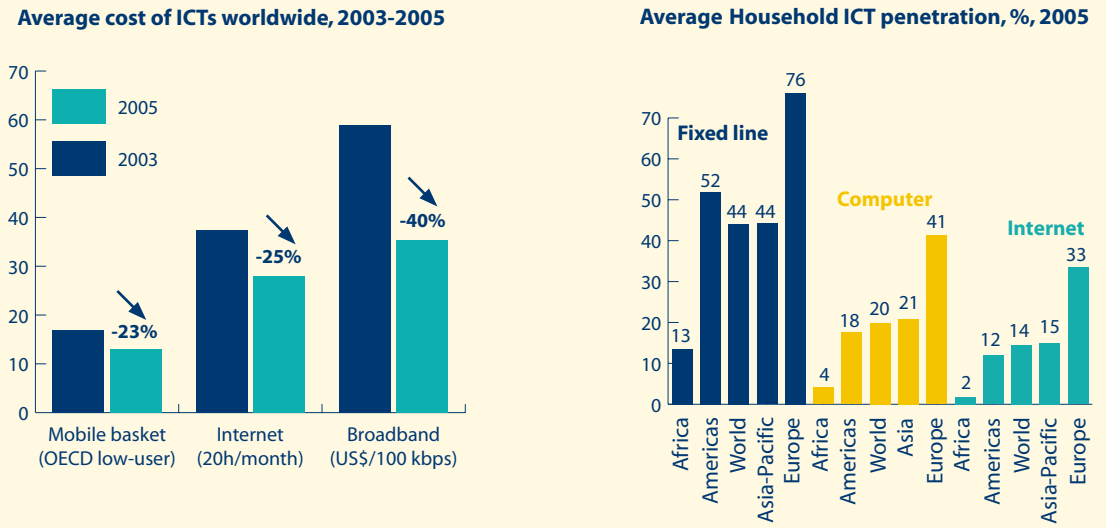
Such state-led gains in basic infrastructure are in contrast to the Latin American countries of Chile and Venezuela (as well as Poland) where early policies for privatization and a vibrant private sector have successfully promoted telecommunications and the higher-margin broadband segment, resulting in strong gains in Utilization.

The single largest overall driver behind these gains, according to the DOI sub-categories, is the reduction in telecommunication prices. ITU monitors telecom prices by different methods, according to the service:

- For mobile tariffs, the OECD low-user basket10 is used as the most representative for developing countries and low-income users;
- For internet access, the cost of 20 hours' Internet access is used, taking either dial-up or broadband, depending on which is cheaper. Where dial-up Internet is cheapest, the cost of 20 hours' local telephone calls is also taken into account (in terms of twenty calls, of duration one hour, split between peak and off-peak rates).
- For broadband, the monthly cost of access is measured according to monthly subscription price in USD per 100 kbps capacity. This allows for comparison among packages with different capacities and also allows for different technologies to be compared (e.g. ADSL, cable modem, Fibre to the Home).

Figure 3.6: The cheaper the service, the more people subscribe

Reductions in the worldwide average price for ICTs, 2003-2005 (left); and regional average household penetration rates for mainlines, computers and Internet, 2004/2005 (right).



Note: The data on regional average household penetration are based on most recently available data for 2004/2005 (right chart).

Source: ITU/KADO Digital Opportunity Platform.

All three services (mobile, Internet and broadband) show strong reductions in average price worldwide since 2003, mainly due to growing liberalisation and more competitive markets (see Figure 3.6, left chart[11]). In mobile telephony, worldwide, prices have been falling by an average of 10 per cent per year. The impact of prepaid telephony has increased the popularity of mobile telephony as the communication medium of choice. Internet access has fallen by a similar amount and in 2005, cost only three-quarters of its price in 2003. As the most recent technology, broadband Internet access is the most expensive, but it has also fallen the most – broadband has enjoyed a 40 per cent reduction in price since 2003 due to growing competition and changes towards flat-rate, unmetered pricing packages. Regardless of trends in income, significant reductions in telecom prices have added to the growing number of subscribers and household subscriptions to ICTs over the same period (see Figure 3.6, right chart).

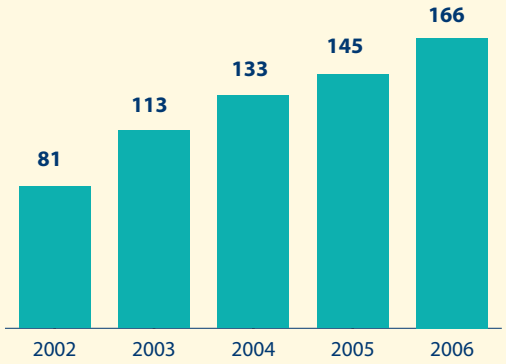
3.6 The changing face of the Digital Divide

And what of the digital divide? As we have seen, the DOI suggests strong gains in mobile telephony in the developing world, offering the prospect of greater access to telecommunications for more of the world's population. And yet the digital divide is continuing to evolve in new ways. The Digital Opportunity Index tracks access to broadband technologies, both fixed and wireless, in the proportion of Internet subscribers and mobile subscribers with access to high-speed networks offering advanced services. It could be argued that broadband is currently not relevant to developing countries, but this is not the case. Broadband and mobile Internet are increasingly important methods of ICT access for developing nations, as their rapid expansion prove. By April 2006, ADSL at speeds of 256 kbit/s and above was commercially available in 166 countries, more than twice the number of broadband economies four years earlier (see Figure 3.7).

Some developing countries, such as Senegal and the Maldives, have already had broadband for several years.

Figure 3.7: Expansion of Broadband, 2002-2006

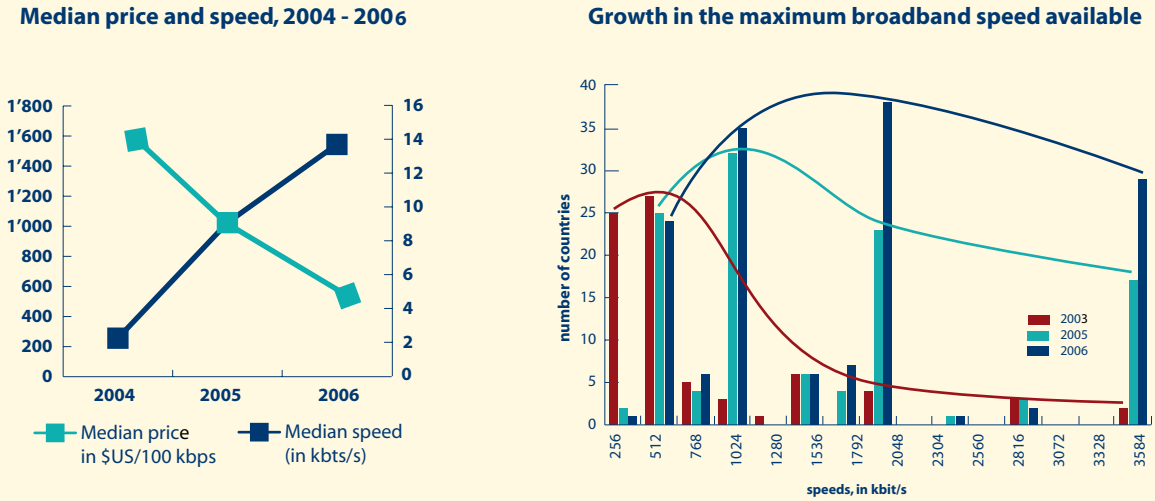
Number of countries with commercial broadband at speed 256 kbit/s or more, 2002-April 2006



Source: ITU/KADO Digital Opportunity Platform.

Figure 3.8: Trends in broadband price and speed, 2003-2006

Trends in median speed and price for the 133 countries for which data are available, 2004-6 (left); trends in maximum broadband speed available, number of countries, 2003-2006 (right).

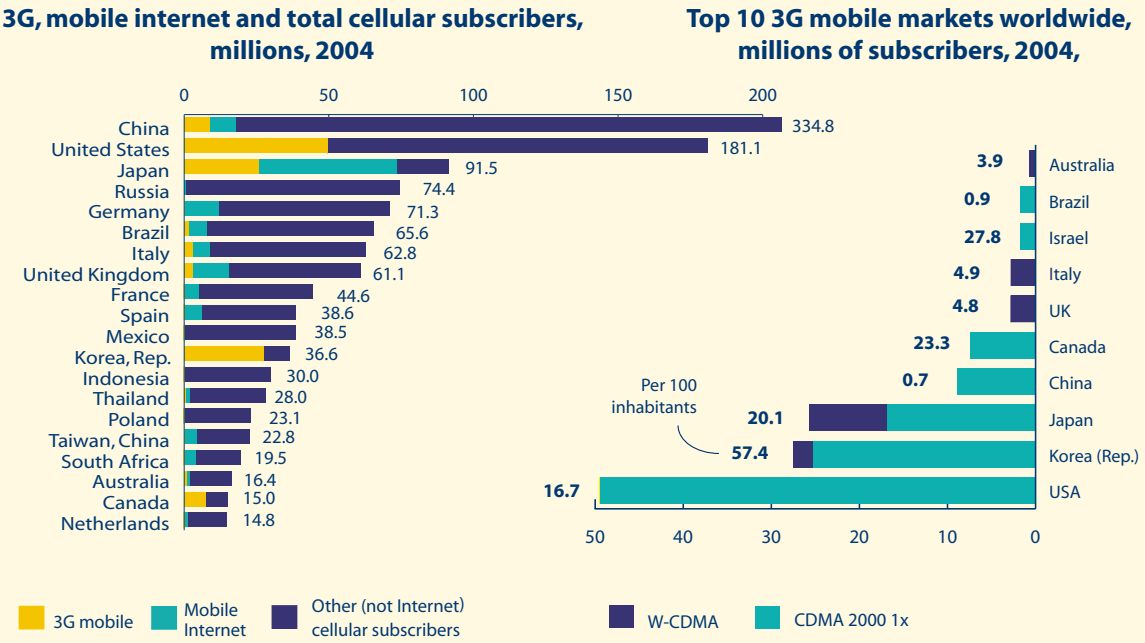


Note: Broadband speeds were sampled in August 2004, August 2005 and March 2006.

Source: ITU/KADO Digital Opportunity Platform.

Broadband ADSL service is spreading further, and being rolled out in Botswana (mid-2005 onwards[12]), Ghana (March 2006[13]) and Libya (where ADSL is being introduced over Libya Telecom and Technology's ATM network[14]). In Rwanda, 700 subscribers[15] enjoy ADSL service in Kiyovu, with service being rolled out in Kigali, Gitarama and Butare in 2006.[16] In Lebanon, a Memorandum of Understanding was signed by the Ministry of Telecommunication in January 2006 for the commercial launch of DSL from March 2006 onwards.[17] Meanwhile, the choice of services available over ADSL is growing. At the end of May 2006, Maroc Telecom launched IPTV over DSL, a first for Africa.[18] Far from being a 'developed world' technology,

Figure 3.9: Expansion of mobile Internet and 3G



Source: ITU/KADO Digital Opportunity Platform.

DSL services are rapidly expanding in reach, speed, services and capability.

Worldwide, both entry-level and average prices are falling (see Figure 3.8, left chart) due to competition (most often between cable and DSL providers, but also between DSL and Fibre To The Home, Premises, Office or Kerb: FTTx[19]) and the introduction of flat-rate pricing packages. Furthermore, speeds are increasing, with higher maximum speeds offered in many more countries (see Figure 3.8, right chart[20]). In 2003, only Japan and the Rep. of Korea offered speeds over 3 Mbps (26 and 20 Mbps respectively). By April 2006, 29 countries had commercial offers in excess of 3 Mbit/s. These were mostly OECD member states, but included some transition and developing economies. However, developed countries generally enjoy greater and more varied data services, at faster speeds and lower prices.

area in Figure 3.9, left). The DOI registers a steady expansion in the number of mobile Internet subscribers, reflected in the steady increase in Utilization over time. Most notably, the DOI shows that mobile Internet and 3G services are no longer the preserve of high-income countries and are now offered in many developing countries throughout central and eastern Asia, Latin America and the Caribbean.

The standards recognized by ITU as IMT-2000 compliant (W-CDMA, CDMA 2000 and TD-SCDMA) are making steady gains among developing markets. Markets are strongly differentiated according to technology, with W-CDMA the technology of choice for Europe and some Asian countries, while CDMA 2000 1x has been adopted throughout Latin America and many of the Commonwealth of Independent States (CIS). TD-SCDMA has yet to be launched, but is expected to feature prominently in China.[22]

Table 3.1: Lowest broadband prices, per month, and change, mid-2005 - early 2006

Economy	Company	Speed kbit/s	Price per month US$	US$ per 100 kbit/s	Change 2005-2006
1 Japan	Yahoo BB	51'200	31.19	0.07	-12.5%
2 Rep. of Korea	Hanaro	51'200	40.59	0.08	...
3 Netherlands	Internet Access	20'480	27.97	0.14	-81.3%
4 Taiwan, China	Chunghwa	12'288	22.67	0.18	...
5 Sweden	Bredbandsbolaget	24'576	56.08	0.23	-6.5%
6 Singapore	Starhub	30'720	73.17	0.24	-85%
7 Italy	Libero	12'288	37.23	0.30	-73.8%
8 Finland	Elisa	24'576	85.64	0.36	-51.4%
9 France	Free	10'240	37.29	0.36	-90.1%
10 United States	Comcast	4'096	20.00	0.49	...
11 Germany	Freenet.de	6'016	30.95	0.52	...
12 United Kingdom	Pipex	8'128	50.89	0.63	-53.6%
13 Hong Kong, China	Netvigator	6'144	51.17	0.83	...
14 Portugal	Sapo	8'128	75.82	0.93	...
15 Canada	Bell	4'096	41.26	1.01	-3.93%
Average		**18'287**	**44.33**	**0.42**	**-50.8%**

Source: ITU

The DOI also measures mobile Internet subscribers[21] (both as a proportion of population and as a share of total cellular subscribers). Mobile Internet has attracted attention as a next-generation communication market with the convergence of mobile and wired Internet technology. The introduction of 3G widely failed to meet early expectations due to problems with handset availability, system reliability, limited content offerings and the lack of a 'killer application' to arouse consumer interest. Thus, 3G only accounted for a small share of total cellular subscribers by end 2004 (green area in Figure 3.9, left). However, these problems are being overcome and the industry is forging ahead with new, advanced mobile services. A growing number of people are now enjoying mobile multimedia services. Mobile Internet also includes other 2.5G technologies such as WAP and GPRS (turquoise

For mobile broadband, by the end of 2005, there were 67 million mobile broadband subscribers in 51 countries, served by 95 operators (see Figure 3.10, left). Japan and the Republic of Korea have the highest ratios of mobile broadband subscribers, due to their early start (see Figure 3.10, right). However, mobile broadband networks have proliferated over the last few years, and other countries are fast catching up. But just as nations reach the goalpost of all of their subscribers being 3G broadband, fourth generation mobile technology may be ready, posing new challenges.

Like fixed wireless technologies, Internet access through mobile broadband networks may be the best hope for many developing countries of achieving a broadband Information Society. Many developing nations have yet to launch

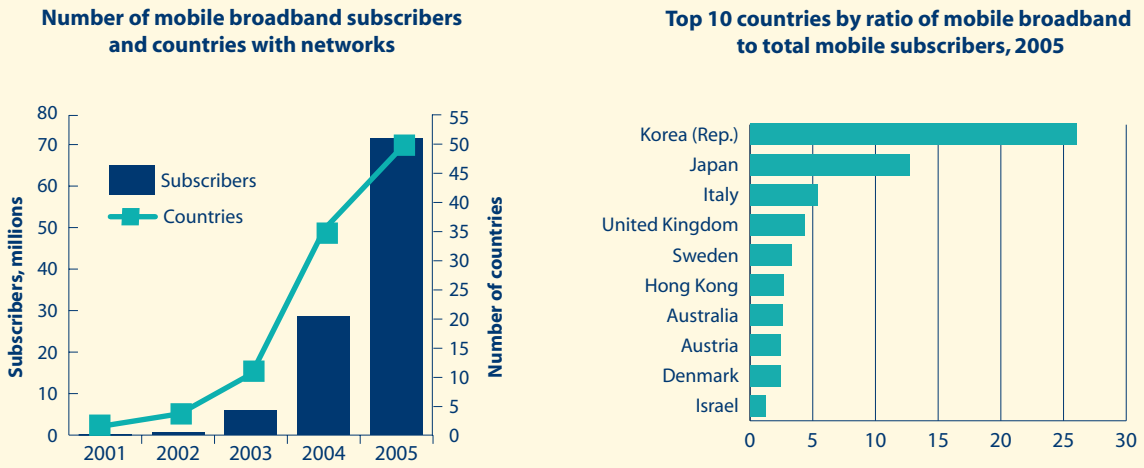
broadband mobile networks, due to a variety of factors. One major reason is that plain second generation mobile technology is still booming and operators are reluctant to make the necessary investments in broadband mobile. Another problem is spectrum complications, particularly in the Americas. However, over time these bottlenecks will be resolved, with many more countries making the transition to mobile broadband before the end of this decade.

W-CDMA networks were operational in 42 countries at the end of 2005, with 10 HSDPA networks by the end of 2005[23]. Five economies had separate networks supporting both W-CDMA and CDMA 2000 1x in 2004 (Australia, Israel, Japan, the Republic of Korea and the United States), with the roll-out of networks in both technologies in four countires (Czech Republic, New Zealand, Romania and Taiwan (China)) during 2005.

As the private sector introduces new, advanced mobile services, operators now derive a greater proportion of their revenues from data services (see Figure 3.11, left). In some countries where 3G services have been introduced, 3G has succeeded boosting the use of data services and revenues. In 2004, Hutchison 3 reported that Average Revenue Per User (ARPU) for postpaid subscribers declined in most of its operations, although ARPU increased in some markets 'reflecting the growing usage of 3G non-voice services'[24]. Hutchison 3 reports that its 3G non-voice revenues (including video-calling, content downloads and messaging) averaged 20 per cent of total revenues for 2004, compared to ten per cent in 2003.

This means that the digital divide needs to be considered in terms of services and mobile capabilities, as well as subscriber numbers and market penetration rates. Data on transmission rates for the most pervasive and popular of all mobile services - text messaging or SMS - reveal large disparities between developed and developing countries, as well as between developing countries. However, in most countries of the world, SMS are growing rapidly (see Figure 3.11, right). Given the strong lead in innovation of the leading mobile economies, the adoption of 3G and mobile Internet services may in fact reinforce inequalities and 'deepen' the digital divide, rather than bridge it. The DOI measures both basic cellular subscribers, as well as the uptake of mobile Internet and 3G, which enables it to evaluate both aspects of inequalities in access. This makes it an ideal tool for policy analysis for addressing the digital divide.

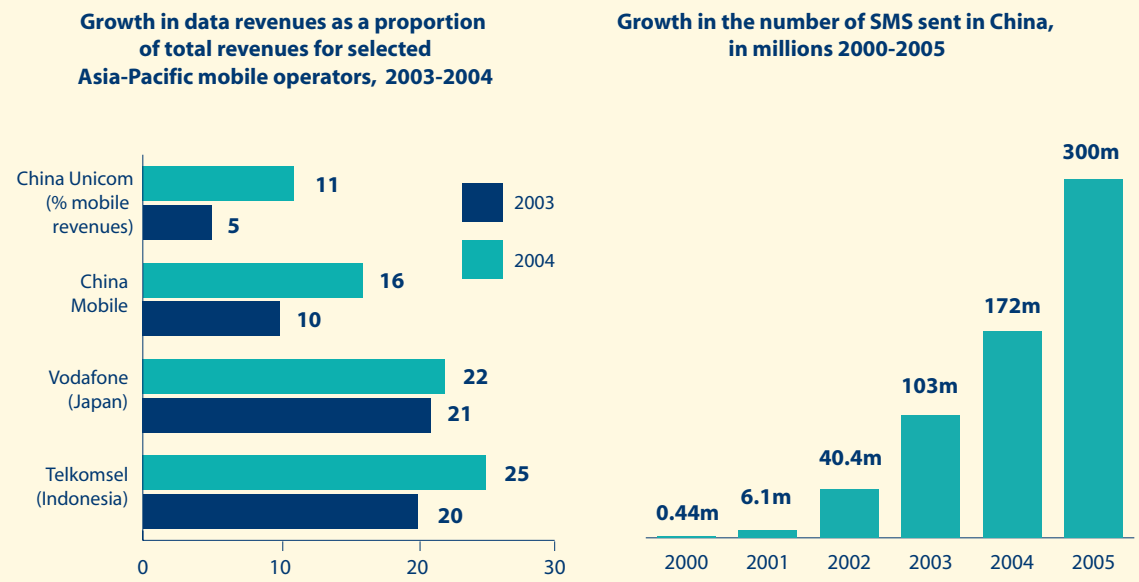
Figure 3.10: Mobile broadband status



Note: Includes only mobile broadband services in excess of 256kbit/s (ie excluding CDMA 2000 1x services).

Source: ITU/Korea Digital Opportunity Platform.

Figure 3.11: Growth in data services and SMS



Source: ITU from company reports (left); China Mobile Annual Report (right).

3.7 Conclusions

This chapter has shown how the DOI can be used to explore trends in each economy's Infrastructure, Opportunity and Utilization of Information and Communication Technologies.[25] The DOI can be used to track progress, not only since the start of the new millennium in 2000, but also looking ahead, in the adoption of new technologies such as broadband and mobile Internet. In particular, the DOI can be used to monitor the transformation of the telecommunication sector towards next-generation networks.

This chapter has also considered how these trends impact the digital divide. Discrepancies in access between countries can no longer be measured only in terms of basic penetration and access, but are taking on new dimensions in speed, mobility and capacity of access, which must be taken into account in assessments of the digital divide. Many parts of the developing world are making strong gains in mobile telephony and, to a lesser extent, Internet access. However, developed countries are forging ahead with new technologies and faster access. Through its measurement of mobile/fixed components and new technologies, the DOI can capture and measure both these trends and can be used to improve and enrich policy-making. The next chapter shows how the DOI can be used to close the policy loop and inform policy-making, in policies to promote ICT development and digital inclusion.

Endnotes

[1] More information and detail on the Digital Opportunity Index is available from: www.itu.int/doi.

[2] Many studies have explored the relationship between ICTs, income and economic growth (as well as productivity), such as Roller and Waverman (2002), Madden and Savage (1998) and Nadiri and Nandi (2003). These studies collectively suggest a strong relationship between ICTs and income, but causation has proved harder to determine, with significant endogeneity between ICTs and income. For a discussion of some of the key issues with regards to mobile telephony in particular, see Vodafone Policy Paper Series, Number 2, March 2005 issue, at: www.vodafone.com/assets/files/en/AIMP_09032005.pdf.

[3] The *Geneva Plan of Action* can be downloaded from: www.itu.int/wsis/documents/doc_multi.asp?lang=en&id=1160|0.

[4] The DOI measures digital opportunity relative to an economy in a fully-equipped Information Society in which all households have Internet access and where telecommunications are accessible and cheap, relative to income (or 'free' in an ideal world). This reference is independent of country data, fixed and invariable, so countries' progress and digital advancement can be measured over time. DOI scores have been extended back in time until 2001 for the 40 Economist countries, where good data are available over this period.

[5] The Republic of Korea launched its Korea Information Infrastructure (KII) project in 1995 to drive gains in infrastructure and establish high-speed, high-capacity optical transmission networks in 144 regions by 2000. This was followed by the *Korea Internet White Paper* (2002) and regulations over the development of mobile Internet.

[6] 'China & the Knowledge Economy: Seizing the 21st Century', World Bank, Washington, www.info.worldbank.org/etools/ library/latestversion.asp?137742.

[7] Submission of the government of China to the WSIS Stocktaking database and Golden Book. Available from www.itu.int/wsis.

[8] 'Egypt Telecommunications Master Plan II Overview (2004)', the Ministry of Communications and Information Technology of the Republic of Egypt, available from www.mcit.gov.eg.

[9] 'Universal Service in Egypt's fast-developing competitive telecommunications market', presentation by Dr. Olfat Abd El Monsef of the Telecommunications regulatory Authority (NTRA) to TELECOM Africa, 2004, available from www.ntra.gov.eg.

[10] The methodology for the low-user OECD basket can be found at www.oecd.org.

[11] ITU has been measuring the price of different telecom tariffs since 2002. 2003 is taken as the earliest year all three technologies (mobile, Internet and broadband) have in common. Different sample sizes in different years complicate the comparison, so 2003 and 2005 were chosen as the years with the largest common sample size. However, the reduction in average price is clear.

[12] www.btc.bw/adsl/index.htm.

[13] www.ghanatelecom.com.gh/gt_aboutus/newsdetails.asp?pnum=3&id=228&catid=0.

[14] www.lttnet.com/english/coming.php and www.lttnet.com/english/sr_libyadsl.php.

[15] Issue No. 294, Balancing Act Africa, 2006, available from: www.balancingact-africa.com/news/back/balancing-act_294.html

[16] www.terracom.rw/services/internet/adsl/ and www.terracom.rw/services/internet/adsl/faq.php

[17] http://corp.terra.net.lb/Dial-Up/DSL.asp.

[18] See Maroc Telecom press release, 31 May 2006, available from: www.iam.ma/details.aspx?id=101 and www.iam.ma/fichiers/Maroc-Telecom-Communique-TVADSL-31mai06-VF(2).pdf.

[19] For example, in Japan, growing competition at deeper levels of infrastructure has eroded the incumbent NTT's market share in DSL broadband and resulted in low prices in the so-called 'broadband wars'. Competition in Japan has resulted in aggressive price reductions and sophisticated marketing strategies. It has also provided incentives for operators to move into fibre networks such as Fibre-To-The-Home (FTTH) to regain market share. See, for example, the presentation by Keiichiro Seki, Director of International Economic Affairs Division at the Ministry of Internal Affairs and Communications of Japan, at: www.itu.int/osg/spu/ngn/documents/presentations/seki-23-march-2006.ppt.

[20] Figure 3.8 shows advertised maximum speeds, which may not always available, depending on backbone load and network congestion, as well as signal attenuation, latency and routing of data. However, but data are not always available for these.

[21] Mobile Internet subscribers are defined as multimedia subscribers, WAP, GPRS, CDMA EV-DO and W-CDMA (IMT 2000 or 3G) subscribers.

[22] For a discussion of the growth of mobile multimedia services in China and Hong Kong SAR, see the country case study prepared for the ITU/BNetzA workshop on 'Defining the regulatory environment for future mobile multimedia services', Mainz, 21-23 June 2006, available at www.itu.int/osg/spu/ni/multimobile/papers/ChinaHKMobileMultimedia.pdf.

[23] According to a survey published in December 2005 by GSA, the Global Mobile Suppliers' Association, available from www.gsacom.com.

[24] Hutchison's Review of Telecommunications Operations, 2004 *Annual Report*, available from http://202.66.146.82/listco/hk/hutchison/annual/2004/telecom.pdf.

[25] More information and detail on the Digital Opportunity Index is available from: www.itu.int/doi.

CHAPTER FOUR

From measurement to policy-making

4.1 Overview

In the *Tunis Agenda for the Information Society*, world leaders call for governments and other stakeholders to move from principles to action (para. 1).[1] Achieving the challenging agenda set out in the *Geneva Plan of Action* and the *Tunis Agenda*, as well as reaching the Millennium Development Goals (MDGs), will require governments to design and implement sustainable development policies or 'national e-strategies', including those that promote digital opportunity. In this context, the Digital Opportunity Index (DOI) provides a practical tool to assess and design policy. As a gauge to monitor changes in the level of access and use of Information and Communication Technologies worldwide, the DOI provides both a snapshot of the status of the digital divide and of its evolution over time. This information is crucial for the evaluation and development of ICT policies at the national, regional and international levels.

This chapter discusses some of the challenges faced by policy-makers in developing sustainable policies for building an 'inclusive development-oriented Information Society' (*Tunis Agenda*, para. 83) in an increasingly complex ICT environment. It examines the ways in which the DOI can support the policy-making process by identifying trends and gaps in the promotion of access to ICTs, infrastructure and utilization. Finally, the chapter explores potential complementarities between the DOI and other indices of social development that could improve our understanding of the interactions between digital opportunity and education, gender and other socio-economic and political factors.

4.2 Informing ICT policies in a complex environment

The evolution of the telecommunication sector around the world from a relatively closed environment, based on state-owned monopolies, to an open one, characterized by increasing competition, has heightened the complexity of the sector. This complexity is also affected by an increased interdependence between the telecommunication sector, the broader ICT sector, and the economy as a whole.

The increased complexity of the telecommunications environment is an international phenomenon that affects developed and developing countries alike. Prompted by internal and external pressures for change and the need to participate in the global economy, many developing countries have initiated institutional reform in their telecommunication sector.[2] These reforms usually include changes in the regulatory environment, revisions to trade and investment laws, restructuring of the incumbent fixed-line operator, and the introduction of market competition (see Table 4.1).

Universal access is a case in point. Facilitating the deployment of telecommunications infrastructure and making services available to all at fair and reasonable rates is a traditional policy objective for the sector and a major goal of policies aimed at bridging the digital divide. In a monopolistic environment, cross-subsidies between different types of subscribers (e.g. from urban to rural, and from business to residential subscribers) and between services (e.g. from long distance and international calls to line rental and local calls) were used to make telephone services more affordable, and to permit the geographic averaging of prices. Once the sector is opened to competition, these implicit subsidies have been substituted in many cases by explicit mechanisms for universal access, such as targeted universal service funds. In addition, pre-paid access has also become an important way of increasing the number of mobile users.

Complex regulatory systems also need to be adaptable. Sustainable regulatory policies need to provide stability to promote investment, including from abroad. Yet, they should also be flexible enough to adapt to changes inside and outside the telecommunication sector, including technological advances. Adaptive regulation requires policy-makers to experiment with different combinations of policy instruments, develop new research tools and even modify the policy-making process itself. Policy-making becomes more of a trial and error exercise based on constant feedback, and learning from the experiences of neighbouring countries. This is where policy tools such as the DOI play an important role in informing telecommunication policy and in gaining a better grasp on its complexity.

Table 4.1: Examples of policy objectives and instruments in an open market environment

Policy Objectives	Examples of policy Instruments	Potential DOI Impact
Information Economy Level		
Economic growth	**Expansive fiscal policy**, monetary policy, competition in ICT	Infrastructure (3, 4, 5) Utilization (9)
Innovation rate	**Targeted subsidies**, Innovation policy, competition in ICT	
ICT Sector Level		
ICT investment level	**Direct public investment, targeted subsidies,** tax incentives, competition in ICT	Opportunity (1) Infrastructure (3, 5)
Universality of service	Targeted subsidies, competition in ICT	Opportunity (1, 2, 3) Infrastructure (4, 5, 6, 7, 8) Utilization (9)
Broadband access	**Targeted subsidies**, competition in ICT	Infrastructure (8) Utilization (10, 11)
Affordability	Retail price caps, price benchmarking, competition in ICT	Opportunity (2, 3)
Quality of service	**Mandated service quality**, competition in ICT	Utilization (10, 11)
Protocols and standards	**Mandated standards**, voluntary agreements, international agencies	Opportunity (1) Infrastructure (4, 5, 6)
Consumer protection	**Conditional regulation**, consumer protection laws	Opportunity (2, 3) Utilization (9)
Inter-operator Level		
Competitive behaviour	Open market entry, antitrust oversight	Opportunity (1, 2, 3) Infrastructure (7, 8) Utilization (10, 11)
Access to incumbent network	Open access, interconnection, unbundling obligations	
Wholesale prices	Price cap for wholesale price, monitoring of interconnection agreements	

Note: Items in blue font refer to policy instruments that are sometimes considered incompatible with competitive policies. The third column indicates where these policy measures could impact a country's DOI sub-index scores. The numbers in parentheses in this column refer to the individual indicators of the DOI, as numbered in Figure 2.3 in Chapter Two.

Source: Adapted from Johannes Bauer, 2004 [3].

4.2.1 The increasing need for information

In this complex environment, indicators traditionally collected from operators on telephone penetration are useful, but insufficient, for policy analysis. Monitoring of the availability, affordability and utilization of ICTs is also vital, as are disaggregated data, to better assess the impact of the digital divide on particular groups, such as women, the elderly or the rural population. The structure adopted for the DOI, with its sequence of sub-indices measuring Opportunity, Infrastructure and Utilization, mirrors the policy cycle of planning, implementation and outcomes. Closing the policy loop relies on feedback obtained through the collection, analysis and benchmarking of ICT statistics.

The cases of Hong Kong (China)[4] and Australia[5] illustrate the positive impact of coordination among the stakeholders involved in the provision and collection of ICT data, such as National Statistical Offices (NSOs), Telecommunication Regulatory Agencies (TRAs), telecommunication ministries, industry and even academia. Considered among the economies with the best practices in data collection, Hong Kong (China) and Australia have succeeded in establishing mechanisms for different stakeholders to participate and provide inputs in the selection of ICT indicators, the formulation of surveys, as well as the analysis of results. The strong connection between their policy-making processes and statistical data collection is reflected in their regular revision of ICT indicators based on policy needs.[6]

The call of the *Geneva Plan of Action* for all countries and regions to set up 'coherent and internationally comparable indicator systems' (para. 28f), as well as the activities of the *Partnership on Measuring ICT for Development* to develop a common set of core ICT indicators, have encouraged coordination among governments and NSOs on data collection worldwide. In 2004, for example, Latin American and Caribbean countries, through the UN Economic Commission for Latin American and the Caribbean (ECLAC) and the European Commission, carried out

an inventory of ICT statistics collected in the region as a first step towards standardization and technical cooperation in building statistical capabilities. Their collaborative efforts are now focusing on the monitoring and evaluation of universal access indicators.[7] Moreover, in early 2006, representatives from TRAs, NSOs and fixed and mobile operators in South Asia came together to develop an ICT indicators manual that seeks to promote uniformity in the indicators, definitions and methodologies used to collect ICT data and facilitate regional comparisons.[8]

4.3 The DOI as a policy tool

As discussed in Chapter one, the DOI provides a comprehensive statistical framework for monitoring the digital divide and evaluating progress towards a more equitable Information Society. The ICT indicators included in the DOI provide policy-makers with a frame of reference for comparisons across time, between regions and between interest groups, such as the low-income and rural populations targeted in universal service policies. For instance, changes over time in the three DOI sub-indices can be used by policy-makers as benchmarks for evaluating the impact of national ICT policies, either by looking at changes in rankings with respect to other countries or at the scores for their nation.

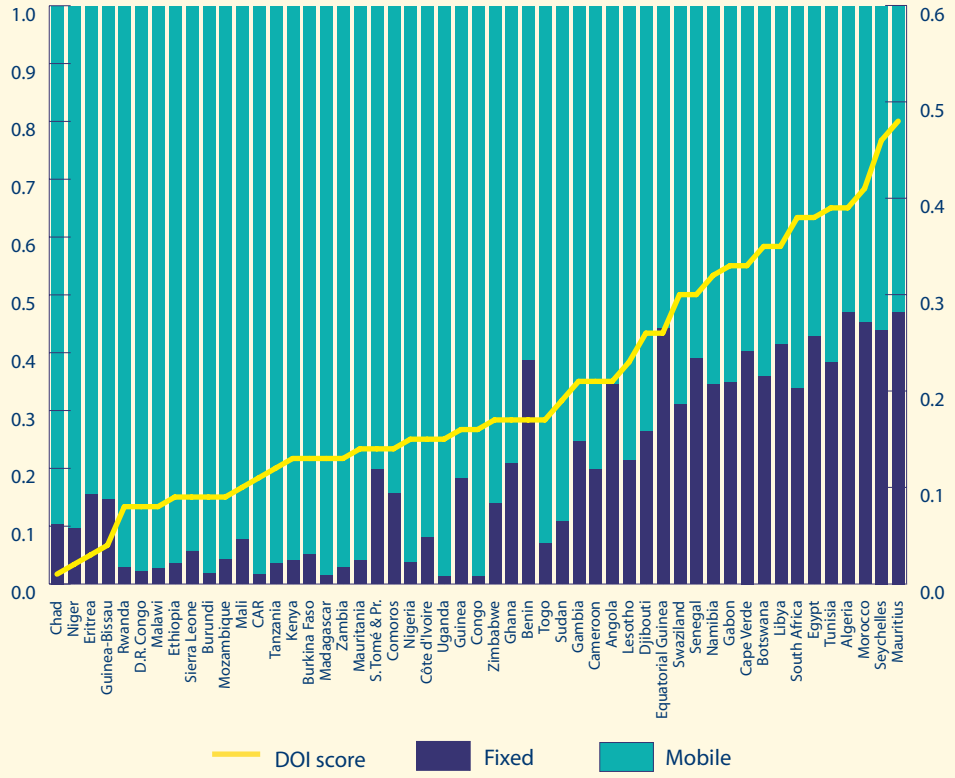
The DOI can also be used to inform the policy process at different levels, from comparisons across countries to analyses of gaps within a particular country, looking at differences across regions in a country or at disparities in access by specific groups, such as women, youth and the disabled. This section illustrates the flexibility of the DOI methodology as a policy tool by applying the DOI for international comparisons, for the evaluation of national policies and gaps, as well as for the assessment of disparities in digital opportunity, based on gender or other variables.

4.3.1 Regional comparisons: a closer look at Africa

The DOI results analyzed in Chapter three indicate that the extent of the divide between high- and low-income countries is large, with high-income countries averaging DOI scores nearly four times higher than those of low-income countries. Not surprisingly, Africa, the region with some of the poorest countries in the world, is greatly impacted by the divide. When compared to other regions, Africa ranks last with an average regional DOI score of 0.20, barely one-third that of Europe (0.55: see Figure 3.2). As illustrated in the DOI world map in the Statistical Annex, 32 of the 41 economies worldwide with DOI scores below 0.2 are in Africa.

Figure 4.1: Mobile and fixed contribution to DOI scores in Africa, 2005

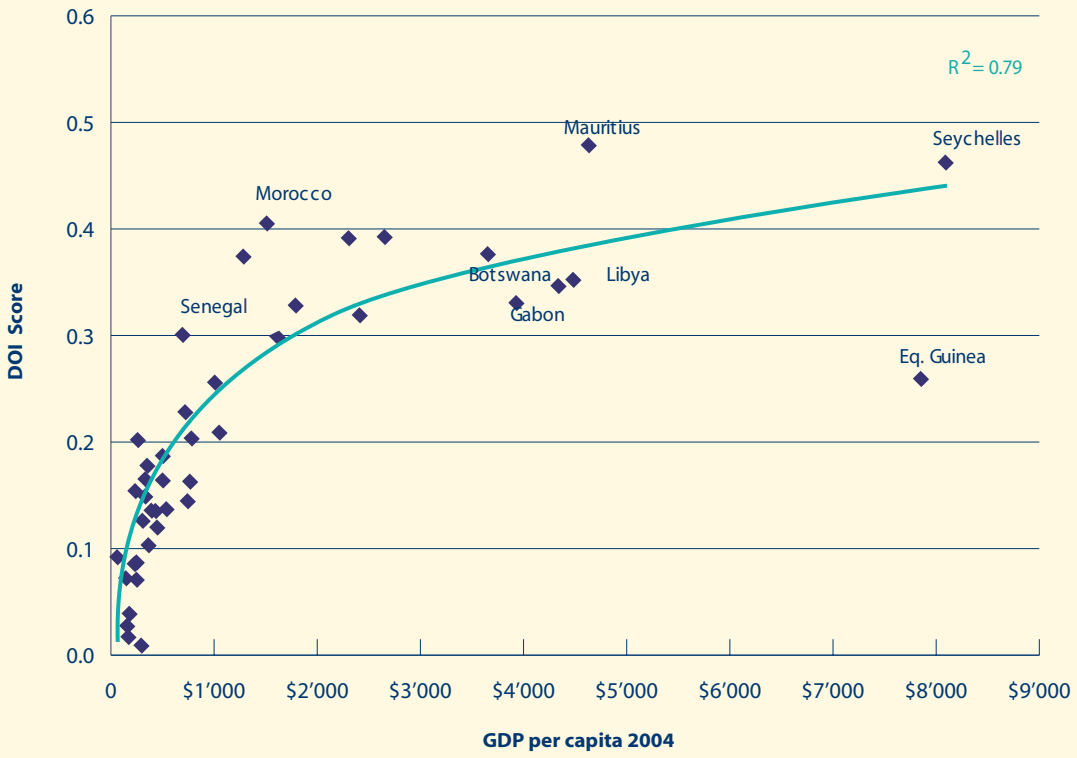
Mobile indicators are strong drivers of the DOI scores for Africa



Source: ITU/KADO Digital Opportunity Platform.

Figure 4.2: Link between income and DOI scores

In Africa, lower levels of income are reflected in generally low DOI scores



Source: ITU/KADO Digital Opportunity Platform.

Nevertheless, despite this situation, many African countries are making progress in reducing their internal gaps. As a region, Africa has the highest growth rate in mobile cellular subscribers of any region, with a 66 per cent growth rate in 2005.[9] In fact, the contribution of mobile indicators to the total DOI scores of the African countries is significant, especially in countries with overall DOI scores below 0.20 (see Figure 4.1), with the mobile contribution to the overall DOI being as high as 99 per cent in the extremes cases of Congo and Uganda (see Figure 3.4). In contrast, those African countries with DOI scores above 0.20 tend to have a greater fixed contribution to their scores.

Interestingly, when relating their performance in the DOI to national economic performance (as measured by gross national income per capita: see Figure 4.2), a few of the higher ranking African countries, such as Botswana, Equatorial Guinea, Gabon and Libya, tend to underperform, compared to countries with similar income. This is because the wealth of these countries is overstated due to natural resources such as diamonds or oil. By contrast, in the Seychelles and Mauritius, their DOI rankings are much higher than would be predicted on the basis of income, partly due to heightened use of ICTs in their large service (tourism) and financial sectors. Evidently, the performance of the telecommunication sectors in these countries cannot be explained exclusively in terms of income and other variables (such as policy initiatives, the existence of a telecommunication regulator and the level of openness of a market) play an important role. The strength of the relationship between the DOI and national economic performance is lower for Africa (R2 = 0.79) than for the world as a whole (R^2 = 0.85), which again suggests the importance of other, non-economic factors.

The DOI map of Africa in the Statistical Annex shows a pattern of high scores among the North African economies (Algeria, Egypt, Libya, Morocco and Tunisia); the western economies (Cape Verde and Senegal); the Southern economies (Botswana, Namibia and South Africa); and the island economies of Mauritius and Seychelles. By contrast, low-ranking economies are mostly inland, in the Sub-Saharan region, and also include economies such as Chad, Eritrea, Ethiopia, Niger and Sierra Leone.

This distribution seems to provide evidence for the impact of institutional arrangements on the development of ICT networks. While most of the African economies won their independence in the 1960s and 1970s, they have followed different paths, due to economic and political factors. Low-ranking states are largely agrarian economies, with highly unequal distributions of income. Niger, for instance, is among the poorest countries in the world, ranking last in the UNDP Human Development Index. At the opposite extreme, high-ranking countries tend to have more diversified and dynamic economies. Mauritius, for example, has focused on developing its financial institutions and building its domestic

and information infrastructure, which has attracted foreign direct investment and helped establish strong trade links with India and South Africa. These factors, combined with a stable political system since the 1960s, and a small geographic area and population, help explain Mauritius' number one DOI ranking within Africa (Data Table 2a) for Opportunity and Infrastructure and number five for Utilization. Similar circumstances apply to Seychelles, a tourist resort of only 81'000 inhabitants, ranking second in the overall DOI for the region.

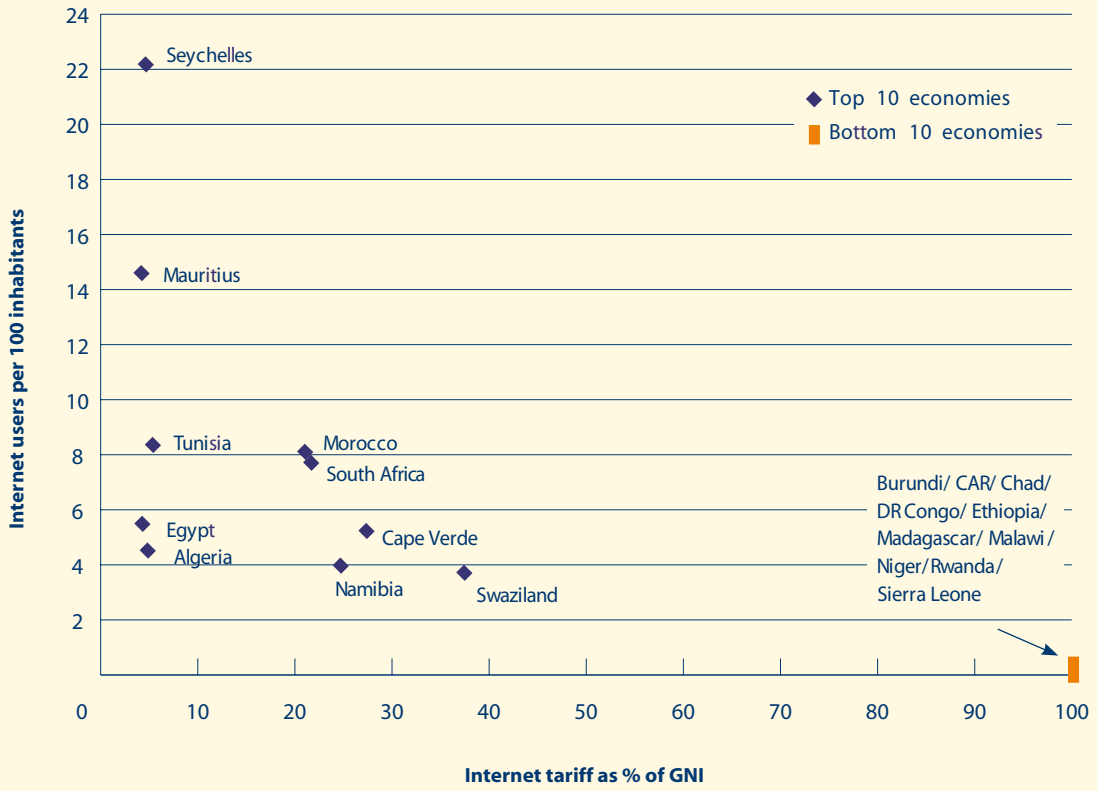
The differences among high- and low-ranking countries are also affected by the stability of their political systems. While high-ranking countries are characterized for having fairly stable democratic systems, with a sound legal framework and political institutions, low-ranking economies have often been plagued by political instability and an uncertain legal framework. Chad, for instance, which is the lowest DOI ranking country overall, suffered civil warfare until 1990 and has ongoing border disputes with its neighbours. Over recent years, the circumstances of some of these countries have improved, supported by debt relief and economic adjustment programmes that have reduced perceptions about the risk of investing in these countries. But warfare is the enemy of human development, and the stain of history lasts long after peace is restored.

From a telecommunication policy perspective, high-ranking countries illustrate the influence of liberalisation and competition in promoting opportunity and infrastructure deployment. Most of the North African countries, as well as Senegal and South Africa, have opened their fixed and mobile markets to competition and are rapidly increasing high-speed network deployment. Competition is helping to reduce tariffs and introduce service packages that respond better to the needs of the population. In Algeria, for instance, the entry of a third wireless cellular provider triggered new strategies for prepaid services that had not previously been offered by the incumbents.

As stated above, Africa has exhibited the highest recent growth rate in the mobile market of any region, with Algeria, Egypt, Nigeria and South Africa accounting for 60 per cent of the new mobile subscribers added in the region. In 2005, Nigeria alone added 9.7 million subscribers, which represents about 7 per cent of its total population.[10] Mobile phones provide more than three-quarters of all the phone connections in 19 countries in Africa.[11] As Africa shows, the tendency of developing countries to promote mobile coverage and utilization over fixed services makes the DOI's mobile components particularly useful for monitoring advances in regional markets.

Figure 4.3: Impact of internet tariffs on utilization

Top and bottom ten ranking African economies by Internet users per 100 inhabitants, 2005



Source: ITU/KADO Digital Opportunity Platform.

In utilization, only 2.5 per cent of Africa's 900 million inhabitants are online, compared to a world average of 16 per cent.[12] Yet, the African market is growing fast in the number of internet users, with a four-fold increase since 2000.[13] The highest densities of internet users per 100 inhabitants are located in Mauritius (22.2 internet users 100 inhabitants), Seychelles (14.6), S. Tomé & Principe (11.1), Tunisia (8.4) and Morocco (8.2). Kenya is a rising star, with the fastest-growing internet population in Sub-Saharan Africa, increasing three-fold in 2005.[14] The vast majority of internet users in Africa are located in urban areas, due to greater wealth and an urban bias in network deployment in the region's cities, as well as tariff structures that can result in higher long-distance rates for rural areas to connect to the internet.

Affordability is the greatest barrier to internet usage in the region (see Figure 4.3). This is partly due to Africa's limited infrastructure and the high cost of bandwidth, as several African countries, particularly landlocked ones, depend on high-cost satellite links, and do not have ready access to undersea fibre optic cables. Furthermore, regional voice and data traffic is often routed through Europe and North America due to the lack of Internet Exchange Points within the region.[15] The average cost of a dial-up Internet account for 20 hours a month in Africa is US$47.09, above the average monthly salary and around 44 per cent higher than the global average in 2005 (see Data Table 7).[16] The introduction of flat rates for Internet calls in some African countries should promote utilization in remote areas. Moreover, some economies (e.g. Seychelles) are offering internet connection rates that are up to 50 per cent lower than local call rates.[17]

Increasing demand, the introduction of cheaper wireless technologies such as WiMAX, and the opening of new traffic interconnection hubs in the region should help reduce the cost of bandwidth in the region. Hopefully, these savings can be passed onto consumers in lower internet access prices.[18]

4.3.2 National comparisons: the case of India

One of the most useful features of the DOI for policy analysis purposes is that it allows for comparisons of countries' rankings, in overall DOI scores, clusters (Opportunity, Infrastructure and Utilization) and individual indicators. This enables policy-makers to compare a country's performance with its peers and to understand in which areas it is doing well and areas where its performance is not so competitive.

Figure 4.4 highlights the results obtained for India when a country-level analysis is used. Overall, India scores 0.29 on the DOI, which gives it a ranking of 119th in the index, ahead of neighbours Pakistan (128th) and Bangladesh (139th), but behind China (74th) and Sri Lanka (106th). India is one of the fastest gainers in the DOI, having increased its score from 0.17 in 2001 (see Figure 3.5). India's main gains originate in mobile penetration, where India is adding new mobile subscribers at the rate of more than two million per month, thanks in part to the 'One India, one rupee' tariff structure and 'lifetime' prepaid plans, which have helped reduce the cost of mobile ownership (see Box 4.1).

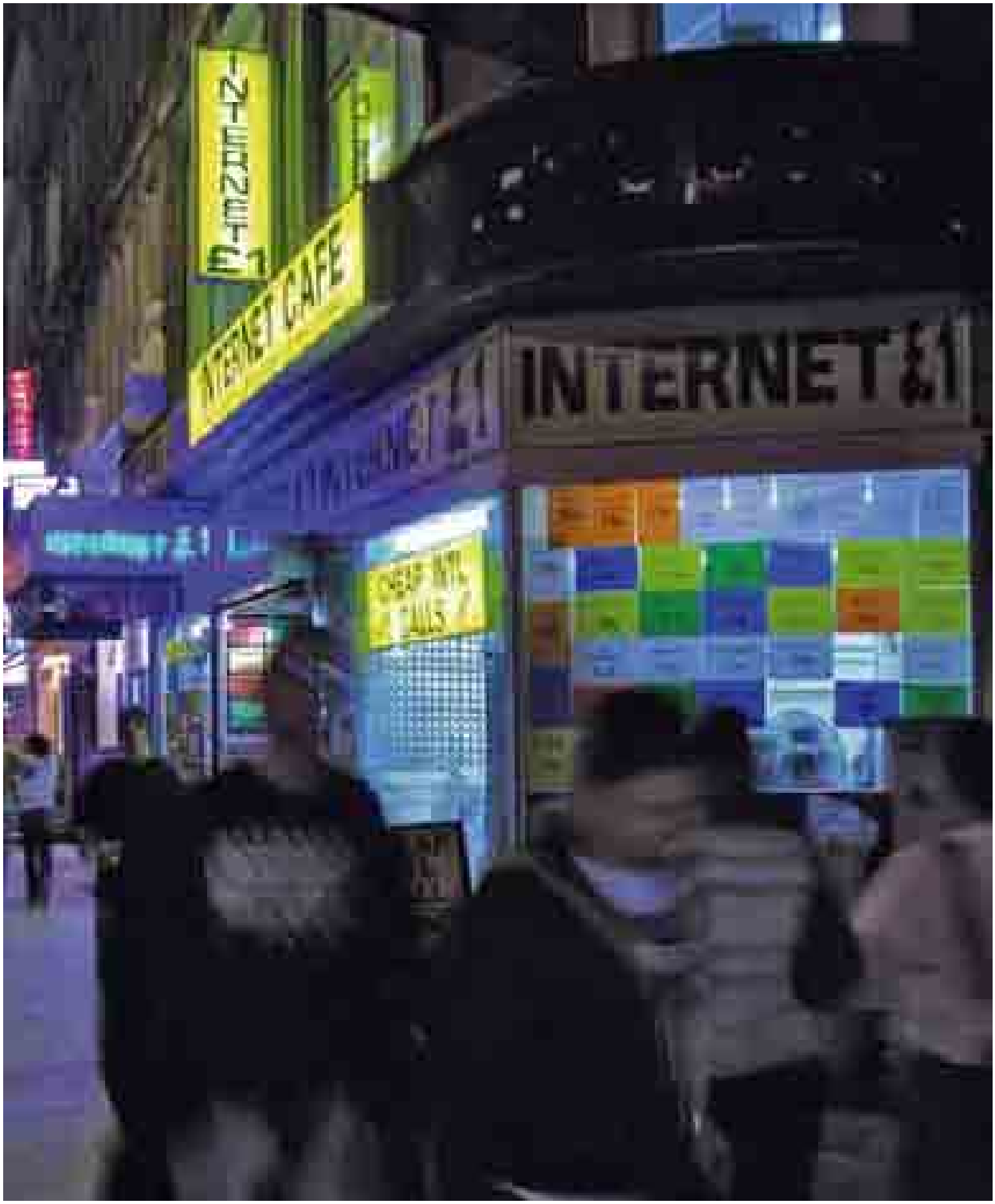
Figure 4.4: DOI scores for India

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

	India, 2005	Indicator	DOI
OPPORTUNITY	1 Percentage of population covered by mobile cellular telephony	60.0%	0.80 = 110th
	2 Internet access tariffs as a percentage of per capita income	19.8%	
	3 Mobile cellular tariffs as a percentage of per capita income	4.9%	
INFRASTRUCTURE	4 Proportion of households with a fixed line telephone	10.3%	0.04 = 139th
	5 Proportion of households with a computer	4.5%	
	6 Proportion of households with Internet access at home	2.3%	
	7 Mobile cellular subscribers per 100 inhabitants	4.5%	
	8 Mobile Internet subscribers per 100 inhabitants	0.0%	
UTILIZATION	9 Proportion of individuals that used the Internet	2.3%	0.29 = 93rd
	10 Ratio of fixed broadband subscribers to total Internet subscribers	9.0%	
	11 Ratio of mobile broadband subscribers to total mobile subscribers	0.0%	
	DIGITAL OPPORTUNITY INDEX	**0.29**	**119th**

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.

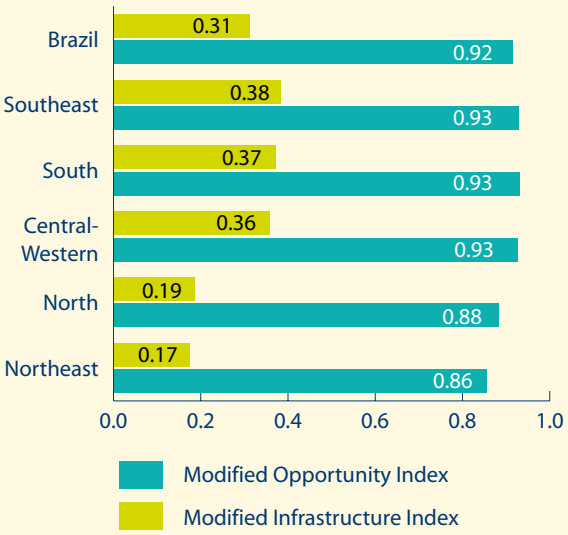


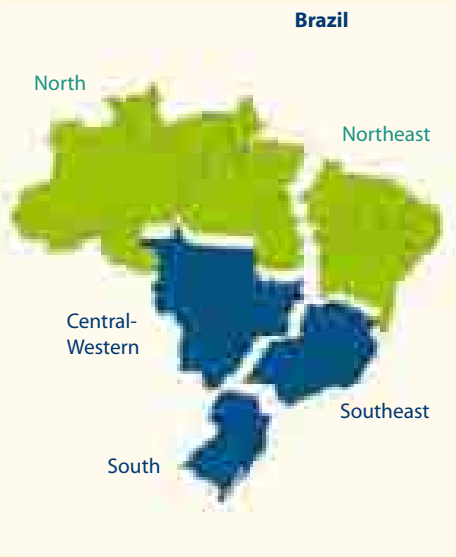
It is instructive, for policy purposes, to look at the different components of India's score. It is doing much better on Utilization (where it ranks 93rd), than on Infrastructure (where it falls to 139th position). India's elevated Utilization score shows that it is succeeding in attracting internet users and persuading these internet users to take up broadband services. Internet and broadband are areas where the private sector is very active. However, in terms of Infrastructure, India is let down by its relatively low proportion of households with fixed-line access and by the fact that, despite recent growth, mobile penetration is still much lower than its neighbours, due to India's relatively late start.

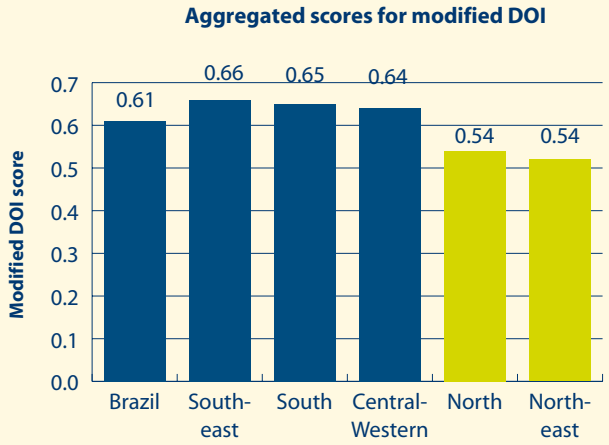
Using the DOI for comparisons between peers can be viewed as a kind of 'national health check', whereby a particular country's performance can be compared with global and regional averages. The country's overall DOI score can then be used to benchmark the performance on individual indicators to produce a specific diagnosis: in the case of India, the diagnosis of 'could do better in infrastructure' would be backed up with further measures to liberalise the fixed-line market. This analysis also suggests that India's current mobile boom still has further to run, as India closes the gap with other developing countries that had introduced nationwide mobile service at an earlier date.

Figure 4.5: Using the DOI to identify digital gaps at the natonal level

Brazilian Digital Opportunity Index Scores (modified) for 2004, per region







Source: ITU/KADO Digital Opportunity Platform.

4.3.3 Monitoring regional disparities within a country: focus on Brazil

After analyzing the usefulness of the DOI as a policy tool for regional comparisons (Africa), and for an individual country (India), the logical next step is to use it for analyzing performance within a country. As expected, connectivity differs widely between urban and rural areas, and between industrial and agricultural regions. Similarly, states with greater administrative and economic importance for the country (e.g., the capital city) tend to have the highest concentrations of subscribers.

The DOI can be used for provincial or state-level comparisons within a country, as shown by the example of Brazil, which ranks fifth in the world in terms of area and population (8.5 million square kilometers and 186.4 million inhabitants). Despite its vast territory, most of Brazil's population is concentrated in the major coastal cities of Rio de Janeiro and Sao Paulo (78 inhabitants/km^2), while its interior is sparsely populated (3 inhabitants/km^2). Brazil is divided into five major regions—North, Northeast, Southeast, South and Central-West—as shown in Figure 4.5. Brazil's overall DOI score in 2005 was 0.42 (up from 0.32 in 2001), which ranks it as 71st in the world.

Although Brazil ranks ninth in the world based on GDP,[19] there are marked imbalances between its regions, with the Southeast having a per capita income three times greater than the Northeast, the region with the highest percentage

of rural population (31 per cent).[20] About 20 per cent of the population (circa 40 million) was living below the poverty line in 2004; in contrast, other countries with similar national GDP levels have less than 10 per cent of citizens below the poverty level.[21] Educational disparities are also apparent, with 30 per cent of the population unable to read or write. Rooted in history, regional disparities persist, despite redistributive policies by the State over recent decades.

In order to apply the DOI within Brazil, it is necessary to modify it to eliminate the indicators for which data are unavailable: in particular, provincial-level data for mobile coverage and the percentage of internet users with access to broadband (for fixed-line and mobile connections). Using the remaining indicators, it is possible to construct an overall DOI score and separate measures for Opportunity and Infrastructure. Brazil's overall average score in the modified DOI is 0.61 but the gap between the highest-ranking region (South-East) and the lowest (Northeast) is 14 percentage points or 23 per cent of the national average. The gap between the two regions is explained by scores that are two- to three-times higher for the Southeast region in terms of mobile subcribership and household access to fixed lines, computers and the internet.[22]

The regional disparities in Opportunity and Infrastructure identified by the DOI can support policy-makers and industry players by pinpointing regions where the adoption of new strategies might be useful and by measuring their impact. To address current gaps, the Brazilian Government has created a Universal Service Fund and licensed competitive wire-line operators to serve sub-areas which larger providers were reluctant to serve.[23] Mobile providers are also offering users innovative rate programmes and discounts on handsets. Meanwhile, fixed operators are exploiting the benefits of convergence to enter the mobile market and attract new subscribers.[24] Clearer rules for unbundling and the promotion of competition in the fixed market are expected to promote network expansion and the continued growth of the Brazilian broadband market.

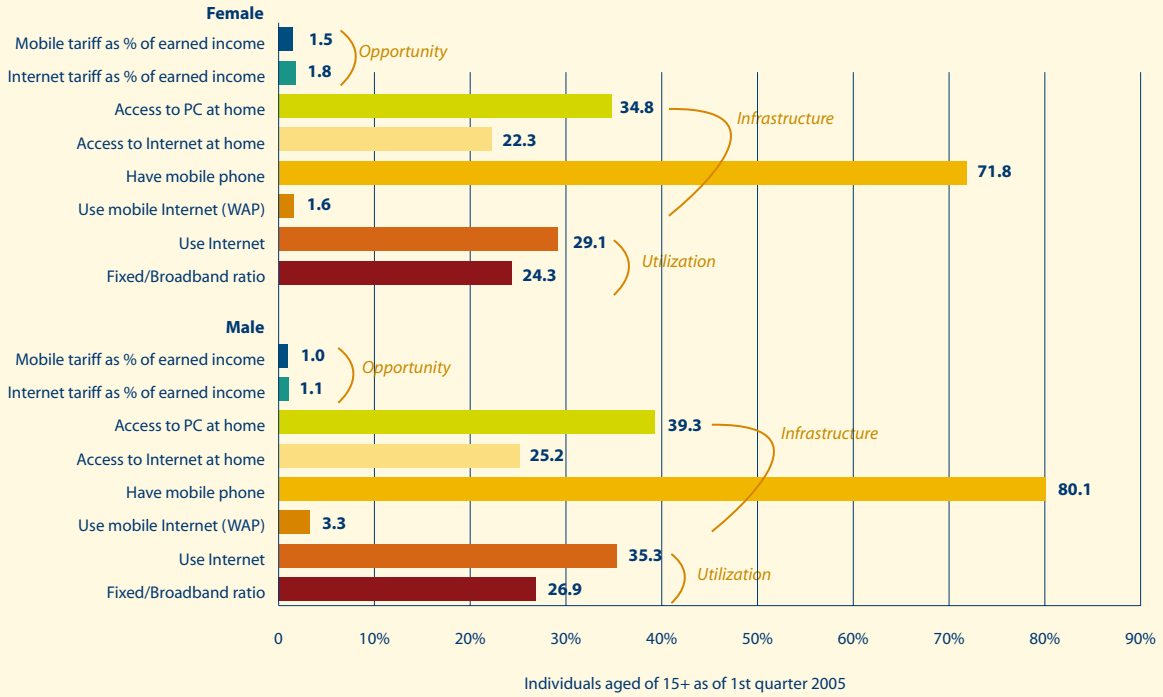
4.3.4 Monitoring national policies for digital inclusion: gender in the Czech Republic

As shown above, the DOI can be used at different geographical levels: between regions, between countries and with a country. However, the DOI can also help analyze the ICT experiences of different groups within society. Social and cultural factors impact people's interaction with ICTs as much as the economic and political factors discussed above. The levels of opportunity and utilization available to certain groups within a particular society are affected not only by income and geographical factors, but also by social variables such as age, ethnicity and gender.

The inclusion of civil society organizations representing women, youth, the disabled and indigenous populations in

Figure 4.6: A gender-disaggregated DOI

Digital opportunity disparities between men and women in the Czech Republic



Source: ITU Digital Opportunity Index, UNDP, and the Czech Statistical Office (http://hdr.undp.org/statistics/data/pdf/hdr05_table_25.pdf, www.czso.cz/eng/edicniplan.nsf/p/9603-05).

the WSIS process (amongst others) was in recognition that a truly inclusive Information Society implies the formation of ICT policies and programmes promoting access to, and use of ICTs, by all groups within society. The *UN Millennium Declaration* recognizes ICTs as tools for development, due to their potential for combating factors driving social marginalization, such as illiteracy and poverty. ICTs can improve education, health, and employment by increasing access to information.

Monitoring the success of programmes and policies that promote opportunity for specific social groups needs disaggregated ICT indicators. By examining patterns of opportunity and access based on the variables of interest—such as gender, age, income, educational level, employment status and rural/urban location—policy-makers can obtain valuable information on existing disparities among the population. Yet, despite their importance for policy-making, most countries do not collect reliable ICT statistics with this level of disaggregation. To overcome this shortcoming, the *Partnership on Measuring ICT for Development* is promoting the collection of classificatory metadata on households and individuals in NSO surveys on ICT core indicators.[25] As pointed out by the Partnership, cross-classification of these variables could provide critical information for policy purposes, but would also need larger samples and is more costly in financial and human resources.

The issue of gender disparities in digital opportunity highlights the crucial relationship between ICT statistics and policies. Although gender inequalities in access to and utilization of ICT infrastructure have been acknowledged in various international fora,[26] gender-informed ICT policies and gender-disaggregated data are still in their infancy.[27] According to UNIFEM, the United Nations Development Fund for Women, 'the urban bias in connectivity… deprives women, more than men, of the universal right to communicate' because women's responsibilities for family care limit their ability to migrate to the urban areas where ICTs are more readily available.[28] Similarly, lack of affordability of services tends to impact on women's ICT access disproportionately, as women have less discretionary income to spend on ICTs in some low-income economies and in some cultures.

Public policies and private programmes that target ICT access and financial support for women (for instance, micro-finance schemes) have already shown positive results in reducing disparities in ICT ownership and use in developing countries. A study of the Grameen experience in Bangladesh found that in the cases where women operated phone businesses, 82 per cent of the users were women; whereas with male operators, only 6.3 per cent of women were phone users.[29] Similar evidence is available for female use of mobile telephone services in Bolivia, the Dominican Republic, India and other developing countries.[30]

The DOI has been used to monitor and evaluate digital opportunity gaps over time and across countries. Figure 4.6 illustrates the use of the DOI methodology to analyze gender divides. Although few economies currently collect gender-

disaggregated statistics for all the indicators included in the DOI, the Czech Republic (CR) shows how the DOI could be used in the future for this purpose. The CR also highlights good practices in collecting disaggregated data. It collects gender statistics for mobile services and forward-looking indicators, such as broadband access at home and mobile internet access. It also reports general ICT statistics (e.g. percentage of households with PC and internet access) and gender-disaggregated data (e.g. PC and internet access at home, by gender) with the same level of disaggregation (in this case per household) and in some cases, also in absolute numbers (at the individual level).

For the gender divide in the CR, the differences between the DOI scores for men and women across the three sub-indices are not very large (0.56 for men, compared with 0.53 for women), but it nevertheless shows that women in the CR are still at a disadvantage, compared to men. Czech women face disparities in the affordability of mobile and internet services relative to their income, mobile phone ownership and utilization of internet and mobile internet services. It is likely that gender-related DOI gaps would be much greater in other countries.

Finally, from a policy perspective, the analysis of gender disparities highlights the importance of including women's groups in policy consultation and formulation, to promote gender issues within the policy agenda and improve the status of women with respect to ICTs.

4.4 Policies for Digital Opportunity

Many studies have examined the correspondence between institutional reform and the performance of the telecommunication sector. Improved performance often coincides with regulatory systems that promote competition and a clear system for recognizing property rights, although it is difficult to determine causality due to the different economic, technical, political and social variables involved.[31] The policy tools to promote digital opportunity, in both developed and developing countries, are not necessarily unique, however. Different combinations of policy instruments and institutional frameworks can result in positive outcomes.

4.4.1 Opportunity: Promoting Affordability

Availability and the affordability of ICTs are basic foundations for digital opportunity. Although disparities between high- and low-income countries (as well as high- and low-income consumers) may persist, competition, regulatory changes and innovative micro-finance programmes are making phone and internet services more affordable. The combination of affordability statistics and more complete information regarding true levels of demand would help policy-makers and industry stakeholders to better target programmes to reach non-users and reduce current obstacles to growth in services.

Box 4.1: Promoting mobile subscribership

India's Lifetime Prepaid Plans

Rapid increases in mobile subscribership have often been the result of innovative initiatives developed by operators around the globe. India is a good example. Prepaid plans allow subscribers better control over their expenses on communication services by providing them with a block of minutes or credits for outgoing phone calls for a predetermined fee. The caveat is that prepaid minutes have an expiry date, usually ranging between six months to a year after purchase, and the minutes not used within the validity period are lost. For operators, the value of validity periods lies in their potential for future revenues, by requiring subscribers to renew their cards regularly in order to avoid losing their connection to the network altogether, including their telephone numbers.

In India, operators are promoting growth in mobile subscribership by extending validity periods or eliminating them completely, in exchange for higher initial activation fees and increased consumer loyalty. In December 2005, Tata Teleservices began offering 'lifetime' prepaid plans for an initial fee of 1000 Rupees (Rs) (approximately US$22.68), an amount ten times higher than regular prepaid plans activation costs (around Rs 100 or US$2.26). New subscribers are rapidly joining the lifetime prepaid plan, despite the higher fee, attracted by the possibility of lifetime free incoming calls, no loss of prepaid minutes, and recharges that pay only for actual minutes of service. Average monthly net additions have doubled from 2.21m during the March–November 2005 period to an average of 4.46m during the December 2005–February 2006 period.

The move to lifetime prepaid plans could have mixed effects on operator revenues. Over the short-term, the large initial payment made by subscribers creates a disincentive for changing providers (churn) and increases customer loyalty. Operators improve their profitability as the number of subscribers increases. Over the long-term, it is expected that the lack of pressure on subscribers to use their minutes within a specific period of time will affect the periodicity of the revenues obtained from recharges and reduce call revenue. Pyramid Research forecasts that ARPU will decrease the average revenue per user in India will decrease to Rs. 247 (US$5.46) by 2010.

Source: Adapted from Pyramid Research, Pyramid Predictions, 4 May 2006. www.pyramidresearch.com/em_may04_india.htm?SC=PD05a.

One of the main policy objectives of low-penetration countries is to accelerate network growth and increase the number of people with access to the service. While connectivity is necessary, it is not always sufficient for the Information Society. The price of access and of use (i.e. the affordability of equipment and services, convenience of access, as well as quality of service) and the ability to use (e.g. appropriate training and language skills) also influence access.

In telecommunication services, lack of affordability may prevent people from:

- purchasing a phone or computer for mobile and internet services (including paying the necessary line rental charges for fixed-line access to the internet),
- paying initial installation costs for fixed lines; and
- making calls, or using the internet as often or for as long as they would like to, due to price concerns.

The indicators of affordability included in the Opportunity cluster of the DOI give policy-makers a useful benchmark to monitor the impact of mobile and internet tariffs on the ability of households in different income brackets to use ICT services.

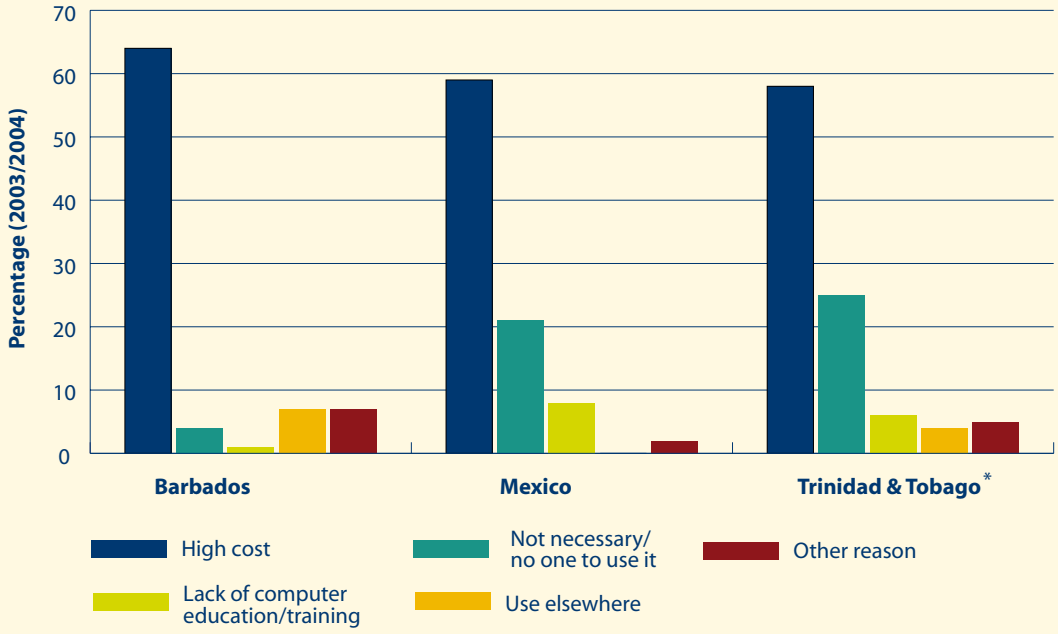
Recent demand surveys in eleven African countries[32] found similarities in user perceptions about the cost of services. While most of those interviewed considered fixed and public phone services to be affordable, the majority consistently perceived the cost of mobile calls to be high. The LIRNEasia 2005 study on low-income users (earning less than US$100 per month) in India and Sri Lanka found, for example, that 79 per cent of more than 3'000 respondents would increase their mobile use, if the cost of calls were to decrease.[33] This indicates that high prices continue to be a disincentive for use. Many users in Africa are still willing, however, to spend more of their income on mobile communications, as they are still cheaper than traveling to visit the person being called.[34] Policies focused on making mobile and Internet services affordable for disadvantaged groups (including low-income users, residents of high-cost areas and non-users) would boost not only Opportunity scores, but also Infrastructure and Utilization.

Mobile penetration has also increased greatly due to operators' marketing strategies, including discount plans and prepayment. Value-stored prepaid cards have increased the access of low-income users to phone services and given consumers more control over their expenditures. In Mexico, as in many other developing countries, pre-payment has become so popular that, by the end of 2005, about 93 per cent of the mobile phones were under prepaid calling plans.[35] Competition among mobile providers is not only reducing costs, but also resulting in innovative offers for prepaid users in many countries. Box 4.1 illustrates the case of prepaid service offers in India, while Chapter five gives further examples.

Innovation in the provision of low rate services is also reaching civil society. Micro-finance programmes, inspired in part by the Grameenphone initiative in Bangladesh, have brought small entrepreneurs into the mobile and internet markets. Resale of phone services by these small local entrepreneurs, as well as sharing schemes among relatives and neighbours, are becoming common practices among low-income users by making it more affordable to use the services.

Figure 4.7: Reasons for not owning a computer

In selected Latin American and Caribbean economies, 2004



Note: * 2003 data for Trinidad and Tobago.
Source: UN ECLAC, January 2006.

Box 4.2: Affordable ICT equipment for low-income users

Microsoft and the mobile handset industry reaching new user markets

To promote the purchase of personal computers with legal software among low-income population in developing countries, the US software company, Microsoft, has launched its FlexGo technology, a full-featured PC, with a modified operating system that allows PC owners to purchase PC usage time in small increments using prepaid cards. The 'pay-as-you-go' financing initiative is modeled on the prepaid card system for mobile phones and has shown positive results in trials in Brazil. FlexGo customers make a minimal upfront payment for the PC, equivalent to one third of its total cost, and pay the balance at their own pace through prepaid cards metering usage time. Once the balance is covered (after about 800 hours of usage time), FlexGo customers own the PC and do not need to purchase any more cards.

The potential success of FlexGo stems from its emphasis on making PC ownership affordable to low-income consumers, who would otherwise be deterred by the large initial investment. According to Microsoft, about 31 per cent of its FlexGo customers in Brazil stated that they would not have bought a PC without the pay-as-you-go offer. While traditional PC financing would result in large installments, FlexGo users pay what they can afford to, based on their income. For Microsoft and PC manufacturers, this initiative opens up new consumer markets, decreases the risk of non-payment, and reduces incentives for software piracy, a common practice in developing countries. Trials are now being extended to India, China, Russia and Mexico.

The mobile handset industry and mobile operators are also joining forces in initiatives aimed at making cellular handsets affordable to low-income subscribers in developing countries, particularly for those in Africa. In 2005, Motorola won a contract with a group of operators from developing countries to supply 6 million handsets at a cost of US$40 or less and a second contract for another 6 million for less than US$30 for 2006. Areeba, the mobile phone brand of Investcom that operates in the Middle East and Africa, estimates that the number of subscribers would double in these two regions if the cost of the handsets were to be reduced by half, from the US$60 average cost in 2004.

Source: Microsoft, 'A computer you can afford', May 2006. www.microsoft.com/presspass/features/2006/may06/05-21EmergingMarket.mspx; T. Standage, 'Connecting the next billion', The Economist: The World in 2006, March, 2006, p. 109.
Image source: Microsoft, www.microsoft.com/whdc/flexgo/payasyougo.mspx.

The analysis of DOI Opportunity data can be enhanced by demand studies to improve policy-makers' understanding of perceived affordability, consumers' willingness to spend on ICTs and their priority for telecommunications relative to other basic services, such as electricity, water and health. The Kingdom of Jordan, for example, bases its definition of affordable tariffs on income statistics for the lowest 10th percentile household group by income, to ensure that initial payments (connection of fixed lines or activation charge for mobile), monthly expenditures (fixed line rental and the monthly cost of prepaid mobile cards) and the cost of additional units of service (monthly rental for fixed and lowest prepaid card for mobile) do not exceed a percentage threshold of monthly income of these households. These income statistics are collected through interviews with household heads, with and without phones.[36]

4.4.2 Infrastructure: universal access/ service policies

Facilitating the deployment of telecommunications infrastructure and making services available to all at fair and reasonable rates is another traditional policy objective for the sector and a major goal of policies targeting the digital divide. The *Geneva Plan of Action* (para. 6) established specific connectivity targets to be achieved by the year 2015, including the connection of all villages with ICTs, all educational institutions, scientific centres, public libraries, museums and archives, health centers, as well as local and central government departments. Fulfilling these goals will need investment in infrastructure, as well as policies for service provision in underserved areas and for specific population groups.

Although universal access/service policies have been adopted in many countries, these policies are not uniform, as the goals they pursue are closely linked to the level of development of

the country and evolve over time. For instance, although the concept of universal service has been pursued as a policy goal in the United States since the early part of the 20th Century, nevertheless the goals and principles of universal service were not explicitly defined until the Telecommunications Act of 1996.[37] The evolving nature of the concept is illustrated by the discussion in many developed countries about the need to extend the breadth of services covered under universal service from basic telephony to access to broadband services by all households.

For less developed countries, universal service focuses on providing the necessary basic infrastructure and coverage for the provision of access throughout their territory. The DOI indicator of 'percentage of the population covered by mobile service' is an important measure in this regard. Although the population coverage measure in the DOI is limited to mobile services, for developed countries, it could be modified to include coverage for 3G mobile. Attracting investment to fulfill universal service goals is a primary policy objective and to this end, policy-makers have supported investment promotion measures and tax incentives. Countries follow different paths to promote network deployment. Some have included universal service obligations in incumbents' licenses, for instance, in network roll-out obligations. Others have applied competitive market mechanisms to promote deployment e.g., through reverse auctions, where the bidder tendering for the lowest level of subsidy is granted the license.

The introduction of competition has driven governments to clarify universal service goals and develop mechanisms for the financing of Universal Service Funds that are non-discriminatory, technology-neutral, and transparent. To make them compatible with a competitive environment, universal access/service policies need to be based on rules that:

- justify the need for support or subsidies in cost-benefit terms;
- identify and limit the population groups to be supported; and
- provide guidelines regarding the amount and duration of financial support.

Although ICTs are important tools in development policies, governments in low-income countries may prefer to dedicate resources to areas where they have the greatest impact on meeting basic needs of the population e.g., sanitation, clean water or electricity. Given limited resources

for telecommunication infrastructure, many developing countries have prioritized the establishment of public payphones, teleshops and telecentres as means to provide communications to communities, rather than fixed services for households, as is often the case in developed countries. Shared ICT facilities (internet cafés, libraries, digital community centres and education facilities) provide telephone and internet access to the public and represent a first step in connectivity, stimulating demand and attracting investment.

Most lower and upper middle income countries already have infrastructure accessible to a large proportion of the population. The policy focus in these countries is on increasing ownership and use of fixed, mobile and internet services and equipment; extending mobile service coverage; lifting regulatory barriers to convergence and competition; and promoting investment in advanced technologies. Universal service policies tend to focus on linking smaller communities that are underserved by commercial interests and on ensuring that low-income users can afford services. In these countries, the DOI infrastructure indicators can help evaluate progress in the adoption of ICTs. Household indicators for fixed lines, computers and internet access among these countries are especially useful. Having greater access to ICTs at work and school, ICT users often appreciate more the value of ICTs at home. Sharing internet facilities often goes on at home, among relatives and friends.

Despite users' apparent willingness to increase their telecommunication expenditures at the household level, affordability can still be a barrier, particularly for the purchase of mobile handsets and computers. Although the cost of basic mobile handsets continues to fall, perceptions among non-users/non-owners of the high cost of mobile phones remain a problem in several countries (See Figure 4.7). Market research conducted by Nokia among mobile phone users and non-users in Argentina, India, Indonesia, the Russian Federation and Ukraine shows that non-users believed that they could not afford to purchase a mobile phone and pay for its ongoing running costs afterwards.[38] Similarly, a demand survey in Nigeria on 5'600 households found that, of the 94 per cent that wanted to own a mobile handset, only 75 per cent could afford to buy a used phone (US$40) and only 70 per cent could afford the monthly charges (around US$4). These economic constraints are worse for PC ownership, which needs a much larger initial financial commitment.

Utilization of broadband and wireless services in developing countries is being promoted both by public and private initiatives. In many countries, the cost of ICT equipment remains high as a result of duties imposed on such 'luxury' imports. India and Mauritius, two countries with a fast pace of mobile and PC adoption and use, are implementing policies to reduce the level of duties on ICT equipment imports[39] Mauritius has cut its taxes on handsets, while India reduced duties to 5 per cent in 2004 and is planning to eliminate the duty altogether. Other countries, such as South Africa, promote ownership by requiring operators to provide a certain number of SIM cards and mobile payphones as part of their universal service obligations (USOs). Similarly, equipment manufacturers are implementing micro-payment initiatives to promote computer and mobile handset ownership among low-income consumers. Box 4.2 provides the examples of Microsoft's FlexGo initiative in Brazil and Motorola's efforts in Africa.

Finally, upper-middle and high-income countries have the most advanced networks, in which the focus of universal service is on providing access to advanced wireless technologies and broadband Internet to all who want it. Developing a reliable, interconnected wireless, wireline and cable network that individuals can access anytime, anywhere, is the end goal, without forgetting about the provision of funds for special groups, such as the disabled and high cost regions. For these countries, infrastructure requirements are mostly left to market forces and the policy priority is on developing clear regulations for interconnection, inter-carrier compensation, spectrum management, and cost separation that would minimize disputes among service, application and network providers of the next generation networks (NGN). In summary, universal service policies evolve in response to countries' level of development, resources and needs. As infrastructure evolves, policy focus tends to shift from shared access (telecentre/household) to individual ubiquitous access; and from basic public telephony to increased mobile and internet access. Similarly, the policy focus on affordability becomes more targeted, shifting from making services affordable for the population as a whole, to pinpointing special groups and areas to maintain within the network. The DOI's different sub-indices can help countries track the evolution of their universal access/service goals over time.

4.4.3 Utilization: broadband and wireless technologies

One of the benefits of liberalisation is that consumers have greater choices in technologies, services and suppliers. Recent innovations have brought consumers:

- new ways to access voice services, such as mobile phones and Voice over IP;
- new ways to pay for services, including value-stored prepaid cards for mobile phones and privately-owned payphones for public use;
- faster and better technologies, such as broadband, fibre optics and digital switches; and
- A greater choice of suppliers in all ICT market sectors.

The internet is increasingly seen as just as important as having access to basic telephone service. Rapid changes in technology encourage countries to accelerate the rate at which their population adopts new technologies. Some countries track very closely the 'league tables' of worldwide broadband rankings. Developing countries are no exception. While the battle to extend basic telephony is far from over, developing countries are also seeking not to be left behind in broadband communications and the internet.

Wireless technologies, such as WiFi and WiMAX, are giving developing countries new low-cost alternatives to provide broadband access to rural and remote areas. Pakistan is a case in point. Lacking widespread broadband infrastructure until now, Wateen Telecom has announced plans to rollout the largest WiMAX network in the world so far, based on the IEEE 802.16e standard. The network is part of 'Broadband Pakistan' project to link 22 cities through broadband internet, voice, data and value-added services.[40] Moreover, with mobile

technology being the fastest-growing form of connectivity in many developing countries and equipment manufacturers looking for new markets, developing countries may adopt mobile communications as the main way of connecting to the internet, as long as services become more affordable.

Subscribers' interest in mobile internet services is already growing in developing countries. The 2005 Mobinet study on global mobile usage reports an upward trend in the percentage of multimedia phone users in Latin America browsing the internet or using mobile e-mail at least once a month on their phones, which jumped from 32 per cent in 2004 to 64 per cent in 2005.[41] According to Siemens' projections, based on the current growth rate of mobile subscriptions and internet users, the convergence of mobile and internet is expected to result in 50 per cent of internet access occurring mainly over mobile devices.[42]

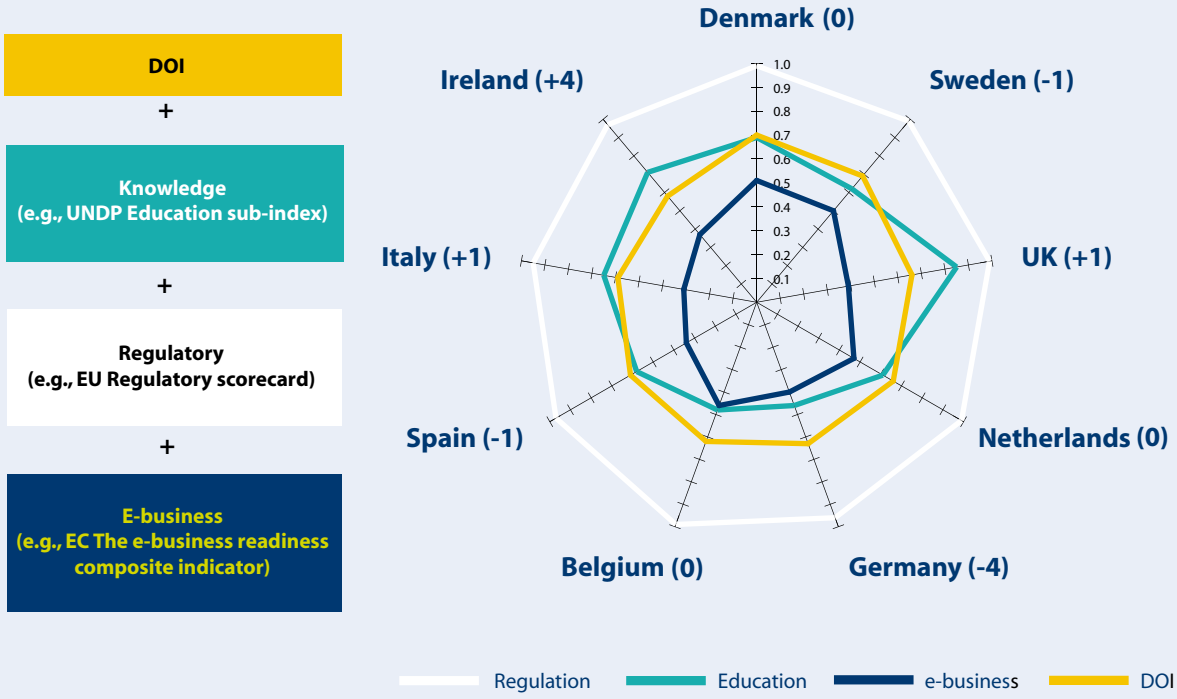
4.5 Complementing the DOI

The previous sections have showed how the DOI methodology can help benchmark international, regional and national performance, using a core set of ICT indicators. But, as discussed above, the telecommunication environment is subject to multiple cultural, economic and political factors. The modular structure of the DOI, based on the sequential clusters of Opportunity, Infrastructure, and Utilization, can be adapted to analysis of particular policy needs. The three DOI clusters can be complemented by social and regulatory indicators, as well as by technology indicators for other sectors influencing the ICT environment (such as government or business).

Regulation influences the structure, performance, and behavior of the telecommunication sector. However, it is difficult to measure the regulatory environment. The European Telecommunications Regulatory Scorecard is an attempt to combine various aspects of the regulatory situation in a country into a numerical score.[43] The Regulatory Scorecard evaluates the impact of a country's regulatory framework on investment and employment in the ICT sector, two variables closely related to the deployment of ICT infrastructure in a country. With respect to social factors, the UNDP's Human Development Index provides useful national and sub-national statistics on poverty and knowledge (adult literacy rate and combined primary, secondary, and tertiary gross enrolment ratio).[44] These social indicators (disaggregated by gender and income groups) can be combined with the DOI

Figure 4.8: Extending the DOI

How the DOI's modular structure can be adapted to include other indices



Note: The number in parentheses reflects the difference in the original DOI rank and the revised rank by including the new components.

Source: Minges, Michael (2006) 'The Digital Opportunity Index', presentation made at ITU/LBS conference 'Digital Transformations in the Information Society', Geneva, 1-2 June 2006, available at: www.itu.int/osg/spu/dtis/documents/presentations/minges.ppt.

Figure 4.9: Examples of matrices for policy evaluation

DOI Score	Opportunity	Infrastructure	Utilization
High			
Medium			
Low			

Coverage \ Affordability	Low	High
Low		
High		

Source: ITU/KADO: see Cho, Cheung-Moon (2006) 'Application of the DOI for policy development', presentation made at ITU/LBS conference 'Digital Transformations in the Information Society', Geneva, 1-2 June 2006, available at: www.itu.int/osg/spu/dtis/documents/presentations/cho.ppt.

to provide useful insights into the impact of education and poverty reduction efforts on closing population divides.

Other indices can also extend the DOI by providing greater detail on the impact of ICTs in other sectors of the economy, such as business or government. The e-business readiness composite indicator, developed for the European Commission, evaluates the availability and use of ICTs in the business sector.[45] It builds on many of the Partnership indicators used for measuring ICTs in enterprises such as the percentage of business with Internet access. The UN Division for Public Administration and Development Management compiles an annual e-government index measuring the development and sophistication of publicly accessible government websites around the world.[46] Figure 4.8 compares selected European economies, and shows how DOI scores could be modified by the inclusion of additional indices and indicators. Although the Regulatory Scorecard and the e-business readiness indices are not as extensive in country coverage, they are useful templates for methodologies and indicators that could be used by other regions.

4.6 Next steps: developing a policy matrix

This chapter has demonstrated the value of the DOI as a tool for assessing ICT policy outcomes at different levels. Through its categories of Opportunity, Infrastructure, and Utilization, the DOI can identify specific areas where performance can be improved (for example, using the policy instruments shown in Table 4.1). The database of DOI statistics for 180 economies and the 2000-2005 time-series for the 40 largest economies offer a solid statistical basis from which the feedback between ICT statistics into policy recommendations can be established.

One next step could be to develop a policy matrix that would classify countries as high/medium/low, based on their scores for the three DOI sub-indices, its eleven indicators, and/or other variables of interest (such as gross national income, population, area size, and social factors, such as education). Once classified, the relationship between performance and the policy framework of countries within a single group could be analyzed. This would allow the identification of patterns of performance linked to specific policy tools, as well as of policies that have been successful in addressing the particular needs of each respective group. Countries could also be classified according to their performance on interrelated indicators, such as affordability and coverage, to make policy recommendations. Figure 4.9 gives examples of potential matrices. Finally, the DOI statistics could be used as a frame of reference to evaluate progress made towards specific goals, such as the *Geneva Plan of Action* for 2015, or targets set at the regional or national level for closing the digital divide.

In accordance with the multi-stakeholder approach on which the WSIS process was based, ITU plans to develop a policy tool-kit for the DOI through a collaborative process, with the participation and input of other partners including governments, other international organisations, business and civil society representatives.

4.7 Conclusions

Data collection and analysis are essential to address the impact of policies and business strategies on ICT development. The eleven indicators included in the Digital Opportunity Index cover core areas to be monitored in order to track changes in the magnitude of the digital divide. The value of the DOI as a policy instrument lies in its flexibility to be applied on the evaluation of performance across and within countries and on its modular structure that facilitates the integration of other indices of interest. The links between policy and performance could be used to develop a policy tool-kit that countries may use to compare their performance with similar countries around the world and to learn from their policy experiences.

Endnotes

1 *Tunis Agenda*, WSIS-05/TUNIS/DOC/6(Rev.1)-E, 18 November 2005.

2 Institutional reform consists of a set of transformations in patterns of interaction and activity, which in the area of telecommunications may include changes in one or more of the following three components: (a) regulation, ranging from the revision of existing laws and regulations in telecommunication, trade, and foreign investment, to the establishment of new legislation and regulatory agencies, to partial or complete elimination of some regulations (deregulation); (b) the internal organization of the incumbent telecommunication operator, and (c) the degree of competition in the market. See R. Samarajiva, 'The role of competition in institutional reform of telecommunications: Lessons from Sri Lanka'. *Telecommunications Policy*, 24(8/9), 2000, pp.699-717.

3 J. Bauer, Governing the networks of the information society. Working Paper 01-04, Quello Center for Telecommunication Management and Law, May 20, 2004.

4 See ITU (2005) 'Hong Kong, China: ICT Data Collection Case Study', available at: www.itu.int/osg/spu/ni/digitalbridges/docs/HKG_CS_final.pdf.

5 See ITU (2005) 'Australia: ICT data collection case study', available at: www.itu.int/ITU-D/ict/cs/australia/material/AUS_CS.pdf.

6 For more detail see ITU, *Building Digital Bridges*, Chapter 3, Geneva, 2005.

7 For more information on ECLAC ICT measurement efforts see www.cepal.org/socinfo/default.asp?idioma=IN.

8 LIRNEasia and the Telecom Regulatory Authority of India are coordinating this initiative. The project includes the implementation of a multi-component study that will focus on the standardization of ICT indicators and the collection of data for six South Asian countries (India, Indonesia, Pakistan, Philippines, Sri Lanka and Thailand). The coordinators expect that the results of this study will lead to the adoption of the regional set of indicators by South Asian regulatory authorities and NSOs and later on expand to other Asian countries. See www.lirneasia.net/2006/05/report-on-workshop-on-ict-indicators-new-delhi.

9 'African mobile market to grow to 186 mln subscribers – study', *Telecompaper*, 9 May 2006, at www.telecompaper.com/news.

10 'African mobile market to grow to 186 mln subscribers – study', *Telecompaper*, 9 May 2006, at www.telecompaper.com/news.

11 ITU data, cited in L. Waverman, M. Meschi, & M. Fuss, 'The impact of telecoms on economic growth in developing countries', *Africa: The impact of mobile phones*. The Vodaphone Policy Paper Series, No. 2, at www.vodafone.com/assets/files/en/GPP%20SIM%20paper.pdf.

12 The actual number of Internet users in Africa is probably higher due to the prevalence of shared accounts and computers and the use of community centres for connectivity to the Internet.

13 'Africa is coming online!', *eMarketer*, 10 May 2006.

14 According to AfricaOnline, Kenya increased its number of Internet users from 500,000 to 1.5 million in one year. 'Africa is coming online!', *eMarketer*, 10 May 2006.

15 R. Ngowi, 'Official: Africa charges more for net use', *Yahoo News*, May 17, 2006. http://news.yahoo.com/s/ap/20060517/ap_on_hi_te/africa_Internet.

16 F. Seye Sylla, *ICT as an Instrument for Participation: The Regional Perspective from Africa, Examples of the Internet use at the Grassroots Level*, United Nations Division for the Advancement of Women (DAW), Expert Group Meeting on 'Information and communication technologies and their impact on and use as an instrument for the advancement and empowerment of women', Seoul, Republic of Korea, 11-14 November, 2002.

17 E. Burns, *Web usage climbs in Africa*, 3 May 2006, www.clickz.com/experts/contact_author/index.php/68343_3603526, with data from AllAfrica Global Media www.allafrica.com and CIA World Factbook, 2006.

18 Senegal has a 45Mbps Internet circuit to France via the new Atlantis-2 cable and is planning to become a regional hub linking its Internet backbone to Mauritania and Mali. Pyramid Research, 'Senegal Gears up for competition', *Pyramid Analysis*, March 2005. www.pyramidresearch.com/pa_mar_05_sen.htm.

19 Based on 2005 estimates, Brazil's GDP is calculated at US$1,576,728, while its per capita income is estimated at US$8,584 (68th worldwide). *World Factbook*.

20 Instituto Brasileiro de Geografia e Estatistica (IBGE), www.receita.fazenda.gov.br/principal/Ingles/SistemaTributarioBR/BrazilianTaxSystem/basicaspects.htm.

21 R. Paes de Barros, R. Henriques and R. Mendonça, *A Estabilidade Inaceitável: Desigualdade e Pobreza no Brasil*, IPEA, 2001. http://integracao.fgvsp.br/BancoPesquisa/pesquisas_n5_2001.htm.

22 For example, seven per cent of households in the North and Northeast regions had access to computers in 2004, compared to 22 per cent in the Southeast. By the same token, 27 per cent of the households in the Northeast had fixed telephones, compared to 62 per cent in the Southeast.

23 Universal access/service policies are set in place to address these internal disparities, justified by network externality, equity and development rationales. Network externality arguments justify subsidizing universal service because adding individuals that would otherwise not subscribe to the network increases the value of the network for each of its users. As the number of subscribers that can be reached through the network increases so does the value of the network. Equity rationales emphasize the redistributive role of universal service policies that facilitate access to underserved populations or regions to the network. Finally, development rationales focus on the importance of communications infrastructure for commerce and its effect on growth and development. Access to communications infrastructure allows participation in the economic life of a country. E. Rosenberg, L. Perez-Chavolla & J. Liu, *Commissioner Primer: Universal Service*. NRRI, 2006.

24 See for example, Pyramid Research, 'Fixed mobile convergence: How Brasil Telecom leverages position to offer innovative converged services', *Analyst Insight*, October 14, 2005.

[25] The Partnership proposed the collection of metadata variables for households and individuals. For households, the Partnership suggested to collected as a minimum, the size (number of members) and composition of the household, that is, if it included children under 16. For individuals, the minimum classificatory variables proposed by the Partnership are: Age, gender, highest education level received, employment status and occupation. For more detail see *Partnership on Measuring ICT for Development*, *Core ICT Indicators*, UN, 2005. www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.

[26] For instance, the United Nations Conference of Women, regional conferences on Gender and Communication Policy of the World Association for Christian Communication (WACC), and the two phases of WSIS.

[27] N. Hafkin, *Gender Issues in ICT Policy in Developing Countries: An Overview*, United Nations Division for the Advancement of Women (DAW), Expert Group Meeting on 'Information and communication technologies and their impact on and use as an instrument for the advancement and empowerment of women'. Seoul, Republic of Korea, 11-14 November 2002, p.4. www.un.org/womenwatch/daw/egm/ict2002/reports/Paper-NHafkin.PDF.

[28] UNIFEM and United Nations University Institute for New Technologies (UNU/TECH). *Gender and Telecommunications: An Agenda for Policy*, 2000. www.unifem.undp.org/pap_itu.htm.

[29] N. Hafkin and N. Taggart, *Gender, information technology and developing countries: An analytical study*, Washington, D.C., Academy for Educational Development, 2001. As cited in Sonia N. Jorge, The Economics of ICT: Challenges and Practical Strategies of ICT use for Women's Economic Empowerment, United Nations Division for the Advancement of Women (DAW), Expert Group Meeting on 'Information and communication technologies and their impact on and use as an instrument for the advancement and empowerment of women'. Seoul, Republic of Korea, 11-14 November 2002, p. 1. www.un.org/womenwatch/daw/egm/ict2002/reports/Paper%20by%20Sonia%20Jorge.pdf.

[30] S. N. Jorge, *The Economics of ICT: Challenges and Practical Strategies of ICT use for Women's Economic Empowerment,* United Nations Division for the Advancement of Women (DAW), Expert Group Meeting on 'Information and communication technologies and their impact on and use as an instrument for the advancement and empowerment of women'. Seoul, Republic of Korea, 11-14 November 2002, p. 2. www.un.org/womenwatch/daw/egm/ict2002/reports/Paper%20by%20Sonia%20Jorge.pdf.

[31] J. Bauer, *Governing the networks of the information society: Prospects and limits of policy in a complex technical system*. Working Paper 01-04. Quello Center for Telecommunication Management and Law, 2004.

[32] See A. Gillwald, S. Esselaar, L. Adam, J. Chuma, G. Frempong, I. Kaggwa, S. Masupe, S. Mulavu, B. Mutagahywa, F. Mwenda, I. Ngalinda, A. Nsengiyumva, O. N. Nzepa, J. Ongora; S: Sebusang; A. Stavrou; C. Stork; R. Tankeu; F. F. Tusubira; & K, Woldekidan, *Towards an African e-Index: Household and individual ICT access across 10 African countries.* LINK Centre, Johannesburg, South Africa, 2005. Intelcon & shekels, *Nigerian demand study,* 2005. Study conducted for the NCC as part of a World Bank funded contract. Cited in C. Milne, *Telecoms demand: Measures for improving affordability in developing countries*. IDRC, infoDev, Lirne.net, January 2006.

[33] LIRNEasia, *Telecom use on a shoestring: The use of cost-saving strategies by the financially constrained*, 2005. www.lirneasia.net/projects/completed-projects/strategies-of-the-poor-telephone-usage.

[34] L. Waverman, M. Meschi, & M. Fuss, 'The impact of telecoms on economic growth in developing countries', *Africa: The impact of mobile phones*. The Vodaphone Policy Paper Series, No. 2. www.vodafone.com/assets/files/en/GPP%20SIM%20paper.pdf.

[35] According to COFETEL, as of 4Q 2005, Mexico had 43,873 prepaid subscribers and 3'268 under the post-paid modality. With the economic recession affecting Mexico's finances, mobile subscribers began migrating from post-paid plans to prepaid plans in early 2002. Telcel, the incumbent's wireless affiliate (now part of America Movil), lost 19 per cent of post-paid subscribers in the first quarter of 2002, compared to the same quarter in 2001, while the number of prepaid subscribers increased 56 per cent (A. García, 'Crecen clientes de Telefónica de México', *Reforma*, 13 May 2002).

[36] TRC Jordan, *Draft regime on the universal service obligation, consultation paper,* 2005. Cited in C. Milne, Telecoms demand: Measures for improving affordability in developing countries. IDRC, infoDev, Lirne.net, January 2006.

[37] The Communications Act of 1934 created the Federal Communications Commission (FCC) with the purpose of 'regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex, a rapid, efficient, nationwide, and worldwide wire and radio communication service with adequate facilities at reasonable charges …'. In contrast, the Telecommunications Act of 1996 aimed to 'promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.' E. Rosenberg, L. Perez-Chavolla & J. Liu, *Commissioner Primer: Universal Service*, NRRI, Columbus, Ohio, 2006, p. 2.

[38] Nokia, 'New insights into non-users point to new potential', New Horizons, 3rd Quarter, 2005. Cited in C. Milne, *Telecoms demand: Measures for improving affordability in developing countries*. IDRC, infoDev, Lirne.net, January 2006.

[39] Mauritius ranks second in mobile digital opportunity, after Seychelles, among African countries included in the DOI. It ranks first in mobile opportunity and use within the continent, due in part to its high ratio of mobile Internet subscribers relative to other African countries. It also ranks first in percentage of households with computers. As for India, the number of mobile cellular subscribers has increased more than two thousand per cent between 2000 and 2005, growing from 3.5 million in 2000 to 75.9 million in 2005.

[40] D. Meyer, 'Pakistan plans largest mobile WiMAX rollout', *c|net News.com*, 23 May, 2006; S. McClelland, 'WiMax World Europe: Motorola WiMax wins Pakistan's Wateen', *Telecommunications Online*, 23 May, 2006, www.telecommagazine.com/search/article.asp?HH_ID=AR_2081&SearchWord=.

[41] A.T. Kearney & University of Cambridge, 'Mobinet 2005: Raising the stakes', 2006, www.atkearney.com/main.taf?p=5,3,1,121,1.

[42] Siemens, *The Internet and UMTS*, www.siemens.com.vn/Marketplaces/IaC/mobile-net-facts-intertrend.htm.

[43] Jones Day / ECTA, 2004 Regulatory Telecommunications Scorecard, www.jonesday.com/pubs/pubs_detail.aspx?pubID=S1187

[44] http://hdr.undp.org.

[45] http://ec.europa.eu/enterprise/ict/policy/ebi/eur21294en.pdf.

[46] www.unpan.org/egovernment5.asp.

CHAPTER FIVE

Beyond WSIS: making a difference globally

5.1 Introduction

This Report introduces a new tool—the Digital Opportunity Index (DOI)—for tracking progress in building the global Information Society. Chapters two and three showed how the DOI is constructed and can be used to identify some key findings and trends driving telecommunications development worldwide. Chapter four showed how the DOI can be used to inform policy-making and design policies to achieve the aims set out in the World Summit on the Information Society (WSIS) outcome documents.

This chapter reviews current implementation and efforts to realise the Information Society in the light of the WSIS. It examines the key role of Multi-Stakeholder Partnerships (MSPs) in extending the benefits of ICTs to all citizens and communities. As the lead agency involved in the organisation of the World Summit, ITU is actively involved in its implementation and follow-up and is committed to working closely with all stakeholders to realise the WSIS goals. This chapter gives examples of real-world, practical initiatives by a range of stakeholders involved in implementing the WSIS goals in the areas tracked by the DOI of Opportunity, Infrastructure and Utilization. It draws on submissions to the WSIS Stocktaking Database[1], which details activities launched in support of the WSIS targets. The Stocktaking Database, like the DOI, is part of the methodology for WSIS evaluation endorsed in the *Tunis Agenda for the Information Society* (para 112-120). This chapter reviews progress since the conclusion of the Summit in Tunis and demonstrates that efforts are underway to build a fair and inclusive Information Society open to all.

5.2 The Importance of Multi-Stakeholder Partnerships in WSIS implementation

Until fairly recently, the roles of stakeholders in telecommunication development were relatively proscribed and fairly separate. Governments led the way in policy formulation and network roll-out and maintenance, on the basis that the provision of telecommunication services constituted a public good. The private sector engaged mainly in innovation, the sale of equipment, the development of applications, as well as the exploitation of new commercial opportunities. The role of policy evaluation was performed mostly by academia and international organisations. Standardisation was performed by various national and regional technical standards bodies and, at the international level, by ITU.

The growth in capabilities, impact, importance and complexity of ICTs has irrevocably changed this status quo. As examined by different *World Telecommunication Development Reports*[2], market liberalization, private sector participation and effective regulation have transformed the telecommunication landscape. Governments remain primarily responsible for policy formulation, but in many countries, private operators with competitive profit incentives have assumed responsibility for network roll-out and the provision of services[3]. Customers no longer simply accept the services they are provided with, but have become increasingly important as the arbiters of new technologies in markets that are increasingly demand-driven. Policy evaluation is now often carried out by autonomous or semi-autonomous regulators.

In recognition of these changing roles, the WSIS was planned from the start as a multi-stakeholder partnership, in which the private sector, and civil society could work alongside with governments and international organisations to develop a shared vision of the future Information Society.

Multi-stakeholder partnerships (MSPs) offer several key benefits for telecommunication development:

- These partnerships can protect and reconcile the different interests of partners, according to their different incentives. For example, private sector profit incentives can be reconciled with less profitable activities such as the provision of telecommunications to remote and rural areas through the use of targets, licences, subsidies or Universal Service Funds.
- Different parties bring different skills and values to the partnership, as well as fresh approaches. MSPs can combine private sector efficiency motives with the public interest promoted by regulators and government.
- The private sector may have ready access to more capital from more varied sources, with fewer restrictions on use, than can be easily funded by the state, given state dependency on tax revenues. This is especially important for the telecommunication sector, where large investments are required.
- Synergies can be realized through working together, to take full advantage of each partner's specialization, knowledge and experience. MSPs can prove a key driver and valuable forum for dialogue, through which ideas can be shared.

The WSIS was planned and hosted in two phases with the most extensive multi-stakeholder participation of any United Nations Summit to date. The Geneva Phase attracted more than 11'000 participants. The Tunis Phase was attended by more than some 19'000 delegates from 174 Member States, of which 6'200 represented civil society, 4'800 from the private sector and 1'500 from international and regional organisations. But most importantly for the future, the Tunis Phase established a multi-stakeholder WSIS implementation mechanism[4] in paragraphs 108-111 and the Annex to the *Tunis Agenda for the Information Society*[5], and an agreed methodology for evaluation (para 112-120). Multi-stakeholder partnerships are the cornerstone of WSIS implementation (see Box 5.1)

Box 5.1: Multi-Stakeholder Partnerships: a vital component of WSIS implementation

'We acknowledge that multi-stakeholder participation is essential to the successful building of a people-centred, inclusive and development-oriented Information Society and that governments could play an important role in this process. We underline that the participation of all stakeholders in implementing WSIS outcomes, and following them up on national, regional and international levels with the overarching goal of helping countries to achieve internationally agreed development goals and objectives, including the Millennium Development Goals, is key to that success.'

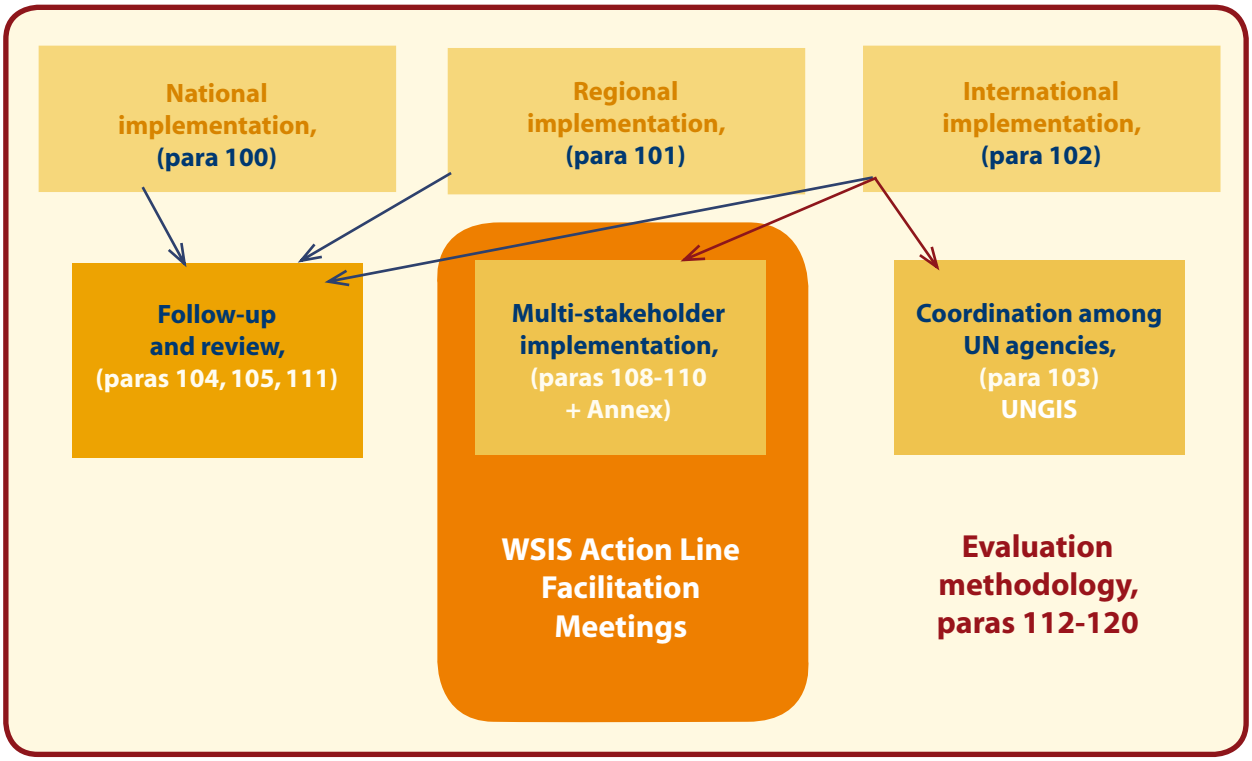
Para 97, Tunis Agenda for the Information Society.

'Each country is encouraged to establish at least one functioning Public/Private Partnership (PPP) or Multi-Sector Partnership (MSP) by 2005, as a showcase for future action.'

Para 8d, Geneva Plan of Action.

Source: WSIS outcome documents, available from www.itu.int/wsis.

Figure 5.1: The framework for WSIS implementation and follow-up



Note: The paragraph numbers refer to the *Tunis Agenda for the Information Society*. For more information, see: www.itu.int/wsis/implementation.

Source: ITU.

5.3 WSIS implementation

5.3.1 Implementation in the *WSIS outcome documents*

The *Tunis Agenda for the Information Society* presents an implementation mechanism along four overlapping dimensions (see Figure 5.1). A broad framework for the implementation mechanism at the national, regional and international levels is described in Paragraphs 100, 101 and 102. Paragraph 102 deals with implementation at the international level and specifies that it should have both inter-governmental and multi-stakeholder components. Coordination among UN agencies is addressed in Paragraph 103, specifically through the UN Group on the Information Society (UNGIS), which was established in April 2006. ITU has been invited to chair UNGIS during the first year of its activities. It is intended to coordinate the activities of UN agencies relevant to WSIS implementation.

The broad follow-up and review process is addressed in Paragraphs 104, 105 and 111, including a possible role for the Commission on Science and Technology for Development (CSTD). At its meeting in May 2006, the CSTD agreed on a new resolution which, *inter alia*, requests UNCTAD and ITU to work together in tracking progress in ICT development and analyzing the digital divide. Finally, paragraphs 108-110, including the Annex, describe the multi-stakeholder implementation process, and in particular the allocation of responsibilities for facilitating the different action lines to multi-stakeholder teams.

The *Tunis Agenda* proposes that ITU, UNESCO and UNDP play the role of lead facilitation agencies to ensure overall coordination among the different multi-stakeholder teams. In order to kick-start the process, a consultation meeting of potential action line facilitators was held on 24 February 2006, in Geneva[6]. One of the main outcomes of the meeting was provisional agreement on the designation of focal points for each of the action lines (see Figure 5.2). These responsibilities were confirmed during a series of action line facilitation meetings, held around the inaugural World Information Society Day, on 17 May 2006.

An important element of the WSIS implementation is the approved evaluation methodology, outlined in paragraphs 112-120 of the *Tunis Agenda*. The Digital Opportunity Index, which is published in this Report, is part of this evaluation methodology, together with the WSIS Stocktaking Database (see Box 5.2) and the work of the *Partnership on Measuring ICT for Development*.

The next three sub-sections highlight a selection of promising initiatives, structured according to the three clusters of the DOI, namely: promoting digital Opportunity, establishing Infrastructure and increasing Utilization.

Figure 5.2: WSIS Action Lines, themes and their focal points

Action Lines	Focal Points
C1. The role of stakeholders	**UN DESA**
C2. Information and communication infrastructure	**ITU**
C3. Access to information and knowledge	**UNESCO**
C4. Capacity building	**UNDP**
C5. Building confidence and security in the use of ICTs	**ITU**
C6. Enabling environment	**UNDP**
C7. ICT Applications	
• E-government	**UN DESA**
• E-business	**UNCTAD**
• E-learning	**UNESCO**
• E-health	**WHO**
• E-employment	**ILO**
• E-environment	**WMO**
• E-agriculture	**FAO**
• E-science	**UNESCO**
C8. Cultural diversity and identity, linguistic diversity and local content	**UNESCO**
C9. Media	**UNESCO**
C10. Ethical dimensions of the Information Society	**UNESCO**
C11. International and regional cooperation	**UN DESA**

Note: For more information, including a full list of WSIS facilitators/moderators for each action line and planned meetings, see www.itu.int/wsis/implementation.

Box 5.2: The WSIS Stocktaking database and online portal

The programmes and initiatives highlighted in this chapter are drawn from the WSIS Stocktaking database, which records more than 3'000 activities related to WSIS. The Stocktaking, which was launched in October 2004, was carried out to record different initiatives and projects, with the aims of demonstrating tangible outcomes, monitoring progress, exchanging experiences and identifying best practices and fresh approaches that may work well elsewhere. A Report on the WSIS Stocktaking was published at Tunis in November 2005 and endorsed by the Summit as part of the approved evaluation methodology for WSIS implementation[7]. The WSIS stocktaking was acknowledged as one of the valuable tools for assisting with follow-up, beyond the conclusion of the Tunis phase (*Tunis Agenda*, para 120).

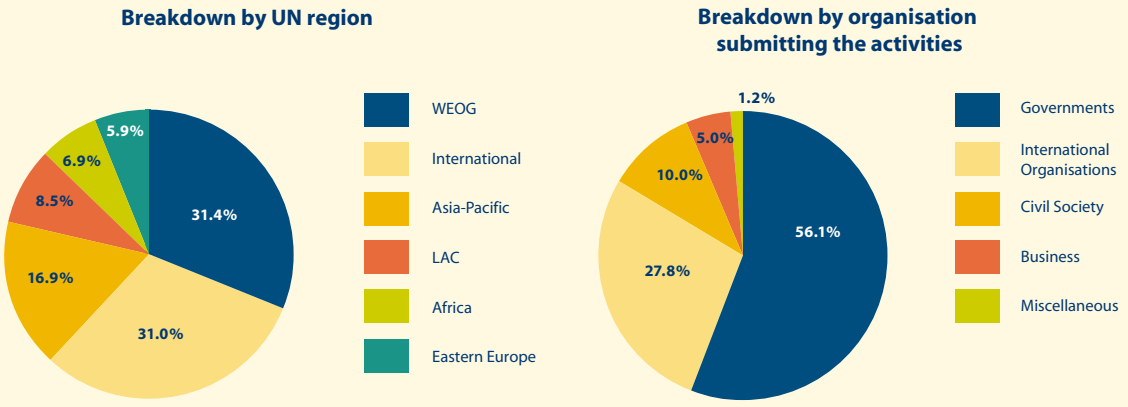
Just over half of the activities in the database were submitted by governments, with a further quarter coming from international and regional organisations. The rest come mainly from civil society (10 per cent) and business entities (5 per cent). Just under one-third of the activities are international in nature. The Western Europe and Others Group (WEOG) accounts for the largest regional grouping, followed by Asia-Pacific (see Figure 5.3). Just over half of the projects submitted are being undertaken by Multi-Stakeholder Partnerships (MSPs), with projects submitted by civil society having the highest percentage of MSPs, at over 80 per cent.

Given the size of the database and compilation of projects, this chapter cannot give a comprehensive nor representative overview of WSIS implementation in its small choice of examples. The full range of information is presented in the Stocktaking Portal (www.itu.int/wsis/stocktaking), which includes hyperlnks to all original sources, as well as links to other relevant sources of information. Nevertheless, the examples cited here give some indications of experiences and fresh approaches in the countries included. To promote the free exchange of ideas, a selection of stories from the WSIS Stocktaking is highlighted on the ICT success stories website, maintained by ITU at www.itu.int/ict_stories.

The Stocktaking database is available at **www.itu.int/wsis/stocktaking** and all new and updated contributions from stakeholders are welcome.

Figure 5.3: WSIS stocktaking activities

Broken down by organisation type and by region



Note: WEOG includes Western Europe, North America, Austalia and New Zealand. LAC = Latin America and the Caribbean.

Source: WSIS Stocktaking Database, www.itu.int/wsis/stocktaking.

5.4 Opportunity

As explained in Chapter two, the basis for an Information Society is ensuring that citizens have convenient and affordable access to ICTs. Digital opportunity, or the ability to enjoy the use of ICTs, is measured according to the two critical aspects of accessibility and affordability discussed below.

5.4.1 Accessibility

Accessibility to ICTs in developing countries depends on terrain, geography, population distribution, literacy and often language (see Box 5.4). To help overcome these constraints, many developing countries have pioneered forms of shared access through telecentres, Community Access Centres or IT Clubs, as discussed in Chapter four. No matter what they are called, public telecentres share a common commitment: to help communities enter the information age and embrace the knowledge economy on their own terms[8].

Telecentres help make ICTs more affordable (where the cost of ICTs is otherwise prohibitively high, effectively putting them out of reach of ordinary people) and more user-friendly (for instance, by offering training, where ICT skills are lacking). Telecentres can also realise economies of scale—for example, by offering different ICTs ('old' and 'new' ICTs - phones or faxes are still valuable and user-friendly in many countries) or supporting computer and hardware maintenance.[9] In parts of the **Philippines**, for example, although Internet tariffs are very low and virtually everybody could afford to use Internet, telephone line rental is comparatively high and the waiting time for acquiring a line is so long that less than 10 per cent of households have a phone. In such cases, Internet cafés or community telecentres are the most accessible means of using the Internet for the majority of people.

In their excellent review of the factors affecting the performance of telecentres, Roman & Colle (2002) note that, in order to have the best chances of success, telecentres are often best 'grafted' onto pre-existing social structures[10]. This helps to integrate the telecentre naturally into the local community and ensures broad-based community support, as the telecentre may be able to take advantage of an existing membership or clientele—for example, by integrating telecentres with local Youth Clubs, sports or religious institutions. Telecentres are not just about installing the basic connectivity of technological hardware and cables, but must also offer 'softer' support functions in training, support and marketing.

Several collaborative initiatives have been launched to promote and support telecentres in different parts of the world. In **South Africa**, bridges.org has carried out notable work to promote access by disadvantaged and remote communities, as well as carrying out extensive research into the problems and challenges of bridging the digital divide at the local, regional and national level[11]. **telecentre.org** is a universal access initiative launched during the Tunis Phase of WSIS. It unites telecentres, networks, innovators, social investors and other stakeholders[12] who believe that ICTs can strengthen individuals and the communities. These networks support the managers of telecentres with the raw materials they need in training, support, marketing, and technology. They also help telecentre managers learn and innovate together, to make technology more useful for the communities they serve.

In **Latin America**, Ajb'atz'Enlace Quiché has launched a model for community telecentre development in the Community CETEBI or Bilingual Inter Cultural Educational Technology centre in **Guatemala**. These new telecentres are designed under a social entrepreneurial business model that should be replicated throughout the country under a franchise model. A pilot project has been implemented in over 30 schools in rural areas, combining free services, such as Internet access, with paid services, such as training courses and digital production. In Mexico, the Secretariat of External Relations and other partners have launched the Free Digital Community Access Centres for Marginalised Populations Programme. Some 7'500 centres equipped with 5-20 computers and connected to a local network have been already established, almost all of them using broadband via satellite.

The Connecting Small Island Pacific Countries project implemented by ITU and a number of other partners aims to increase Internet penetration and teledensity in island states throughout the **Pacific region**. The project provides multi-purpose telecentres where villagers can have easy access to ICTs to address their communication needs. During the first phase, ten telecentres in Samoa and ten telecentres in the Solomon Islands were established. By 2008, the project will be extended to other countries in the region.

In Asia, the Ministry of Transport and Communication of the **Republic of Armenia** with support from the Government of Canada and the World Bank have developed a multi-level project, Rural Telecentres for Internet Access and Computer Training. In **Bhutan**, in partnership with ITU and its Sector Members (including the Korea Agency for Digital Opportunity and Promotion and Japan Telecom), the Telecommunication Ministry of Bhutan, the regulatory agency and Bhutan Telecom have started the Access to ICTs programme. Eight telecentres have been established with permanent Internet connections, including several temples and schools in the capital and surrounding rural areas. In **Indonesia**, the Government, Association of Community Internet Centre Deployment and APW Komitel have been working together in a public-private partnership to establish community telecentres in a number of rural and urban areas, taking into account the needs of grassroot organisations and SMEs.

In **Africa**, the many barriers to Internet access and the growth of telecentres include high start-up costs, large rural populations, low population density, illiteracy constraints, and multiple local languages, among others. Based on the evidence of the DOI, mobile and Internet tariffs for mobile and Internet services are high compared to the average monthly income in most African countries and overall ICT utilization is low (see Chapter four).

To overcome some of these barriers in **Ethiopia**, UNESCO, UNDP and the British Council are working to support the development of Community Multimedia Centres (CMCs). CMCs offer networking possibilities with other communities within Ethiopia and abroad, allowing rural people to take full advantage of the free flow of information and contribute to community development initiatives, for example, with women's groups, youth clubs and HIV/AIDS awareness groups.

Sudan has relatively good affordability of ICT services, but extremely low utilization. This is partly due to the fact that most of the population lives in rural areas, where there is practically no infrastructure. Sudatel has been working to implement a Telecentres project, intended to realise the digital potential of the country more fully. Sudatel is further developing this project with support from many partners, including the Government, private sector, international donors and local community organisations.

Box 5.3: A Multi-Stakeholder Partnership in Action - Connect the World

'Connect the World' is a multi-stakeholder partnership, initiated by ITU in June 2005, which currently has 42 members. Under the 'Global Pledge to Connect the World', leaders from Connect the World partners gathered to pledge their support for the common goal of connecting the unconnected by 2015 and creating digital opportunities for all. All partners in Connect the World are actively undertaking initiatives in one of the three domains: enabling environment; infrastructure and readiness; services and applications. The main activities of the platform's partners include showcasing development efforts currently underway, bringing stakeholders together to launch new partnerships ('match-making'), and tracking progress to identify areas where more action is needed. Connect the World is an open initiative that welcomes new partners.

Source: Connect the World website, at www.itu.int/partners/index.html.

Box 5.4: Multilingualism in accessing the Internet

The Internet provides opportunities to access information, as well as create and disseminate content. This can be easy if, firstly, you have access to ICTs; secondly, if you have the basic knowledge of how to use them; and, last but not least, if your language is represented on the Internet in its written form. The ability to learn and communicate depends not only on the availability of infrastructure - the integration of languages into the Internet becomes a critical factor for the effective use of ICTs.

CARDICIS, the Caribbean Cultural Diversity and Information Society has been conceived by the Networks & Development Foundation (FUNREDES) to bring together key actors in civil society specialising in ICT4D in the Caribbean, as well as relevant international organisations, to consider the importance of cultural and linguistic diversity to the planning of regional solutions.

In 2004, a partnership between the Universal Networking Digital Language (UNDL) Foundation, the United Nations and Bibliotheca Alexandrina established the **Ibrahim Shihata Arabic-UNL Centre** (ISAUC). ISAUC will play a major role in designing and implementing the Arabic language's digital component and will act as an active language centre for Arabic. Moreover, the UNL System linked to the Centre offers a powerful platform for inter-lingual communications in support of the goal of enabling all people to generate information and have access to knowledge in their own, native language.

In **Ethiopia**, a new language standard for computerization purposes is being developed to enable national and international software solution providers to incorporate the major Ethiopian languages into their local facilities. It is hoped this will enable Ethiopian communities to use ICTs with their own local languages. The Ethiopian Information and Communication Development Authority has united efforts with partners from concerned government bodies, private sector and civil society to make this possible.

The **Navajo Nation**, OCCAM and ITU have committed to a non-exclusive partnership programme intended to foster partnership using ICTs for equitable and self-sustainable development. This should ensure ICT access for indigenous groups through a multilingual portal and enhance capacity-building to support the integration of the Navajo Nation into the Information Society.

Under the UNCTAD – UNDP global programme, the **eLangViet** (eVietnameseVillage) project has been implemented since 2004. The project is based on a closed intranet system bringing easy-to-understand Vietnamese-language know-how on trade, production, health and education to the grassroots of Vietnam, through specially-equipped and staffed rural telecentres. The Ministry of Trade of Vietnam, the Viet Nam Trade Information Centre and the local authorities of 6 provinces are involved in the project.

Source: WSIS Stocktaking database, available at www.itu.int/wsis/stocktaking.

5.4.2 Affordability

Although prices for telecommunication services have on average declined by between 20-40 per cent worldwide between 2003-2005 (see Figure 3.6 in Chapter three), this is not an experience shared throughout Africa and some other developing regions, where new technologies such as broadband are available only at premium prices to exploit the higher margins available in the business market.

With privatization and the growth of private operators, the cross-subsidisation of services available to state-owned incumbents (for example, the cross-subsidisation of rural services from higher margin urban and business segments) is no longer available, as discussed in Chapter four. In some countries, governments may in fact benefit through higher telecommunication tariffs, either through maximisation of the state-owned incumbent's revenues, through increased tax-take or in some instances, through Rural Telecommunications Development Funds, which are commonly funded by a levy as a percentage of government revenues.[13] In some countries, regulators have assumed responsibility for tariff policy, often on the basis of partial and incomplete information provided by an incumbent resisting change. Faced with these problems, some governments are now less able to influence tariff policy directly, and have instead focused on targeted programmes to support specific initiatives.

Some examples include projects to subsidise Personal Computers or PCs. The cost of a PC is a key factor driving the growth of the PC and Internet penetration in households (or lack of it, as the case may be). A computer can cost the equivalent of up to eight years' income for an average person in Bangladesh, but less than a month's wages for the average American[14]. This is even more important in developing countries, where large average household size means that many more potential users can be reached. Thus, the proportion of households with a home computer is a much more representative indicator of the actual PC use than the proportion of home computers per 100 inhabitants.

In **Algeria**, the OUSRATIC - One PC Per Home programme mentioned in Chapter two (Figure 2.13) targets low Internet connectivity and ICT utilization, even though Algeria is one of the most advanced digital opportunity economies in Africa. This initiative is part of the Government's strategy for building the Algerian Information Society by 2010 that aims to equip all 5 million national households with an Internet connection, and, where possible, with ADSL. The Ministry of the Post and

ICTs established this programme with a number of public and private partners, including service providers and banks, to create a multi-incentive scheme for households to get a PC and Internet connection through low-interest, long-term loans. Similarly, the PC4ALL programme in **Lebanon** aims to provide affordable PCs to citizens, to be paid for in monthly instalments over 2-3 years. The target is to increase PC penetration to 30 per cent of the population by 2010. **Egypt** has a similar programme, called A PC For Every Household.

The **Used PC Distribution** project of the Ministry of Information and Communication of the Republic of Korea (MIC), KADO and other business partners gathers used PCs from public and private companies and repairs and distributes them to disadvantaged populations, mainly among disabled and low-income categories. Over 5'000 PCs have been provided to 197 developing countries including Cambodia, Vietnam, East Timor and Kazakhstan. KADO plans to gather and distribute 25'000 more PCs to developing countries by 2006.

5.5 Infrastructure

The importance of infrastructure as a key enabling factor of the Information Society is widely recognised, and was acknowledged by WSIS. However, as previous chapters have shown, infrastructure is fast evolving in its scope, coverage and capabilities, with important implications for developing countries. There are different trajectories towards the Information Society, depending on income, policy, institutional infrastructure and the involvement of stakeholders. Ultimately, ensuring sufficient development of infrastructure is a critical factor for the wider and more effective adoption of ICTs. Catalysed by the Geneva and Tunis outcomes, ongoing efforts are underway to promote the expansion of infrastructure in all regions.

ITU has been nominated as the focal point for the WSIS Action Line on information and communications infrastructure (C2).

Box 5.5: Free and Open Source Software (FOSS) and Resources

Free and Open Source Software is digital, online, free of charge and free from most copyright restrictions. It offers users with limited resources the chance to take full advantage of the opportunities offered by the Information Society. Several promising initiatives have been launched to promote the use of this software, particularly in developing countries.

Connect Africa is a project undertaken by UNCTAD in partnership with the Observatoire Technologique du Centre des Technologies de l'Information of the State of Geneva in Switzerland. The project provides customised training to ICT engineers and technicians from the least developed countries of Africa. The Kingdom of Lesotho is the first pilot country to benefit from Connect Africa. The project has provided Lesotho with 220 computers accompanied by software installation and open-source solutions for servers and clients, for use in a number of areas, including schools. Preparations are now underway to pilot the project in Mali.

Myanmar, Vietnam and Thailand have collaborated on the Enhancing Open Source Software (OSS) Collaborative Development project, coordinated and supported by NECTEC of Thailand and other private partners. The project aims to train up trainers and technical experts on OSS in these economies. It also aims to create a joint working-group on OSS standardization and localization.

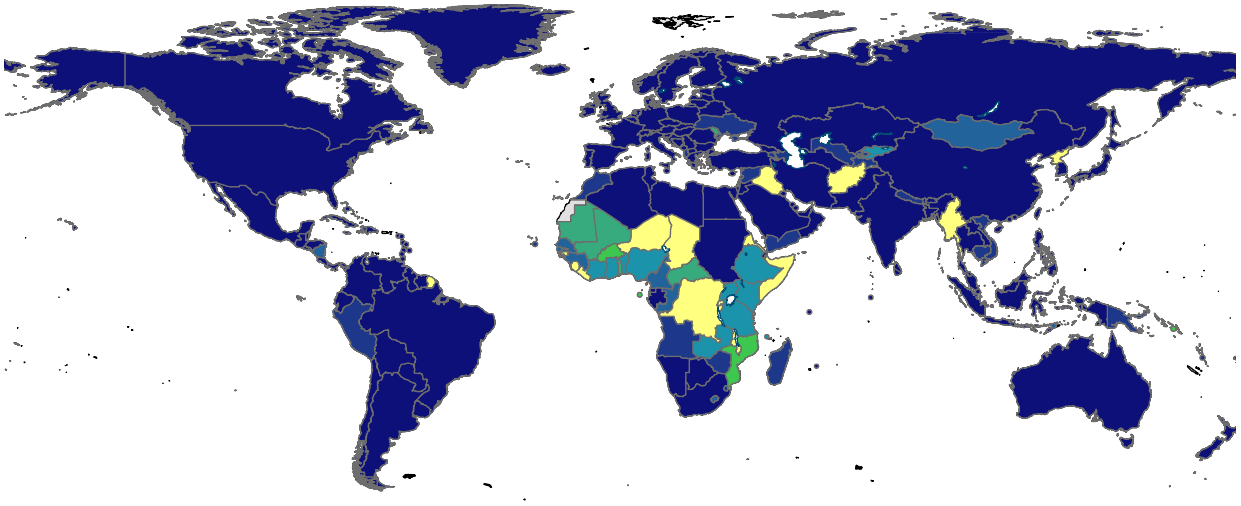
Under the framework of the **Open Solution Network**, the United Nations Capital Development Fund (UNCDF) and Microsoft Corporation are looking into ways of establishing a network to promote the exchange of e-government software and start-up kits between local governments of 49 LDCs, as well as regional local government organisations. Under this model, local governments from industrialised countries could potentially make IP and non-IP related software available to local governments in LDCs.

The **FOSS Partnership** programme is based on the mandate of UNCTAD within the United Nations system and its work on issues relating to e-commerce and the role of ICTs in trade and economic and social development. The FOSS Partnership was conceived in recognition of the fact that free and open source software will be a key factor in the growth of digital opportunity in developing countries. It aims to enable broader and better use of ICTs through the use, in particular, of open source software and processes, in commercial, public and personal activities.

Source: WSIS Stocktaking database, available at www.itu.int/wsis/stocktaking.

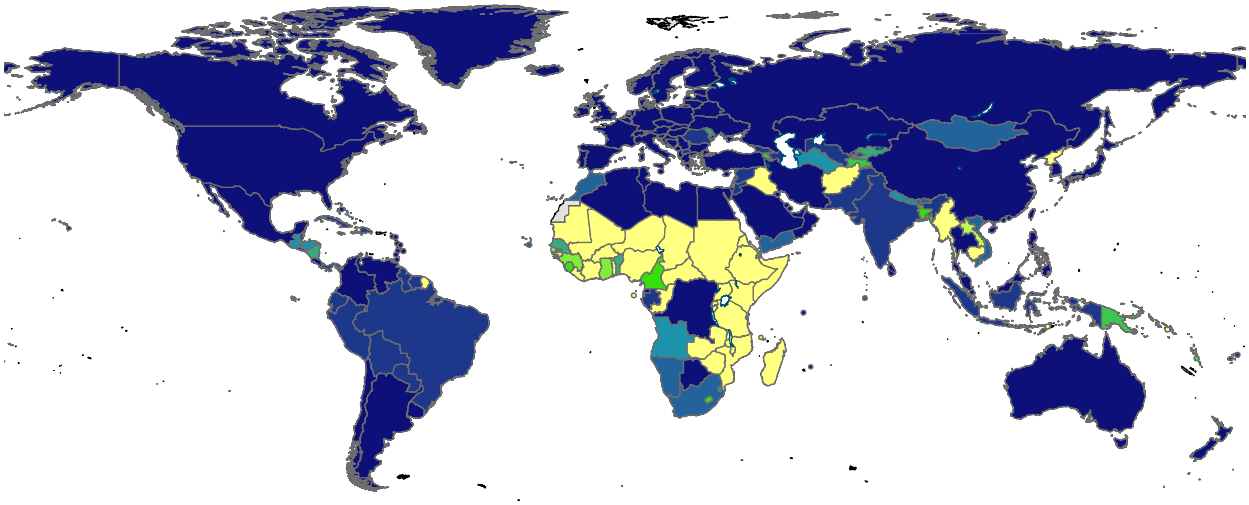
Figure 5.4: Mobile and internet Affordability Worldwide, 2005 *Applying the DOI opportunity indicators*

Mobile affordability (OECD low-user basket as a % of monthly GDP per capita)



Note: 1 means affordable; 0 means that the price of 20hours Internet use is in excess of average GNI per capita.

Internet affordability (cost of 20h Internet connection as a % of monthly GDP per capita)



Note: 1 means affordable; 0 means that the price of lower-user call basket is in excess of average GNI per capita.

Source: ITU/KADO Digital Opportunity Platform

A first Consultation on the Facilitation was held in Doha, Qatar, in February 2006 and a second meeting in Geneva in May 2006[15]. Some 25 Regional Initiatives have been included in the ITU's Doha Action Plan. ITU has established 'virtual groups' of experts to review demand-driven activities on the national, regional and international levels and build partnerships around major initiatives. This section reviews new initiatives in fixed telephony, mobile, and wireless forms of infrastructure to review progress in programmes to promote the key DOI category of Infrastructure.

'Connectivity is a central enabling agent in building the Information Society. Universal, ubiquitous, equitable and affordable access to ICT infrastructure and services, constitutes one of the challenges of the Information Society and should be an objective of all stakeholders involved in building it.'

para 2, *Geneva Plan of Action.*

5.5.1 Fixed line telephony

Fixed line telephony has been challenged by the worldwide growth in mobile phones, as discussed in Chapter three. However, there remains a strong need for basic connectivity in Africa and Asia, where connectivity is the main factor driving the digital divide and limiting access to ICTs[16]. Meanwhile, fixed-line penetration is actually falling in some higher-income countries. Of particular concern to developing countries with their high rural populations are urban/rural divides in connectivity, particularly while dial-up remains the most widely-used technology to access the Internet. Several countries have initiated programmes to address rural connectivity and village connectivity (see Box 5.6). Of equal importance, however, are initiatives to establish more sophisticated infrastructure in backbone networks and Internet Exchange Points (IXPs). ITU held a workshop entitled 'What Rules for IP-enabled Next-Generation Networks (NGN)?' in April 2006, examining the implications of the transition to NGN for developing countries.[17]

In **Australia**, the National Communications Fund (NCF) founded by the national Government, will support the roll-out of infrastructure and applications for high-speed

Box 5.6: Connecting villages

The Ethiopian Telecommunications Corporation (ETC) established 'The Rural Connectivity Project' to provide telephone services to nearly 15'000 rural villages or kebeles, reducing the average distance rural communities travel to get to telecom services from 50 km to nearly 10 km. This initiative is one of many seeking to improve ICT adoption in **Ethiopia**. This programme aims to connect 15'000 villagers to telecommunication services by 2015 to enable them to take advantage of the opportunities ICTs create for growth, poverty reduction and full involvement in the global Information Society.

In **Indonesia**, the DESA berDERING 2010 programme aims to provide telephone access into all Indonesian villages by 2010. Even if, overall, national infrastructure is relatively well-developed, about 43'000 villages out of 72'000 still lack telephone access. A multi-stakeholder coalition, including the Government and national telecommunication operators, is seeking to provide village connectivity throughout Indonesia.

In 2004, the Ministry of Information Industry of **China** started the 'Cun Cun Tong' or 'Village connected' Project. This project is a transitional measure promoting universal telecom services in rural areas (China has not yet established a universal service fund). This project aims to promote universal access in 70'000 villages without telephone coverage. A public-private partnership has been set up assigning unconnected villages in 31 provinces to six basic telecom operators. These operators will self-finance and complete the coverage of the provinces. By the end of 2005, China had already connected more than 50'000 villages. The task of remaining 20'000 villages will be completed by 2010.

Jordan's 'e-Village' project aims to transform villages into gender-sensitive, empowered communities where ICTs can be used to achieve a better quality of life. It is implemented in line with the UN Development Fund for Women (UNIFEM)'s strategic objectives to raise awareness of opportunities for women's participation in the labour market. Jordan has affordable ICT services, as measured by the DOI, but digital opportunities for women are low compared to those for men. The project addresses this gap and seeks to raise opportunities for rural women in the field of ICTs within villages, bridging the digital divide through a gender-mainstream approach. Partners include the Government of Jordan, local municipalities and the National Information Technology Centre, as well as the British Council, United Nations Volunteers, UNESCO, AMIR/USAID, iEarn, Jordan Telecom Fund, Wanadoo, Intel, Computer Clubhouse Network, Target S.S, Cisco, Microsoft, and the Arab Academy for Microsoft Technologies.

The 'Lagos Digital Village' is an ICT training and opportunity centre for **Nigeria**'s youth. This project aims to raise a new generation of Nigerian youth with appropriate ICT skills, which will help them to achieve better personal and professional development. The project is a multi-stakeholder partnership between Junior Achievement of Nigeria, Microsoft and the Lagos State Government, and it enjoys support from volunteer tutors and the Lagos Mainland Local Government.

Source: WSIS Stocktaking Database, www.itu.int/wsis/stocktaking.

telecommunication networks to deliver education and health services to the most remote parts of Australia.

An ambitious project for the interconnection of the three East African Internet Exchange Points (IXPs) in **Kenya**, **Uganda** and **Tanzania** aims to increase and rationalise the volume of within-region traffic. A multi-stakeholder task force has been established, comprising representatives from regulators, Internet Service Providers (ISPs) and public telecommunication operators from the three countries, which are currently among the most poorly connected nations worldwide.

The Telecom Operations project conceived by the Canadian International Development Agency (CIDA) aims to develop, test, and communicate a viable and sustainable model for improved access to services and growth in teledensity in rural areas throughout **India**. It aims to contribute to poverty reduction and social and economic development.

5.5.2 Mobile communications

The role of mobile connectivity in enhancing access has been extensively discussed throughout this Report. Developing countries are increasingly achieving the telecommunication transition through mobile telephony (see Box 1.1 in Chapter one). The growth of cellular telephony promises to be the most immediate means of bridging the digital divide in many developing countries.

Meanwhile, in developed countries, mobile telephony is gaining new capabilities. ITU has organised several workshops to trace the legal, regulatory and development implications of new innovations in mobile. A workshop on Networked RFID: Systems and Services was held in February 2006 in Geneva, Switzerland, examining the implications of RFID[18]. In June 2006, together with the Federal Network Agency of Germany, ITU will hold a workshop on the Regulatory Environment for Future Multimedia Services.[19]

The large number of competing private cellular operators means that fewer concrete partnerships have been undertaken to implement WSIS goals. The private sector has a strong involvement in the deployment of new mobile networks and civil society and international organisations

'Well-developed information and communication network infrastructure and applications, adapted to regional, national and local conditions, easily-accessible and affordable, and making greater use of broadband and other innovative technologies where possible, can accelerate the social and economic progress of countries, and the well-being of all individuals, communities and peoples.'

Para 22, *Geneva Declaration of Principles*

have as yet only limited opportunities to play an active role. Nevertheless, some projects confirm the promise of mobile expansion for the promotion of digital opportunities.

Under the 'Mobile phones on National Highways programme', implemented by the Department of Communications, Information Technology and the Arts of **Australia**, funding is being provided to Telstra, with support from the private sector, to improve mobile phone coverage to 62 segments along 34 selected regional highways. This programme was developed in response to concerns about mobile phone coverage in rural areas - even though Australia is doing particularly well with regards to Opportunity, its Infrastructure development is only two-thirds complete, according to the DOI.

Nokia and the Grameen Foundation (one of two laureates awarded the inaugural World Information Society Award by ITU in 2006), have joined forces to bring affordable telecommunications to rural women. Building on the experience of the 'phone ladies' in **Bangladesh** and **Uganda**, the original Grameen concept is also being adapted now in Rwanda. In order to achieve full network coverage in rural Uganda and Rwanda, the partners have jointly developed a solution based on Nokia's entry-level phones and an external antenna to serve rural communities in these countries. This rural village phone project aims to provide rural communities with reliable and affordable communications services through mobile phones to enable them to start self-sustaining businesses. With the help of micro-finance, people living in rural areas can become 'village phone operators' to provide communications to their communities.

In **Nepal**, Spice Nepal Private Limited (SNPL), a joint venture company of Kazakhstan and Nepal, launched its mobile services in September 2005. There are currently two mobile operators active in Nepal and mobile penetration stood at 1.7 per cent as of mid-2005. This mobile partnership was catalysed by the WSIS process, and launched to coincide with the Tunis Phase of the WSIS, in commemoration of the impact that the World Summit had had on ICT development in Nepal.

The **World Bank Group Private Sector support**, which has a long-term activities in the ICT for Development sector, also supports developing countries' needs with regards to the WSIS implementation by working with infrastructure service providers and IT companies to extend access to basic voice and data communications to unserved or under-served areas, mainly through mobile and fixed-line services.

'Encourage the use of unused wireless capacity, including satellite, in developed countries and in particular in developing countries, to provide access in remote areas, especially in developing countries and countries with economies in transition, and to improve low-cost connectivity in developing countries.'

para 9i, *Geneva Plan of Action*

5.5.3 Broadband

With the growth of Internet-enabled services worldwide, many governments, international agencies, telecommunication companies and entrepreneurs recognize the importance of promoting the Internet and upgrading their existing networks (para 22, Geneva Declaration of Principles). The implementation of higher-speed Internet access networks has led to growth in capacity and download speeds, as discussed in Chapter three. Different solutions have been adopted in the different parts of the world.

In South America, the Rio de Janeiro State Government in Brazil has established a Digital Inclusion Programme that aims to disseminate Internet and other ICTs and to equip Internet Community Centres with broadband, especially among disadvantaged communities, to reduce social inequality. In the same region, the Fostering Broadband Internet Access in the Andean Countries programme aims to increase broadband connectivity in Bolivia, Colombia, Ecuador, Peru and Venezuela. Led by ITU, the programme also involves the Association of the Telecommunication Companies of the Andean Community (ASETA). A number of studies and workshops are being undertaken to harmonise national projects to comply with the guidelines set.

In the Arab region, the countries from the Gulf emerge as clear leaders. One promising project is the Basra-Kuwait Connection project, designed and led by the Ministry of Communication of Kuwait, to provide greater bandwidth between the Gulf and other Arab countries. Heaving already achieved relatively high DOI scores, the Gulf countries are today focusing on the next generation of digital technologies. Meanwhile, in 2006, the Government of Egypt is spearheading an ambitious Broadband Initiative, to increase broadband penetration and provide all citizens with easy and affordable access to the opportunities offered by the ICTs. Collaborative efforts from the national Government and the private sector are playing a central role in achieving these objectives. The concrete initial target of the initiative is 50'000 subscribers during the first year. To meet this target, the initiative aims to: reduce monthly charges for 256 Kbit/s ADSL services by 50 per cent to reach 150 EGP (about 20 USD); reduce ADSL installation times to one week maximum; and increase public awareness of ADSL through marketing campaigns.

Eastern European countries generally do better in terms of broadband connectivity than most CIS and developing countries, but still lag behind OECD countries in infrastructure capacities. Different initiatives have been launched to accelerate this transition. The iBulgaria initiative of the Ministry of Transport and Communications (MTC) of Bulgaria was launched in late 2004. This initiative is based on two mutually-related groups of actions: the stimulation of service provision (mainly by private operators), as well as application- and content-creation incentives in online services. In Lithuania, the Broadband Infrastructure Development Strategy 2005-2010 of the Government promotes the use of broadband networks by public administration, private companies and individuals. In particular, it promotes broadband networks in non-competitive (mainly rural) areas through public and private capital investment. The long-term goal is to connect all public administration to the broadband network by 2009.

In Asia, many less developed countries are seeking to accelerate their technological pace and guarantee good and reliable infrastructure for their citizens. The Broadband Satellite Gateway of the Ministry of Posts and Telecommunications of **Myanmar** is based on a Broadband Satellite System that has multiple applications, from distance-learning and telemedicine to job recruitment interviews, direct-sales and legal teleworking. The project is being undertaken by the Government of Myanmar, with industry and civil society partners.

5.5.4 Wireless communications

The high cost of conventional wireline infrastructure prevents the full utilization of ICTs for development objectives. Wireless technologies offer easy-to-install, low-cost solutions complementing conventional infrastructure. The cost of wireless networking equipment continues to fall, while capabilities grow. WSIS recognized the potential of these technologies to bring more people online faster, at lower cost. As explained in Chapter two, the flexibility and ease of installation of Wi-Fi are key success factors, and this is increasingly true also for WiMax, allowing networks to be built bottom-up, according to local needs, in line with local demand. Local government and communities can get involved in installing affordable infrastructure.

The UN ICT Task Force has established the joint Wireless Internet Opportunity for Developing Countries programme with the Wireless Internet Institute (W2i) to raise awareness and capacity among developing country businesses, NGOs and policy-makers on the steps needed to promote Wireless Internet deployment. In Uganda, the pilot Wireless IP project around Nakaseke Multipurpose Community Telecentre is a joint venture between the Government of **Uganda** and ITU that aims to test the viability of wireless IP technology in rural areas.

Developed by the Association for Progressive Communication (APC), the Community Wireless Connectivity project aims to develop capacity around the use of wireless technologies for community networking in **Africa**. What makes the APC project unique is that, rather than just providing wireless technologies, it teaches the local community to build the technologies itself. The APC project seeks to use wireless technology in a community-based way. During workshops delivered in the field in the local dialect, local people learn how to design and implement a wireless access point and how to maintain it. Training in basic ICT skills is also provided, with computer equipment for the local wireless telecentres.

In **Asia** and **Latin America**, many countries are opting for Very Small Aperture Terminals (VSATs), which cost less and are easier to set up than other communication technologies, and which can connect individuals, access points, enterprises or phone shops via satellite. In Africa in particular, VSAT solutions promise to generate benefits for many people and partnership efforts have been established. In **Namibia**, the Infrastructure Expansion and Modernization of Telecommunications Infrastructure Programme aims to realize a 100 per cent digital backbone. As of 2006, it connects all major towns along the main routes through a 6'000 km fibre optic network. A VSAT solution now allows access to the remote areas.

SWANSAT is a constellation of high powered geosynchronous orbit (GSO) satellites licensed for global provision of two-way broadband services utilizing six GHz in the W-band from as many as twelve GSO slots. The first spacecraft in the programme is planned for deployment in mid-2010, and will deliver satellite-delivered "open" telecommunications (including broadband) to poorer people throughout Asia and beyond, who could not otherwise afford internet services. Its sponsors include charitable trusts and Not-For-Profit organisations. The price of telecom services will be based on the local economy.

Box 5.7: Bridging the Gender digital divide in Africa

Equal access to ICTs for women and man is insufficient to guarantee gender equality. Women and girls have to be given special attention and opportunities to empower disadvantaged women, who are often over-represented among the rural poor and illiterate. Women are also confronted by more restrictions in access to and use of ICTs than men. Domestic duties and social barriers can prevent women from taking advantage of digital opportunities.

To help reverse these trends, the Government of the Czech Republic has collaborated with the ITU's Special Initiative on Gender Issues and the Centre for Excellence for English-speaking Africa, and the Advanced Level Telecommunications Training Institute in **Kenya** to support the training of students and teachers from the Uthiru Girls High School in Nairobi in 2005. Students received hands-on training in the use of basic computer applications and the Internet.

The LinKS project on Gender, Biodiversity and Local Knowledge Systems for Food Security in Eastern and Southern Africa led by FAO works with grassroot organisations on the collection and dissemination of information on the linkages between gender, local knowledge and agrobiodiversity. The project provides partners (local communities, NGOs, government and policy-makers) with opportunities to share what they have learned about farming knowledge and practices. In **Tanzania**, this effort resulted in the creation of the Local and Indigenous Knowledge Systems (LinKS) Trust, which will establish and operate a resource centre for documentation, database information, research development and training.

The BBC World Service Trust Project My Life-Hekaity: Where am I now and where do I want to be by 2015? allows young women to create their own content on the Internet. The project has run workshops with local NGO partners in **Egypt, Saudi Arabia, Syria and Yemen** to enable young women to generate socially meaningful content in the form of personal audio-visual stories that explore their aspirations for the future. The stories published on BBC Arabic.com generated a huge response from Internet users. This cultural exchange and interaction has contributed significantly to enhancing girls' communication and media literacy.

The female-led **MCT Network project for African Women** is an initiative that aims to extend affordable and easy ICT access and services to rural and sub-urban communities in Sub-Saharan Africa in response to the WSIS Action Plan. The multi-stakeholder team implementing the project is driven by African Ministries of Communication and Infrastructure, Telecom Operators, local NGOs and women groups.

Source: WSIS Stocktaking database, available at www.itu.int/wsis/stocktaking.

5.6 Utilization

For the implementation of the WSIS *Plan of Action*, a key goal is to design national e-strategies that are in accordance with local and national development priorities[20], including for utilization. ITU estimates that only 30 per cent of Internet users worldwide live in the developing world. However, as Chapter three emphasized, the digital divide is no longer about basic connectivity alone, but about utilization and how ICTs are used. New skills are needed to take full advantage of ICTs and make use of them for participating in the digital world. With this is mind, effective e-strategies must include the development of skills and applications to enhance abilities to use ICTs effectively. Worldwide, strategies have generally focused on education, telemedicine and networks for e-commerce and economic activities online, among others. However, it is not sufficient to use ICTs in new and promising ways; users have to feel secure in their use of ICTs. Further, ICTs should be used in a manner that respects the rights and privacy of other users. This section considers promising initiatives in education/skills, telemedicine, e-commerce and cybersecurity.

5.6.1 Education

Skills training is essential in order to be able to participate and take full advantage of ICTs. Increasing the availability of education, improving its quality, as well as increasing the number of teachers and upgrading their skills are vital to improve education and training networks. Improving ICT literacy and implementing ICTs in education is an expensive and long-term commitment, but essential. It is also an area where the private sector are keen to work in partnership with government and international organisations, given their interest in developing local pools of skilled labour. Microsoft Corporation, Intel and Cisco are working in collaboration with various governments on ICT training and skills programmes.

ITU is working in partnership with Cisco to implement the **Internet Training Centres Initiative**, that will establish 50 Internet training centres in least developed and developing countries. These centres will be responsible for increasing ICT knowledge as widely as possible in local communities. ITU's and Cisco's immediate contribution is to establish the infrastructure needed for the centres and to ensure the training of the teachers vital to this project. Pilot projects with a gender focus have proven a great success.

Malaysia's national ICT agenda Vision 20/20 aims to transform the country into a knowledge-based society by attracting world-class technology-led companies. The corridor, which extends from Kuala Lumpur's city centre, is located in a 750 square km technology zone with a 2.5 gigabyte fibre optic cable system catering to a web of smart cities, smart homes and smart schools. This is the third Malaysian smart city, after Cyberjaya and Putrajaya.

In **Africa**, the Partners in Learning programme of the Government of Burkina Faso and Microsoft has the mission

to help the country elaborate its own digital development vision, build capacities and deploy a nationwide ICT training campaign. The volunteers of Computer Training Caravan in Burundi will carry out ICT training for teachers and students from public secondary schools to improve the digital inclusion of youth nationwide. These mobile units serve specific areas and stop at schools and communities for two-week periods offering tutorials in basic computer and Internet skills.

The **NEPAD e-Africa Commission** launched the NEPAD e-Schools Initiative to implement ICT facilities in 120 Schools in 20 countries over a ten-year period, with the secondary schools component being completed in the first five years. Implementation will start in Algeria, Benin, Burkina Faso, Cameroon, Republic of Congo, Egypt, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Mali, Mauritius, Mozambique, Nigeria, Rwanda, Senegal, South Africa and Uganda. The establishment of NEPAD e-Schools Satellite Network is also planned. Under the auspices of the NEPAD e-Africa Commission, this multi-sector partnership include national governments, private sector consortia (such as HP, Microsoft, Oracle, Cisco, and AMD) and development partners from the international organizations (such as AfDB, COL, CSIR, InfoDev, ITU, UNDP, WHO). Other programmes in Africa seek to bridge the gender divide (see Box 5.7).

Broadband for Schools is a nationwide programme of the Government of **Turkey** and Turk Telekom, that promotes modern and adapted infrastructure, such as broadband, for educational purposes. It was agreed to provide ADSL connection at 512 kbit/s to the 42'500 schools primary and secondary schools (or 90 per cent of the students) in the country by 2006.

Skills and education also needs relevant and appropriate content online to interest and educate students. In **Egypt**, the Million Book Project will create a universal digital library that will foster creativity and widespread access to knowledge. Bibliotheca Alexandrina and its partners are working together to digitise one million books within three years, by 2008, and publishing them as a searchable free access collection on the Internet. All project partners are providing content to ensure that the collection is extensive, diverse and multilingual, and the digital content is widely accessible.

5.6.2 Telemedicine

Specialised eHealth applications are increasing. Initiatives seeking to raise awareness and provide wider information about health issues and prevention are the most common. A close second is the use of ICTs for Health Management Information Systems. However, applications in diagnosis, investigation and even operations over the Internet are spreading rapidly. Telemedicine solutions are now being used in many developing countries to deliver healthcare to remote and rural areas, where medical staff are often lacking and people have to travel long distances to receive medical attention.

Australia is among the most developed in terms of Utilization of ICTs, as shown by the DOI, but the Broadband for Health initiative aims to increase the use of broadband still further, through subsidies to general practitioners, Aboriginal Community Controlled Health Services and pharmacies. Broadband allows healthcare professionals to streamline clinical and administrative services, and will benefit both patients and healthcare providers through improved communications. The project is being implemented by the Australian Department of Health and Ageing and private sector partners.

The Regional Telemedicine project aims to connect 75 hospitals in **Kenya**, **Tanzania** and **Uganda** over five years by clinical outreach through radio (the DOI shows low ICT utilization in these three countries for 2005). The key implementing agency, the African Medical & Research Foundation (AMREF), has embarked on telemedicine to improve quality and access and reduce the costs of its clinical outreach programme. This initiative relates closely to WSIS implementation as it unites the efforts of the national telecommunication and health ministries, hospitals, civil society entities and the largest mobile operator in Kenya, Safaricom.

In **Peru**, the National Institute of Investigation and Qualification of Telecommunications (INICTEL) has developed innovative medical equipment, Telecardio 12, that permits the transmission of patient's cardiac signals from rural medical centres to specialised central hospitals over a telephone line using a PC. Rural populations in remote areas have no, or only limited, access to specialised healthcare, making this technology all the more important for improving healthcare. A pilot has proven successful in the local health centre in the province of Cajatambo connected with the Hospital of Ravine Health in Lima. The project will be replicated in other remote parts of the country.

Established in early 2005, the **Global Observatory for eHealth** is a significant new initiative of the World Health Organization (WHO) reflecting its recognition of the importance of ICTs for strengthening health systems and services in the follow-up to WSIS. The Observatory aims to improve health by providing Member States with strategic information and guidance on effective practices, policies and standards in eHealth. The Observatory has a progressive role in ensuring people-centred implementation of the WSIS outcomes.

5.6.3 E-networks for economic development and poverty reduction

ICTs are an important engine of economic growth. Economic poverty is directly related to the information poverty. In many developing countries, the lack of integration and use of ICTs is one of the major obstacles to the economic growth. Further, ICTs can help address poverty by providing people with access to relevant knowledge and basic information, particularly in agriculture and the primary commodities that account for most developing country exports (see Box 5.8). The following projects give examples of projects that empower people to be active participants in the Information Society, rather than passive consumers.

An Inter-regional Trade Information Platform for Trade Support Institutions in French-speaking **Central and West African countries** will be created by the International Trade Centre (UNCTAD/WTO). It aims to boost trade and create business opportunities through the exchange of trade information, including a directory of buyer and seller companies. The content of this information network will be managed by

locals, so part of the project is focused on developing local capacities in the use of ICTs.

An Industrial Information Network (IIN) has been established in **Pakistan** as a joint venture of the Ministry of Information Technology and Telecom, the Ministry of Industries and Production, SMEDA as executing agency and UNIDO as technical consultant. It aims to use ICTs to connect businesses based on business-to-business (B2B) and business-to-government (B2G) interactions. There is an information portal catering to the online trading and information needs of businesses from different sectors. The project is initially focusing on the textile and leather sectors, with more sectors to be integrated at a later date.

Responding to growing requests from its Member States for ICT components within its projects, **UNIDO** has made information-sharing and networking activities a cornerstone of its technical assistance programmes. It has strengthened its activities with ICT solutions for its partners, including Micro-, Small- and Medium-Sized Enterprises and related intermediary institutions from the public and private sector.

Enablis Entrepreneurship Network is a commercial, non-profit organisation that aims to drive economic development and build self-sustaining Small- and Medium-sized enterprises (SMEs) in developing countries. The network supports entrepreneurs in their everyday use of ICTs through collaboration with partners from the public, private sector and civil society. Enablis is funded and supported by the Government of Canada through the Canada Fund for Africa, as well as by Industry Canada and South Africa, Telesystem-Canada, Accenture and Hewlett-Packard. South Africa is the site for the first operational hub; other hubs are planned in other locations in Africa.

In **India**, partners are working to connect Indian villages to global market. The Digital Empowerment Foundation aims to establish villages on the Internet, by creating an India-wide web-based platform to accumulate grassroot information and make it available in the public domain. A specialised e-commerce platform will be set up for trading local art craft to provide digital opportunities for people in remote rural areas and overcome the rural digital divide. There is strong separation between digital hubs, such as Bangalore, and the rural areas that cover most of India.

The Management and Information System (MIS) project for village-based savings and lending groups uses Self-Help Groups to address the needs of SMEs in **Asian-Pacific developing countries.** The MIS will establish improved village connectivity and communications to help the everyday decision-making of rural people and tracking of accounts, financial position, loan repayment performance and related information for a community of self-help groups. The project is implemented with support from partners from the public and private sector and NGOs from India, Sri Lanka, UK, USA and Germany.

The **United Arab Emirates** have established Tejari as a B2B online marketplace that should support the online trading environment. Tejari has been used by all the Government Departments in Dubai and some major private sector organisations for online procurement. The increasing demand for Tejari's products and services has enabled it expand into five other countries. Tejari is plans to extend its multi-stakeholder partnerships. The UAE, together with Bahrain, are the most highly-ranked Arab digital economies in the DOI, and the UAE continues to lead the region in the Utilization index.

Box 5.8: Internet Agriculture

The following projects have been designed to address the challenges faced by small farmers, including lack of competitiveness and multiple intermediaries. A number of collaborative and sustainable models have been built, based on innovative usage of ICTs to promote rural digital inclusion and welfare in rural communities.

The Agencia Española de Cooperación Internacional (AECI) of **Spain** has established a programme to provide advice, technical support and cooperation networks to facilitate the management of fisheries in the Western and Central Mediterranean. Spain, Morocco, Algeria, Tunisia, Libya and Malta should contribute to the sustainable development of fisheries in the region through a functional and reliable ICT platform.

With support from IDRC's Connectivity Africa programme, Pride Africa is seeking to improve smallholder farmers' productivity and access to markets using ICTs. DrumNet in **Kenya** helps smallholder farmers using an ICT-enabled network of support centres to deliver targeted marketing, financial and information services. Farmers can access ICT-enabled information on crop planting, weather forecasts and real-time market information through mobile phones. DrumNet is implemented by the Ministry of Agriculture of Kenya, micro-finance institutions (Equity Bank) and extension services.

The **Rice Knowledge Bank** is the world's leading repository of easily accessible rice training and extension information that, is designed to help over 100 million rice farmers in the developing world, through training and extension intermediaries. It focuses in particular on Asian-Pacific countries to increase their income. Sponsors include international and national development organisations and banks.

The Farmer Information Network is a conceptual model for using ICTs for agricultural and rural development. It creates a network of rural people, supported by intermediary organisations. Farmnet projects are ongoing in **Bolivia** and **Namibia**, with pipelines planned for East Africa and Latin America based on the work of partners including the FAO and UNFA.

Source: WSIS Stocktaking database, available at www.itu.int/wsis/stocktaking.

5.6.4 Cybersecurity

ITU is the focal point for WSIS Action Line C5 on Building Confidence and Trust in the Information Society. The 2006 'World Telecommunication Day' adopted the theme of Promoting Global Cybersecurity, and ITU organised the first Facilitation Meeting on Action Line C5 in Geneva on 15-16 May 2006[21]. Entitled Partnerships for Global Cybersecurity (see Box 5.9), this meeting focused on partnerships among governments, the private sector and other stakeholders, based on five main themes: information-sharing of national approaches, good practices and guidelines; developing watch, warning and incident response capabilities; technical standards and industry solutions; harmonizing national legal approaches and international legal coordination; and privacy, data and consumer protection. Follow-up activities from this first meeting include a cybersecurity roadmap/toolkit for national policy makers and capacity-building programmes on the harmonization of cybercrime legislation, particularly with regard to the Council of Europe's Convention on Cybercrime.

Box 5.9: Partnerships for Global Cybersecurity

With our growing dependency on ICTs, cybersecurity and critical information infrastructure protection have become increasingly important in many countries. In an ITU survey carried out in early 2006, almost two-thirds of respondents claimed that they avoided certain activities online because of security concerns. The main fears cited were identity theft, viruses and worms (See Box Figure 5.9) A number of countries have begun national programmes to assess related vulnerabilities and take measures to mitigate them. Examples include assessment of critical information infrastructures; the development of strategies to assess risks and address them; review of national legal frameworks to criminalise misuse of ICTs; enhanced judicial cooperation and enforcement; and enhanced efforts in privacy, data and consumer protection.

The WSIS *Declaration of Principles* recognises that strengthening the trust framework (including information security and network security, authentication, privacy and consumer protection) is a prerequisite for the development of the Information Society and for building confidence among users of ICTs. In order to achieve this, a global culture of cybersecurity needs to be actively promoted, developed and implemented in cooperation with all stakeholders and international expert bodies.

The ITU runs many activities on cybersecurity and countering spam, including the launch of a global online reference source of national cybersecurity initiatives and websites worldwide. The Cybersecurity Gateway (**www.itu.int/cybersecurity**) seeks to make stakeholders more aware of the various actors and groups working on the different aspects of cybersecurity on the national, regional and international levels. By proving a framework for sharing cybersecurity related information and resources, ITU wants to take a first step towards concrete action on WSIS action line C5, and building trust and security in the use of ICTs by increasing awareness. With the Cybersecurity Gateway, ITU aims to open the door to a more focused discussion on the roles and responsibilities of cybersecurity actors and what immediate collaborative actions could and should be taken to move forward on building and promoting a global culture of cybersecurity.

Source: ITU.

Box Figure 5.9: Online Fears

Responses to an online survey, March-May 2006

5.7 Conclusions

The WSIS made a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all people[22], where people can access and utilize information and knowledge. At the Tunis phase of the Summit, all stakeholders committed themselves to remain fully engaged—nationally, regionally and internationally—to ensure implementation and follow-up of the outcomes and commitments of the WSIS[23]. This chapter has highlighted some of the projects and initiatives that are underway around the world to make this happen. The key findings emerging from this review are that WSIS has succeeded in raising awareness of ICTs and their opportunities and in mobilising resources. WSIS has catalysed implementation in different fields. Considerable progress has been made towards building a richer and more inclusive Information Society, in which everyone can participate. Although WSIS set 2015 as the date for the overall review of WSIS implementation, the early signs are encouraging, providing all stakeholders can remain engaged.

Endnotes

[1] For the WSIS Stocktaking Database, see www.itu.int/wsis/stocktaking.

[2] The series of reports charting development and trends in telecommunication worldwide published by the ITU. Available from the ITU bookshop, see www.itu.int.

[3] According to the World Telecommunication Development Report (2006), based on the ITU's Regulatory Database, 61 per cent of basic fixed voice telephony is now subject to some form of competition by 2006, with 39 per cent of basic voice services provided by a monopoly provider (usually state-owned). In cellular telephony, the proportions are even higher, with 87 per cent of cellular services provided within a competitive market framework, usually involving another operator that is usually (but not always) privately-run.

[4] For more information on the multi-stakeholder implementation of WSIS outcomes, see: www.itu.int/wsis/implementation.

[5] See the *Tunis Agenda for the Information Society*, para 108-111 + Annex, available from www.itu.int/wsis.

[6] For more information, see: www.itu.int/wsis/implementation/consultation24feb.html.

[7] The stocktaking website portal can be found at: www.itu.int/wsis/stocktaking. The first report is available in six languages at: www.itu.int/wsis/documents/doc_multi.asp?lang=en&id=2167|0.

[8] 'From the Ground Up – The Evolution of the Telecentre Movement', Andy Carvin, 2006, available from www.telecentre.org.

[9] For an excellent review of factors affecting the use of ICTs in developing countries, see 'Information Technology, Development and Policy', eds Roche, Edward Mozley and Michael James Blaine (Brookfield, Vermont: Avebury Publishing, 1996).

[10] Roman & Colle (2002), 'Themes and Issues in Telecentre Sustainability', Development Informatics Working Paper series, No. 10, January 2002.

[11] See www.bridges.org.

[12] telecentre.org's founding social investors include Canada's International Development Research Centre (IDRC), the Microsoft Unlimited Potential programme and the Swiss Agency for Development and Cooperation (SDC). This partnership will expand to include new partners over time. See www.telecentre.org.

[13] The World Bank notes problems in the practice and operation of such Funds, which may not be well regulated, but may prove well-funded. In some countries, these Funds have become part of the State apparatus and bureaucracy. The World Bank notes that in some cases, well-funded Universal Service Funds have become lucrative targets for meddling and interference. See the World Bank's Working Papers in Telecommunication Reform series for Ghana and Uganda, available from www.worldbank.org.

[14] 'From Rural Village to Global Village: Telecommunications Development in the Information Age', Heather Hudson, Lawrence Erlbaum Associates, NJ, 2006.

[15] For information on the implementation of WSIS action line C2 (infrastructure), see: www.itu.int/wsis/c2/index.html.

[16] See UNCTAD's work to assess the extent and magnitude of the digital divide using Gini coefficients, as published in the UNCTAD ICT Development Report, available from www.unctad.org/stdev.

[17] For more information, including background papers on interconnection and universal service in an NGN environment, see www.itu.int/osg/spu/ngn/event-march-2006.phtml.

[18] For more information, see: www.itu.int/ITU-T/worksem/rfid/index.html.

[19] For more information, see: www.itu.int/osg/spu/ni/multimobile/index.html.

[20] *Tunis Agenda for the Information Society* para 90 a).

[21] For more information, see: www.itu.int/osg/spu/cybersecurity/index.phtml.

[22] Opening paragraphs of the *Geneva Declaration of Principles* and the *Tunis Commitment*.

[23] *Tunis Agenda for the Information Society*, para. 83.

CHAPTER SIX

Towards an Information Society for all

6.1 Conclusions

The World Summit on the Information Society made a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all[1], where people can access and utilize information and knowledge. This Report responds to the call of the *Geneva Plan of Action* for monitoring the WSIS implementation and follow-up, with 'analytical work on policies and their implementation' and that 'appropriate indicators and benchmarking … should clarify the magnitude of the digital divide in both its domestic and international dimensions'[2]. In response, this Report has introduced the Digital Opportunity Index (DOI) as a tool to measure progress in building the Information Society, and showed how it can be used to track the key dynamics driving the Information Society worldwide.

This Report explains how the DOI measures digital opportunity or people's ability to access and use ICTs, in its structure of:

- **Opportunity,** or people's potential for using ICT, in terms of coverage and affordability (including mobile and Internet price data);
- **Infrastructure,** the basic framework for accessing the Information Society, in both fixed and mobile means of access; and
- **Utilization,** to capture people's participation in the Information Society in their usage of ICTs, including innovative technologies such as broadband and mobile Internet.

The DOI measures digital opportunity for 180 economies to date, the widest coverage yet achieved by any composite index that seeks to monitor the development of the Information Society. It has a flexible, modular structure that can be broken down into separate scores for a country's fixed and mobile sectors. Furthermore, in addition to indicators monitoring the quantity of access, it also includes a number of technological advancement ratios measuring quality of access (for example, the ratio of broadband subscribers as a proportion of total Internet subscribers). This means that the DOI is capable of capturing and measuring phenomena such as technological leapfrogging and the rapid growth in mobile communications. The DOI is thus development-oriented, as it can evaluate developing countries on their strengths, in mobile telephony and wireless communications, rather than their weaknesses in the (absence of) fixed-line structure, often the main focus of other indices.

The Report shows how the DOI can be used to enrich and inform policy-making, on several levels. The DOI can be used to evaluate discrepancies and inequalities in access between geographical regions (the international digital divide) and regions within a country (the domestic digital divide) at a point in time. This means that the DOI is capable of monitoring the extent of existing inequalities, and can help policy-makers in their efforts to address differences and inequality in access to ICTs.

This Report has also tracked the shifting dynamics of the Information Society over time using the DOI. Time series data have been developed for 2001-2005 for 40 key economies. This analysis shows that the economies with the fastest growth in digital opportunity are the developing giants of China, India, Brazil and Russia[3]. However, the profile of development is different. China and Russia have experienced strong growth in infrastructure, whilst India has made strong gains in the accessibility and affordability of telecommunications. Brazil has succeeded in strengthening all three aspects to digital opportunity—opportunity, infrastructure and utilization—implying rounded and balanced development of the Information Society. Through its analysis of different indicators, the DOI can track changes in the shifting dynamics of digital opportunity, to allow policy-makers to prioritise particular aspects of policy in specific countries.

Furthermore, the DOI is a versatile and forward-looking index. It includes the innovative, new technologies from which future digital opportunities will grow, including broadband and mobile Internet access. This Report analyses the strong growth in broadband (Chapter three) and mobile Internet (Chapter two). Far from being the preserve of developed countries, more and more countries are enjoying the benefits of higher-speed access in commercially available broadband and mobile Internet. Importantly, the prices

of telecommunications (mobile, Internet and broadband services) are, on average, falling. However, developed countries generally enjoy greater and more varied data services, at faster speeds and lower cost. The strong gains in mobile telephony by the developing world evidenced by the DOI offer the prospect of greater access to telecommunications by more of the world's population, but the digital divide continues to evolve in new ways. The digital divide can no longer be measured only in terms of basic connectivity, but is taking on new dimensions in speed, capacity and mobility of access.

Chapter four considers the changing policy landscape in the goals of universal access/service, affordability, digital inclusion, broadband and wireless access, amongst others. It shows how policy-makers can use the DOI to inform policy-making and policy design to achieve the WSIS goals. It demonstrates different applications of the DOI for analysing digital gaps between regions at the national and international levels, for assessing gender gaps and for monitoring digital inclusion.

The DOI is a useful policy tool that can be adapted to assess all of data requirements. The DOI has been used in this Report to:

- Analyse digital opportunity throughout the continent of Africa;
- Perform a benchmark comparison of India's performance relative to neighbouring countries;
- Examine regional disparities in digital opportunity in Brazil; and
- Identify the extent of the gender gap in the Czech Republic.

The DOI is not an abstract mathematical construction, but has real 'hands-on' applications for policy-makers, particularly in the context of the commitments made by governments at the World Summit. The chapter also outlines indications for next steps in the application of the DOI for policy-making, as it is intended to apply the DOI in new ways, based on the feedback received from this first edition.

Following on from this policy analysis, this Report also reviews current implementation and efforts to realise the Information Society in the light of the WSIS goals. During the WSIS, all stakeholders committed themselves to remain fully engaged to ensure implementation and follow-up of the outcomes and commitments of the WSIS. Multi-Stakeholder Partnerships play a key role in this process. As the organisation with the lead managerial role in the World Summit, the ITU is actively involved in its implementation and follow-up and has committed to working closely with all stakeholders to realise the WSIS goals.

Chapter five reviews progress in implementation since the conclusion of the Summit in Tunis to extend the benefits of ICTs to more people, new communities and different cultures. It highlights some of the projects and initiatives that are underway around the world to make this happen. It gives examples of real-world, practical initiatives by a range of all stakeholders. The World Summit has catalysed implementation and real progress has been made towards building a richer and more inclusive Information Society, in which everyone can participate.

6.2 Next Steps

This inaugural edition of the *World Information Society Report*s is the first of an annual series of reports tracking progress in building the Information Society. The DOI will be updated annually and will continue to be developed to meet policy needs and the requirements of governments and policy-makers. In this context, feedback on this first edition is very welcome in helping to hone the DOI as a tool and to improve its usefulness in different policy contexts.

One important direction for future work is in the development of a matrix, to establish linkages among policy goals, performance and the regulatory environment. A policy matrix would allow the relationships between performance and development strategies of a country to be analysed. The DOI will also be used as a frame of reference to evaluate progress towards specific goals, including those contained in the *Geneva Plan of Action* for 2015, or countries' own regional and national targets for bridging the digital divide.

Another important step is to improve the accessibility of the index, by continuing to develop the DOI website[4] and helping policy-makers to use the DOI for their own purposes, for instance by designing appropriate questionnaires, submitting the latest data, setting policy targets on the basis of peer comparisons, or combining the DOI with other indices of socio-economic development.

ITU and the Korea Agency for Digital Opportunity and Promotion (KADO) are working to develop a policy toolkit for the DOI through an open and participatory collaborative process. This will include the involvement and input of other stakeholders, including governments, other international organisations, business and civil society representatives. The policy toolkit will be further discussed at a workshop hosted by the Government of the Republic of Korea, to be held in Seoul, 31 August-1 September 2006.

Finally, future editions of this Report will use and apply the DOI to track the growth of digital opportunity and progress towards a rich and inclusive Information Society around the world, in line with the WSIS goals.

Endnotes

[1] Opening paragraphs of the *Geneva Declaration of Principles* and the *Tunis Commitment*.

[2] *WSIS Geneva Plan of Action*, excerpts from para 28.

[3] Termed the 'BRIC' economies by some analysts.

[4] See www.itu.int/doi.

Statistical Annex

Contents

Introduction to the statistical annex

Data are presented for 180 economies with populations greater than 40'000 and where sufficient data are available to compile the Digital Opportunity Index.

Economies are grouped by geographic region: Africa, the Americas, Asia, Europe and Oceania. In Table 2 and the regional map, Oceania is shown as part of the Asia-Pacific region. Economies are shown in alphabetical order within each region in the tables. See Table A for a list of economies in alphabetical order and their location in the world tables.

The data cover the public telecommunications sector. Due to differing regulatory obligations for the provision of data, a complete measurement of the sector for some economies cannot be achieved. Data for major telecommunication operators, covering at least 90 per cent of the market, are shown for all economies. More detailed information about coverage and country specific notes together with a full time-series from 1960, 1965, 1970, 1975-2004 is contained in the ITU World Telecommunication Indicators Database, available separately online or on CD-ROM.

Data refer to the reporting period that is closest to the end of year indicated. See Table A for the fiscal year reporting period used in each economy.

Telecommunication data are supplied by an annual questionnaire sent to telecommunication authorities and operating companies. These data are supplemented by annual reports and statistical yearbooks of telecommunication ministries, regulators, operators and industry associations. In some cases, estimates are derived from ITU background documents or other references; estimates are shown in italic. Pricing data are obtained from service provider websites and by correspondence with service providers. Demographic and macro-economic data are provided by the relevant international organizations identified in the Technical notes.

The following signs and symbols are used in the tables:
The absence of any sign or symbol indicates that data are in units.

Comments and suggestions relating to the World Telecommunication Indicators should be addressed to:

Strategy and Policy Unit

International Telecommunication Union

Place des Nations
CH-1211 Geneva 20
Switzerland

Fax: +41 22 730 6449

E-mail: spumail@itu.int

Additional information about Telecommunication Indicators can be found at the ITU's website at www.itu.int/ITU-D/ict/.

Italic	Year other than that specified or estimate.
k	Thousands (i.e., 1'000).
M	Millions (i.e., 1'000'000).
B	Billions (i.e., 1'000'000'000).
US$ or USD	United States dollars. See the Technical notes for how US$ figures are obtained.
%	Per cent.
_	Zero or a quantity less than half the unit shown. Also used for data items that are not applicable.
...	Data not available.
CAGR	Compound Annual Growth Rate. See the Technical notes for how this is computed.

Table A: List of economies

Economy	Location*	Period	Region
Albania	133	Ending 31.12	Europe
Algeria	1	Ending 31.12	Africa
Angola	2	Ending 31.12	Africa
Antigua & Barbuda	52	Beginning 01.04	Americas
Argentina	53	Ending 30.09	Americas
Armenia	87	Ending 31.12	Asia
Australia	173	Ending 30.06	Oceania
Austria	134	Ending 31.12	Europe
Azerbaijan	88	Ending 31.12	Asia
Bahamas	54	Ending 31.12	Americas
Bahrain	89	Ending 31.12	Asia
Bangladesh	90	Ending 30.06	Asia
Barbados	55	Beginning 01.04	Americas
Belarus	135	Ending 31.12	Europe
Belgium	136	Ending 31.12	Europe
Belize	56	Beginning 01.04	Americas
Benin	3	Ending 31.12	Africa
Bhutan	91	Ending 31.12	Asia
Bolivia	57	Ending 31.12	Americas
Bosnia	137	Ending 31.12	Europe
Botswana	4	Beginning 01.04	Africa
Brazil	58	Ending 31.12	Americas
Brunei Darussalam	92	Ending 31.12	Asia
Bulgaria	138	Ending 31.12	Europe
Burkina Faso	5	Ending 31.12	Africa
Burundi	6	Ending 31.12	Africa
Cambodia	93	Ending 31.12	Asia
Cameroon	7	Ending 31.12	Africa
Canada	59	Ending 31.12	Americas
Cape Verde	8	Ending 31.12	Africa
Central African Rep.	9	Ending 31.12	Africa
Chad	10	Ending 31.12	Africa
Chile	60	Ending 31.12	Americas
China	94	Ending 31.12	Asia
Colombia	61	Ending 31.12	Americas
Comoros	11	Ending 31.12	Africa
Congo	12	Ending 31.12	Africa
Costa Rica	62	Ending 31.12	Americas
Côte d'Ivoire	13	Ending 31.12	Africa
Croatia	139	Ending 31.12	Europe
Cuba	63	Ending 31.12	Americas
Cyprus	140	Ending 31.12	Europe
Czech Republic	141	Ending 31.12	Europe
D.R. Congo	14	Ending 31.12	Africa
Denmark	142	Ending 31.12	Europe
Djibouti	15	Ending 31.12	Africa
Dominica	64	Beginning 01.04	Americas
Dominican Rep.	65	Ending 31.12	Americas
Ecuador	66	Ending 31.12	Americas
Egypt	16	Ending 31.12	Africa
El Salvador	67	Ending 31.12	Americas
Equatorial Guinea	17	Ending 31.12	Africa
Eritrea	18	Ending 31.12	Africa
Estonia	143	Ending 31.12	Europe
Ethiopia	19	Ending 30.06	Africa
Fiji	174	Ending 31.12	Oceania
Finland	144	Ending 31.12	Europe
France	145	Ending 31.12	Europe
Gabon	20	Ending 31.12	Africa
Gambia	21	Beginning 01.04	Africa

Economy	Location*	Period	Region
Georgia	95	Ending 31.12	Asia
Germany	146	Ending 31.12	Europe
Ghana	22	Ending 31.12	Africa
Greece	147	Ending 31.12	Europe
Grenada	68	Ending 31.12	Americas
Guatemala	69	Ending 31.12	Americas
Guinea	23	Ending 31.12	Africa
Guinea-Bissau	24	Ending 31.12	Africa
Guyana	70	Ending 31.12	Americas
Haiti	71	Ending 31.12	Americas
Honduras	72	Ending 31.12	Americas
Hong Kong, China	96	Beginning 01.04	Asia
Hungary	148	Ending 31.12	Europe
Iceland	149	Ending 31.12	Europe
India	97	Beginning 01.04	Asia
Indonesia	98	Ending 31.12	Asia
Iran (I.R.)	99	Beginning 22.03	Asia
Ireland	150	Beginning 01.04	Europe
Israel	100	Ending 31.12	Asia
Italy	151	Ending 31.12	Europe
Jamaica	73	Beginning 01.04	Americas
Japan	101	Beginning 01.04	Asia
Jordan	102	Ending 31.12	Asia
Kazakhstan	103	Ending 31.12	Asia
Kenya	25	Ending 30.06	Africa
Korea (Rep.)	104	Ending 31.12	Asia
Kuwait	105	Ending 31.12	Asia
Kyrgyzstan	106	Ending 31.12	Asia
Lao P.D.R.	107	Ending 31.12	Asia
Latvia	152	Ending 31.12	Europe
Lebanon	108	Ending 31.12	Asia
Lesotho	26	Beginning 01.04	Africa
Libya	27	Ending 31.12	Africa
Lithuania	153	Ending 31.12	Europe
Luxembourg	154	Ending 31.12	Europe
Macao, China	109	Ending 31.12	Asia
Madagascar	28	Ending 31.12	Africa
Malawi	29	Ending 31.12	Africa
Malaysia	110	Ending 31.12	Asia
Maldives	111	Ending 31.12	Asia
Mali	30	Ending 31.12	Africa
Malta	155	Ending 31.12	Europe
Mauritania	31	Ending 31.12	Africa
Mauritius	32	Ending 31.12	Africa
Mexico	74	Ending 31.12	Americas
Moldova	156	Ending 31.12	Europe
Mongolia	112	Ending 31.12	Asia
Morocco	33	Ending 31.12	Africa
Mozambique	34	Ending 31.12	Africa
Myanmar	113	Ending 31.12	Asia
Namibia	35	Ending 30.09	Africa
Nepal	114	Ending 15.7	Asia
Netherlands	157	Ending 31.12	Europe
New Zealand	175	Ending 30.06	Oceania
Nicaragua	75	Ending 31.12	Americas
Niger	36	Ending 31.12	Africa
Nigeria	37	Ending 31.12	Africa
Norway	158	Ending 31.12	Europe
Oman	115	Ending 31.12	Asia
Pakistan	116	Ending 30.06	Asia

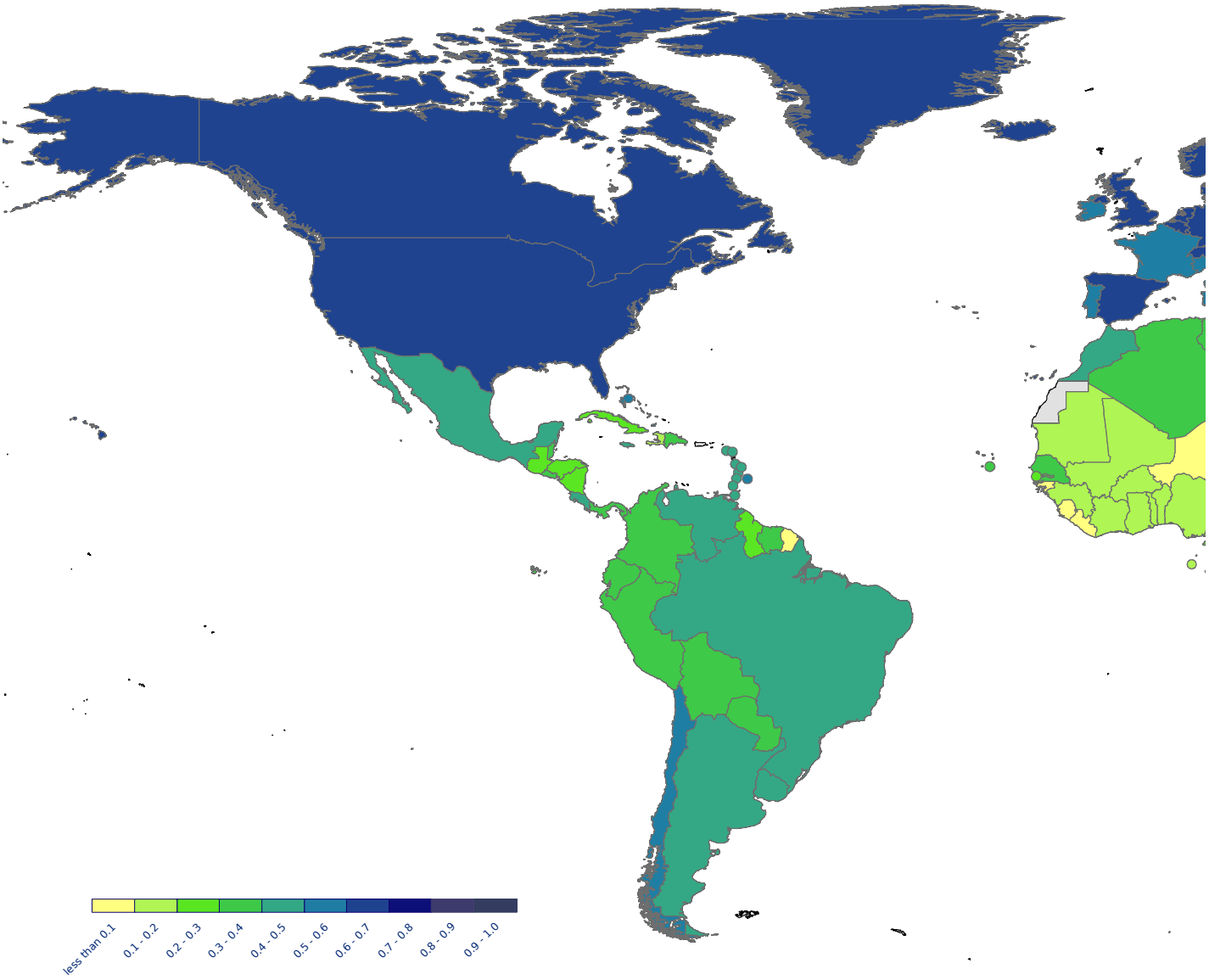
Economy	Location*	Period	Region
Palestine	117	Ending 31.12	Asia
Panama	76	Ending 31.12	Americas
Papua New Guinea	176	Ending 31.12	Oceania
Paraguay	77	Ending 31.12	Americas
Peru	78	Ending 31.12	Americas
Philippines	118	Ending 31.12	Asia
Poland	159	Ending 31.12	Europe
Portugal	160	Ending 31.12	Europe
Qatar	119	Ending 31.12	Asia
Romania	161	Ending 31.12	Europe
Russia	162	Ending 31.12	Europe
Rwanda	38	Ending 31.12	Africa
S. Tomé & Principe	39	Ending 31.12	Africa
Samoa	177	Ending 31.12	Oceania
Saudi Arabia	120	Ending 31.12	Asia
Senegal	40	Ending 31.12	Africa
Serbia & Montenegro	163	Ending 31.12	Europe
Seychelles	41	Beginning 01.04	Africa
Sierra Leone	42	Ending 31.12	Africa
Solomon Islands	178	Beginning 01.04	Oceania
Singapore	121	Beginning 01.04	Asia
Slovak Republic	164	Ending 31.12	Europe
Slovenia	165	Ending 31.12	Europe
South Africa	43	Beginning 01.04	Africa
Spain	166	Ending 31.12	Europe
Sri Lanka	122	Ending 31.12	Asia
St. Kitts and Nevis	79	Beginning 01.04	Americas
St. Lucia	80	Beginning 01.04	Americas
St. Vincent	81	Beginning 01.04	Americas
Sudan	44	Ending 31.12	Africa

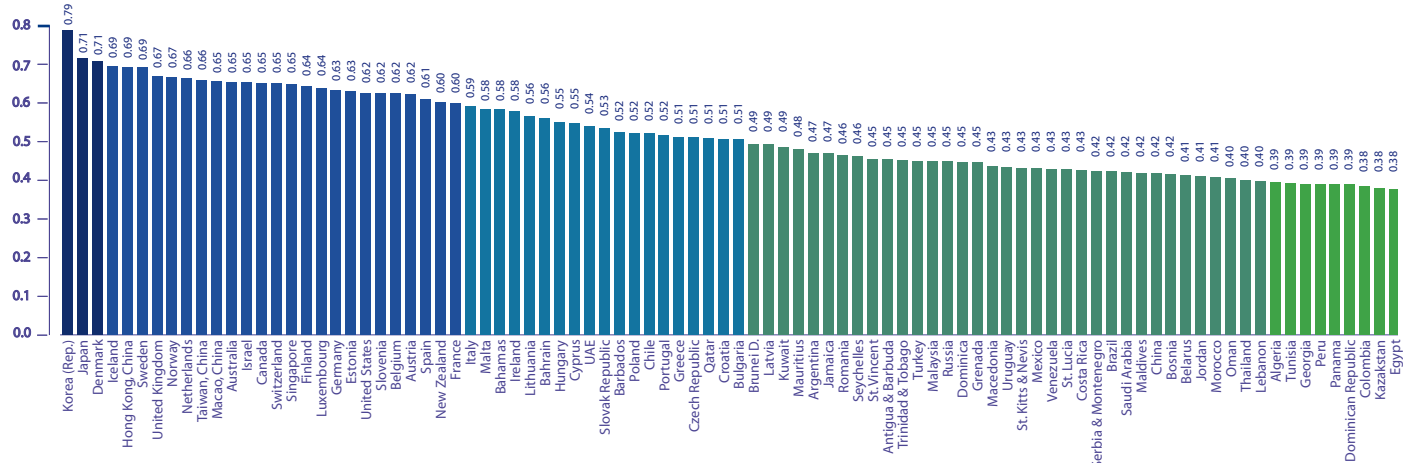
Economy	Location*	Period	Region
Suriname	82	Ending 31.12	Americas
Swaziland	45	Beginning 01.04	Africa
Sweden	167	Ending 31.12	Europe
Switzerland	168	Ending 31.12	Europe
Syria	123	Ending 31.12	Asia
Taiwan, China	124	Ending 31.12	Asia
Tajikistan	125	Ending 31.12	Asia
Tanzania	46	Ending 31.12	Africa
TFYR Macedonia	169	Ending 31.12	Europe
Thailand	126	Ending 30.09	Asia
Timor, Leste	127	Ending 31.12	Asia
Togo	47	Ending 31.12	Africa
Tonga	179	Ending 31.12	Oceania
Trinidad & Tobago	83	Beginning 01.04	Americas
Tunisia	48	Ending 31.12	Africa
Turkey	170	Ending 31.12	Europe
Turkmenistan	128	Ending 31.12	Asia
Uganda	49	Ending 30.06	Africa
Ukraine	171	Ending 31.12	Europe
United Arab Emirates	129	Ending 31.12	Asia
United Kingdom	172	Beginning 01.04	Europe
United States	84	Ending 31.12	Americas
Uruguay	85	Ending 31.12	Americas
Uzbekistan	130	Ending 31.12	Asia
Vanuatu	180	Ending 31.12	Oceania
Venezuela	86	Ending 31.12	Americas
Viet Nam	131	Ending 31.12	Asia
Yemen	132	Ending 31.12	Asia
Zambia	50	Beginning 01.04	Africa
Zimbabwe	51	Ending 30.06	Africa

Note: In Table and map 2d, Oceania is included in the Asia-Pacific region.

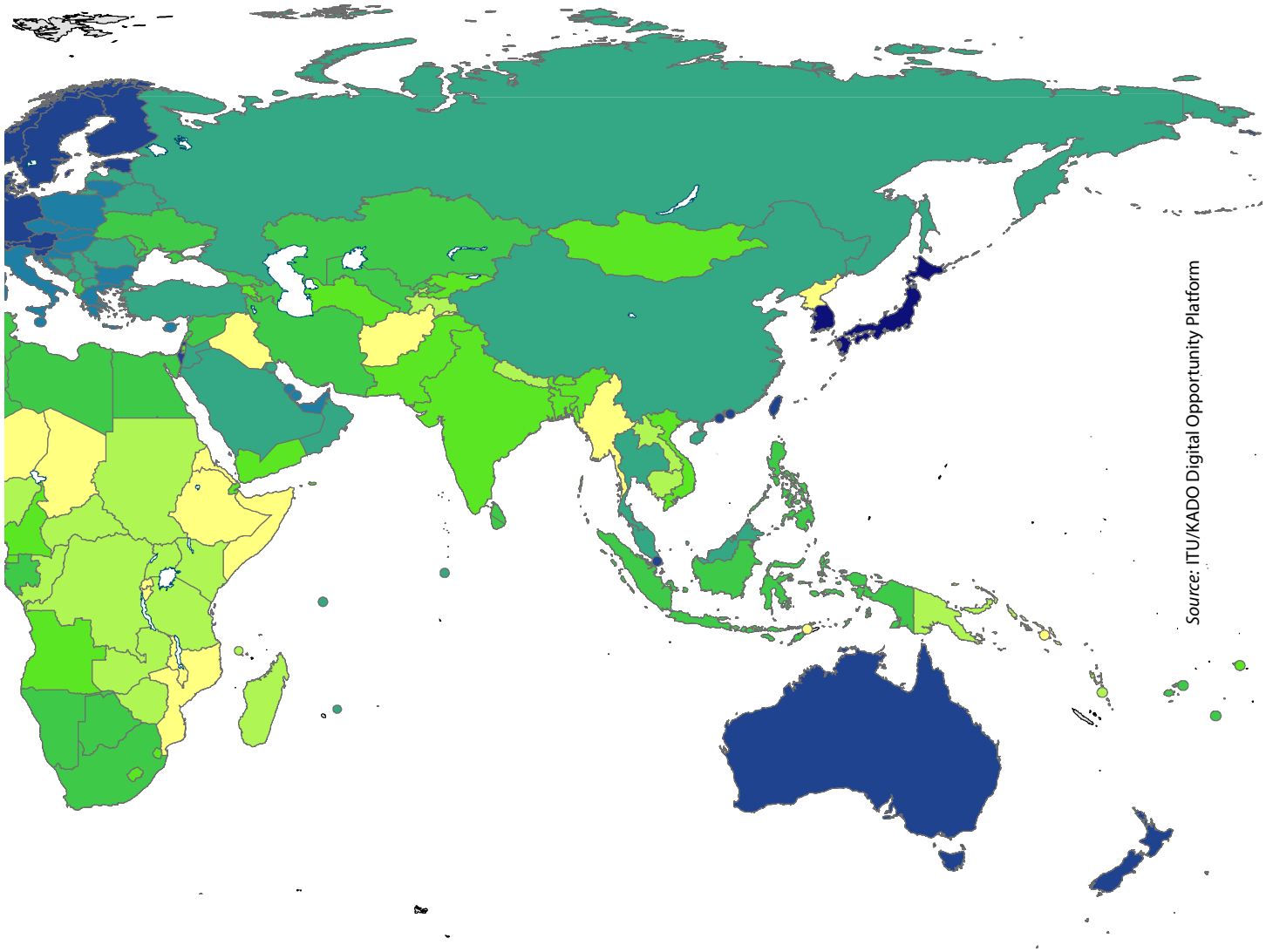
* Location refers to Country Number in Tables 3-10 (Table 1 in alphabetical order and Table 2 by region).

Digital Opportunity Index Worldwide, 2005





For more information about the DOI, please visit www.itu.int/doi.



Source: ITU/KADO Digital Opportunity Platform

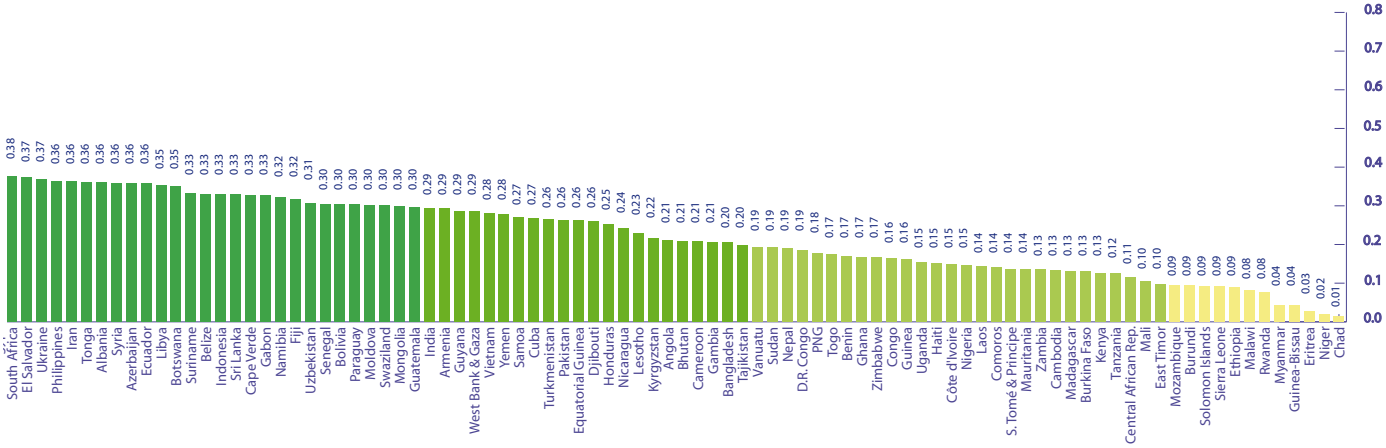


Table 1 Digital Opportunity Index 2005 – World

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 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

Table 1 Digital Opportunity Index 2005 – World

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
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
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
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

Table 1 Digital Opportunity Index 2005 – World

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
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
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

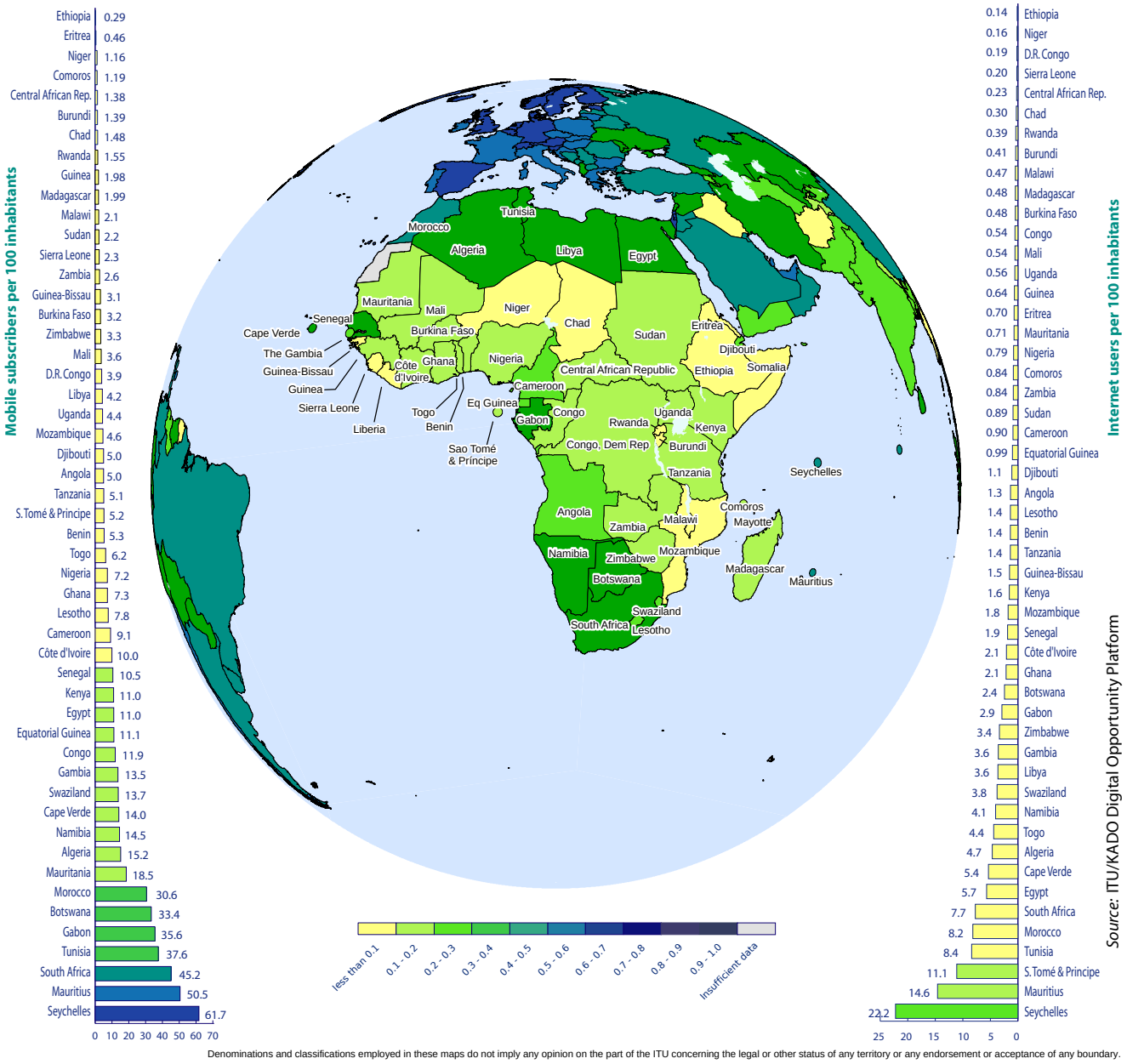
Table 1 Digital Opportunity Index 2005 – World

	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
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
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**

Note: For data comparability and coverage, see the technical notes.

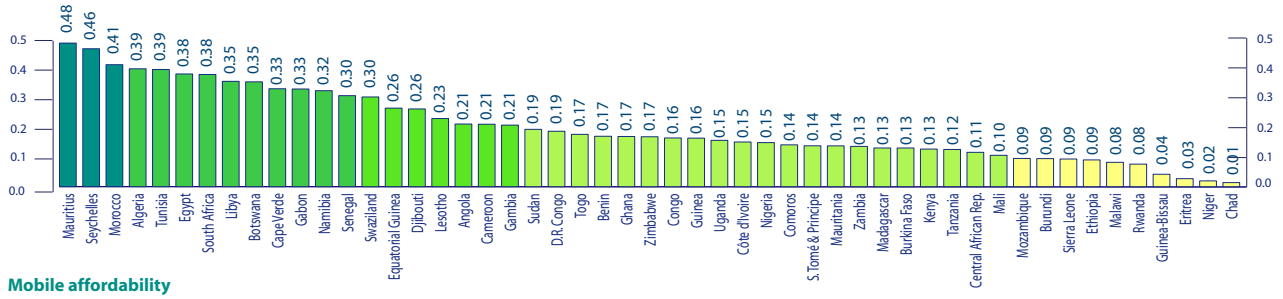
Source: ITU/KADO Digital Opportunity Platform.

Africa Regional Map of Digital Opportunity, 2005



Denominations and classifications employed in these maps do not imply any opinion on the part of the ITU concerning the legal or other status of any territory or any endorsement or acceptance of any boundary.

Overall DOI score



Mobile affordability

Note: 0.00 means that the price of 20hours Internet use is in excess of average GNI per capita.

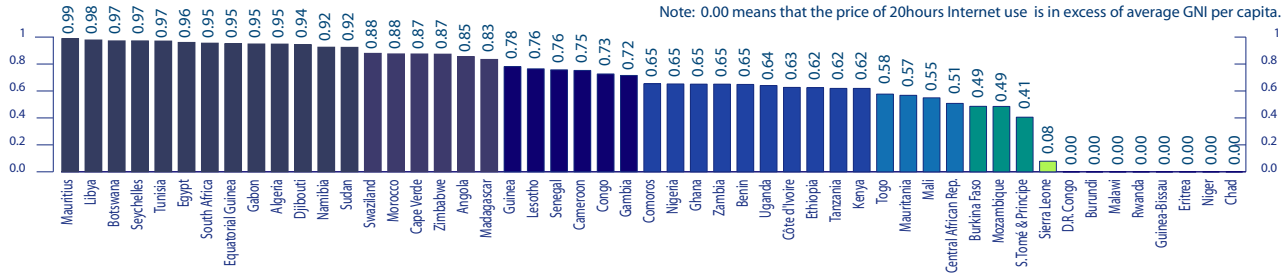


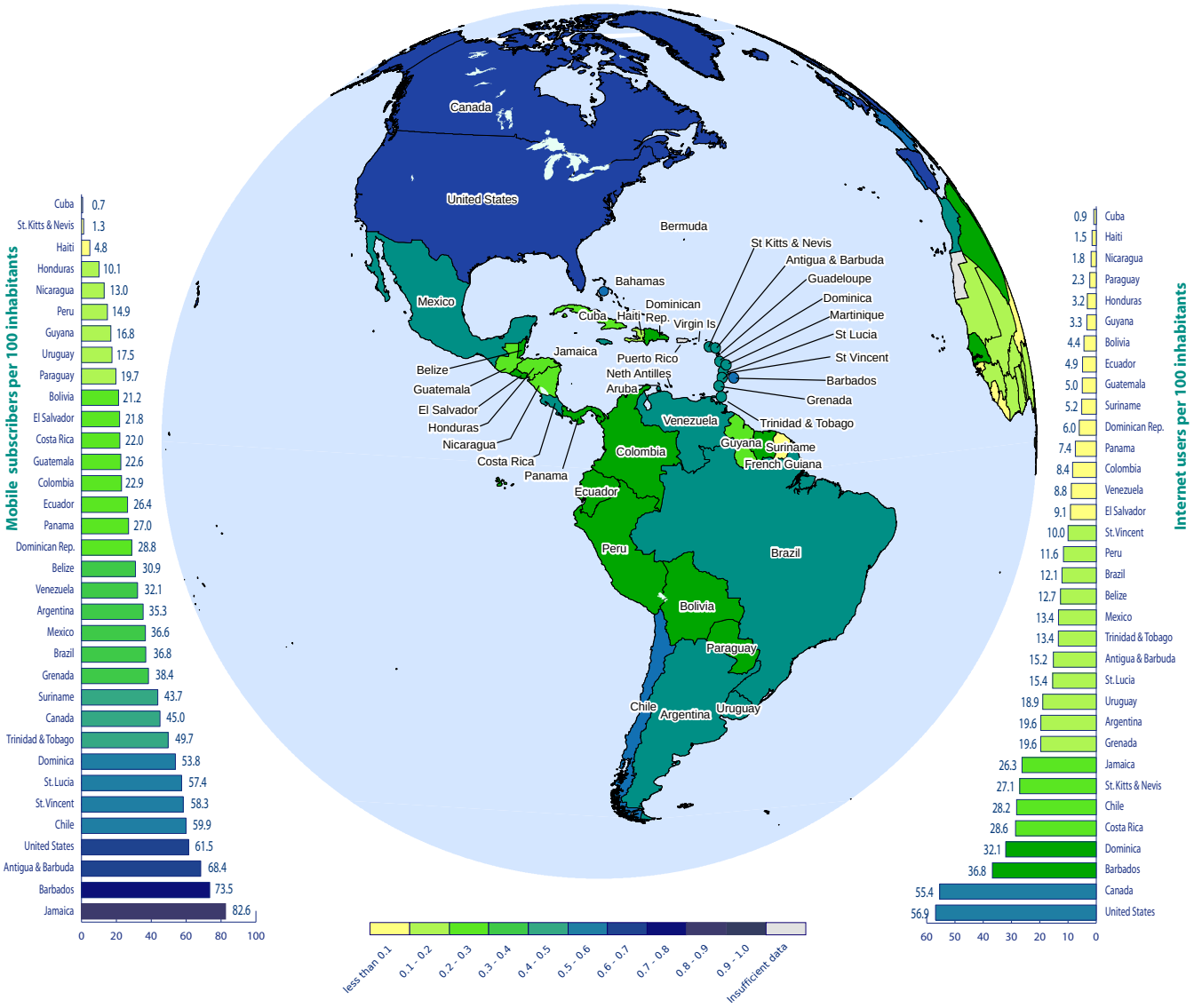
Table 2a Digital Opportunity Index 2005 – Africa

Rank in Africa 2004/2005	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
1	Mauritius	0.98	0.41	0.06	0.48	50
2	Seychelles	0.97	0.32	0.10	0.46	54
3	Morocco	0.87	0.12	0.23	0.41	78
4	Algeria	0.91	0.15	0.12	0.39	82
5	Tunisia	0.96	0.16	0.05	0.39	83
6	Egypt	0.94	0.17	0.02	0.38	90
7	South Africa	0.90	0.18	0.05	0.38	91
8	Libya	0.92	0.12	0.01	0.35	101
9	Botswana	0.92	0.12	0.01	0.35	102
10	Cape Verde	0.80	0.15	0.04	0.33	107
11	Gabon	0.86	0.11	0.01	0.33	108
12	Namibia	0.85	0.10	0.01	0.32	109
13	Senegal	0.72	0.06	0.14	0.30	112
14	Swaziland	0.80	0.09	0.01	0.30	116
15	Equatorial Guinea	0.73	0.05	0.00	0.26	129
16	Djibouti	0.74	0.04	0.00	0.26	130
17	Lesotho	0.65	0.03	0.00	0.23	133
18	Angola	0.60	0.02	0.00	0.21	135
19	Cameroon	0.59	0.03	0.00	0.21	137
20	Gambia	0.53	0.08	0.01	0.21	138
21	Sudan	0.51	0.05	0.02	0.19	142
22	D.R. Congo	0.54	0.01	0.00	0.19	144
23	Togo	0.48	0.03	0.02	0.17	146
24	Benin	0.48	0.02	0.00	0.17	147
25	Ghana	0.47	0.03	0.01	0.17	148
26	Zimbabwe	0.42	0.05	0.03	0.17	149
27	Cote d'Ivoire	0.46	0.03	0.00	0.16	150
28	Guinea	0.47	0.01	0.00	0.16	151
29	Uganda	0.45	0.01	0.00	0.15	152
30	D.R. Congo	0.39	0.05	0.01	0.15	154
31	Nigeria	0.41	0.03	0.00	0.15	155
32	Comoros	0.40	0.02	0.00	0.14	157
33	S.Tomé & Principe	0.32	0.05	0.04	0.14	158
34	Mauritania	0.36	0.05	0.00	0.14	159
35	Zambia	0.39	0.01	0.00	0.13	160
36	Madagascar	0.38	0.01	0.00	0.13	162
37	Burkina Faso	0.36	0.02	0.00	0.13	163
38	Kenya	0.34	0.03	0.01	0.13	164
39	Tanzania	0.35	0.02	0.00	0.12	165
40	Central African Rep.	0.34	0.01	0.00	0.11	166
41	Mali	0.30	0.01	0.00	0.10	167
42	Mozambique	0.26	0.02	0.01	0.09	169
43	Burundi	0.27	0.01	0.00	0.09	170
44	Sierra Leone	0.26	0.01	0.00	0.09	172
45	Ethiopia	0.26	0.01	0.00	0.09	173
46	Malawi	0.23	0.01	0.00	0.08	174
47	Rwanda	0.22	0.01	0.00	0.08	175
48	Guinea-Bissau	0.10	0.02	0.01	0.04	177
49	Eritrea	0.07	0.01	0.00	0.03	178
50	Niger	0.05	0.01	0.00	0.02	179
51	Chad	0.03	0.01	0.00	0.01	180
Africa		**0.52**	**0.06**	**0.02**	**0.20**	**139**

Note: For data comparability and coverage, see the technical notes.

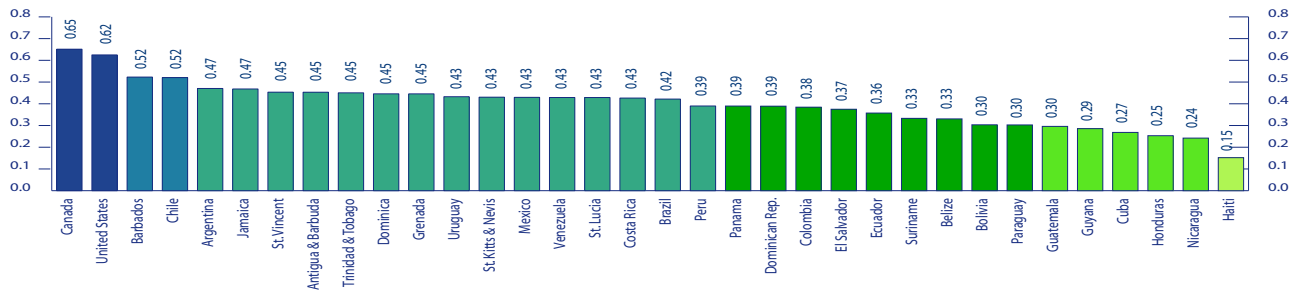
Source: ITU/KADO Digital Opportunity Platform.

Americas Regional Map of Digital Opportunity, 2005



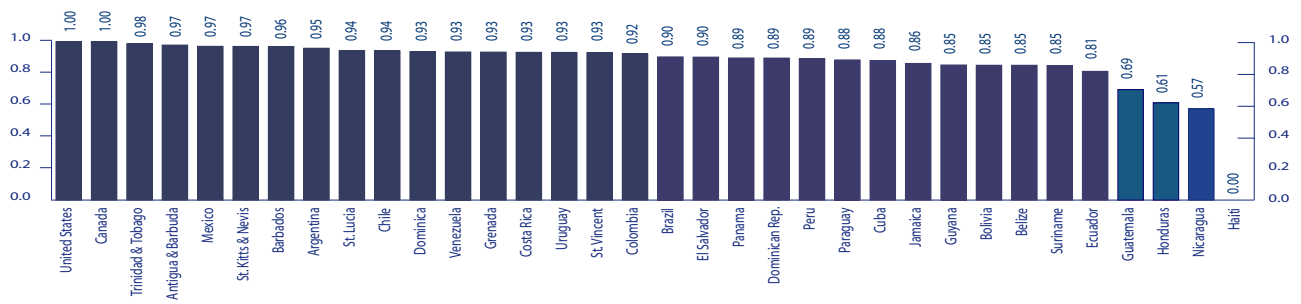
Denominations and classifications employed in these maps do not imply any opinion on the part of the ITU concerning the legal or other status of any territory or any endorsement or acceptance of any boundary.

Overall DOI score



Internet affordability (1 = affordable; 0 = not affordable)

Note: 0.00 means that the price of lower-user call basket is in excess of average GNI per capita.



Source: ITU/KADO Digital Opportunity Platform

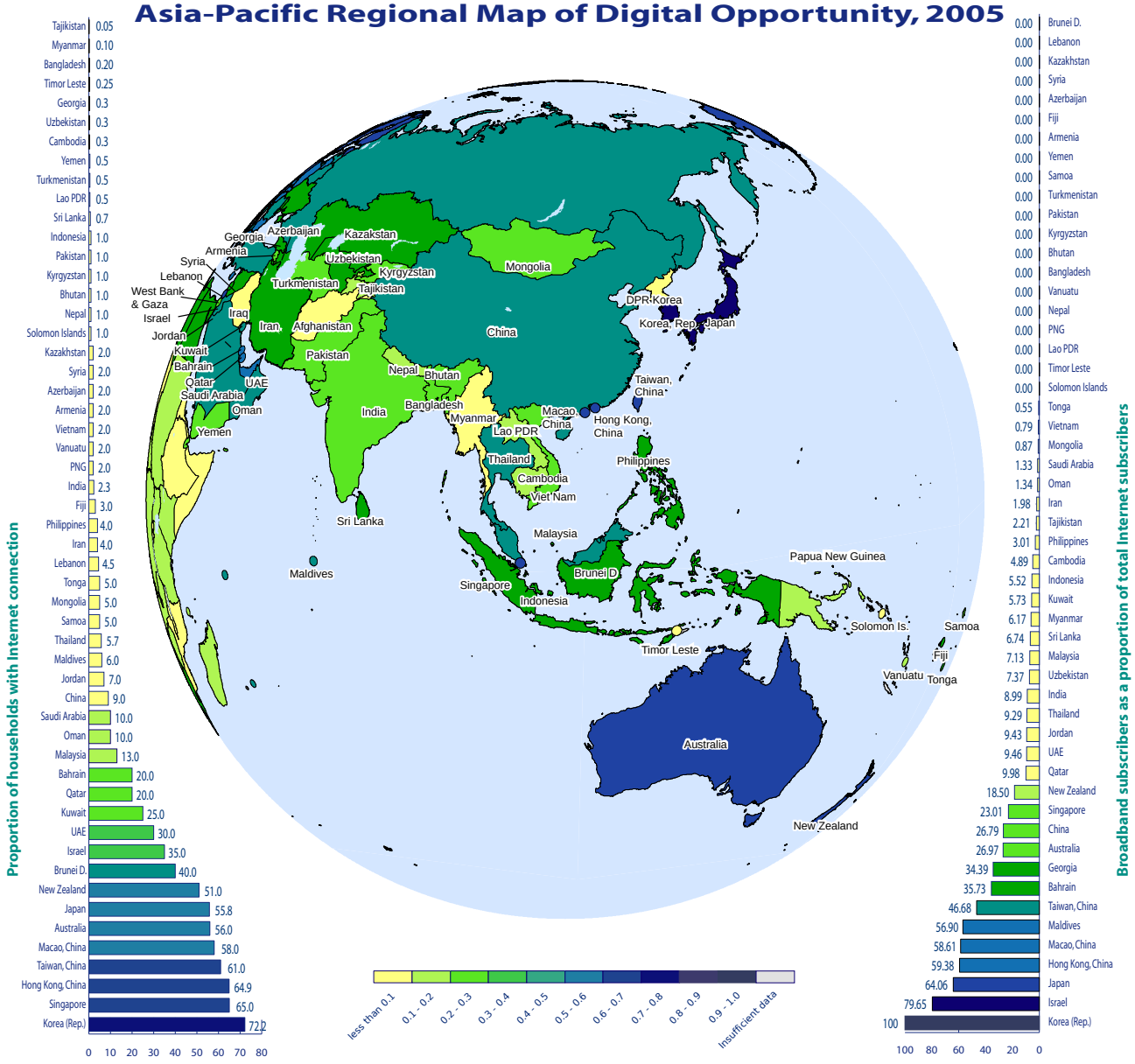
Table 2b Digital Opportunity Index 2005 – Americas

Rank in Americas 2004/2005	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Index Opportunity 2004/2005	World Rank 2004/2005
1	Canada	0.98	0.55	0.43	0.65	14
2	United States	0.98	0.55	0.34	0.62	21
3	Bahamas	0.97	0.45	0.33	0.58	30
4	Barbados	0.96	0.47	0.14	0.52	38
5	Chile	0.96	0.31	0.29	0.52	40
6	Argentina	0.96	0.30	0.15	0.47	51
7	Jamaica	0.93	0.30	0.18	0.47	52
8	St. Vincent	0.89	0.32	0.15	0.45	55
9	Antigua & Barbuda	0.94	0.37	0.05	0.45	56
10	Trinidad & Tobago	0.97	0.30	0.07	0.45	57
11	Dominica	0.88	0.32	0.14	0.45	61
12	Grenada	0.90	0.29	0.15	0.45	62
13	Uruguay	0.96	0.24	0.09	0.43	64
14	St. Kitts and Nevis	0.90	0.26	0.13	0.43	65
15	Mexico	0.93	0.22	0.13	0.43	66
16	Venezuela	0.93	0.18	0.18	0.43	67
17	St. Lucia	0.93	0.30	0.05	0.43	68
18	Costa Rica	0.89	0.25	0.14	0.43	69
19	Brazil	0.87	0.24	0.16	0.42	71
20	Peru	0.86	0.10	0.21	0.39	85
21	Panama	0.90	0.16	0.10	0.39	86
22	Dominican Rep.	0.91	0.13	0.13	0.39	87
23	Colombia	0.88	0.19	0.08	0.38	88
24	El Salvador	0.90	0.14	0.09	0.37	92
25	Ecuador	0.89	0.16	0.02	0.36	100
26	Suriname	0.71	0.26	0.03	0.33	103
27	Belize	0.77	0.18	0.04	0.33	104
28	Bolivia	0.79	0.11	0.01	0.30	113
29	Paraguay	0.80	0.09	0.02	0.30	114
30	Guatemala	0.77	0.11	0.02	0.30	118
31	Guyana	0.72	0.13	0.01	0.29	121
32	Cuba	0.76	0.04	0.00	0.27	126
33	Honduras	0.68	0.07	0.01	0.25	131
34	Nicaragua	0.60	0.07	0.06	0.24	132
35	Haiti	0.43	0.02	0.00	0.15	153
Americas		**0.86**	**0.23**	**0.12**	**0.40**	**79**

Note: For data comparability and coverage, see the technical notes.

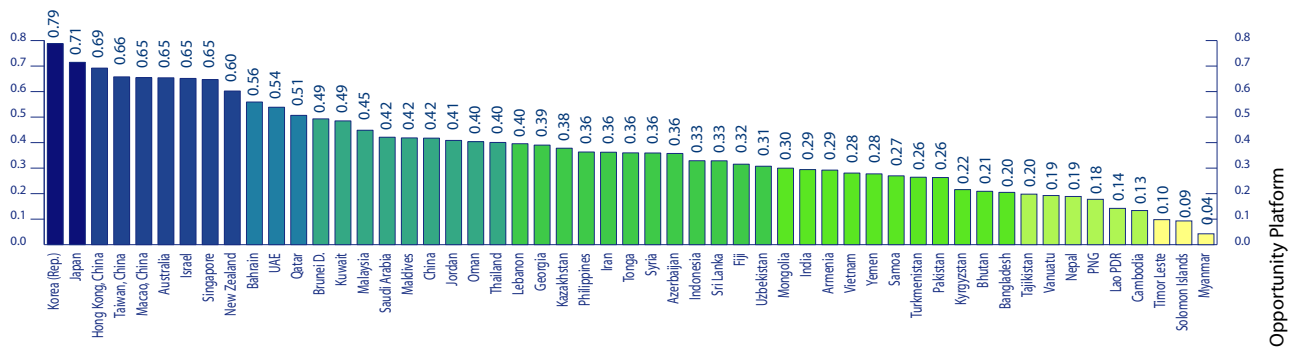
Source: ITU/KADO Digital Opportunity Platform.

Asia-Pacific Regional Map of Digital Opportunity, 2005

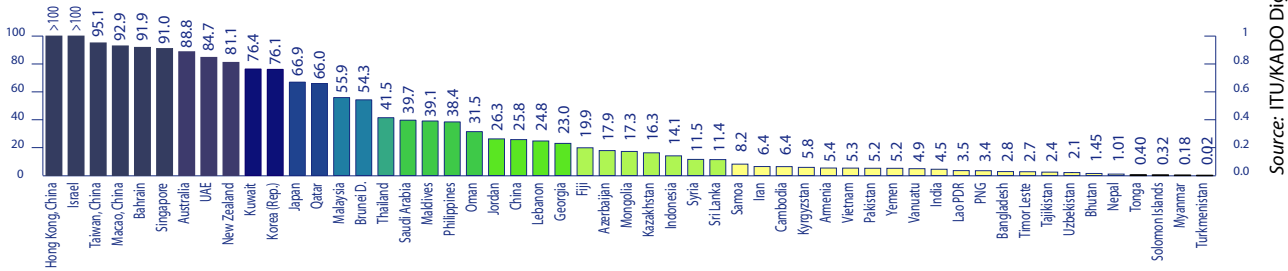


Denominations and classifications employed in these maps do not imply any opinion on the part of the ITU concerning the legal or other status of any territory or any endorsement or acceptance of any boundary.

Overall DOI score



Mobile subscribers per 100 inhabitants



Source: ITU/KADO Digital Opportunity Platform

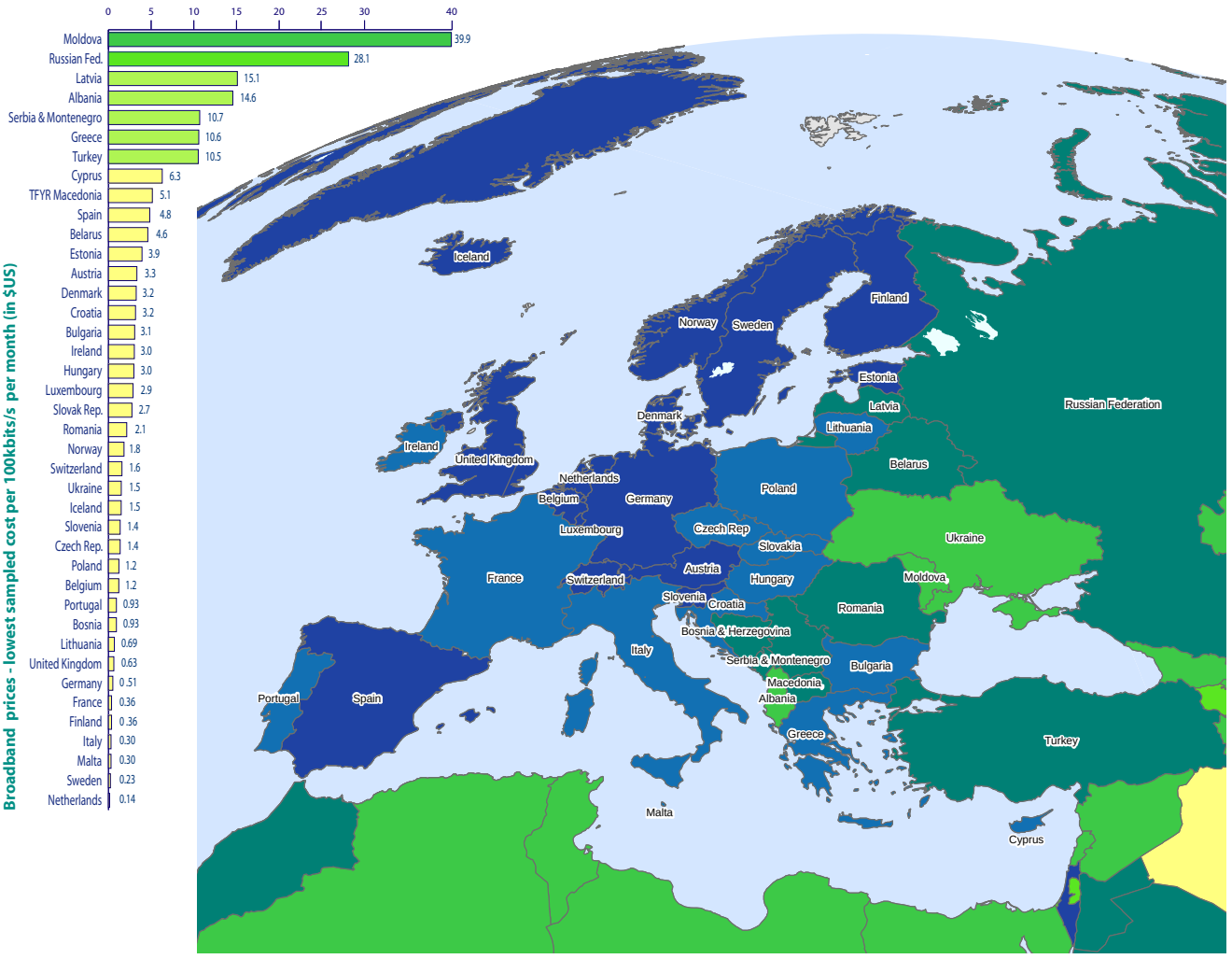
Table 2c Digital Opportunity Index 2005 – Asia-Pacific

Rank in Asia-Pacific 2004/2005	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
1	Korea (Rep.)	0.99	0.74	0.64	0.79	1
2	Japan	0.99	0.69	0.46	0.71	2
3	Hong Kong, China	1.00	0.70	0.38	0.69	5
4	Taiwan, China	0.99	0.69	0.29	0.66	10
5	Macao, China	1.00	0.66	0.30	0.65	11
6	Australia	0.98	0.63	0.35	0.65	12
7	Israel	0.98	0.57	0.40	0.65	13
8	Singapore	1.00	0.68	0.27	0.65	16
9	New Zealand	0.98	0.57	0.25	0.60	26
10	Bahrain	0.99	0.49	0.20	0.56	33
11	United Arab Emirates	0.99	0.49	0.14	0.54	36
12	Qatar	0.98	0.42	0.12	0.51	44
13	Brunei Darussalam	0.93	0.46	0.09	0.49	47
14	Kuwait	0.99	0.40	0.06	0.49	49
15	Malaysia	0.98	0.22	0.15	0.45	59
16	Saudi Arabia	0.96	0.27	0.04	0.42	72
17	Maldives	0.84	0.20	0.22	0.42	73
18	China	0.89	0.25	0.11	0.42	74
19	Jordan	0.94	0.22	0.07	0.41	77
20	Oman	0.97	0.21	0.03	0.40	79
21	Thailand	0.95	0.18	0.07	0.40	80
22	Lebanon	0.96	0.18	0.05	0.40	81
23	Georgia	0.92	0.12	0.13	0.39	84
24	Kazakhstan	0.94	0.17	0.02	0.38	89
25	Philippines	0.93	0.13	0.03	0.36	94
26	Iran (I.R.)	0.89	0.16	0.03	0.36	95
27	Tonga	0.93	0.13	0.02	0.36	96
28	Syria	0.91	0.15	0.01	0.36	98
29	Azerbaijan	0.90	0.15	0.02	0.36	99
30	Indonesia	0.89	0.06	0.04	0.33	105
31	Sri Lanka	0.90	0.06	0.03	0.33	106
32	Fiji	0.78	0.14	0.03	0.32	110
33	Uzbekistan	0.83	0.06	0.03	0.31	111
34	Mongolia	0.74	0.09	0.06	0.30	117
35	India	0.80	0.04	0.04	0.29	119
36	Armenia	0.70	0.15	0.02	0.29	120
37	Palestine	0.63	0.21	0.02	0.29	122
38	Vietnam	0.76	0.06	0.02	0.28	123
39	Yemen	0.78	0.06	0.00	0.28	124
40	Samoa	0.71	0.09	0.01	0.27	125
41	Turkmenistan	0.72	0.07	0.00	0.26	127
42	Pakistan	0.73	0.05	0.00	0.26	128
43	Kyrgyzstan	0.55	0.09	0.01	0.22	134
44	Bhutan	0.59	0.02	0.01	0.21	136
45	Bangladesh	0.60	0.01	0.00	0.20	139
46	Tajikistan	0.53	0.05	0.01	0.20	140
47	Vanuatu	0.52	0.04	0.01	0.19	141
48	Nepal	0.55	0.01	0.00	0.19	143
49	Papua New Guinea	0.50	0.02	0.01	0.18	145
50	Lao P.D.R.	0.40	0.02	0.01	0.14	156
51	Cambodia	0.36	0.02	0.02	0.13	161
52	Timor-Leste	0.28	0.01	0.00	0.10	168
53	Solomon Islands	0.26	0.02	0.00	0.09	171
54	Myanmar	0.10	*0.01*	0.02	0.04	176
	Asia-Pacific	**0.80**	**0.23**	**0.10**	**0.37**	**89**

Note: For data comparability and coverage, see the technical notes.

Source: ITU/KADO Digital Opportunity Platform.

Europe Regional Map of Digital Opportunity, 2005



Source: ITU/KADO Digital Opportunity Platform

Denominations and classifications employed in these maps do not imply any opinion on the part of the ITU concerning the legal or other status of any territory or any endorsement or acceptance of any boundary.

Overall DOI score

Broadband as a proportion of total Internet subscribers

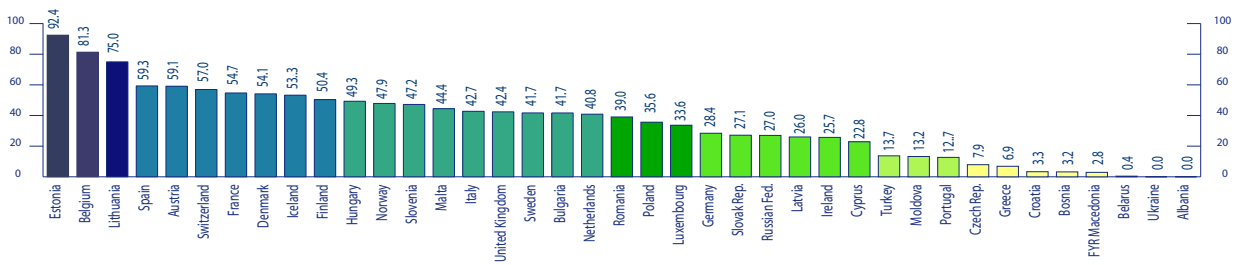


Table 2d Digital Opportunity Index 2005 – Europe

Rank in Europe 2004/2005	Economy	Opportunity 2004/2005	Infrastructure 2004/2005	Utilization 2004/2005	Digital Opportunity Index 2004/2005	World Rank 2004/2005
1	Denmark	0.99	0.75	0.37	0.71	3
2	Iceland	0.99	0.72	0.37	0.69	4
3	Sweden	0.99	0.74	0.35	0.69	6
4	United Kingdom	0.99	0.68	0.33	0.67	7
5	Norway	0.99	0.66	0.34	0.67	8
6	Netherlands	0.99	0.67	0.32	0.66	9
7	Switzerland	0.99	0.63	0.33	0.65	15
8	Finland	0.99	0.60	0.34	0.64	17
9	Luxembourg	0.99	0.65	0.27	0.64	18
10	Germany	0.99	0.64	0.27	0.63	19
11	Estonia	0.98	0.47	0.44	0.63	20
12	Slovenia	0.98	0.63	0.26	0.62	22
13	Belgium	0.99	0.50	0.38	0.62	23
14	Austria	0.99	0.54	0.34	0.62	24
15	Spain	0.99	0.54	0.30	0.61	25
16	France	0.99	0.49	0.31	0.60	27
17	Italy	0.99	0.54	0.24	0.59	28
18	Malta	0.99	0.48	0.28	0.58	29
19	Ireland	0.99	0.55	0.18	0.58	31
20	Lithuania	0.99	0.38	0.32	0.56	32
21	Hungary	0.98	0.43	0.24	0.55	34
22	Cyprus	0.99	0.50	0.16	0.55	35
23	Slovak Republic	0.98	0.39	0.23	0.53	37
24	Poland	0.98	0.39	0.19	0.52	39
25	Portugal	0.98	0.45	0.12	0.52	41
26	Greece	0.99	0.47	0.07	0.51	42
27	Czech Republic	0.98	0.42	0.13	0.51	43
28	Croatia	0.97	0.44	0.10	0.51	45
29	Bulgaria	0.96	0.34	0.22	0.51	46
30	Latvia	0.97	0.33	0.17	0.49	48
31	Romania	0.93	0.26	0.20	0.46	53
32	Turkey	0.97	0.30	0.08	0.45	58
33	Russia	0.96	0.25	0.13	0.45	60
34	TFYR Macedonia	0.92	0.35	0.04	0.43	63
35	Serbia and Montenegro	0.95	0.30	0.03	0.42	70
36	Bosnia	0.93	0.27	0.05	0.42	75
37	Belarus	0.92	0.24	0.07	0.41	76
38	Ukraine	0.91	0.17	0.02	0.37	93
39	Albania	0.90	0.17	0.01	0.36	97
40	Moldova	0.68	0.14	0.07	0.30	115
Europe		**0.97**	**0.46**	**0.22**	**0.55**	**38**

Note: For data comparability and coverage, see the technical notes.

Source: ITU/KADO Digital Opportunity Platform.

Technical notes

General methodology

The compound annual growth rate (CAGR) is computed by the formula:

[(Pv / P0) (1/n)]-1

where Pv = Present value

P0 = Beginning value

n = Number of periods

The result is multiplied by 100 to obtain a percentage.

United States dollar figures are reached by applying the average annual exchange rate (from the International Monetary Fund, IMF) to the figure reported in national currency, unless otherwise noted. For economies where the IMF rate is unavailable or where the exchange rate typically applied to foreign exchange transactions differs markedly from the official IMF rate, a World Bank conversion rate is used. For the few economies where neither the IMF nor World Bank rates are available, a United Nations end-of-period rate is used.

Group figures are either totals or weighted averages depending on the indicator. For example, for main telephone lines, the total number of main telephone lines for each grouping is shown, while for main lines per 100 inhabitants, the weighted average is shown. Group figures are shown in bold in the tables. In cases of significant missing data and country rankings, group totals are not shown. Group growth rates generally refer to economies for which data is available for both years. Data were collected and updated on an ongoing basis up to the date of publication; different collection times and dates may account for slight discrepancies between individual entries in the Tables and the text of the report.

1. Digital Opportunity Index 2005

The *Digital Opportunity Index 2005* is calculated according to the methodology described in Chapter two of this Report for 180 economies. In Table 1, these are ranked in alphabetical order. Index values are calculated for each indicator by calculating the data value as a proportion of the reference values in the Methodological Note in Chapter two (usually 100 per cent for per capita penetration, household penetration rates and broadband ratios). This gives an index value for the eleven indicators shown in Figure 2.2. A simple average of these index values is taken to give values for the DOI sub-indices of *Opportunity, Infrastructure and Utilization*, which are in turn averaged to obtain a country's overall *Digital Opportunity Index* (DOI) score. *World rank* shows the relative position of each economy in terms of its overall DOI score, on a scale of 1 to 180, where 1 represents the highest overall DOI score.

2. Regional Tables of Digital Opportunity Index 2005

This data presents the *Digital Opportunity Index* (DOI) score for 180 countries in regional order, with the same DOI sub-indices of *Opportunity, Infrastructure and Utilization*. World rank shows the relative position of each economy in terms of its overall DOI score, on a scale of 1 to 180, where 1 represents the highest overall DOI score. *Regional ranking* gives the relative ranking of the country within each region:

2a Africa – between 1 and 51;

2b Americas – between 1 and 35;

2c Asia-Pacific – between 1 and 54;

2d Europe – between 1 and 40;

Where 1 is the highest Digital Opportunity Index score achieved within the region.

3. Basic indicators

The data for *Population* are mid-year estimates from the United Nations (UN). National statistics have been used for some countries. *Population Density* is based on land area data from the UN: the land area does not include any overseas dependencies, but does include inland waters. The data for *gross domestic product (GDP)* are generally from the IMF, the Organisation for Economic Co-operation and Development (OECD) or the World Bank. They are current price data in national currency converted to United States dollars by the method identified above. Readers are advised to consult the publications of the international organisations listed in Sources for precise definitions of the demographic and macro-economic data. *Total telephone subscribers* refer to the sum of main telephone lines and cellular mobile subscribers. *Total telephone subscribers per 100 inhabitants* is calculated by dividing the total number of telephone subscribers by the population and multiplying by 100.

4. Mobile subscribers

Cellular mobile telephone subscribers refers to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the PSTN. *Per 100 inhabitants* is obtained by dividing the number of cellular subscribers by the population and multiplying by 100. *% digital* is the number of mobile cellular subscribers who use a second-generation digital cellular service (e.g. GSM, CDMA, DAMPS, PCS, PHS, W-CDMA) or a third generation one (e.g., CDMA 1x, CDMA 1x EV-DO, CDMA 1x EV-DV, TD-SCDMA, W-CDMA) by the total number

of mobile subscribers. As a *% of total telephone subscribers* is obtained by dividing the number of cellular subscribers by the total number of telephone subscribers (sum of the main telephone lines and the cellular subscribers) and multiplying by 100.

5. Mobile tariffs

The table shows the costs associated with cellular mobile telephone service. Where possible, the prices of the incumbent and/or major operator were taken, from operators' websites or by correspondence with service providers. This may not necessarily be the most cost-effective connection, but rather a representative package on offer to consumers a the time of the survey, in August 2005. *Connection charge* refers to connection charges for basic telephone service in USD, using exchange rates as at 5 September 2005. Offers of free local calls on connection were not taken into account. *Per minute local call* refers to the average cost of a one-minute mobile call to within the same network, off-net and to a fixed line during Peak and Off-peak hours. Any taxes involved in these charges are included to improve comparability. *Cost of a local SMS* is the charge to the consumer of sending a single short messaging service (SMS) text within the local exchange area. The *OECD low-user basket* gives the price of a standard basket of mobile usage monthly usage in USD determined by the OECD for 25 outgoing calls per month (on and off the network and to a fixed line) in predetermined ratios (based on typical usage patterns) plus 30 SMS messages. For more details on the OECD/Teligen methodology, see www.oecd.org. As a *percentage (%) of monthly income* is the price of the OECD low-user mobile basket divided by per capita monthly income (World Bank, Atlas method, no PPP).

6. Information technology

Internet hosts refers to the number of computers in the economy that are directly linked to the worldwide Internet network. Note that Internet host computers are identified by a two digit country code or a three digit generic top-level domain generally reflecting the nature of the organization using the Internet computer. The numbers of hosts are assigned to countries based on the country code although this does not necessarily indicate that the host is actually physically in the country. In addition, all other hosts for which there is no country code identification (e.g. generic top-level domains such as .edu or .com) are assigned to the United States. Therefore, the number of Internet hosts shown for each country can only be considered an approximation. Data on Internet host computers come from Internet Software Consortium (www.isc.org) and RIPE (www.ripe.net). *Internet Users* is based on reported estimates, derivations based on reported Internet access provider subscriber counts, or calculated by multiplying the number of hosts by an estimated multiplier. Estimated PCs shows the number of *personal computers* (PCs) in use, both in absolute numbers and in terms of PC ownership *per 100 inhabitants*. These numbers are derived from the annual questionnaire, supplemented by other sources.

7. Internet tariffs

This table gives a representative selection of the cheapest prices commercially available for 20 hours per month of Internet access for each economy (or the commercial package most closely approximating to this), whether it is through dial-up or broadband access. The cost of a 20 hour dial-up package is calculated. For dial-up, the cost is assumed to spread across 10 hours of peak usage and 10 hours of off-peak usage. The cost of dial-up also includes telephone usage charges, based on twenty hours of local calls of one-hour duration, with twenty connection set-up charges. Where countries have a special Internet dial-up tariff, this is used. Where countries have a flat rate telephone usage charge (per call rather than per minute), a call of duration one hour per session is assumed. Note that the monthly rental for the telephone line is not included. If there is a specific 20 hour package (i.e. 20 hours included in the subscription price), this is assumed to be the cheapest. Where broadband is available, the cost of a monthly broadband subscription is compared to the cost of dial-up, since in some countries, broadband may be cheaper, even for low usage levels. Where broadband is used, telephone usage charges are not included. Average exchange rates for 2005 were used.

8. Broadband subscribers

Although various definitions of broadband exist, the statistics here exclude services offering a combined throughput of less than 256 kbit/s in both directions. *DSL* refers to the total number of digital subscriber lines. *Cable modem Internet subscribers* refers to Internet subscribers via a cable TV network. *Other* refers to other broadband access technologies that are not related to DSL or cable modem. Examples may include fibre-optic, fixed wireless, apartment LANs, satellite connections etc. Broadband subscribers refer to the sum of DSL, cable modem and other broadband subscribers. *Broadband subscribers per 100 inhabitants* is calculated by dividing the total number of broadband subscribers by the population and multiplying by 100. Total broadband subscribers sums the latest known values for DSL, cable modem, and other technologies. As a result, the *Total broadband subscribers* figure may combine data from different years. Broadband subscriber data originate from various sources, including: ITU research, OECD, the Arab Advisors Group and other sources.

9. Broadband tariffs

The prices gathered for the Broadband tariffs table are meant only as a broad representation of typical broadband offers available in an economy. Broadband is considered any dedicated connection to the Internet of 256 kbit/s or faster. They do not necessarily represent the least expensive, fastest or most cost-effective connections in a particular economy. Rather, they give a small sample of the typical offers available to consumers. All prices were gathered during March 2006, with exchange rates valid as of mid-March 2006. Broadband offers are usually residential offerings unless only business connections are available from the ISP. Since ADSL technologies are increasingly used to replace leased lines in businesses, the costs shown in the table may be very high in some developing economies and markets since they represent

replacements for leased lines (indicated by the abbreviation LL), rather than residential broadband offers. In general, ISP choices do not necessarily reflect the dominant ISP in the market. Some ISPs place download limits on broadband connections and where applicable, the service offering closest to 1 Gigabyte of data per month is used. Other ISPs may put time restrictions on broadband usage. The service offering closest to 100 hours per month is selected. The prices included are those advertised and may or may not include ISP charges. Where ISP charges are known to be separate, they are included. Taxes may or may not be included in the advertised prices. All prices are gathered in local currency and converted to nominal US$ at the exchange rate on 5 September, 2005. Most prices in the table are for DSL services. Cable modem prices are given if they are found to be lower or more prevalent. The prices shown do not include installation charges or telephone line rentals that are often required for DSL service. In most cases, two prices are gathered for each economy. *Lower speed monthly charge* refers to a lower-speed connection, typically between 256 - 1'024 kbit/s download speed and is meant to show an example of a typical "entry-level" broadband offer in the economy. The monthly charge reflects the ISP charge for one month of service. It does not include installation fees or modem rental charges if they are charged separately. *Speed (kbit/s) down* represents the advertised maximum theoretical download speed and not speeds guaranteed to users. *Higher speed monthly charge* refers to a faster and typically more expensive offer available in the economy. It is not necessarily from the same provider as the Lower speed offering. Again, charges do not include installation fees or modem rentals. *Download speeds* are theoretical maximums. *Lowest sampled cost US$ per 100 kbit/s* gives the most cost-effective subscription based on criteria of least cost per 100 kbit/s. This is calculated by dividing the monthly subscription charge in US$ by the theoretical download speed, and then multiplying by 100. This figure is calculated for each recorded sample and the lowest cost per 100 kbit/s is given. Lowest sampled cost as a % of monthly income (GNI) is Lowest sampled cost US$ per 100 kbit/s divided by per capita monthly income (World Bank, Atlas method, no PPP). The figure is then reported as a percentage (multiplied by 100). ISP lists the name of the Internet service provider whose sampled price was the lowest per 100 kbit/s over all the samples for that economy.

10. Fixed lines

This table shows the number of *Fixed lines* (or main telephone lines) and *Fixed lines per 100 inhabitants* (or teledensity) for the years indicated and corresponding annual growth rates. *Fixed telephone lines* refer to telephone lines connecting a customer's equipment (e.g., telephone set, facsimile machine) to the public switched telephone network (PSTN) and which have a dedicated port on a telephone exchange. It includes ISDN subscribers but not broadband lines, even though these may be used for voice, to avoid double counting. Note that for most countries, main lines also include public payphones. *Fixed telephone lines per 100 inhabitant*s is calculated by dividing the number of main lines by the population and multiplying by 100.

Sources

Demographic and economic

In addition to national sources, demographic and economic statistics were obtained from the following:

International Monetary Fund. Various years. International Financial Statistics. Washington D.C

United Nations. Various years. Monthly Bulletin of Statistics. New York.

World Bank. Various years. World Development Indicators. Washington D.C.

Telecommunications

The telecommunications data are obtained via an annual questionnaire. Depending on the economy, the questionnaire is sent to the government ministry responsible for telecommunications, to the telecommunications regulator or to the telecommunication operator. Data is cross-checked and supplemented from reports issued by these organisations as well as regional telecommunication agencies. For pricing data, information is obtained from company websites or by correspondence with service providers. In a few cases, data are obtained from mission reports prepared by ITU staff or from other sources (see the Technical Notes). In some instances, estimates, generally based on extrapolation or interpolation techniques, are made by ITU staff.

Photo Credits

pp.8 & 9	IMG_1510 posted at www.morguefile.com
p.11	219472_1634 posted at www.sxc.hu
pp. 18 & 19	20562069_7cf1e2aaec_o posted at www.flickr.com
pp.40& 41	lightsCNCN2294 posted at www.morguefile.com
pp.54 & 55	Vuela! By Gusstav posted at www.flickr.com
p. 61	london by bahi_P posted at www.flickr.com
p. 63	Internet-mais-rapida-do-brazil by faiper posted at www.flickr.com
p.68	126238642_3374dcfaaf_o alt www.flickr.com
p.74 & 75	Mozaic, Dec. 21 2004 by jbum posted at www.flickr.com
p.80	Children with globe, Connect the World Partnership
p.82	443019_39495092 posted at www.sxc.hu
p. 85	116093927_e1661bf151_o[1] posted at www.flickr.com
p. 87	472760_85196922 posted at www.sxc.hu
p. 94 & 95	137657495_49a7896d9f_o posted at www.flickr.com

For further information about the
World Information Society Report series,

please contact the
International Telecommunication Union
Place des Nations
CH-1211 Geneva 20
tel: +41 22 730 51 11
fax: +41 22 730 72 56
e-mail: spumail@itu.int
www.itu.int/wisr