

Chapter 8

The International Scene and the Road Ahead

This chapter concludes the Guide with an overview of the international activities for measuring ICTs and future challenges.

Introduction

Measurement of the information society is a relatively new field and much of it is based on concepts, definitions, standards and methods described in this *Guide*. Details of the measurement work done by OECD member countries can be found in Annex 8.A1, while Annex 8.A2 and Annex 8.A3 provide details of measurement efforts in a number of non-OECD economies.

Clearly much has been accomplished and our understanding of the role of ICT is greatly improved. However, it is still early by historical standards – as the list of challenges at the end of this chapter attests.

The international scene

One of the most exciting developments in the area of information society has been the expansion of interest on a global scale. Exploiting the linkages between ICT and economic development is now a key priority not only for developed countries, but also for many developing economies, donors and international organisations.

However, the task is long-term in nature and far from trivial. As stakeholders try to identify and measure what amounts to a complex reality, they realise that there are significant statistical challenges to overcome. Even where harmonised and well-defined indicators exist (for instance, those collected globally by the ITU), there are challenges resulting from rapid technological change – as well as changes in how technology is being used.

Context

While efforts by member countries were co-ordinated through the OECD and found a common forum in the WPIIS, a number of non-OECD countries started measurement initiatives for the information society in the late 1990s (in some cases, with the support of the OECD through its outreach activities). From the outset, the importance of international comparability was evident and thus regional initiatives were formed, usually with the participation of at least one OECD member country.

Historical efforts to co-ordinate global initiatives in respect of ICT development stretch back more than two decades. In 1984, the ITU commissioned the Maitland Report and this was followed a decade later by the Buenos Aires Declaration on Global Telecommunication Development for the 21st Century.

The Okinawa charter of the G8 in July 2000 started by saying that ICT is “... one of the most potent forces in shaping the twenty-first century” (G8, 2000) and continued by placing emphasis on the enabling and transforming nature of ICT, both economically and socially. Bridging the digital divide and seizing digital opportunities became influential global drivers. “Creating digital opportunities is not something that happens after addressing the “core” development challenges; it is a key component of addressing those challenges in the 21st century” (G8, 2001).

The Digital Opportunity Taskforce (DOT Force) was formed in 2000 to facilitate this process through: fostering policy, regulatory and network readiness; improving connectivity, increasing access and lowering costs; building human capacity; and encouraging participation in global e-commerce networks (G8, 2001). In addition to representatives from G8 countries, the DOT Force included members from developing economies, international organisations, businesses and non-profit organisations. The Genoa Plan of Action was drafted in 2001, while its implementation and follow-through were discussed in Kananaskis (G8, 2002), where the formal process was concluded.

In April 2006, the Global Alliance for ICT and Development (GAID) was approved by the Secretary-General of the UN. “The Alliance responds to the need and demand for an inclusive global forum and platform for cross-sectoral policy dialogue on the use of ICT for enhancing the achievement of internationally agreed development goals, notably reduction of poverty” (see www.un-gaid.org).

The international interest in information society issues increased significantly with the organisation of the two World Summits on the Information Society (WSIS, Geneva 2003 and Tunis 2005). The 2003 Summit brought a higher global profile to the topic and helped solidify and intensify work related to ICT. The *Declaration of Principles* from the Geneva meeting recognised the potential of ICT as a driver for progress and stated that: “We are firmly convinced that we are collectively entering a new era of enormous potential, that of the information society and expanded human communication.” It also reinforced the commitment of the international community to “evaluate and follow-up progress in bridging the digital divide”, as well as “strengthening co-operation to seek common responses to the challenges and to the implementation of the Plan of Action” (WSIS, 2003a).

By their nature, the Summits provided a forum for the discussion of many aspects of the information society including measurement. The *Plan of Action* stated that: “A realistic international performance evaluation and benchmarking (both qualitative and quantitative) through comparable statistical indicators and research results, should be developed to follow up the implementation of the objectives, goals and targets in the *Plan of Action*, taking into account different national circumstances” (WSIS, 2003b).

The 2003 WSIS *Plan of Action* made a number of suggestions concerning the development of statistical indicators for benchmarking and performance evaluation, to follow up the implementation of the WSIS *Plan* and to track global progress in the use of ICT. It called upon all countries and regions to develop tools to provide statistical information, and to set up coherent and internationally comparable indicator systems. It also outlined a series of “indicative targets” to be achieved by 2015, relating to the use of ICT – in the areas of community access, education, health, science, culture, government and broadcasting.

As an outcome of the second phase of WSIS in November 2005, the Tunis Agenda for the Information Society called for “periodic periodic evaluation, using an agreed methodology, such as described in paragraphs 113-120” (paragraph 112) and stated that in paragraph 114: “The development of ICT indicators is important for measuring the digital divide. We note the launch, in June 2004, of the *Partnership on Measuring ICT for Development*, and its efforts...” (WSIS, 2005).

Direct statistical mobilisation

While conferences and other meetings dedicated to the information society have increased over recent years, measurement issues were often subsumed under policy themes and dealt with in a piecemeal fashion. With the exception of the OECD and Eurostat, and the more recent initiatives discussed elsewhere, there were few international meetings of information society statisticians (OECD/UN/UNDP/World Bank Forum, 2003). However, the need for reliable and comparable statistical information had risen in importance and, indeed, had become a priority, leading to an increased level of attention to measurement issues in recent years.

In 2002, a meeting of the International Association for Official Statistics (IAOS) took place in London. Although its theme was more general in nature – looking at the measurement issues associated with the so-called “new economy” – many ICT-related issues were discussed. The conclusions and recommendations from the meeting were submitted to the UN Statistics Division and, in addition to specific statistical issues, emphasis was placed on the need for more investment in information society measures in order “to build evidence on access, adoption and impact of ICT and electronic networks for business and households” (ONS, 2002a, b).

The International Telecommunication Union (ITU) organises its World Telecommunication/ICT Indicators Meetings (WTIM) annually, bringing together policy makers, regulators and national statistical offices. The purpose of the WTIM is to discuss topics related to the identification, definition, collection, processing, dissemination and use of telecommunication/ICT indicators and to enhance collaboration between the different parties involved – at national, regional and international level.

An international meeting that directly solicited the participation of producers of statistical information took place in Geneva in September 2003. Having earlier received the mandate by its governing body to make measurement a priority, the United Nations Conference on Trade and Development (UNCTAD) extended invitations to statistical offices of all countries to discuss the state of, and prospects for, statistical measurement of e-commerce and e-business. The objective of the meeting was to provide a framework for introducing developing economies’ views into the ongoing debates on digital economy statistics and indicators, and to provide a forum for statisticians of all countries. Country experiences were shared and the needs of developing economies were heard, in particular the need for training. In collaboration with the OECD, an effort started to identify a core set of indicators (Schaaper, 2003), that would be suitable for all countries, and a decision was made for the creation of a virtual forum that would continue the dialogue (UNCTAD, 2003).

Perhaps the most influential meeting aimed at information society statistics on a global scale occurred under WSIS in December 2003. Jointly organised by the UNECE, UNCTAD, ITU, UIS, OECD and Eurostat (UNECE, 2003a, b), the Statistical Workshop on “Monitoring the Information Society: Data, Measurement and Methods” was attended by a great number of countries and representatives from international organisations. The outcomes of the meeting included the production of this *Guide* by the OECD, and recommendations for further work towards measuring the information society. In particular, the meeting encouraged countries to collect data on ICT in various areas, and to develop tools to measure the impacts of ICTs. The workshop recommended that data collection should be integrated within systems of official statistics and that policy makers and administrators should be involved in this process.

Partnership on Measuring ICT for Development¹

The Geneva phase of WSIS highlighted the importance of benchmarking and measuring progress toward the information society through internationally comparable statistical indicators (Geneva Plan of Action, para. 28). In response to this, the *Partnership on Measuring ICT for Development* was subsequently launched at UNCTAD XI in Sao Paulo in June 2004.

The Tunis phase of WSIS recognized that the development of ICT indicators is important for measuring the digital divide, and called upon countries and international organizations to allocate appropriate resources for the provision of ICT statistics and to develop effective measurement methodologies, including basic ICT indicators and an analysis of the state of the Information Society (Tunis Agenda for the Information Society, para. 112-120).

In particular, member States called for periodic evaluation, using an agreed methodology, and referring to the work of the *Partnership on Measuring ICT for Development*.

In 2008, the UN Economic and Social Council recommended that the *Partnership* continue working on ICT measurement to track progress in the achievement of WSIS goals and targets.² In 2009, it recognized the work of the *Partnership*, its institutional strengthening and the creation of a working group to measure the economic and social impact of ICTs, and recommended that the *Partnership* consider the creation of benchmarks and impact indicators for further consideration by the United Nations Statistical Commission.³

The *Partnership* was created to accommodate and further develop various initiatives regarding the availability and measurement of ICT indicators at the regional and international levels. It provides an open framework for co-ordinating ongoing and future activities. The *Partnership* is a joint effort among all stakeholders involved, based on an inclusive approach and the principle of equality among the partners involved. It particularly aims to assist developing economies in their efforts to produce information society statistics by mobilising the resources necessary to build local capacities. Ideally, this will result in an expansion of ICT statistics harmonised internationally, providing a key input to future policy and analytical work on the information society, including the digital divide. Continued coordination and co-operation among Partners have enabled the *Partnership* to make significant progress in its methodological work, capacity building and data dissemination activities. For more information on the various activities of the *Partnership* since its launch, see: measuring-ict.unctad.org.

The definition of a core list of ICT indicators has been one of the main achievements of the *Partnership*.⁴ The core list was endorsed by the UN Statistical Commission on March 2007 and was revised in 2009. The core list was the outcome of an intensive consultation process by the *Partnership* with national statistical offices (NSOs) worldwide, based on internationally agreed standards. The core indicators are recommended by the *Partnership* as a basis for the collection of ICT statistics that could be comparable at the international level, and that will support the formulation and evaluation of ICT policies.

Several countries have already integrated the core list of ICT indicators into their existing household and business surveys.

The current *Partnership* core ICT indicators list is composed of 46 ICT indicators and two reference indicators in the following areas:

- ICT infrastructure and access (10 indicators);
- ICT access and use by households and individuals (12 indicators and one reference indicator);
- ICT access and use by enterprises (12 indicators);
- ICT sector and trade in ICT goods (4 indicators);
- ICT in education (8 indicators and one reference indicator).

The complete *Partnership* core ICT indicators list is presented in Annex 8.A3.

A further eight core indicators on ICT in government are expected to be added to the list in 2011, after consultation work is finalised. The development of ICT indicators is a continuous process, and the list will undergo periodic review. As countries gain experience in the collection of ICT data, and as policy needs evolve, indicators may be modified, removed or added. The nature of ICTs themselves is dynamic, and indicators and definitions should be adapted as technology progresses, such as broadband speeds or mobile applications and capabilities.

Other methodological work of the *Partnership* is organised around task groups, each one led by a volunteering organisation, and including the partner organisations that are involved in the respective activities, as well as any others that are invited to participate. Currently, these include a task group on education indicators, a task group on government indicators, a capacity building task group, a task group on measuring ICT impact, and a task group to develop indicators to measure WSIS targets.

OECD's role in the Partnership

OECD's main contributions to the *Partnership* are:

- the collection and provision of metadata information for OECD countries as part of the global stocktaking exercise;
- assistance with the development of a common list of core ICT indicators (for instance, Schaaper, 2003);
- assistance with methodological work associated with the core indicators through several means, including this *Guide* (for instance, Roberts, 2005a, b);
- contribution to the development of training material for capacity building, in particular by providing material from this *Guide*; and
- participation in the development of a global database of ICT indicators, mainly by providing data for OECD countries and for some non-OECD countries.

Future challenges for the OECD

While continuing to develop indicators to measure the “readiness” for the information society and the “use” of ICT, the WPIIS and other areas of the OECD are responding to measurement needs that are increasingly sophisticated. A major challenge is developing new indicators in areas that are inherently difficult to measure – because the concepts are undefined, complex or dynamic. Examples include:

- e-business (see the discussion in Chapter 5);
- ICT expenditure and investment (see Chapter 5);

- ICT education and skills, and ICT occupations;
- outsourcing;
- trust in the online environment (see Annex 5A.1);
- social and economic impacts of ICT (a discussion can be found in Chapters 4, 5 and 6); and
- following significant activity during 2006 and 2007 to update ICT sector and product classifications and to introduce new classifications for “content and media”, the challenge remains for member countries and the OECD to compile data using these classifications.

Conclusion

The current situation surrounding information society measurement inspires cautious optimism. As ICT increasingly affects our economies and societies, it is evident that the value of quantitative information is appreciated more than before. Nevertheless, the magnitude of the task ahead cannot be underestimated. The production and intelligent use of the resource that quantitative information represents is plagued by many problems, including the state and capacity of statistical infrastructures, budgetary constraints and trade-offs, and cultural attitudes towards information. In addition, specific areas of measurement require a certain know-how and come with their own body of knowledge. This is particularly the case for the information society, considering the newness of the area.

To impart this know-how to a larger community is a key objective of this *Guide*. Statisticians and users of such information in countries who initiate information society measurement should not have to start from the beginning, as their counterparts did a few years ago. On the contrary, they can benefit from a ready resource – at least to the extent that its boundaries stretch at the present time. In addition to obvious benefits, it will immediately increase the value of new outputs as they will meet the requirement of international comparability.

It is frequently argued that the reality of developing economies is different; therefore, adaptations must be introduced to existing statistical recommendations prior to their implementation. The appropriateness of the household unit as a unit of observation is just one example. In the context of developing economies, the argument goes, the notion of a household is not the same considering the housing situation, the more communal attitudes of people and the generally larger family size. It is acknowledged that there will be areas where cultural and structural differences will necessitate adaptation, both for national needs and international relevance. Annex 8.A3 of this *Guide* provides recommendations to developing economies concerning the applicability of the concepts elaborated in this *Guide* and in some cases discusses possible adaptations.

But while the need for adaptation may be true, there are no compelling reasons why the underlying conceptual and definitional work contained here would not be generally applicable. There is no reason, for example, why the definition of the ICT sector, the definition of e-commerce or the definitions of ICT products cannot be applied to developed and developing economies alike.

The creation of the *Partnership on Measuring ICT for Development*, bringing together most of the relevant international organisations, has been an important step in bringing pioneer methodology on ICT measurement to developing economies. At the same time, this development will also allow developing economies to contribute to the global stock of

knowledge and to aid in future developments. The *Partnership* has set itself some ambitious goals, which, if met, will help to close part of the data gap that exists between developed and developing economies.

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ANNEX 8.A1

Member Countries' ICT Statistics Collection Work

This annex consists of a brief overview and a web link to the OECD ICT statistics metadata “homepage” (www.oecd.org/sti/ictmetadata). The entries found there constitute a significant repository of information about ICT statistical work undertaken by official statisticians of OECD countries. The aims of Annex 8.A1 are to:

- provide a valuable information base for countries (both member and non-member) undertaking survey development work in this area;
- be a documentation repository on a public website of potential use to OECD countries that may use the links to provide a reference to their own work on ICT statistics; and
- be a metadata repository for the OECD (and other agencies that collect ICT statistics) to assist in data interpretation and to provide information on methods of ICT measurement.

Features of country entries in this annex are:

- Metadata were initially collected in early 2005 and subsequently revised in late 2005 and early 2007. Reference dates are included for each country's entry.
- Content is limited to official statistics (including administrative data collated and released as official statistics) and analyses based on those statistics.
- Content covers general information, metadata on ICT collection activity and information on cross-cutting and analytical work based on official statistics.
- Entries are generally completed in such a way that they only need to be updated annually.
- Data in respect of some statistical work undertaken by countries that participate in the Eurostat community surveys have been obtained directly from Eurostat in order to reduce burden on participating countries. Eurostat collects detailed metadata from participating countries in respect of their ICT use surveys.
- Countries are encouraged to include web links and contacts' e-mail addresses where they exist and are both specific (for instance, a link to information about a particular statistical collection) and reasonably stable (not likely to be broken in the annual timeframe envisaged).

It is expected that countries will be asked to provide updates periodically. The timing of revisions is likely to be co-ordinated with other events, for instance, ICT data collections, WPIIS meetings or revisions to the *Guide*.

ANNEX 8.A2

Non-member Economies

The objective of this annex is to give information about the collection of ICT indicators outside the OECD region. This will be done in four separate sections as follows:

1. Availability of core ICT indicators on ICT infrastructure and access in non-OECD economies (ITU).
2. Availability of the core ICT indicators on access to, and use of ICT by households and individuals in non-OECD economies (ITU).
3. Availability of the core ICT indicators on use of ICT by businesses in non-OECD economies (UNCTAD).
4. Availability of the core ICT indicators in ICT in education in non-OECD economies (UNESCO).

Readers should note the efforts of the *Partnership on Measuring ICT for Development* in establishing an agreed set of core ICT indicators including definitions, model questions and methodological recommendations. The *Partnership's* main objective in undertaking this work is to enable the production of internationally comparable data on various aspects of ICT. An important goal of the *Partnership* is to help countries (and particularly those in the developing world) to develop ICT surveys or add suitable questions to existing collections. In March 2007, the UN Statistical Commission endorsed the core list of ICT indicators and encouraged countries to use it in their data collection programmes (UNSC, 2007; *Partnership on Measuring ICT for Development*, 2007). The core list was revised in 2010 and is shown in Annex 8.A3 (*Partnership*, 2010). More information about the *Partnership* can be found in Chapter 8.

The availability tables hereafter show only the non-OECD member economies for which data are available. If an economy does not collect any data then it has not been included in the table. And core ICT indicators for which coverage is too poor have not been included by the collecting agency (ITU, UNCTAD, UNESCO). Note, the designations employed and the presentation of the material in this annex do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where the designation "country or area" appears, it covers countries, territories, cities or areas.

Core ICT indicators on ICT infrastructure and access

There are ten core indicators on ICT infrastructure and access. There are two broad types of infrastructure and access indicators – those where a higher value implies a better situation in terms of ICT infrastructure and access development, and the tariff indicators, where a lower value usually indicates a better situation. The complete list of core indicators is shown in Annex 8.A3.

Table 8.A2.1. **Availability of the core ICT indicators on ICT infrastructure and access, 2009 or latest available year**

	Fixed telephone lines per 100 inhabitants	Mobile cellular subscriptions per 100 inhabitants	Internet subscriptions per 100 inhabitants	Fixed broadband subscriptions per 100 inhabitants	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants	International Internet bandwidth per inhabitant	Percent coverage of mobile cellular network (population)	Fixed broadband Internet monthly subscription (USD)	Mobile cellular prepaid tariffs (per month), in USD, and as a percentage of monthly per capita income
	A1	A2	A3	A4	A5	A6	A7	A8	A9
Afghanistan	✓	✓	✓	✓	✓	✓	✓
Albania	✓	✓	✓	✓	✓	✓	✓	✓	✓
Algeria	✓	✓	..	✓	✓	..	✓	✓	✓
American Samoa	✓	✓
Andorra	✓	✓	✓	✓	✓	✓	✓	✓	..
Angola	✓	✓	✓	✓	✓	✓	..	✓	✓
Antigua and Barbuda	✓	✓	✓	✓	✓	✓	✓	✓	✓
Argentina	✓	✓	✓	✓	✓	✓	✓	✓	✓
Armenia	✓	✓	..	✓	✓	✓	✓
Aruba	✓	✓	✓	✓	✓	✓	✓	✓	..
Azerbaijan	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bahamas	✓	✓	✓	✓	✓	✓	✓	✓	..
Bahrain	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bangladesh	✓	✓	..	✓	✓	✓	..	✓	✓
Barbados	✓	✓	✓	✓	✓	✓	✓	✓	✓
Belarus	✓	✓	✓	✓	✓	✓	✓	✓	✓
Belize	✓	✓	✓	✓	✓	✓	..	✓	✓
Benin	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bermuda	✓	✓	..	✓	✓	✓	..
Bhutan	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bolivia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bosnia and Herzegovina	✓	✓	✓	✓	✓	✓	✓	✓	✓
Botswana	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brazil	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brunei Darussalam	✓	✓	✓	✓	✓	✓	..	✓	..
Bulgaria	✓	✓	✓	✓	✓	✓	✓	✓	✓
Burkina Faso	✓	✓	✓	✓	✓	✓	..	✓	✓
Burundi	✓	✓	✓	✓	✓	✓	✓
Cambodia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cameroon	✓	✓	..	✓	✓	✓	..	✓	✓
Cape Verde	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cayman Islands	✓	✓	✓	..	✓
Central African Rep.	✓	✓	..	✓	✓	✓	✓

Table 8.A2.1. **Availability of the core ICT indicators on ICT infrastructure and access, 2009 or latest available year (cont.)**

	Fixed telephone lines per 100 inhabitants	Mobile cellular subscriptions per 100 inhabitants	Internet subscriptions per 100 inhabitants	Fixed broadband subscriptions per 100 inhabitants	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants	International internet bandwidth per inhabitant	Percent coverage of mobile cellular network (population)	Fixed broadband Internet monthly subscription (USD)	Mobile cellular prepaid tariffs (per month) in USD, and as a percentage of monthly per capita income
	A1	A2	A3	A4	A5	A6	A7	A8	A9
Chad	✓	✓	✓	✓	✓	✓	..	✓	..
China	✓	✓	✓	✓	✓	✓	✓	✓	✓
Colombia	✓	✓	✓	✓	✓	✓	..	✓	✓
Comoros	✓	✓	✓	✓	✓	✓	..	✓	✓
Congo	✓	✓	..	✓	✓	✓
Congo (Democratic Republic of the)	✓	✓	✓	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cote d'Ivoire	✓	✓	..	✓	✓	✓	✓	✓	✓
Croatia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cuba	✓	✓	✓	✓	✓	✓	✓
Cyprus	✓	✓	✓	✓	✓	✓	✓	✓	✓
Djibouti	✓	✓	✓	✓	✓	✓	✓	✓	..
Dominica	✓	✓	..	✓	✓	✓	✓
Dominican Republic	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ecuador	✓	✓	✓	✓	✓	✓	..	✓	✓
Egypt	✓	✓	✓	✓	✓	✓	✓	✓	✓
El Salvador	✓	✓	✓	✓	✓	✓	✓	✓	✓
Equatorial Guinea	✓	✓	..	✓	✓	✓	✓
Eritrea	✓	✓	✓	✓	✓	✓
Ethiopia	✓	✓	✓	✓	✓	✓	..	✓	..
Faroe Islands	✓	✓	✓	✓	✓
Fiji	✓	✓	✓	✓	✓	✓	✓	✓	..
FYR Macedonia	✓	✓	✓	✓	✓	✓	✓	✓	✓
French Guiana	✓	✓	..	✓	✓
French Polynesia	✓	✓	✓	✓	✓	✓
Gabon	✓	✓	✓	✓	✓	✓	✓
Gambia	✓	✓	✓	✓	✓	✓	✓	✓	..
Georgia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ghana	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gibraltar	✓	✓	✓	✓	✓	✓
Greenland	✓	✓	✓	✓	✓	?	✓
Grenada	✓	✓	✓	✓	✓	..
Guam	✓	✓	✓	..
Guatemala	✓	✓	..	✓	✓	✓	..	✓	..
Guinea	✓	✓	..	✓	✓	✓	✓	✓	✓
Guinea-Bissau	✓	✓	✓	✓	✓	✓	✓
Guyana	✓	✓	..	✓	..	✓	✓	✓	..
Haiti	✓	✓	✓	✓	✓	✓	✓
Honduras	✓	✓	✓	✓	✓	✓	✓
Hong Kong, China	✓	✓	✓	✓	✓	✓	✓	✓	..
India	✓	✓	✓	✓	..	✓	✓	✓	✓

Table 8.A2.1. **Availability of the core ICT indicators on ICT infrastructure and access, 2009 or latest available year (cont.)**

	Fixed telephone lines per 100 inhabitants	Mobile cellular subscriptions per 100 inhabitants	Internet subscriptions per 100 inhabitants	Fixed broadband subscriptions per 100 inhabitants	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants	International internet bandwidth per inhabitant	Percent coverage of mobile cellular network (population)	Fixed broadband Internet monthly subscription (USD)	Mobile cellular prepaid tariffs (per month) in USD, and as a percentage of monthly per capita income
	A1	A2	A3	A4	A5	A6	A7	A8	A9
Indonesia	✓	✓	✓	✓	✓	✓	..	✓	✓
Iran	✓	✓	..	✓	✓	✓	✓	✓	✓
Iraq	✓	✓	✓	✓	✓	✓	✓
Jamaica	✓	✓	✓	✓	✓	✓	✓	✓	..
Jersey	✓
Jordan	✓	✓	✓	✓	✓	✓	✓	✓	..
Kazakhstan	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kenya	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kiribati	✓	✓	..	✓	✓	✓
Kuwait	✓	✓	..	✓	✓	✓	..	✓	..
Kyrgyzstan	✓	✓	✓	✓	✓	✓	✓	✓	✓
Laos	✓	✓	✓	✓	✓	✓	✓	✓	✓
Latvia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lebanon	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lesotho	✓	✓	..	✓	✓	✓	..	✓	✓
Liberia	✓	✓	✓	✓
Libya	✓	✓	✓
Liechtenstein	✓	✓	✓	✓	✓	✓	✓
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓	..
Macao, China	✓	✓	✓	✓	✓	✓	✓	✓	✓
Madagascar	✓	✓	✓	✓	✓	✓	..	✓	✓
Malawi	✓	✓	✓	✓	✓	✓	..	✓	✓
Malaysia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Maldives	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mali	✓	✓	✓	✓	✓	✓	..	✓	✓
Malta	✓	✓	..	✓	✓	✓	✓	✓	✓
Marshall Islands	✓	✓	..	✓	✓	✓
Mauritania	✓	✓	✓	✓	✓	✓
Mauritius	✓	✓	✓	✓	✓	✓	✓	✓	✓
Micronesia (Fed. States of)	✓	✓	..	✓	✓	✓	..	✓	✓
Moldova	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mongolia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Montenegro	✓	✓	..	✓	✓	✓	..	✓	✓
Morocco	✓	✓	✓	✓	✓	✓	..	✓	✓
Mozambique	✓	✓	✓	✓	✓	✓	✓	✓	✓
Myanmar	✓	✓	✓	✓	✓	✓	..	✓	✓
Namibia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nauru	✓	✓	✓
Nepal	✓	✓	✓	✓	✓	✓	..	✓	..
Netherlands Antilles	✓	✓	✓	✓
New Caledonia	✓	✓	✓	✓	✓	✓	✓
Nicaragua	✓	✓	..	✓	✓	✓	✓	✓	..
Niger	✓	✓	..	✓	✓	✓	..	✓	✓

Table 8.A2.1. **Availability of the core ICT indicators on ICT infrastructure and access, 2009 or latest available year (cont.)**

	Fixed telephone lines per 100 inhabitants	Mobile cellular subscriptions per 100 inhabitants	Internet subscriptions per 100 inhabitants	Fixed broadband subscriptions per 100 inhabitants	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants	International internet bandwidth per inhabitant	Percent coverage of mobile cellular network (population)	Fixed broadband Internet monthly subscription (USD)	Mobile cellular prepaid tariffs (per month) in USD, and as a percentage of monthly per capita income
	A1	A2	A3	A4	A5	A6	A7	A8	A9
Nigeria	✓	✓	✓	✓	✓	✓	✓	✓	✓
Northern Mariana Islands	✓	✓	✓	✓	✓
Oman	✓	✓	✓	✓	✓	✓	✓	✓	..
Pakistan	✓	✓	✓	✓	✓	✓	✓	✓	✓
Palau	✓	✓	✓	✓	✓	✓	✓	..	✓
Panama	✓	✓	✓	✓	✓	✓	✓
Papua New Guinea	✓	✓	..	✓	✓	✓	..	✓	..
Paraguay	✓	✓	✓	✓	✓	✓	..	✓	✓
Peru	✓	✓	✓	✓	✓	✓	✓	✓	✓
Philippines	✓	✓	✓	✓	✓	✓	✓	✓	✓
Puerto Rico	✓	✓	✓	✓	✓	✓	✓	..	✓
Qatar	✓	✓	✓	✓	✓	✓	✓	✓	✓
Romania	✓	✓	✓	✓	✓	✓	✓	✓	..
Russia	✓	✓	..	✓	✓	✓	..	✓	✓
Rwanda	✓	✓	✓	✓	✓	✓	✓	✓	✓
Saint Kitts and Nevis	✓	✓	..	✓	✓	✓	✓
Saint Lucia	✓	✓	✓	✓	✓	✓	✓
Samoa	✓	✓	..	✓	✓	✓	✓
San Marino	✓	✓	..	✓	✓	✓	✓
Sao Tome and Principe	✓	✓	✓	✓	✓	✓	✓	✓	✓
Saudi Arabia	✓	✓	✓	✓	✓	✓	✓	✓	..
Senegal	✓	✓	✓	✓	✓	✓	✓	✓	✓
Serbia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Seychelles	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sierra Leone	✓	✓	..	✓	✓	✓	✓
Singapore	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solomon Islands	✓	✓	..	✓	✓	✓	..
Somalia	✓	✓	..	✓	✓
South Africa	✓	✓	..	✓	✓	✓	✓
Sri Lanka	✓	✓	✓	✓	✓	✓	✓	✓	..
St. Vincent and the Grenadines	✓	✓	✓	✓	✓	✓	✓	✓	..
Sudan	✓	✓	..	✓	✓	✓	✓	✓	✓
Suriname	✓	✓	✓	✓	✓	✓	..	✓	✓
Swaziland	✓	✓	✓	✓	✓	✓	✓	✓	✓
Syria	✓	✓	✓	✓	✓	✓	✓	..	✓
Chinese Taipei	✓	✓	✓	✓	✓	✓	✓	..	✓
Tajikistan	✓	✓	..	✓	✓	✓	..	✓	✓
Tanzania	✓	✓	..	✓	✓	✓	✓	✓	..
Thailand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Timor-Leste	✓	✓	✓	✓	✓	✓	..	✓	✓
Togo	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tonga	✓	✓	✓	✓	✓	✓	✓	✓	..
Trinidad and Tobago	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 8.A2.1. **Availability of the core ICT indicators on ICT infrastructure and access, 2009 or latest available year (cont.)**

	Fixed telephone lines per 100 inhabitants	Mobile cellular subscriptions per 100 inhabitants	Internet subscriptions per 100 inhabitants	Fixed broadband subscriptions per 100 inhabitants	Mobile cellular subscriptions with access to data communication at broadband speed per 100 inhabitants	International internet bandwidth per inhabitant	Percent coverage of mobile cellular network (population)	Fixed broadband Internet monthly subscription (USD)	Mobile cellular prepaid tariffs (per month), in USD, and as a percentage of monthly per capita income
	A1	A2	A3	A4	A5	A6	A7	A8	A9
Tunisia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Turkmenistan	✓	✓	..	✓	✓	✓	✓
Tuvalu	✓	✓	✓	✓	✓	✓	✓	..	✓
Uganda	✓	✓	✓	✓	✓	✓	✓	✓	..
Ukraine	✓	✓	✓	✓	✓	✓	..	✓	..
United Arab Emirates	✓	✓	✓	✓	✓	✓	..	✓	✓
Uruguay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Uzbekistan	✓	✓	✓	✓	✓	✓	✓	..	✓
Vanuatu	✓	✓	✓	✓	✓	✓	..	✓	✓
Venezuela	✓	✓	✓	✓	✓	✓	✓	✓	✓
Viet Nam	✓	✓	✓	✓	✓	✓	..	✓	✓
Virgin Islands (US)	✓	✓	✓	✓	✓
Yemen	✓	✓	✓	✓	✓	✓	✓	✓	✓

..: Not available.

1. Footnote by Turkey: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

2. Footnote by all the European Union Member States of the OECD and the European Commission: The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Source: International Telecommunication Union (ITU), World Telecommunication/ICT Indicators database, December 2010.

Core ICT indicators on access to, and use of, ICT by households and individuals

There are core 12 indicators on access to, and use of, ICT by households and individuals – six on household access to ICT and six on the use of ICT by individuals. There is also a reference indicator on access to electricity by households. The complete list of core indicators is shown in Annex 8.A3.

Table 8.A2.2. Availability of the core ICT indicators on access to, and use of, ICT by households and individuals in non-OECD member economies, 2009 or latest available year

	Proportion of households with a radio	Proportion of households with a TV	Proportion of households with a fixed line telephone	Proportion of households with a mobile cellular telephone	Proportion of households with a computer	Proportion of individuals who used a computer (from any location) in the last 12 months	Proportion of households with Internet access at home	Proportion of individuals who used the Internet (from any location) in the last 12 months	Proportion of individuals who used a mobile cellular telephone	Proportion of households with electricity
	HH1	HH2	HH3	HH3bis	HH4	HH5	HH6	HH7	HH10	HHR1
Afghanistan	✓	..	✓
Albania	✓	..	✓
Algeria	✓	..	✓
Andorra	✓
Angola	✓	✓	✓	✓	✓	..	✓	✓
Antigua and Barbuda	✓	✓	✓	✓	✓	✓	✓
Argentina	✓	..	✓
Armenia	✓	✓	✓	✓	✓	..	✓
Azerbaijan	✓	✓	✓	✓	✓	✓	✓	✓
Bahrain	✓	✓	✓	✓	✓	..
Bangladesh	✓	✓	✓	✓	✓	..	✓	✓
Barbados	✓
Belarus	..	✓	✓	..	✓	..	✓	✓	..	✓
Benin	..	✓	✓	..	✓
Bermuda	✓	✓	✓	✓
Bhutan	✓	✓	✓	✓	✓	..	✓	✓
Bolivia	✓	✓	✓	✓	✓	..	✓	✓
Bosnia and Herzegovina	✓	✓	✓	✓	✓	..	✓	✓
Botswana	✓	..	✓
Brazil	✓	✓	✓	✓	✓	..	✓	✓	✓	..
Brunei Darussalam	✓	..	✓
Bulgaria	..	✓	✓	✓	✓	✓	✓	..
Burkina Faso	✓	✓	✓	✓	✓	..	✓	✓
Cambodia	✓	✓	✓	✓	✓	..	✓
Cameroon	✓	✓	✓	✓	✓	..	✓	✓
Cape Verde	..	✓	✓	..	✓
Cayman Islands	..	✓	✓	✓	✓	..	✓
Chad	✓	..	✓
China	✓	..	✓
Colombia	..	✓	✓	✓	✓	..	✓
Comoros	✓	..	✓
Congo	✓	..	✓
Congo (Democratic Republic of the)	✓	✓	✓	✓	✓	..	✓	✓
Costa Rica	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cote d'Ivoire	✓	..	✓
Croatia	..	✓	✓	..	✓	✓	✓	✓	✓	✓
Cuba	✓	..	✓
Cyprus	..	✓	✓	✓	✓	✓	✓	..
Djibouti	✓	✓	✓	..	✓
Dominican Republic	✓	✓	✓	✓	✓	..	✓

Table 8.A2.2. **Availability of the core ICT indicators on access to, and use of, ICT by households and individuals in non-OECD member economies, 2009 or latest available year (cont.)**

	Proportion of households with a radio	Proportion of households with a TV	Proportion of households with a fixed line telephone	Proportion of households with a mobile cellular telephone	Proportion of households with a computer	Proportion of individuals who used a computer (from any location) in the last 12 months	Proportion of households with Internet access at home	Proportion of individuals who used the Internet (from any location) in the last 12 months	Proportion of individuals who used a mobile cellular telephone	Proportion of households with electricity
	HH1	HH2	HH3	HH3bis	HH4	HH5	HH6	HH7	HH10	HHR1
Ecuador	✓	✓	✓	✓	✓	✓	✓	✓	✓	..
Egypt	✓	✓	✓	✓	✓	..	✓	✓
El Salvador	✓	✓	✓	✓	✓	..	✓	✓	..	✓
Eritrea	✓	..	✓
Ethiopia	✓	..	✓	..	✓
Fiji	✓	..	✓
FYR Macedonia	✓	✓	✓	✓	✓	..
Gabon	✓	..	✓
Gambia	..	✓	✓	..	✓
Georgia	✓	✓	✓	..	✓	✓
Ghana	✓	✓	..	✓	✓	..	✓	✓
Greenland	✓
Guatemala	..	✓	✓	..	✓
Guinea	✓	..	✓
Guinea-Bissau	✓	..	✓
Guyana	✓
Haiti	✓	..	✓
Honduras	✓	✓	✓	..	✓	✓	✓	✓
Hong Kong, China	..	✓	✓	✓	✓	✓	✓	..
India	..	✓	✓	..	✓	✓
Indonesia	✓	✓	✓	✓	✓	..	✓	✓
Iran	..	✓	✓	..	✓	✓
Jamaica	✓	✓	✓	..	✓	✓
Jordan	✓	✓	✓	✓	✓	✓	✓	✓	..	✓
Kazakhstan	..	✓	✓	..	✓
Kenya	✓	..	✓
Kuwait	✓	..	✓
Kyrgyzstan	..	✓	✓	✓	✓	..	✓
Laos	✓	..	✓
Latvia	✓	✓	✓	✓	✓	..
Lebanon	✓	..	✓	..	✓
Lesotho	✓	..	✓
Liberia	✓	✓	..	✓	✓	✓
Libya	✓
Lithuania	✓	✓	✓	✓	✓	..
Macao, China	✓	✓	✓	✓	✓	..	✓	✓	..	✓
Madagascar	✓	..	✓	✓	✓	..	✓
Malawi	✓	✓	✓	..	✓
Malaysia	✓	✓	✓	✓	✓	..	✓	✓
Maldives	✓	..	✓
Mali	..	✓	✓	..	✓

Table 8.A2.2. **Availability of the core ICT indicators on access to, and use of, ICT by households and individuals in non-OECD member economies, 2009 or latest available year (cont.)**

	Proportion of households with a radio	Proportion of households with a TV	Proportion of households with a fixed line telephone	Proportion of households with a mobile cellular telephone	Proportion of households with a computer	Proportion of individuals who used a computer (from any location) in the last 12 months	Proportion of households with Internet access at home	Proportion of individuals who used the Internet (from any location) in the last 12 months	Proportion of individuals who used a mobile cellular telephone	Proportion of households with electricity
	HH1	HH2	HH3	HH3bis	HH4	HH5	HH6	HH7	HH10	HHR1
Malta	..	✓	✓	✓	✓	✓	✓	..
Mauritania	✓	..	✓
Mauritius	..	✓	✓	✓	✓	✓	✓	✓
Moldova	✓	✓	✓	✓	✓	✓	✓	✓	..	✓
Mongolia	..	✓	✓	..	✓	✓
Montenegro	✓	✓	✓	✓	✓	..	✓
Morocco	✓	✓	✓	✓	✓	✓	✓	✓
Mozambique	✓	..	✓	..	✓
Myanmar	✓	..	✓
Namibia	✓	✓	✓	✓	✓	..	✓	✓
Nepal	✓	✓	✓	✓	✓	..	✓	✓
New Caledonia	✓	..	✓
Nicaragua	..	✓	✓	✓	✓	..	✓	✓
Niger	✓	✓	✓	✓	✓	✓	✓	✓	..	✓
Nigeria	✓	✓	✓	✓	✓	..	✓	✓
Oman	..	✓	✓	✓	✓
Pakistan	..	✓	✓	..	✓
Panama	✓	✓	✓	..	✓
Papua New Guinea	✓	..	✓
Paraguay	✓	✓	✓	✓	✓	..	✓	✓	..	✓
Peru	✓	✓	✓	✓	✓	..	✓	✓	..	✓
Philippines	✓	✓	✓	✓	✓	..	✓	✓
Qatar	..	✓	✓	✓	✓	..	✓
Romania	✓	✓	✓	✓	✓	..
Russia	..	✓	✓	✓	✓	✓
Rwanda	✓	✓	✓	✓	✓	..	✓	✓
Saint Kitts and Nevis	✓	✓	✓	✓
Saudi Arabia	✓
Senegal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Serbia	..	✓	..	✓	✓	✓	✓	✓	✓	..
Seychelles	✓	..	✓
Sierra Leone	✓	✓	✓	✓	✓
Singapore	✓	✓	✓	✓	✓	✓	✓	..
South Africa	✓	✓	✓	✓	✓	..	✓	✓
Sri Lanka	✓	✓	✓	..	✓	✓
St. Vincent and the Grenadines	✓	..	✓
Sudan	✓	..	✓
Suriname	✓	✓	✓	..	✓
Swaziland	✓	..	✓	✓
Syria	✓	..	✓
Chinese Taipei	..	✓	✓	..	✓

Table 8.A2.2. **Availability of the core ICT indicators on access to, and use of, ICT by households and individuals in non-OECD member economies, 2009 or latest available year (cont.)**

	Proportion of households with a radio	Proportion of households with a TV	Proportion of households with a fixed line telephone	Proportion of households with a mobile cellular telephone	Proportion of households with a computer	Proportion of individuals who used a computer (from any location) in the last 12 months	Proportion of households with Internet access at home	Proportion of individuals who used the Internet (from any location) in the last 12 months	Proportion of individuals who used a mobile cellular telephone	Proportion of households with electricity
	HH1	HH2	HH3	HH3bis	HH4	HH5	HH6	HH7	HH10	HHR1
Tajikistan	✓	..	✓
Tanzania	✓	✓	✓	✓	✓	..	✓	✓
Thailand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Togo	✓	..	✓
Trinidad and Tobago	✓	..	✓
Tunisia	✓	..	✓
Turkmenistan	✓	..	✓
Uganda	✓	✓	✓	..	✓	..	✓	✓
Ukraine	✓	✓	✓	..	✓	✓	..	✓
United Arab Emirates	✓	✓	✓	✓	✓	✓	..	✓
Uruguay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Uzbekistan	✓	..	✓
Vanuatu	✓
Venezuela	✓	✓	✓	..	✓
Viet Nam	..	✓	✓	..	✓	..	✓	✓
Yemen	✓	..	✓
Zambia	✓	✓	..	✓	✓	..	✓	✓
Zimbabwe	✓	..	✓

..: Not available.

1. See note to Table 8.A2.1.

Source: International Telecommunication Union (ITU), World Telecommunication/ICT Indicators database, December 2010.

Table 8.A2.3. Availability of the core ICT indicator: Individuals who used the Internet in the last 12 months, by location (HH8), in non-OECD member economies, 2009 or latest available year

	Proportion of individuals who used the Internet in the last 12 months, by location of use (HH8)							
	At home	At work	At place of education	At another person's home	At community Internet access facility	At commercial Internet access facility	At any place via a mobile cellular telephone	At any place via other mobile access devices
Azerbaijan	✓	✓	✓	✓	✓	✓	✓	..
Belarus	✓	✓	✓	✓	✓	✓
Brazil	✓	✓	✓	✓	✓	✓	✓	..
Bulgaria	✓	✓	✓	✓	✓	✓
Colombia	✓	✓	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓	✓	✓
Croatia	✓	✓	✓	✓	✓	✓	✓	✓
Cyprus	✓	✓	✓	✓	✓	✓	✓	✓
Ecuador	✓	✓	✓	✓	..	✓	..	✓
El Salvador	✓	✓	✓	✓	✓	✓	..	✓
FYR Macedonia	✓	✓	✓	✓	✓	✓	✓	✓
Hong Kong, China	✓	✓	✓	..	✓	✓	✓	..
Latvia	✓	✓	✓	✓	✓	✓	✓	✓
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓
Macao, China	✓	✓	✓	..	✓
Malta	✓	✓	✓	✓	✓	✓	✓	✓
Mauritius	✓	✓	✓	✓	✓	✓
Morocco	✓	✓	✓	✓	✓	✓	✓	✓
Nicaragua	✓	✓	✓	✓	✓	✓
Oman	✓	✓	✓	✓	✓	✓
Palestinian Authority	✓	✓	✓	✓	✓	✓	✓	..
Paraguay	✓	✓	✓	✓	..	✓
Peru	✓	✓	✓	✓	..	✓
Qatar	✓	✓	✓	✓	✓	✓	✓	✓
Romania	✓	✓	✓	✓	✓	✓	✓	✓
Serbia	✓	✓	✓	✓	✓	✓	✓	✓
Singapore	✓	✓	✓	✓	✓	✓	✓	✓
Thailand	✓	✓	✓	✓	✓	✓
Ukraine	✓	✓	✓	✓	✓
United Arab Emirates	✓	✓	✓
Uruguay	✓	✓	✓	✓	✓	✓

..: Not available.

1. See note to Table 8.A2.1.

Source: International Telecommunication Union (ITU), World Telecommunication/ICT Indicators database, December 2010.

Core ICT indicators on use of ICT by businesses

There are 12 core indicators on use of ICT by businesses. The complete list of core indicators is shown in Annex 8.A3.

Table 8.A2.4. Availability of the core ICT indicators on use of ICT by businesses in non-OECD member economies, 2009 or latest available year

	Proportion of:				Proportion of enterprises with:				Proportion of enterprises accessing the Internet by:						Proportion of enterprises:		
	Enterprises using	Persons employed	Enterprises using	Persons employed	With a website	With an intranet	Receiving orders	Placing orders over	Analogue modem	ISDN	Fixed line connection	Fixed broadband	Other modes of access	Narrowband	Mobile broadband	Local area network	An extranet
	B1	B2	B3	B4	B5	B6	B7	B8	B9.a	B9.b	B9.c	B9.d	B9.e	B9.n	B9.m	B10	B11
Argentina	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Azerbaijan	✓	✓	✓	✓	✓	✓	..	✓	✓	✓	✓	✓	✓	✓	✓
Belarus	✓	..	✓	..	✓	✓	..
Bermuda	✓	✓	✓	✓	✓	✓	✓	✓
Brazil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓
Bulgaria	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
China	✓	..	✓	..	✓	✓	✓	✓	✓	..
Hong Kong, China	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Macao, China	✓	..	✓	✓	✓
Colombia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Croatia	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Cuba	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cyprus	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Egypt	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	..	✓	✓
FYR Macedonia	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	..	✓	✓
India	✓
Jordan	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Kazakhstan	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Kyrgyzstan	✓	..	✓	..	✓	✓	✓	..
Latvia	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Lesotho	✓	✓	✓	..	✓	✓	..	✓
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Malta	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Mauritius	✓	✓	✓	✓	✓	✓	✓	✓
Mongolia	✓
Panama	✓	✓	✓	✓	..	✓	✓	✓	✓	✓	✓	..	✓	✓	✓
Qatar	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	✓
Romania	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Russian Federation	✓	✓	✓	✓	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Senegal	✓	..	✓	✓	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Serbia	✓	✓	✓	..	✓	✓	✓	✓	✓	✓	..	✓	✓	✓	✓
Singapore	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	✓
Suriname	✓	..	✓
Thailand	✓	✓	✓	✓	✓	..	✓	✓	✓	✓	..	✓	✓
United Arab Emirates	✓	..	✓	..	✓	✓	✓	✓	✓	..	✓	..	✓	✓
Uruguay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

..: Not available.

–: Magnitude nil.

1. See note to Table 8.A2.1.

Source: United Nations Conference on Trade and Development (UNCTAD), December 2010.

Table 8.A2.5. **Availability of the core ICT indicators on use of ICT by businesses in non-OECD member economies, 2009 or latest available year**

	Proportion of enterprises using the Internet for:														
	Sending and receiving e-mail	Information about goods or services	Information from public authorities	o Information searches or research	Internet banking or accessing other financial services	Internet banking	accessing other financial services	Interacting with general government organisations	Providing customer services	Delivering products online	Other types of activity	Telephoning over the Internet/VoIP	Instant messaging, bulletin boards	Staff training	Internal or external recruitment
	B12.a	B12.b.i	B12.b.ii	B12.b.iii	B12.c	B12.c.i	B12.c.ii	B12.d	B12.e	B12.f	B12.g	B12.h	B12.i	B12.j	B12.k
Argentina	✓	✓	✓	✓	..	✓	✓	✓
Azerbaijan	✓	..	✓	✓
Belarus
Bermuda
Brazil	✓	✓	✓	✓	..	✓	✓	✓	✓	..
Bulgaria	✓	✓	..	✓	✓	✓	..
China	✓	✓	✓	✓	✓	✓	✓
Hong Kong, China	✓	✓	✓	✓	✓	✓	✓	✓	..	✓
Colombia	✓	✓	✓	✓	✓	✓	✓	✓
Croatia	✓	✓	..	✓	✓	..
Cuba	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cyprus	✓	✓	..	✓	✓	✓	..
Egypt	✓	✓	✓	✓	..	✓	✓	✓
FYR Macedonia	✓	✓	..	✓	✓	..
India
Jordan	✓	✓	✓	✓
Kazakhstan	✓	✓	✓	✓	..	✓	✓	✓	✓
Kyrgyzstan	✓	..	✓	✓
Latvia	✓	✓	..	✓	✓	✓	..
Lesotho	✓	✓	✓
Lithuania	✓	✓	..	✓	✓	✓	..
Malta	✓	✓	..	✓	✓	✓	..
Mauritius
Mongolia
Panama	✓	✓	✓	✓	✓	✓	✓	..	✓
Qatar	✓	✓	✓	✓	..	✓	✓
Romania	✓	✓	✓	✓	..
Russian Federation	✓	✓	✓	✓	..	✓	..	✓	..	✓	..	✓	✓
Senegal	✓	✓	✓	✓	..	✓
Serbia	✓	✓	✓	✓
Singapore	✓	✓	✓	✓	..	✓	..	✓	..	✓	✓	✓	✓
Suriname
Thailand	✓	✓	..	✓	✓	✓	✓	✓	✓
United Arab Emirates	✓	✓	✓	✓	..	✓	✓	✓
Uruguay	✓	✓	✓	✓	✓	✓	✓	✓

..: Not available.

1. See note to Table 8.A2.1.

Source: United Nations Conference on Trade and Development (UNCTAD), December 2010.

Core ICT indicators in ICT in education

There are eight core indicators on ICT in education and one reference indicator on proportion of schools with electricity. The complete list is shown in Annex 8.A3. These indicators are new to the list of core ICT indicators, although they have been in development by the UNESCO Institute for Statistics (UIS) for several years. The ICT in education indicators have been subject to extensive testing and consultation. The key principles for selection of the indicators include policy relevance, feasibility of reliable data collection, minimization of data collection burden and international comparability (UIS, 2009).

Table 8.A2.6. **Availability of the core ICT indicators on ICT in education in non-OECD member economies, 2009 or latest available year**

	Infrastructure (electricity and old technology in schools)				Infrastructure (computers in schools)		Infrastructure (Internet in schools)			Learners and ICT usage	Teaching staff and ICTs
	Proportion of schools with electricity	Proportion of schools with a radio used for educational purposes	Proportion of schools with a television used for educational purposes	Proportion of schools with a telephone communication facility	Learners-to-computer ratio in schools with computer-assisted instruction	Learners-to-computer for pedagogical use ratio	Proportion of schools with Internet access	Proportion of schools with fixed narrowband Internet access (using modem dial-up, ISDN)	Proportion of schools with fixed broadband Internet access (DSL, cable, other fixed broadband)	Proportion of learners who have access to the Internet at school	Proportion of ICT-qualified teachers in primary and secondary schools
	EDR1	ED1	ED2	ED3	ED4	ED4bis	ED5a.	ED5b.	ED5c.	ED6	ED8
Argentina	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bahrain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Belarus	✓	.	.	✓	✓	✓	✓	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓	✓	✓	✓
Dominican Republic	✓	✓	✓	✓
Egypt	✓	✓	..	✓	✓	✓	✓	..	✓
Ethiopia	✓	..	✓	✓
Ghana	✓	.	.	✓	✓	✓
Guatemala	✓	✓	✓	✓	✓
Jordan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Malaysia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mauritius	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	..
Morocco	✓	-	-	✓	✓	..	✓	..	✓
Oman	✓	✓	✓	✓	✓	✓	✓
Palestine	✓	✓	✓	✓	✓
Paraguay	✓	.	.	✓	✓	✓
Russian Federation	✓	✓	✓	✓	✓
Senegal	✓	✓
Tunisia	✓	-	-	✓	✓	✓
Uruguay	✓	✓	✓	..	✓

..: Not available.

-: Magnitude nil.

.: Category not applicable.

Source: UNESCO Institute for Statistics (UIS), December 2010.

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ANNEX 8.A3

*Measurement Issues for Developing Economies***Introduction**

This annex provides an overview of measurement of the information society from the perspective of non-OECD economies. Its aim is to facilitate applicability of the *Guide* to those economies, thus improving prospects for internationally comparable data in this area.

Readers should also note the efforts of the *Partnership on Measuring ICT for Development* in establishing an agreed set of core ICT indicators including definitions, model questions and methodological recommendations (2005, 2008, 2010). The *Partnership's* main objective in undertaking this work is to enable the production of internationally comparable data on various aspects of ICT. An important goal of the *Partnership* is to help countries (and particularly those in the developing world) to develop ICT surveys or add suitable questions to existing collections. In March 2007, the UN Statistical Commission endorsed the core list of ICT indicators and encouraged countries to use it in their data collection programmes (UNSC, 2007; *Partnership on Measuring ICT for Development*, 2007). The core list was revised in 2008 and in 2010 and is shown at the end of this annex. More information about the *Partnership* can be found in Chapter 8.

It is important to note at the outset that measurement of the information society should be an integral part of a country's statistical system, with many concepts, classifications and methodologies being common to other areas of statistical enquiry. For instance, surveys of ICT use are not very different from other statistical surveys in terms of frames, sample selection, statistical units, questionnaire design, collection methodology or data processing. In fact, ICT use surveys can often be integrated with other surveys, thus reducing the costs of data collection.

It is beyond the scope of this annex to explore all the initiatives of non-OECD countries in collecting ICT statistics. Instead, it will highlight areas where developing economies might diverge from OECD guidelines because of difficulties in measurement or because of the unique way in which the information society has evolved or taken shape within a particular country. The purpose of the annex is to expand the range of countries to which the *Guide* can be applied, by providing suggestions that take into account the different circumstances of statistically less advanced countries. It has been prepared with the least developed economies particularly in mind.¹ Countries in more advanced stages of development are likely to move towards direct use of the standards set by OECD and therefore some of the issues discussed – and problems identified – here will be of less concern to them.

To assist with cross-referencing, the structure and content of the annex broadly follows that of the *Guide*.

Measuring the information society in developing economies

Information on availability, access and use of ICT is being collected by a range of national, regional and international organisations. For instance, all of the ICT infrastructure and access core indicators, and the indicators on household ICT access and individual ICT use proposed by the *Partnership on Measuring ICT for Development* are already being collected and disseminated by the ITU. ITU data are collected primarily through annual questionnaires addressed to countries, usually the regulatory telecommunication/ICT authority, the Ministry in charge of telecommunication/ICT and national statistical offices (NSOs). The core indicators on ICT use by businesses are collected by UNCTAD, through an annual survey usually directed to NSOs.

In spite of the leading place that the Internet and computers occupy in discussions of public policy, ICT in the context of developing economies could include “traditional” or “older” technologies (such as radio and television) as well. For example, by 2010, the proportion of households with a TV is approaching 80 per cent, globally. In Africa, however, only about 30 per cent of households have a television (ITU, 2010a). Measures, such as those established by the *Partnership* on the number of television and radio sets per 100 inhabitants, would help address the information needs in this area.²

Although the *Guide* deals with ICT measurement, it is worth considering the following guiding principles that govern any measurement activities, but which may be of greater relevance to developing economies.

- Countries may have different priorities for data collection. They may not be able to afford dedicated surveys on ICT. Instead, they may be able to include ICT related questions in existing surveys, some of which include background information (e.g. demographic and socio-economic data in social surveys).
- National Statistical Offices and other agencies with a role in the collection of official statistics have a strong part to play in co-ordination as well as standard setting and data collection.³ It is essential that metadata systems are incorporated into such developments in order to capture information essential to informed use of national data.
- A methodology that is appropriate to the circumstances should be used. It should be needs-driven and relate to local cultural determinants, with variables that can be captured accurately and adequately. It might evolve from a first-time collection of essential core indicators to a more sophisticated collection of elaborate disaggregated indicators.
- Caution should be exercised that international comparisons take into account the different circumstances of countries and their economic and social situation. Analyses and best practice examples⁴ can help countries to learn from others’ experiences in data collection.⁵ Ideally, countries will adopt recommendations of the *Partnership* (2010) for standardised metadata associated with ICT measurement (for instance, on scope and classifications).

ICT products

The main uses of an ICT product classification in a country’s statistical system are for measuring trade in, production of, expenditure on, and use of, ICT products.

The OECD started revising its ICT goods classification in 2006 and finalised an ICT products classification in 2008 (see Chapter 2 for details). The full list of categories included in the ICT product classification can be found in Annex 2.A1 of this *Guide*.

Relevant *Partnership* indicators for ICT product measurement are currently limited to international trade in ICT goods.

ICT infrastructure

ICT infrastructure is a crucial resource for an information society. As newer technologies emerge, they create the challenge of establishing infrastructure able to meet demand. For this reason, measurement of infrastructure may precede measurement of products or usage.⁶

Many developing economies suffer from a lack of the basic infrastructure needed to build a solid ICT base, such as electricity and roads. ITU data show that in many developing economies, the majority of fixed telephone lines are concentrated in urban areas. The evolving mobile network infrastructure has significantly reduced the urban-rural gap and mobile cellular networks today are providing access to previously unconnected areas. ITU estimates that by 2010, only about 10 per cent of the world's population is not living within reach of a mobile cellular signal, and in Africa, over 50 per cent of the rural population are covered (ITU, 2010a). Given the increasing spread of high speed mobile broadband (3G and beyond) networks, these developments are also providing unprecedented opportunities for bringing broadband Internet access to rural and remote areas.

In some non-OECD countries, providing access to information through public access points is an important element of the national ICT strategy. Data on crucial aspects of ICT infrastructure will not be complete unless use of such public Internet access points is included in surveys and preferably extended to include use by socially excluded and marginalised groups.

The *Partnership's* core indicators include one on individual Internet use by location that has community Internet access facility as a response category.

International bandwidth is a critical infrastructure component and is of importance to many developing economies. However, bandwidth linking developing nations and the developed world is scarce and expensive. There is also a critical lack of connectivity between developing nations (particularly in Africa), meaning that inter-regional communications must often be routed over long and expensive inter-continental routes. Bandwidth data collected by the ITU show that developing economies still have considerably less bandwidth than developed countries.

While not all developing economies have deployed broadband technologies, more and more countries are starting to use high speed Internet access, particularly in the business sector. Fixed and mobile broadband access are important indicators that are included in the *Partnership's* core list and collected by the ITU and UNCTAD.

When newer technologies, such as mobile phones, are introduced to a local market, it is important to consider the "leap-frogging" effect of such technology. For example, the number of mobile phone subscriptions exceeds the number of fixed lines in the majority of developing economies,⁷ and some countries are reconsidering their policies for landline provision. Reflecting this trend, one of the core ICT infrastructure indicators proposed by the *Partnership* (2010) is Mobile cellular telephone subscriptions per 100 inhabitants, an indicator that is tracked by the ITU. Another trend for developing economies is to leap

straight to wireless technology for Internet access. Though such technologies may not be the preferred option in all situations, they offer the advantage of avoiding the necessity of laying landlines in rugged or inhospitable terrain.

ICT supply

In the OECD conceptual framework, “ICT supply” refers to the ICT sector, whose component industries are defined as follows: “The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display” (OECD, 2006). OECD revised the definition in 2006 in order to be consistent with the revised ISIC Rev. 4 (UNSD, 2008). An outcome of the revision was that the ICT sector definition was more restricted than the original concept (which dated from 1998). See Chapter 4 and Annex 7.A1 for more information.

It may be useful for country surveys to consider whether the market in new technologies is led by imports or by local manufacturing businesses. One would normally assume that initial penetration takes place through imports; however, growth in local supplies might price out imported goods over time. During 2005, announcements by major suppliers to supply specially manufactured phones and computers to developing economies⁸ suggest that there may be rapid changes in markets. These changes would ideally be captured statistically, for instance, by measuring the supply of such devices and their use by different groups.

Patents, including those for ICT inventions, are regularly used as an index of innovation in the developed world, but a number of substantive barriers hinder their use outside OECD countries. Since Intellectual Property Rights (IPR) laws are not enforced properly in many developing economies, local patenting is seen as relatively ineffective. It should be noted that for most developing economies, the number of patents in the US, European and Japanese patent offices is negligible, and therefore not relevant for statistical analysis.

National patent systems are not always comparable, for instance, some countries have a lower threshold when evaluating novelty and patentability of patent applications. Furthermore, national patent laws and regulations may change over time, making statistical time series difficult to interpret.

ICT demand by businesses

Many businesses in developed countries have moved beyond basic Internet access to a dynamic e-business infrastructure using technologies such as payment gateways, secure channels, digital certification and online tracking. In contrast, many developing economies still lack the basic human capital and infrastructure that would enable a sufficient market for online services and allow such transactions to be carried out reliably. As a consequence, many businesses in developing economies are still in the early stages of using ICTs, such as computers, the Internet and a basic website, rather than moving to e-business processes such as customer relationship management or supply chain management. Similarly, their use of the Internet is often focused on obtaining information about markets, or trying to identify international companies to which they could bid as suppliers.

Therefore, not only do a lower proportion of businesses in most developing economies use ICT, but those that do are most likely to use simpler ICTs. Business surveys on the use

of ICT in non-OECD countries might therefore prefer to focus on the relatively simple core indicators identified by the *Partnership*. Several issues related to the measurement of the *Partnership's* core indicators on the use of ICT by businesses and on the ICT sector, and relevant to developing countries, are discussed in the UNCTAD *Manual for the Production of Statistics on the Information Economy* (UNCTAD, 2009). See also the comments in Chapter 5 on the statistical challenges of measuring e-commerce. Some of these (for instance, the challenge of reliably measuring a rare event) will be particularly applicable to many developing economies.

The *Partnership's* core list does not include indicators on barriers, although these might be useful for individual countries. They include barriers relating to skills, finance, language, availability of content, quality and cost of infrastructure, and critical mass of users.

While countries may establish a priority for measurement of trends in business use of ICT, such work may be hampered by problems in the statistical system. The potential for work on businesses can be severely limited by the absence of reliable business registers in some countries. In others, the capacity to carry out large-scale surveys is lacking. Such capacity may need to be built according to individual country requirements. If a comprehensive business register is not available for a country, then establishing one might be the first priority of statistical agencies. Volatile business demographics and a large informal sector are major issues hindering the development of business registers in many developing economies. Transparent metadata should be provided to indicate the sampling base for any business survey – especially where the sample frame has been limited by lack of complete or up-to-date information.

ICT demand by households and individuals

In developing economies, there are various socio-economic problems that create barriers to people owning, accessing and using ICT. These problems, amongst others, include illiteracy, language, socio-cultural barriers, lack of ICT skills (including keyboard skills), lack of access to ICT and low income.

While the set of household and individual classificatory variables recommended by the *Partnership* (2010) represents a useful minimal set, it does not cover all these characteristics. Surveys of ICT penetration and use in developing economies may therefore need to consider a wider range of social factors and issues than proposed by the *Partnership* and collected annually by ITU. If such factors are not considered, there is a risk of incorrectly identifying reasons for low levels of ICT access and use in developing economies.

In the majority of developing economies, household access to, and individual use of, computers and the Internet remains low. Community access potentially plays an important role in helping to overcome this divide – especially in rural areas. Several countries are taking steps to address this gap by increasing the number of public Internet access points, including in schools, libraries, cultural and other community centres.

Radio and television are still the leading electronic means of information distribution in some developing economies (especially the least developed countries), particularly in rural and remote areas. “New” technologies, such as computers and Internet access, may only exist in urban areas. Such limitations in access mean that some developing economies might prefer to frame surveys according to those limits. However, for reasons of

international comparability, information collected from such surveys should be adjusted so that it represents the population of the entire country.

International household surveys have seen increasing co-ordination in the last five years (in particular through the International Household Survey Network established by the World Bank in 2004) and there is increasing use of censuses and surveys in developing economies. Nevertheless, such surveys remain expensive. It is likely that with scarce resources, developing economies would not be able to run a dedicated ICT household survey more frequently than every few years. Such timing may not be frequent enough to capture the rapid pace of change that can ensue as a new technology enters a national market. It is thus almost certain that the majority of developing economies will want to add questions on ICT to existing multi-purpose, labour force or general household surveys.

Such household surveys are characterised by competing interests and pressures to reduce interview time to a minimum. Countries would thus need to determine a small core set of key questions. Such core questions are unlikely to be the same as those chosen for OECD countries, but it is important that the small group of questions that are chosen are closely aligned with international guidelines to allow international comparisons and benchmarking. The core indicators on access to and use of, ICT by households and individuals that have been presented by the *Partnership* (2010) are likely to be a useful starting point. Given the comments above on the importance of barriers to ICT use, a question on household barriers (such as question 5 in the OECD model survey shown in Annex 6.A1) and/or individual barriers could be added to the core suite of questions for developing economies.

The ITU *Manual for Measuring ICT Access and Use by Households and Individuals* (ITU, 2009) provides a comprehensive account of statistical standards and methodologies relevant to the collection of the core ICT household indicators developed by the *Partnership*. It has been specifically designed to assist developing countries in preparing household ICT surveys, and covers all necessary statistical standards and measurement topics. The technical manual provides detailed information on data sources and collection techniques, and covers the areas of questionnaire and survey design, data processing and quality, and information on the dissemination of household ICT data and metadata. The Manual also serves as the basis for ITU's training course on measuring ICT access and use by household and individual, which is being delivered to developing countries on a regular basis.

Content

Many developing economies have yet to agree on standards for representation codes of their languages, keyboard layouts and fonts. When languages are spoken across multiple countries whose publishers do not agree on standards, the situation gets still more complicated. Other challenges arise in the case of languages for which Internet domain names and e-mail identification must be typed using the Roman alphabet and not in the local language.

Countries that want to use software in other national languages may have to translate the material and adapt it, as China has already been doing on a huge scale. However, this will increase costs, especially for countries with several languages, or several scripts. For example, Thailand has 74 living languages and China has 2 922 living languages.⁹

Work by researchers on the statistics of language use on the Internet has shown how the inherent technical bias of ICT in favour of Latin scripts and European languages

hinders the collection of accurate data on numbers of websites and pages by countries (Paolillo et al., 2005).

Although the availability of local Internet infrastructure is increasing in many developing economies, it appears that relatively little local or indigenous content is being generated in some countries. This, of course, reflects the fact that it is often such groups who have the least access to the Internet. To support economic growth and development, the importance of access to local knowledge is important. There will be a need to preserve, protect, research and promote access to local knowledge in a climate where other predominant languages, such as English, are being used.

In many developing economies, even where businesses have websites, these may be directed at an international rather than a local audience (and may therefore use English rather than local languages). Such websites are likely to have more information content than an interactive or transaction orientated content as there will be few domestic transactions in such circumstances, while international transactions may be infrequent and relatively expensive. Surveys of websites and domain names might wish to consider how best to capture this aspect of website content, and how to monitor any transition to a more interactive structure such as the construction of national “portals” for particular sectors or markets as domestic access to the web increases.

There may be areas of content that are more appropriate for developing economies and to which surveys might pay special attention. websites on development projects themselves, often supported with imported donor technology, are a case in point. Online activities, assuming the availability of uninterrupted electricity and infrastructure, have the potential to address remote communities and excluded groups. There are many initiatives aimed at increasing the use of ICT in education that are targeted at rural and excluded groups. Countries might therefore wish to pay particular attention to content directed towards such groups, and seek to measure the degree to which such content is helping to bring excluded groups into the wider community. See also the *Partnership’s* core indicators on ICT in education.

In respect of measurement, countries should note the recent OECD sectoral and product classifications of Content and media that are described and detailed in this *Guide*.

Other issues

The “digital divide”

A considerable proportion of the population in developing economies is still excluded from the information society, especially from broadband Internet access. In other words, the social and economic divide is also “digital”. ITU’s ICT Development Index (IDI), published annually since 2009, tracks the digital divide by measuring the relative difference in IDI levels amongst economies and over time. The index is calculated from 11 indicators and three sub indices: ICT access sub-index: fixed telephone lines per 100 inhabitants, mobile cellular subscriptions per 100 inhabitants, international Internet bandwidth (bits/second per Internet user), proportion of households with a computer, and proportion of households with Internet access; ICT use sub-index: Internet users per 100 inhabitants, fixed broadband Internet subscriptions per 100 inhabitants, and mobile broadband subscriptions per 100 inhabitants; and ICT skills sub-index: adult literacy rate, and gross school enrolment rates (secondary and tertiary levels); (ITU, 2010b).

There are several dimensions to the digital divide that go beyond basic ICT access, use and skills. They imply a variety of societal concerns about education and capacity building, social equity including gender equity and the appropriate use of technology. In particular, it has been noted that in more traditional societies, barriers may be more social and cultural than economic. Furthermore, among such barriers, the key role of education should be noted in creating access opportunities and awareness, and providing potential users with the skills needed to use ICT effectively.

The *Guide* has suggested that simple penetration rates may not be appropriate for addressing the digital divide as they tend to emphasise the “haves” rather than the “have-nots”. However, as this annex has indicated, many developing economies are still at a very early stage in adoption of ICT and may not have the resources for collecting more complex indicators on a regular basis. For this reason, it is recommended that non-OECD countries consider simple penetration indicators, at least where ICT development is at an early stage and a sophisticated market does not exist. The *Partnership’s* core ICT indicators include appropriate intensity indicators such as the proportion of individuals using the Internet classified by gender or highest education level received.

Considerations of cost and the limitations of the statistical system apply to some aspects of digital divide measurement. Resource issues may prevent much sub-national analysis, especially in trying to draw a valid sample in an area, or for a social group, where little ICT is in use. Under these circumstances, this annex suggests that it may be more appropriate for surveys to concentrate on ICT infrastructure indicators.

E-government

Several developing economies have realised the role that ICT can play in delivering government services, and have started implementing innovative models that may be technically simple but are already dramatically changing the way information is distributed within society. The success of such schemes is often limited by the small proportion of citizens who are able to use the technologies required for access.

Because of the potentially important role of government in developing economies in introducing new technologies, e-government issues, and therefore measurement, are likely to be important.

In developed countries, new technologies can be introduced directly to the individual consumer. In developing economies, new technologies may be introduced through community services such as public access points or community telecentres. Developing economies may therefore have to rely on government or other donors to introduce networked services and infrastructure rather than waiting for the market or private industry to do so. It may thus be useful to collect e-government indicators such as the availability of websites and electronic services. However, note the comments in Annex 5.A1 on the challenges of collecting statistical information from the public sector. Such challenges are likely to apply to both OECD and developing economies.

However, there are a number of barriers that hinder a country’s measurement of e-government and these apply to both developing and other countries.

Eight core indicators on ICT in government are expected to be added to the *Partnership* core ICT list in 2011, after consultation work is finalised.

Education and training

Some studies (for example, the SITES studies¹⁰) have shown that ICT plays a role in improving the quality of formal education in school classrooms and in encouraging further supplemental learning by students at their homes. Data on availability of ICT in formal education, its costs and benefits, use, equity of access and impact in terms of educational outcomes are very useful in the context of planning formal education programmes.

It is often understood that the main reason for using ICT in the classroom is to better prepare the current generation of students for a workplace where ICT, particularly computers, the Internet and related technologies, is becoming much widely used. Computer literacy – the ability to use ICT effectively and efficiently – thus gives a competitive edge in an increasingly globalised job market, and tests of ICT skills, such as the International Computer Driving Licence,¹¹ are becoming more common.

In a move to put in place internationally standardised methodologies and indicators to monitor the growing integration of information and communication technologies into education across countries, the UIS has released the *Guide to Measuring Information and Communication Technologies (ICT) in Education* (UIS, 2009). In addition to the UIS core set of indicators, this guide presents an expanded list to address a wide range of policy concerns in relation to the new paradigm of ICT-enhanced education service delivery. It will help to ensure consistent use and interpretation of ICT in education statistics among policymakers, statisticians, researchers, experts and statistical institutions across the world. This technical paper should serve as a reference and training guide for collecting comparable data at the country level and for completing future UIS questionnaires on ICT in education. Given the rapidly evolving nature of this field, this is intended to be a living document that will be subject to future refinements.

ICT plays a potentially major role in the promotion of distance education. This is particularly so in the context of developing economies, where ICTs, especially the older ones, such as the radio and the television, may be used at home in community programmes for distance learning. Therefore, data on these facilities would be useful for planning such programmes.

Illiteracy is a major human development issue that can potentially be addressed through the application of ICT. Adult literacy rates remain at low levels in many countries, with rates usually below 50 per cent in the least developed countries. Radio and television, as broadcast technologies, are attractive in Africa because they can leverage costs to address the needs of a large number of learners over distance and, with re-broadcast over time, these could potentially offer alternative means of delivering information that would otherwise be inaccessible to illiterate adults. ICT can aid in the teaching of reading to some who would not be reached by conventional learning approaches. Surveys might thus consider how to capture a variety of ways in which ICT can improve literacy.

For-profit ICT training has become a growing service industry in developing economies. It offers relatively high-end information processing skills (like managing network operating systems software) and also low-end skills, for example, data entry in India.

ICT training (in formal education, non-formal education and private industry-led vocational training) for developing economies should not be seen as an ancillary service, but as a vital part of ICT infrastructure that must be in place as a precursor to market penetration, especially where governments are trying to encourage market growth.

The *Partnership* core indicators of 2010 include a set of core “ICT in education” indicators developed by UIS. Through its publication, namely the *Guide to Measuring Information and Communication Technologies (ICT) in Education*, (UIS, 2009), the UIS has also put in place an expanded set of internationally standardised indicators and methodological tools on ICT in education to help monitor the growing integration of ICT across countries’ education systems.

The gender dimension

In many developing economies, the number of women producers and traders is increasing as a result of micro-credit initiatives. Women’s dual role (in direct production and in caring for the family) typically implies reduced physical business mobility and overcoming social barriers to information access.¹² ICT provides an opportunity both to give women wider access to information and services as well as allowing them to develop their own business skills. In India, there are a number of projects underway, including the Smile project (Savitri Marketing Institution for Ladies Empowerment), a voluntary organisation in Pune. According to Agarwal (2004), this project has “increased literacy level of underprivileged women through the usage of ICT. Internet has also helped them market their various products like soft toys, candles, bags, utility items, etc. Through Internet, there is greater awareness and exposure and market reach for the products.” More examples from India can be found in Agarwal (2004).

Note that classificatory variables recommended for the core individual ICT use indicators established by the *Partnership* (2010) and collected by ITU annually through a questionnaire sent to NSOs, include education level and gender. Core indicators on aspects of individual use of ICT should therefore be classifiable by gender to provide more information on the gender dimension. It is also recommended that developing economies aim to collect gender data relating to ICT barriers (where information on the latter is collected).

A methodological issue relating to gender may occur where a patriarchal culture makes it difficult to randomly select individuals in household surveys, for instance, if it is culturally unacceptable to the patriarch to have his wife selected rather than him. Where this is the case, appropriate adjustments should be made so that results are representative of the population.

Health information and services

Lack of access to information and communication has been identified as a critical factor in public health crises around the world. The delivery of information on health, as well as various health services, may be facilitated and improved through ICT-based solutions. Providing local points of access to life skills education and online consultation would be a critical starting point for addressing health care crises in developing economies.

Availability and use of health care facilities supported or enabled by ICT might be measured by adding suitable questions to existing surveys of individuals. In this context, note that the core indicators on access to, and use of ICT by households and individuals that were established by the *Partnership* (2005b, 2008b, 2010) include one on individuals’ use of the Internet to get information related to health or health services.

Partnership on measuring ICT for development – core ICT indicators (2010)

Core indicators on ICT infrastructure and access

A1	Fixed telephone lines per 100 inhabitants
A2	Mobile cellular telephone subscribers per 100 inhabitants
A3	Fixed Internet subscribers per 100 inhabitants
A4	Fixed broadband Internet subscribers per 100 inhabitants
A5	Mobile broadband subscribers per 100 inhabitants
A6	International Internet bandwidth per inhabitant (bits/second/inhabitant)
A7	Percentage of population covered by a mobile cellular telephone network
A8	Fixed broadband Internet access tariffs (per month), in USD, and as a percentage of monthly per capita income
A9	Mobile cellular prepaid tariffs (per month), in US\$, and as a percentage of monthly per capita income
A10	Percentage of localities with public Internet access centres (PIACs)

Core indicators on access to, and use of ICT by households and individuals

HH1	Proportion of households with a radio
HH2	Proportion of households with a TV
HH3	Proportion of households with a telephone <ul style="list-style-type: none"> ● Any telephone ● Fixed telephone only ● Mobile cellular telephone only ● Both a fixed and a mobile cellular telephone
HH4	Proportion of households with a computer
HH5	Proportion of individuals who used a computer (from any location) in the last 12 months
HH6	Proportion of households with Internet access at home
HH7	Proportion of individuals who used the Internet (from any location) in the last 12 months
HH8	Location of individual use of the Internet in the last 12 months <ul style="list-style-type: none"> ● Home ● Work ● Place of education ● Another person's home ● Community Internet access facility commercial Internet access facility any place via a mobile cellular telephone ● Any place via <i>other</i> mobile access devices
HH9	Internet activities undertaken by individuals in the last 12 months (from any location) <ul style="list-style-type: none"> ● Getting information about goods or services ● Getting information related to health or health services ● Getting information from general government organisations ● Interacting with general government organisations ● Sending or receiving email ● Telephoning over the Internet/VoIP ● Posting information or instant messaging ● Purchasing or ordering goods or services ● Internet banking ● Education or learning activities ● Playing or downloading videogames or computer games ● Downloading movies, images, music; watching TV or video; or listening to radio or music ● Downloading software ● Reading or downloading online newspapers or magazines, electronic books
HH10	Proportion of individuals with use of a mobile cellular telephone in the last 12 months
HH11	Proportion of households with access to the Internet by type of access <ul style="list-style-type: none"> ● Narrowband ● Fixed broadband ● Mobile broadband
HH12	Frequency of individual use of the Internet in the last 12 months (from any location) <ul style="list-style-type: none"> ● at least once a day ● at least once a week but not every day ● less than once a week
<i>Reference indicator</i>	
HHR1	Proportion of households with electricity

Core indicators on use of ICT by businesses

B1	Proportion of businesses using computers
B2	Proportion of persons employed routinely using computers
B3	Proportion of businesses using the Internet
B4	Proportion of persons employed routinely using the Internet
B5	Proportion of businesses with a web presence
B6	Proportion of businesses with an intranet
B7	Proportion of businesses receiving orders over the Internet
B8	Proportion of businesses placing orders over the Internet
B9	Proportion of businesses using the Internet by type of access Narrowband Fixed broadband Mobile broadband
B10	Proportion of businesses with a local area network (LAN)
B11	Proportion of businesses with an extranet
B12	Proportion of businesses using the Internet by type of activity Sending or receiving e-mail Telephoning over the Internet/VoIP Posting information or instant messaging Getting information about goods or services Getting information from general government organisations Interacting with general government organisations Internet banking Accessing other financial services Providing customer services Delivering products online Internal or external recruitment Staff training

Core indicators on the ICT (producing) sector and trade in ICT goods

ICT1	Proportion of total business sector workforce involved in the ICT sector as a proportion of the total business sector workforce
ICT2	ICT sector share of gross value added as a proportion of total business sector gross value added
ICT3	ICT goods imports as a percentage of total imports
ICT4	ICT goods exports as a percentage of total exports

Core indicators on ICT in education

ED1	Proportion of schools with a radio used for educational purposes (by ISCED level 1 to 3)
ED2	Proportion of schools with a TV used for educational purposes (by ISCED level 1 to 3)
ED3	Proportion of schools with a telephone communication facility (by ISCED level 1 to 3)
ED4	Learners-to-computer ratio in schools with computer-assisted instruction (by ISCED level 1 to 3)
ED5	Proportion of schools with Internet access, by type (by ISCED level 1 to 3) Any Internet access Access by fixed narrowband only Access by fixed broadband only Both fixed narrowband and broadband access
ED6	Proportion of learners who have access to the Internet at school (by ISCED level 1 to 3)
ED7	Proportion of learners enrolled by gender at the post-secondary level in ICT-related fields (for ISCED levels 4, 5 and 6)
ED8	Proportion of ICT-qualified teachers in schools (by ISCED level 1 to 3)
<i>Reference indicator</i>	
EDR1	Proportion of schools with electricity (by ISCED level 1 to 3)*

* Since electricity is not specifically an ICT commodity, but an important prerequisite for using many ICTs, it is not included in the core list, but included as a reference indicator. International studies reviewed by UIS revealed that the lack of electricity is such a significant barrier in many developing economies that monitoring trends of its provision is as relevant as monitoring the supply and use of ICT.

Classifications for core ICT indicators

Classificatory variables are used to describe the indicators for business and household/individual ICT use and classifications are used for the core indicators on the ICT sector and trade. The classifications are described in *Partnership* (2010). They are:

- Business characteristics (Industry classification (ISIC) and Employment size).
- Household characteristics (Household composition and Household size).
- Individual characteristics (Age ranges, Gender, Highest education level received, Labour force status, Occupation).
- ICT sector (Industry classification (ISIC)).
- Trade (ICT goods classification); and
- Education (Levels of education (ISCED), Gender).

Methodological information associated with the core ICT indicators

The latest methodological notes on the *Partnership's* core indicators can be found in *Partnership* (2010), the *ITU Manual* (ITU, 2009) and the *UNCTAD Manual* (UNCTAD, 2009). The notes include information on measurement concepts, definitions, statistical units, scope and coverage.

Notes

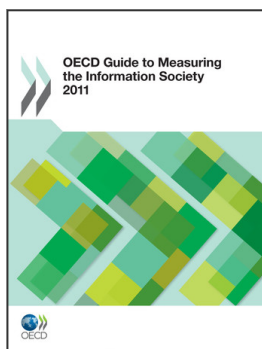
1. "Developing economy" in this annex does not refer to a homogeneous set of countries and the authors do not assume that developing countries cannot collect the data suggested by the *Guide*. Some measurement issues discussed here may not always be relevant, especially for least developed countries (LDCs), but could become relevant in the near future with the ever-expanding growth of ICT.
2. It should be noted that older technologies such as radio or television have undergone tremendous change in how they disseminate information by converging with digital and wireless technologies.
3. Co-ordination with other agencies is paramount and this requires that the statistical system of a country (including the National Statistical Office, other agencies having statistics as their main core business and the statistical units of ministries and government agencies) be able to share a common set of definitions (of ICT for example), be aware of each others' data collection activities and needs, how they are each serving the common purpose of good national policy making on the information society, and what data gaps exist.
4. For examples, see ITU's case studies on Hong Kong, China and Australia, at: www.itu.int/ITU-D/ict/cs/.
5. See also Annex 8.A1 of this *Guide*. It provides metadata on ICT statistics produced by OECD countries.
6. Note that the ITU, through its *World Telecommunication Indicators Database*, collects a range of ICT infrastructure data.
7. ITU, *World Telecommunication/ICT Indicators Database*, 2010, see: www.itu.int/ITU-D/ict/publications/world/world.html.
8. For instance, in 2005, IBM agreed to create a reduced function PC for the Indian market (*Financial Times*, May 2005); there is also an agreement between Nokia and a consortium of GSM service operators to produce a considerably cheaper mobile phone for emerging markets (*The Economist*, July 2005).
9. See: *Ethnologue*, www.ethnologue.com.
10. The SITES project (Second Information Technology in Education Study) includes a set of case studies on innovative practices involving ICT (174 studies involving 28 countries in Europe, North America, Asia Pacific, Africa, and South America). An analysis of the cases studies found that "technology is supporting significant changes in classroom teaching and learning. They paint a very different picture than the traditional classroom where the teacher lectures in front of the

classroom and students take notes or do worksheets. They show important similarities in how technology is being used in many countries around the world.” (IEA, 2003).

11. See: www.acs.org.au/icdl/.
12. An example of ICT integration in education is a radio instruction project among nomadic women in Mongolia called the Gobi Women’s Project. It seeks to provide literacy and numeracy instruction built around lessons of interest to around 15 000 nomadic women, and to create income opportunities for them. Among the programme topics are livestock rearing techniques; family care (family planning, health, nutrition and hygiene); income generation using locally available raw materials; and basic business skills for a new market economy. See: www.unesco.org/education/educprog/lwif/doc/portfolio/case1.htm.

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