Partnership on Measuring ICT for Development

Core ICT Indicators 2010

PARTNERSHIP ON MEASURING ICT FOR DEVELOPMENT

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Foreword

The first edition of *Core ICT Indicators* was released during the Tunis phase of the World Summit on the Information Society in late 2005. It followed an intensive consultation process with statistical agencies and policy-makers that was facilitated by members of the Partnership on Measuring ICT for Development.

The Partnership on Measuring ICT for Development was launched in June 2004, following the first phase of the World Summit on the Information Society (WSIS). Its current members are Eurostat, the International Telecommunication Union (ITU), the Organisation for Economic Co-operation and Development (OECD), the United Nations Conference on Trade and Development UNCTAD, the United Nations Department of Economic and Social Affairs (UNDESA), the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS), the World Bank, and four United Nations Regional Commissions (the UN Economic Commission for Africa, the UN Economic Commission for Latin America and the Caribbean, the UN Economic and Social Commission for Asia and the Pacific, and the UN Economic and Social Commission for Western Asia). For further information on the objectives and activities of the *Partnership*, see http://measuring-ict.unctad.org.

The work of the *Partnership* is directed towards achieving internationally comparable and reliable ICT statistics. In order to achieve this, its members are involved in developing and maintaining a core list of ICT indicators. Other activities include the compilation and dissemination of ICT data, and the provision of technical assistance enabling statistical agencies to collect data that underlie the core list of ICT indicators.

Significant progress has been made on these objectives since the 2005 release of *Core ICT Indicators*. In the area of data compilation and dissemination, the *Partnership* published a statistical snapshot of the information society in 2008 (*Partnership*, 2008a). In respect of capacity building, *Partnership* members have produced manuals for collecting core ICT business and household indicators (UNCTAD, 2009; ITU, 2009a). In addition, members have conducted a large number of training courses and capacity-building workshops. Finally, the original core list of ICT indicators has been reviewed and expanded as described in this publication.

Like the 2005 edition, this publication provides definitions, model questions and other statistical standards relating to the core list of ICT indicators. In addition, advice is provided on significant statistical issues associated with each indicator. Considerable experience with the collection and compilation of the core indicators since 2005 has resulted in new recommendations on how to report core ICT indicator data.

The publication was prepared by Sheridan Roberts, a consultant to the *Partnership*. Substantive contributions were received from ITU, UNCTAD and the UNESCO Institute for Statistics. Other useful information was received from UNECLAC and the OECD.

The production of the publication was funded by ITU, Telecommunication Development Bureau (BDT). ITU also formatted, typeset and printed the publication.

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Chapter 1

Introduction

1. This publication presents the first revision of the core list of ICT indicators, originally published by the Partnership on Measuring ICT for Development in 2005. The main purpose of the core list is to help countries produce high quality and internationally comparable data on information and communication technology. To assist in achieving this goal, the indicators have associated statistical standards and guidance.

2. There are 46 ICT indicators in the revised core list and two reference indicators. In comparison, the 2005 list contained 41 ICT indicators (and one reference indicator).

3. The Geneva phase of the World Summit on the Information Society (WSIS) in 2003 highlighted the importance of benchmarking and measuring progress towards the information society using internationally comparable statistics. The Partnership on Measuring ICT for Development[1] was subsequently created to coordinate international efforts in this area.

4. The 2005 Tunis phase of WSIS re-iterated the importance of measurement and called for the tracking of progress in the use of ICT to achieve internationally agreed goals. The efforts of the *Partnership* were referred to in the Tunis Agenda.[2]

5. Following the Geneva phase of WSIS, members of the *Partnership* started to work with statistical agencies and policy-makers to develop an agreed 'core list' of indicators for measuring ICT. A number of regional meetings on ICT measurement were held and ICT indicators of interest to policy-makers were discussed.[3] The *Partnership* consolidated a global core list and circulated it for comment. A final list was agreed on at the WSIS Thematic Meeting on Measuring the Information Society, held in Geneva in February 2005.

6. The core list, published as *Core ICT Indicators* (*Partnership*, 2005), was officially launched at the second phase of WSIS, held in Tunis in November 2005, during the Parallel Event on Measuring the Information Society. Since then, it has served as the basis for the *Partnership*'s work on measuring ICT.

7. The 2005 core list included 41 core ICT indicators in the groups, ICT infrastructure and access; access to, and use of, ICT by households and individuals;[4] use of ICT by businesses; the ICT sector; and trade in ICT goods.

8. The list was endorsed in 2007 by the United Nations Statistical Commission at its 38th session. The *Commission* encouraged countries to use the core list in their data collection programmes (UNSC, 2007). The *Commission* further recognized that ICT is a rapidly evolving area and encouraged the *Partnership* to continue work to improve and update the list of indicators. In 2008, the United Nations Economic and

Social Council recommended that the *Partnership* consider the creation of additional benchmarks and indicators in order to track progress towards the achievement of WSIS goals.[5]

9. Revisions and additions to the core list were subsequently presented as an "item for information" to the United Nations Statistical Commission's 2009 meeting and noted by members (UNSC, 2009). This publication presents the revised core list of ICT indicators. Its aim is to present the core ICT indicators in a non-technical way, suited to a broad audience. It is expected that the main interest will come from policy-makers and official statisticians, especially those of developing economies.

10. The original core list and its revision are based on a supply/demand conceptual model of the information society.[6] The core indicators reflect policy-makers' need for relevant data while acknowledging issues of statistical feasibility. This means that some highly relevant indicators are not included in the core list because it is not possible to obtain good quality internationally comparable data. A good example is an indicator on use of mobile phones by individuals in rural areas; while there is a strong policy need for such data, internationally comparable systems of geographic classification do not exist. This issue is further explored in ITU (2009a).

11. Revisions to the 2005 list arose from several sources and are documented in *Partnership* (2009). The main sources are:

- Feedback on the policy and practical relevance of the core indicators, including from participants of the *Partnership* 2008 Global Event[7] on Measuring the Information Society and participants in other workshops and seminars organized by the *Partnership*. Draft proposals were sent to all national statistical offices following the 2008 *Global Event* and their feedback has been taken into account. Of particular relevance is the addition of new categories in the household and business use indicators to reflect changes in the nature of ICT use. They include categories on mobile Internet access, updates to means of Internet access to include mobile broadband, more detail on communication using the Internet and new business Internet activities.

- Revisions made to indicators included in the International Telecommunication Union's *Telecommunication Indicators Handbook* (ITU, 2007), following the fifth and sixth World Telecommunication/ICT Indicators meetings (held in 2006 and 2007). These cover many of the changes made to the ICT infrastructure and access indicators, as well as changes to the definitions of technologies used for the household and business access and use indicators. Some of the changes to the ICT infrastructure and access indicators were a response to data collection and data quality issues (for example, the removal of three indicators and the adoption of OECD tariff basket methodology for measuring mobile cellular prepaid tariffs).

- Changes to other international statistical standards and closer compliance with those standards, particularly those of the United Nations Statistics Division (UNSD),[8] the OECD and the International Labour Organization (ILO).[9] The changes include new guidance on some concepts and statistical units, and changes to classificatory variables. Of particular importance are changes to the definitions of the ICT sector and ICT goods, which have been updated by the OECD following major revisions to the international standards for industry and product classifications.[10]

12. An important improvement to the first core list has been the addition of eight new indicators on measuring ICT in education (and one reference indicator). These indicators were developed by the UNESCO

Institute for Statistics (UIS) over several years and have been subject to extensive testing and consultation processes. They are presented in Chapter 7.

13. The main purpose of the core list is to help countries that collect (or are planning to collect) ICT statistics to produce high quality and internationally comparable data. In order to achieve this, the indicators have associated statistical standards as follows:

- Definitions of terms and concepts (e.g. *computer, the Internet*);
- Derivation of indicators (e.g. use of appropriate denominators for proportions);
- Model questions that can be included on national survey vehicles;
- Classificatory variables (e.g. business size; age ranges for individual ICT use core indicators);
- Collection scope (e.g. by business size or industry, age of individuals); and
- Statistical units (e.g. household, individual).

14. In addition, advice is provided on significant known statistical issues associated with each indicator and on reporting core ICT indicator data.

15. An important consideration, when contemplating changes to the core indicator concepts and definitions, is how best to retain the time series value of existing data. It is considered that most of the revisions made to the first list will have little impact on ongoing time series. The ICT sector and trade indicators, ICT1 to ICT4 are an exception to this because changes to the definitions of the ICT sector and ICT goods will occur with the implementation by countries of ISIC Revision 4 and the HS2007.[11] This is further explained in chapters 5 and 6.

16. Participants at the *Partnership*'s 2008 *Global Event* [7] discussed a number of other possible ICT indicators, including indicators on the economic and social impacts of ICT, e-government, barriers to ICT use, ICT expenditure and investment, trade in ICT services, and IT security and trust. Indicators in these and other areas, such as use of mobile telephony[12] and digital content, may be added to the core list in the future, following more development work and/or advances in other areas of statistics.[13] The *Partnership* has established task groups to look more closely at measurement of ICT impacts and e-government.

17. The *Partnership* is involved in a number of other activities that support its mission of achieving internationally comparable and reliable ICT statistics. They include the compilation and dissemination of ICT data,[14] and the provision of technical assistance to enable statistical agencies to collect the data that underlie the core indicators. Members have been particularly active in this last activity; statistical manuals have been produced by ITU and UNCTAD,[15] which also conduct training courses and capacity-building workshops.[16]

Content and structure of this publication

18. The revised core list is shown in Tables 1 to 6 below.

19. Each of chapters 2 to 7 presents information about a subset of the core list of ICT indicators (with Chapter 2 corresponding to Table 1 and so on). The content of each chapter varies somewhat but includes at least:

- Each of the indicators, with definitional material, method of calculation and comments on associated statistical issues.

- A section on statistical standards and methodologies associated with the core indicators.

20. In addition, chapters 3 and 4, covering the household ICT access and use, and the business ICT use indicators respectively, contain more guidance, including:

- A model question corresponding to each indicator, and

- More information on data collection, processing and reporting. This is included because these indicators are usually collected by statistical surveys (or survey modules) specifically designed for ICT statistics.[17]

Core list of ICT indicators

Table 1. Core indicators on ICT infrastructure and access

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

Table 2. 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 telephone: Any telephone Fixed telephone only Mobile cellular telephone only Both fixed and mobile cellular telephone
HH4	Proportion of households with a computer
HH5	Proportion of individuals who used a computer in the last 12 months
HH6	Proportion of households with Internet access
HH7	Proportion of individuals who used the Internet in the last 12 months
HH8	Location of individual use of the Internet in the last 12 months: 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 *other* mobile access devices
HH9	Internet activities undertaken by individuals in the last 12 months: Getting information about goods or services Getting information related to health or health services Getting information from general government organizations Interacting with general government organizations Sending or receiving e-mail 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 video games 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 who used a mobile cellular telephone in the last 12 months
HH11	Proportion of households with access to the Internet by type of access: Narrowband Fixed broadband Mobile broadband
HH12	Frequency of individual use of the Internet in the last 12 months: At least once a day At least once a week but not every day Less than once a week
HHR1	Proportion of households with electricity[18]

Table 3. 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 organizations Interacting with general government organizations Internet banking Accessing other financial services Providing customer services Delivering products online Internal or external recruitment Staff training

Table 4. Core indicators on the ICT (producing) sector

ICT1	Proportion of total business sector workforce involved in the ICT sector
ICT2	ICT sector share of gross value added

Table 5. Core indicators on international trade in ICT goods

ICT3	ICT goods imports as a percentage of total imports
ICT4	ICT goods exports as a percentage of total exports

Table 6. Core indicators on ICT in education

ED1	Proportion of schools with a radio used for educational purposes
ED2	Proportion of schools with a television used for educational purposes
ED3	Proportion of schools with a telephone communication facility
ED4	Learners-to-computer ratio in schools with computer-assisted instruction
ED5	Proportion of schools with Internet access by type of access: 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
ED7	Proportion of learners enrolled at the post-secondary level in ICT-related fields
ED8	Proportion of ICT-qualified teachers in schools
EDR1	Proportion of schools with electricity[18]

Endnotes

[1] The *Partnership* was launched in June 2004. The *Partnership* project document can be found here: http://www.itu.int/ITU-D/ict/partnership/material/Partnership%20Project%20Document%2023%20June.pdf.

[2] Among other things, to develop a common set of core ICT indicators, to establish a mutually agreed framework for their elaboration and to promote capacity building in developing countries for monitoring the Information Society. See ITU (2005).

[3] For more information on these meetings, see *Partnership* (2008a).

[4] A 'reference indicator', HHR1, on the proportion of households with electricity is also part of this set.

[5] ECOSOC Resolution 2008/3, see http://www.un.org/ecosoc/docs/2008/Resolution%202008-3.pdf.

[6] See OECD (2009a) Chapter 1 for such a model.

[7] The 2008 Global Event on Measuring the Information Society, organized by the *Partnership*, held in Geneva, 27-29 May 2008, see http://new.unctad.org/templates/Event____888.aspx.

[8] Notably, revisions to the 1993 System of National Accounts (SNA), the introduction of ISIC Rev. 4 and the CPC Ver. 2/HS2007.

[9] Revisions to the *International Standard Classification of Occupations* (ISCO).

[10] ISIC Rev. 4 and the CPC Ver. 2/HS2007.

[11] Harmonized System (World Customs Organization) used for trade statistics.

[12] UNCTAD (2009) presents proposed indicators and model questions on mobile phone use by businesses.

[13] Such as the finalization of an internationally agreed classification of ICT services.

[14] For example, *The Global Information Society: a Statistical View, 2008 Partnership* (2008a). In the future, core ICT indicator data will be disseminated through the UN's Data Portal (http://data.un.org/).

[15] *Manual for Measuring ICT Access and Use by Households and Individuals* (ITU, 2009a) and *Manual for the Production of Statistics on the Information Economy*, Revised Edition (UNCTAD, 2009). The manuals are referred to extensively throughout this publication.

[16] For details, see *Events* http://new.unctad.org/default____575.aspx.

[17] The other indicators generally come from sources that are not specifically designed to collect ICT statistics.

[18] Electricity is not an ICT commodity, but is an important prerequisite for using many ICTs, so is included as a reference indicator. Studies reviewed by UIS reveal that lack of electricity is a significant barrier in many developing economies and monitoring trends of its provision is as relevant as monitoring the supply and use of ICT.

Chapter 2

Core indicators on ICT infrastructure and access

21. This chapter presents the 10 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.

22. The indicators are presented in several ways, including weighted by population (as a proportion of 100 inhabitants, proportion of inhabitants, percentage of population), cost per month (in absolute terms and as a percentage of monthly *per capita* income) and percentage of localities.

23. The core indicators on ICT infrastructure and access are collected by the International Telecommunication Union (ITU), as part of a much larger collection of telecommunication indicators. The ITU data, some of which go back as far as 1960, are published in the World Telecommunication/ICT Indicators Database (ITU, 2009b) and are defined in ITU's *Telecommunication Indicators Handbook* (ITU, 2007).

24. Data for the indicators come from several sources, the main one of which is an annual survey of telecommunication authorities and some private companies. Other sources include reports provided by telecommunication regulatory authorities, ministries and operators. Because data are collected from providers rather than users, they are widely available for both developed and developing economies.

25. In order to assist the standardization of statistics in this field, the definitions are reviewed regularly,[1] particularly to reflect technological changes and the addition of new services. The most recent changes to the definitions are reflected in the indicators presented here.[2]

Core indicators

26. Each of the indicators is presented below, with the following information:

- The name of the indicator and a brief description;
- Definition of the ICTs covered by the indicator e.g. fixed telephone lines, mobile broadband subscribers;
- How the indicator is calculated; and
- Explanatory notes.

A1 Fixed telephone lines per 100 inhabitants

A1 refers to the number of fixed telephone lines in a country for each 100 inhabitants.[3]

Fixed telephone lines refer to telephone lines connecting a subscriber's terminal equipment to the public switched telephone network (PSTN) and which have a dedicated port on a telephone exchange. This term is synonymous with the terms "main station" and "Direct Exchange Line" (DEL) that are commonly used in telecommunication documents. It may not be the same as an access line or a subscriber. The number of ISDN channels, public payphones and fixed wireless subscribers are included.

Fixed telephone lines per 100 inhabitants is calculated by dividing the number of fixed telephone lines by the total population and then multiplying by 100.

Explanatory notes

The emergence of integrated services digital networks (ISDN) has affected the concept of the main line. ISDN converts a single physical line into virtual channels. The total number of ISDN channels is included in the indicator.

A2 Mobile cellular telephone subscriptions per 100 inhabitants

A2 refers to the number of mobile cellular telephone subscriptions in a country for each 100 inhabitants.

Mobile cellular telephone subscriptions refer to subscriptions of portable telephones to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, including IMT-2000 (Third Generation, 3G). Both postpaid and prepaid subscriptions are included. Prepaid subscriptions are those where accounts have been used within a reasonable period of time (e.g. 3 months). *Inactive subscriptions*, that is, prepaid cards where a call has not been made or received within the last 3 months, are excluded.

Mobile cellular telephone subscriptions per 100 inhabitants is calculated by dividing the number of mobile cellular telephone subscriptions by the total population and then multiplying by 100.

Explanatory notes

Subscriptions should be distinguished from users. *Subscriptions* are taken by entities (e.g. businesses, individuals) that subscribe to a mobile phone service by a postpaid or prepaid account. They are likely to be legal owners of a mobile phone and the associated subscription. Individual mobile phone *users* are covered by the household indicator HH10. The household indicator is generally presented as the proportion of individuals but the underlying data refer to the number of mobile phone users.

A3 Fixed Internet subscribers per 100 inhabitants

A3 refers to the number of fixed Internet subscribers in a country for each 100 inhabitants.

Fixed Internet subscribers refer to the total number of Internet subscribers with fixed access, which includes dial-up and total fixed broadband subscribers: cable modem, DSL Internet subscribers, other fixed broadband and leased line Internet subscribers.

Fixed Internet subscribers per 100 inhabitants is calculated by dividing the number of fixed Internet subscribers by the total population and then multiplying by 100.

Explanatory notes

Subscribers should be distinguished from users. *Subscribers* are entities (e.g. businesses, individuals) that subscribe to an Internet access service. *Users* are entities that use those services. In the case of individuals, users are always more numerous than subscribers, because one subscription can service several users. The difference is likely to be even greater where public access to the Internet is common. Internet users are covered by the household indicator HH7 and the business indicator B3.

A4 Fixed broadband Internet subscribers per 100 inhabitants

A4 refers to the number of fixed broadband Internet subscribers in a country for each 100 inhabitants.

Fixed broadband Internet subscribers refer to entities (e.g. businesses, individuals) subscribing to paid high-speed access to the public Internet (a TCP/IP connection). High speed access is defined as being at least 256 kbit/s, in one or both directions. Fixed broadband Internet includes cable modem, DSL, fibre and other fixed broadband technology (such as satellite broadband Internet, Ethernet LANs, fixed wireless access, Wireless Local Area Network and WiMAX). Subscribers to data communications access (including the Internet) via mobile cellular networks are excluded.

Fixed broadband Internet subscribers per 100 inhabitants is calculated by dividing the number of fixed broadband Internet subscribers by the total population and then multiplying by 100.

Explanatory notes

See note above on the distinction between Internet subscribers and users.

A5 Mobile broadband subscriptions per 100 inhabitants

A5 refers to the number of mobile broadband subscriptions in a country for each 100 inhabitants.

Mobile broadband subscriptions are subscriptions to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (defined as greater than or equal to 256 kbit/s in one or both directions) such as WCDMA, HSDPA, CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV, irrespective of the device used to access the Internet (handheld computer, laptop or mobile phone etc). These services are typically referred to as 3G or 3.5G and include:

- Wideband CDMA (W-CDMA), an IMT-2000 3G mobile network technology, based on CDMA that presently delivers packet-switched data transmission speeds up to 384 kbit/s and up to 2 Mbit/s when fully implemented. It is known as *Universal Mobile Telecommunications System* (UMTS) in Europe.
- High-speed Downlink Packet Access (HSDPA), an upgrade to W-CDMA to allow downlink data transmission at speeds of typically 8-10 Mbit/s. It is complemented by High-Speed Uplink Packet Access (HSUPA), which offers uplink speeds of around 5 Mbit/s.
- CDMA2000 1xEV-DO (Evolution, Data Optimised), an IMT-2000 3G mobile network technology, based on CDMA that delivers packet-switched data transmission speeds of up to 4.9 Mbit/s.

Mobile broadband subscriptions per 100 inhabitants is calculated by dividing the number of mobile broadband subscriptions by the total population and then multiplying by 100.

Explanatory notes

See above note on the distinction between subscriptions and users.

A6 International Internet bandwidth per inhabitant (bits/second/inhabitant)

A6 refers to the international Internet bandwidth potentially available to each inhabitant of a country. It is expressed as bits/second/inhabitant.

International Internet bandwidth refers to the capacity that backbone operators provide to carry Internet traffic, measured in bits per second.

International Internet bandwidth per inhabitant is calculated by dividing the amount of bandwidth (in bits/second) by the total population.

Explanatory notes

An alternative derivative of this indicator is *International Internet bandwidth per Internet user.*

A7 Percentage of the population covered by a mobile cellular telephone network

A7 refers to the percentage of a country's inhabitants that live within areas served by a mobile cellular signal, irrespective of whether or not they choose to use it.

Percentage of the population covered by a mobile cellular telephone network measures the theoretical ability to use mobile cellular services if one has a cellular telephone and a subscription.

Percentage of the population covered by a mobile cellular telephone network is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population and then multiplying by 100 to be expressed as a percentage.

Explanatory notes

This indicator should not be confused with the percentage of the land area covered by a mobile cellular signal or the percentage of the population that subscribes to a mobile cellular service.

A8 Fixed broadband Internet access tariffs per month in US$, and as a percentage of monthly *per capita* income

A8 has two parts:

Fixed broadband Internet access tariffs per month, in US$
Fixed broadband Internet access tariffs per month, as a percentage of monthly *per capita* income

Fixed broadband Internet access tariffs represent the cheapest broadband entry plan converted to US$ for a minimum 256 kbit/s connection. Data are compiled by ITU using the tariffs collected from countries (through a questionnaire, directly from Internet service providers' (ISP) websites or through direct correspondence with ISPs).

Monthly charges do not include installation fees nor modem rentals.

As a percentage of monthly per capita income refers to the fixed broadband Internet access tariffs per month in US$ divided by the average monthly gross national income *per capita* (World Bank, Atlas method, current US$). The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

To ensure international comparability, this indicator is compiled by ITU, in consultation with Member States.

A9 Mobile cellular telephone prepaid tariffs per month in US$, and as a percentage of monthly *per capita* income

A9 has two parts:

Mobile cellular telephone prepaid tariffs per month, in US$
Mobile cellular telephone prepaid tariffs per month, as a percentage of monthly *per capita* income

Mobile cellular telephone prepaid tariffs are based on the methodology of the *OECD monthly low-user basket*[4] (version 2001), which includes the cost of monthly mobile usage for 25 outgoing calls (on-net, off-net and to a fixed line) in predetermined ratios, plus 30 SMS messages.

As a percentage of monthly per capita income is calculated by dividing the price of the monthly low user basket by the average monthly gross national income per capita (World Bank, Atlas method, current US$). The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

To ensure international comparability, this indicator is compiled by ITU, in consultation with Member States.

A10 Percentage of localities with public Internet access centres (PIACs)

A10 refers to the percentage of a country's localities that provide Internet access to the public through PIACs.

A *public Internet access centre (PIAC)* is a site, location, or centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis. PIACs include telecentres, digital community centres, Internet cafés, libraries, education centres and other similar establishments that offer Internet access to the general public. All such centres should have at least one public computer for Internet access.

Localities can refer to a country's villages, towns, cities or enumeration areas used by the national statistical office for survey purposes.

Percentage of localities with public Internet access centres is calculated by dividing the number of localities with at least one PIAC by the total number of the country's localities. The result is then multiplied by 100.

Explanatory notes

This indicator can be broken down by PIAC size, based on the number of inhabitants. It can also be split by rural/urban localities.

Statistical standards and methodologies

27. The core indicators A1 to A10 are a small subset of around 100 telecommunication infrastructure and access indicators collected by ITU from several sources but mainly through an annual survey of telecommunication authorities and some private companies. Additional data are obtained from reports provided by telecommunication regulatory authorities, ministries and operators, and from ITU staff reports. In some cases, estimates are derived from ITU background documents or other references.

28. Terminology and indicators are defined in ITU's Telecommunication/ICT Indicators Handbook,[5] the current version of which is April 2007. During the World Telecommunication/ICT Indicators meeting held in Cairo, Egypt in March 2009, a revised draft list of telecommunication indicators and their definitions were presented. The meeting suggested forming an Expert Group on Telecom/ICT Indicators (EGTI) to examine the draft list of indicators. The work of the EGTI, which is carried out via an online discussion forum, is expected to conclude in March 2010. The revised list of indicators will be presented during the 8th World Telecommunication Indicators meeting to be held in 2010 and will be used by the ITU as of its 2010 data collection.

Endnotes

[1] Via World Telecommunication/ICT Indicators meetings; the last three took place in October 2006, December 2007 and March 2009.

[2] The definitions are consistent with draft definitions presented to the March 2009 World Telecommunication/ICT Indicators meeting. Those definitions are expected to be finalised in 2010.

[3] There is no scope limitation on the number of inhabitants for the infrastructure and access indicators (that is, all of a country's inhabitants are included).

[4] For definition, see: http://oberon.sourceoecd.org/vl=15177325/cl=12/nw=1/rpsv/sti2007/ge11-1.htm.

[5] The document is entitled "Definitions of World Telecommunications/ICT Indicators, Final Version (April 2007)", http://www.itu.int/ITU-D/ict/handbook.html.

Chapter 3

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

29. This chapter presents the core indicators on access to, and use of, ICT by households and individuals. There are 12 indicators – six on household access to ICT and six on the use of ICT by individuals (i.e. household members).[1] There is also a reference indicator on access to electricity by households. Several of the indicators have a set of defined response categories, each of which could be considered to be a separate indicator.

30. ICT household statistics are typically collected by national statistical offices (NSOs) through household surveys.[2] Most developed economies have been collecting these statistics for a number of years, using model questionnaires recommended by the Organisation for Economic Co-operation and Development (OECD) and Eurostat. Other economies are making good progress in collecting these indicators using the core indicators and associated standards recommended by the *Partnership*.

31. Some of the core indicators on household/individual ICT access and use are reasonably widely available, especially for developed economies. However, there remain questions of data comparability, including variable age scope (for individuals) and variations in questions asked. In addition, most countries do not have good time series of ICT access and ICT use data and much of the available data are out-of-date and therefore less useful given the pace of change in adoption of many technologies (this is especially true of developing and least developed economies). See *Partnership* (2008a) for a more detailed discussion of these issues.

32. At the outset, it is important to understand the difference between *ICT access* and *ICT use* as it is a fundamental one. *ICT access* refers to the availability of ICT within the home. *Use of ICT* refers to use of ICT by one or more *individuals* of the household, whether at home or elsewhere.

33. Indicators HH1–HH4, HH6 and HH11 refer to access of the household to ICT equipment and services *at home*, not to the use of those products by individual household members. In order for a household to have access to ICT equipment or services, it should be *able to be used*, that is, any necessary equipment, software and services should be in working condition. While ICT access will usually be associated with ownership of ICT equipment or payment for an ICT service, ownership or payment is not a necessary condition for access. However, the access has to be based at home; for example, if a member of a household uses the Internet outside the home, it is NOT household access to the Internet.

34. The *access indicators* are presented as the *proportion of households with [equipment, Internet access]*. With the exception of HH11, indicator values are calculated by dividing the number of in-scope households with [equipment, Internet access] by the total number of in-scope households. For HH11 (Internet access by type), output for each *type of Internet access* category should generally be presented as the proportion of households with Internet access.

35. Indicators HH5, HH7–HH10 and HH12 refer to use of ICT equipment and services by individual household members. The suggested reference period[3] is the last 12 months.

36. Three individual *use indicators* (HH5, HH7 and HH10) are presented as the *proportion of individuals who used [equipment, Internet] in the last 12 months*. Values for these indicators are calculated by dividing the number of in-scope individuals using [equipment, Internet] by the total number of in-scope individuals. The other three individual use indicators (HH8, HH9 and HH12) break down Internet use by location, Internet activities undertaken and frequency of use, respectively. For these indicators, output may be calculated as either the *proportion of in-scope individuals* or the *proportion of individuals using the Internet*.

37. By convention, the ICT household indicators are expressed as a percentage.

38. Sub-indicators for the ICT household access indicators can be constructed using the two classificatory variables, household composition and household size. Sub-indicators for the individual use indicators can be constructed using the five classificatory variables, age, gender, education, labour force status and occupation.[4] A minimum set of classificatory variables is presented later in this chapter, for households and for individuals, along with the other statistical standards associated with the indicators – scope, statistical units (household and individual) and time-related factors. Specific methodological issues covered are some aspects of data processing and reporting.

Core indicators

39. Each of the core indicators is presented below, with the following information:

- The name of the indicator and associated response categories;
- A brief description of the indicator;
- Definition of the ICTs covered by the indicator e.g. computer, the Internet;
- How the indicator is calculated;
- A suggested model question;[5] and
- Explanatory notes (which include question instructions, the population of statistical units that is asked the question, possible variations to the model question and any significant statistical issues).

HH1 Proportion of households with a radio

HH1 refers to radio access (not use) at home by in-scope households.[6]

A *radio* is defined as a device capable of receiving broadcast radio signals, using popular frequencies, such as FM, AM, LW and SW. It includes a radio set integrated in a car or an alarm clock and digital audio player (MP3 player) but excludes radios integrated with a mobile phone or in a computer.

The *proportion of households with a radio* is calculated by dividing the number[7] of in-scope households with a radio by the total number[7] of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Does this household/any member of this household have a radio at home?

Explanatory notes

The radio should be in working condition.

The question is asked of all in-scope households.

There are no known significant statistical issues with this indicator, although care should be taken to fully define *radio* in questionnaires.

HH2 Proportion of households with a TV

HH2 refers to television access (not use) at home by in-scope households.

A *TV* (television) is defined as a stand-alone device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. It excludes TV functionality integrated with another device, such as a computer or a mobile phone.

The *proportion of households with a TV* is calculated by dividing the number of in-scope households with a television by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Does this household/any member of this household have a television at home?

Explanatory notes

The television should be in working condition.

The question is asked of all in-scope households.

There are no known significant statistical issues with this indicator, although the exclusion of TV functionality integrated with another device should be noted.

HH3 Proportion of households with telephone

HH3 refers to telephone access (not use) at home by in-scope households. The indicator is split into four parts, as follows:

Proportion of households with any telephone

Proportion of households with fixed telephone only

Proportion of households with mobile cellular telephone only

Proportion of households with both fixed and mobile cellular telephone

The *proportion of households with any telephone* is calculated by dividing the number of in-scope households with access to any telephone (fixed or mobile) by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

The *proportion of households with fixed telephone only* is calculated by dividing the number of in-scope households with a fixed telephone only by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

The *proportion of households with mobile cellular telephone only* is calculated by dividing the number of in-scope households with a mobile phone only by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

The *proportion of households with both fixed and mobile cellular telephone* is calculated by dividing the number of in-scope households with both a fixed and mobile phone by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model questions

Does this household have a fixed line telephone at home?

A fixed telephone line is defined as a telephone line connecting a customer's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and which has a dedicated port on a telephone exchange. This term is synonymous with the terms "main station" or "Direct Exchange Line" (DEL) that are commonly used in telecommunication documents. It may not be the same as an access line or a subscriber.

Does any member of this household/do you have a mobile cellular telephone at home?

A mobile cellular telephone is defined as a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, as well as IMT-2000 (3G). Users of both postpaid subscriptions and prepaid accounts are included.

Explanatory notes

The telephone equipment and services should be in working condition.

The questions are asked of all in-scope households.

The term 'do you' in the second model question is included to cover single person households. It does not refer to individual activities.

Even though there are four parts to this indicator, they can be calculated using the combination of responses to two questions. Households with *any telephone* are those responding 'yes' to either or both questions. Households with *fixed telephone only* respond 'yes' to the first question and 'no' to the second. Households with *mobile cellular telephone only* respond 'yes' to the second question and 'no' to the first. Households with *both fixed and mobile cellular telephone* respond 'yes' to both questions.

There are no known significant statistical issues with this indicator.

HH4 Proportion of households with a computer

HH4 refers to computer access (not use) at home by in-scope households.

A *computer* is a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets.

The *proportion of households with a computer* is calculated by dividing the number of in-scope households with a computer by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Does this household/any member of this household have a computer at home, regardless of whether it is used?

Explanatory notes

The computer should be in working condition.

The question is asked of all in-scope households.

There are no known significant statistical issues with this indicator, although care should be taken with the definition of *computer*.

HH5 Proportion of individuals who used a computer in the last 12 months[8]

HH5 refers to computer use in the previous 12 months from any location by in-scope individuals.

A *computer* is a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets.

The *proportion of individuals who used a computer* is calculated by dividing the number of in-scope individuals who used a computer from any location in the last 12 months by the total number of in-scope individuals. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Have you used a computer from any location in the last 12 months?

Explanatory notes

The question is asked of all in-scope individuals.

There are no known significant statistical issues for this indicator, although care should be taken with the definition of *computer* and to include use from *any* location.

HH6 Proportion of households with Internet access

HH6 refers to access to (not use of) the Internet at home by in-scope households.

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The *proportion of households with Internet access* at home is calculated by dividing the number of in-scope households with Internet access by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Does this household/any member of this household have Internet access at home, regardless of whether it is used?

Explanatory notes

Access may be by any device enabling Internet access (not only a computer). This includes a mobile phone, PDA, games machine and digital TV. Access can be via a fixed or mobile network.

The Internet connection should be functional, that is any equipment, software or services needed should be in working condition.

The question is asked of all in-scope households.

There are no known significant statistical issues with this indicator, although care should be taken to explicitly include all devices that may access the Internet.

HH7 Proportion of individuals who used the Internet in the last 12 months

HH7 refers to Internet use in the previous 12 months from any location by in-scope individuals.

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The *proportion of individuals who used the Internet* is calculated by dividing the number of in-scope individuals who used the Internet (from any location) in the last 12 months by the total number of in-scope individuals. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Have you used the Internet from any location in the last 12 months?

Explanatory notes

Internet use may be facilitated by any device enabling Internet access (not only a computer). This includes a mobile phone, PDA, games machine and digital TV. Use can be via a fixed or mobile network.

The question is asked of all in-scope individuals.

There are no known significant statistical issues with this indicator, although care should be taken to include use from any location.

HH8 Location of individual use of the Internet in the last 12 months

HH8 refers to the location of Internet use by in-scope individuals in the previous 12 months.

Locations are defined per the response categories in the model question below. They are:

- 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 *other* mobile access devices

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The proportion of individuals who used the Internet at each location can be calculated as either the proportion of in-scope individuals or the proportion of Internet users, using the Internet at each location. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Where did you use the Internet in the last 12 months? (select all that apply)

Home	
Work	*Where a person's workplace is located at his/her home, then he/she would answer yes to the home category only.*
Place of education	*For students. Teachers (and others who work at a place of education) would report 'work' as the place of Internet use.* *Where a place of education is also made available as a location for general community Internet use, such use should be reported in the Community Internet access facility category.*
Another person's home	*The home of a friend, relative or neighbour.*
Community Internet access facility	*For example, public libraries, publicly provided Internet kiosks, non-commercial telecentres, digital community centres, post offices, other government agencies; access is typically free and is available to the general public.*
Commercial Internet access facility	*For example, Internet or cybercafés, hotels and airports; access is typically paid (i.e. not free of charge).*
Other locations (please specify .....)	*Excluding use at any location via a mobile phone or other mobile access device. Note that 'other locations' is not a core indicator category. However, it is useful to include it in questionnaires as it allows respondents to provide a comprehensive response. Locations included in an 'other' category may need to be re-coded to one of the other categories. If this happens frequently, it can indicate problems with category wording.*
Any place via a mobile cellular telephone	*Use of the Internet at any location via a mobile phone (including handheld devices with mobile phone functionality).*
Any place via other mobile access devices	*Use of the Internet at any location via other mobile access devices, e.g. a laptop computer or handheld device that uses wireless access (at a WiFi 'hotspot') or a laptop computer connected to a mobile phone network.*

Explanatory notes

Use of the Internet is not assumed to be only via a computer — it may also be by mobile phone, PDA, games machine, digital TV etc. Except for mobile Internet use, the locations are associated with the equipment used e.g. a PC installed at work or at an Internet café.

Individuals should be asked about all locations of Internet use (that is, the survey question used by countries should specify multiple responses). In cases where countries ask about the *main location* or a small number of *most commonly used locations,* the results will not be comparable with those of countries that ask about *all locations of use*. The difference is that the last will reflect the actual use at each place, whereas the first two will not.

The question is asked of all in-scope individuals who used the Internet in the last 12 months.

Countries can replace the Community and/or Commercial Internet access facility categories with those that reflect the types of facilities available in their country.

HH8 Location of individual use of the Internet in the last 12 months (continued)

Countries may ask about response categories as a series of yes/no questions, rather than a single 'list' question. The method chosen will often reflect the method of data collection e.g. a telephone interview is more likely to use a series of questions. Other country variations are: remove categories where items are not feasible; and add or split categories corresponding to country data requirements. Care should be taken when adding or splitting categories that statistical bias is not introduced. This could occur if the provision of alternative categories affects response. Where categories have been split into sub-categories, care needs to be taken when aggregating responses to reflect the response categories of the model question (in particular, to avoid double counting individuals who respond to more than one of the sub-categories).

The main statistical issue with this indicator is using a denominator that is not clear, or comparing indicators that have been compiled using different denominators. The 'locations' involving mobile devices (mobile phone or other mobile access device) may require explanation as they are fairly technical. It would be helpful if interviewers have a list of commonly available mobile services in the country as a reference. More information can be found in ITU 2009a, Chapter 6.

HH9 Internet activities undertaken by individuals in the last 12 months

HH9 refers to Internet activities undertaken by in-scope individuals from any location in the previous 12 months.

Internet activities are defined per the response categories in the model question below. They are:

- Getting information about goods or services
- Getting information related to health or health services
- Getting information from general government organizations
- Interacting with general government organizations
- Sending or receiving e-mail
- 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 video games 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

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The proportion of individuals who undertook each activity can be calculated as either the proportion of in-scope individuals or the proportion of Internet users who undertook each activity. In either case, the result is then multiplied by 100 to be expressed as a percentage.

HH9 Internet activities undertaken by individuals in the last 12 months (continued)

Suggested model question

For which of the following activities did you use the Internet for private purposes in the last 12 months (from any location)? (select all that apply)

Getting information about goods or services	
Getting information related to health or health services	*Includes information on injury, disease, nutrition and improving health generally.*
Getting information from general government organizations	*Government organizations should be explained to respondents in a way that is consistent with the SNA93 (2008 revision) concept of general government. See Explanatory notes below for details. Information may be obtained via websites or e-mail.*
Interacting with general government organizations	*Government organizations should be explained to respondents in a way that is consistent with the SNA93 (2008 revision) concept of general government. See Explanatory notes below for details. Interacting with general government includes downloading/requesting forms, completing/lodging forms online, making online payments and purchasing from government organizations via the Internet. It excludes getting information from government organizations.*
Sending or receiving e-mail	
Telephoning over the Internet/VoIP	*Using Skype, iTalk, etc. Includes video calls (via webcam).*
Posting information or instant messaging	*Posting messages or other information to chat sites, blogs, newsgroups, online discussion forums and similar; use of instant messaging.*
Purchasing or ordering goods or services	*Purchase orders placed via the Internet whether or not payment was made online. Orders that were cancelled or not completed are excluded. Includes purchasing of products such as music, travel and accommodation via the Internet.*
Internet banking	*Includes electronic transactions with a bank for payment or transfers, or for looking up account information. Excludes electronic transactions via the Internet for other types of financial services, such as share and insurance purchases.*
Education or learning activities	*Formal learning activities such as study associated with school or tertiary education courses as well as distance education involving online activities. (A more narrow interpretation is likely to be less meaningful as it could include a range of activities such as using the Internet to search for information.)*
Playing or downloading video games or computer games	*Includes file sharing games and playing games online, either paid or free of charge.*
Downloading movies, images, music, watching TV or video, or listening to radio or music	*Includes file sharing and using web radio or web television, either paid or free of charge.*
Downloading software	*Includes downloading of patches and upgrades, either paid or free of charge.*
Reading or downloading online newspapers or magazines, electronic books	*Includes accessing news websites and subscriptions to online news services, either paid or free of charge.*
Other activities (please specify ……)	*'Other activities' is not a core indicator category. However, it is useful to include it in questionnaires as it allows respondents to provide a comprehensive response. Activities included in an 'other' category may need to be re-coded to one of the other categories. If this happens frequently, it can indicate problems with category wording. 'Other' categories can also indicate emerging activities.*

HH9 Internet activities undertaken by individuals in the last 12 months (continued)

Explanatory notes

Internet use is not assumed to be only via a computer — it may also be by mobile phone, PDA, games machine, digital TV etc. It can be via a fixed or mobile network.

Individuals should be asked about all Internet activities (that is, the question used by countries should specify multiple responses). Activities are not mutually exclusive.

Internet activities are restricted to private purposes and therefore exclude activities such as purchasing over the Internet undertaken as part of a person's job.

General government organizations should be explained to respondents in a way that is consistent with the SNA93 (2008 revision) (UNSD, 2008a) concept of general government. According to the SNA "… the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units. Importantly, they do not include public corporations (legal entities, predominantly owned and controlled by the government that are created for the purpose of producing goods and services for the market and may be a source of profit or other financial gain to their owner/s).

The question is asked of all in-scope individuals who used the Internet in the last 12 months.

Countries may ask about response categories as a series of yes/no questions, rather than a single 'list' question. Other country variations are: remove categories where items are not feasible; and add or split categories corresponding to country data requirements. Care should be taken when adding or splitting categories that statistical bias is not introduced. Where categories have been split into sub-categories, care needs to be taken when aggregating responses to reflect the response categories of the model question.

There are several statistical issues with this indicator. They include not including all activities, from all locations, using a denominator that is not clear, or comparing indicators that have been compiled using different denominators. In respect of the activity categories, the concept of a general government organization may prove difficult for respondents to understand, especially in a consistent way. Some countries clarify the definition by listing particular general government organizations or functions of those organizations. See ITU 2009a Chapter 6 for more information.

HH10 Proportion of individuals who used a mobile cellular telephone in the last 12 months[9]

HH10 refers to mobile cellular telephone use in the previous 12 months by in-scope individuals.

Mobile cellular telephone refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, as well as IMT-2000 (3G). Users of both postpaid subscriptions and prepaid accounts are included.

The *proportion of individuals who used a mobile cellular telephone* is calculated by dividing the total number of in-scope individuals who used a mobile cellular telephone in the last 12 months by the total number of in-scope individuals. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Have you used a mobile cellular telephone in the last 12 months?

Explanatory notes

Use of a mobile phone does not require that the telephone is owned or paid for by the user. It may be available through work, a friend or family member. It may be owned collectively by several individuals or the use could be purchased from a public telephone call service. A useful supplementary indicator would be the frequency of mobile phone use (similar to HH12).

The question is asked of all in-scope individuals.

The main statistical issue with this indicator is to ensure that the question does not only measure use by mobile phone subscribers.

HH11 Proportion of households with access to the Internet by type of access

HH11 refers to the Internet access service/s used at home by in-scope households.

Internet access services are defined per the response categories in the model question below. They should be aggregated into the following broad categories:

- Narrowband
- Fixed broadband
- Mobile broadband

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

This indicator is generally calculated as the proportion of in-scope households with Internet access that use each type of access service, for instance, the proportion of households with Internet access that use a fixed broadband service as their means of access. However, it may also be useful to compare with the total population, for instance, the proportion of all households with mobile broadband. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

What type/s of Internet access services are used for Internet access at home? (select all that apply)

Narrowband	*Includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s. Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and i-mode.*
Fixed broadband	*Refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such as DSL (Digital Subscriber Line), cable modem, high speed leased lines, fibre-to-the-home, powerline, satellite, fixed wireless, Wireless Local Area Network and WiMAX.*
Mobile broadband	*Refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such us Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; High-speed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV. Access can be via any device (handheld computer, laptop or mobile phone etc.).*

Explanatory notes

The Internet connection should be functional, that is, any equipment, software or services needed should be in working condition.

It is expected that countries will collect data at a finer level than shown above. The categories chosen by countries should allow aggregation to total narrowband and total broadband, as well as to fixed and mobile broadband, as defined above. ITU's model questionnaire (Annex 2, ITU 2009a) has a set of more detailed categories: analogue modem, ISDN, other narrowband, DSL, cable modem, other fixed broadband and mobile broadband.

As households can have more than one access service, multiple responses are possible.

The question is asked of all in-scope households with Internet access at home.

The main statistical issue is the technical nature of the categories and the likelihood that many respondents will not know what kind of access service/s they have. It would be helpful if interviewers had a reference list of access services (with product names) commonly available in the country. Questions should use categories that are relevant to services existing in the country and are likely to be understood by respondents.

HH12 Frequency of individual use of the Internet in the last 12 months

HH12 refers to frequency of Internet use by in-scope individuals from any location in the previous 12 months, as follows:

- At least once a day
- At least once a week but not every day
- Less than once a week

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The *frequency of individual use of the Internet* can be calculated as either the proportion of in-scope individuals or the proportion of Internet users, using the Internet with each frequency. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

How often did you typically use the Internet during the last 12 months (from any location)?

At least once a day	*Once a working day for respondents who only (or most frequently) used the Internet from work.*
At least once a week but not every day	
Less than once a week	

Explanatory notes

Use of the Internet is not assumed to be only via a computer — it may also be by mobile phone, PDA, games machine, digital TV etc. It can be via a fixed or mobile network.

Typically means on most days (or a typical day). It is recommended that countries collect this information in respect of a typical period; therefore, respondents should ignore weekends (if they only use the Internet at work) and breaks from their usual routine, such as holidays.

The question is asked of all in-scope individuals who used the Internet in the last 12 months.

Countries are able to add additional frequency categories if they wish to obtain finer level information, for example, 'less than once a week' could be split into 'at least once a month but not every week' and 'less than once a month'. In practice, for most countries, it is likely that the proportion of individuals using the Internet less than once a month will be small.

The main statistical issue with this indicator is using a denominator that is not clear, or comparing indicators that have been compiled using different denominators.

HHR1 Proportion of households with electricity

Indicator HHR1 is a reference indicator, included because electricity is required to run many ICTs.

Electricity access may be by a grid/mains connection, or from power generated locally (including at the dwelling). Local power includes electricity generated by a fuel-powered generator, or from renewable resources such as wind, water or solar. It excludes sole use of energy storage devices, such as batteries (though these may be used to store electricity from other sources).

The *proportion of households with electricity* is calculated by dividing the number of in-scope households with electricity by the total number of in-scope households. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Does the dwelling in which this household resides have access to electricity?

Explanatory notes

The question is asked of all in-scope households.

There are no known significant statistical issues with this indicator, which is collected by a number of developing economies.

Statistical standards and methodologies

40. There are a large number of statistical standards and methodologies associated with household surveys.[10] These are well covered by existing household survey manuals (for instance, UNSD 2005a and 2005b) and standards documents (for instance, UNESCO, 1997; ILO, 1993). ITU's manual (ITU, 2009a) provides a comprehensive account of statistical standards and methodologies relevant to the collection of ICT household statistics.

41. This publication describes the statistical standards and methodologies that are specific to the core ICT indicators. They are: classificatory variables, scope, statistical units, time-related issues, and some aspects of processing and reporting of the indicators.

42. The standards and methodologies that apply to household surveys more generally are not covered here but information can be found in the sources cited above. Topics include: statistical standards such as concepts and classifications, survey vehicles, collection techniques, general principles of question and questionnaire design, target populations and survey frames, sample design and selection, data processing, data quality and evaluation, and dissemination of data and metadata.

Expressing indicators in algebraic terms

43. The core indicator metadata above describe formulae for calculating the core indicators. For example, the *proportion of individuals who used the Internet* (HH7) is calculated by dividing the number[7] of in-scope individuals using the Internet by the total number[7] of in-scope individuals, then multiplying by 100. For some indicators, there are two ways of calculating the core indicator. For example, the proportion of individuals undertaking various Internet activities (HH9) can be calculated as either the proportion of in-scope individuals or the proportion of Internet users who undertook each activity.

44. The formulae can also be expressed in algebraic terms. For the first example above, the *proportion of individuals using the Internet* can be expressed as:

$$\frac{N_{Inter}}{N_I} * 100$$

where N_{Inter} is the number of in-scope individuals in the population that used the Internet and N_I is the estimated total number of in-scope individuals in the population. The proportion is multiplied by 100 to convert it to a percentage.

45. For the second example, the proportion of individuals undertaking particular Internet activities (HH9) can be depicted as either:

$$\frac{N_{Activityi}}{N_I} * 100 \quad \text{or} \quad \frac{N_{Activityi}}{N_{Inter}} * 100 ,$$

where $N_{Activityi}$ is the number of in-scope individuals in the population that undertook a particular activity, denoted as *Activity i* (e.g. using the Internet to get information about goods or services) and N_{Inter} and N_I are as defined above. The result is multiplied by 100 to convert the proportion to a percentage.

Classifying indicator data

46. We saw above that each of the core indicators refers to either households or individuals. There are a number of ways that such units can be classified to make statistical output more relevant. For instance, a household can be classified by its size or whether it is located in an urban or rural area. An individual can be classified by age, gender or income etc.

47. The ICT indicators have specified classificatory variables for households and individuals. They are a subset of all possible ways that the data can be classified, and include those that are both policy relevant and statistically feasible for international comparison. ITU (2009a) discusses classifications that are not standards for the core list of ICT indicators. Some (for instance, household income and geographical area) are highly relevant but very difficult to collect in a consistent manner.

48. The classifications used for the core indicators are based on standard international classifications, where these exist.

Classifying households

49. For the ICT household access indicators (HH1, HH2, HH3, HH4, HH6 and HH11), sub-indicators may be constructed using the household classificatory variables, household composition and household size.

50. The classifications applying to households are:

- **Household composition**: two-way classification – households with/without children under 15/16/18 years of age.
- **Household size**: number of members, including those outside the minimum age scope of 15-74 years; ITU (2009a) recommends size ranges as follows: 1, 2, 3-5, 6-10, more than 10.

51. The age cut-off for children (15/16/18 years) is flexible to suit how countries define children. Ideally, 15 years is the preferred cut-off, although 16 or 18 are acceptable substitutes where these are the ages used in country collections.

Classifying individuals

52. For the individual use indicators (HH5, HH7, HH8, HH9, HH10 and HH12), sub-indicators may be constructed using the individual classificatory variables, age, gender, highest education level, labour force status and occupation.

53. The classifications applying to individuals are:

- **Age ranges** (in years): 1 to 4, 5 to 9, 10 to 14, 15 to 24; 25 to 34; 35 to 44; 45 to 54; 55 to 64; 65 to 74, 75 or over. These ranges are consistent with (though not as fine as) the age ranges adopted by UNSD (2008b). The minimum scope recommended for the individual use core indicators is the 15-74 years age range. However, where data are collected for children (and this is encouraged), countries should tabulate data on the basis of the above size classes if possible.
- **Gender**: male/female.

- **Highest education level**: four-way classification defined using ISCED97[11] as follows:
  1. Primary education or lower – no formal education, pre-primary (ISCED 0) or primary education (ISCED 1);
  2. Lower secondary education (ISCED 2);
  3. Upper secondary or post-secondary non-tertiary (ISCED 3, 4); and
  4. Tertiary (ISCED 5, 6).
- **Labour force status**: four-way classification defined using ICSE-93[12] as follows:
  1. Paid employee;
  2. Self-employed;
  3. Unemployed; and
  4. Not in the labour force.
- **Occupation** is based on the broadest level (major group) of ISCO (the *International Standard Classification of Occupations*), maintained by the ILO (ILO, 2009). An occupation is defined by the ILO as a "set of jobs whose main tasks and duties are characterized by a high degree of similarity". Most countries are currently using ISCO-88 (1988) or their country equivalent. Changes will occur on adoption by countries of ISCO-08 (2008). At the major group level, the differences are fairly minor. See ITU (2009a) for a list of the major groups of ISCO-88 and ISCO-08.

Scope and statistical units

54. The minimum recommended age scope for individuals is 15-74. Countries are encouraged to expand this scope to fulfil national policy requirements. In particular, developing economies may wish to collect information in respect of children under 15 years, given the importance of this age group to the development of an information society.[13]

55. It is expected that most surveys will restrict their scope for individuals to those living in private dwellings (therefore excluding individuals in institutions such as prisons, nursing homes and special dwellings such as hotels).

56. Consistent with the scope for individuals, the household minimum recommended scope excludes households consisting only of members over 74 years, or under 15 years. Other scope limitations will follow from those applying to individuals, for instance, restricting household surveys to those households in private dwellings.

57. As we have seen, the *household unit* is used to elicit information about the facilities in place in the household (for example, whether there is a TV, computer or Internet connection). The *individual unit* is used to provide information on use of ICT (both at, and away from, home) and the nature of that use (for instance, frequency and range of activities undertaken).

58. While it is clear what an individual is, the concept of household may require some clarification. UNSD has defined a household in the context of population censuses (UNSD, 2008b) and the system of national accounts (SNA)[14] (UNSD, 2008a). Details can be found in ITU (2009a).

59. Consistent with the two UNSD definitions, for the purposes of the core indicators, a *household* is defined as follows: a *household* consists of one or more people, who may or may not be related to each other; who share accommodation; and who make common provision for food.

Time-related factors

60. There are several time characteristics that are relevant to the core indicators. They are:

- Frequency (how frequently the indicators are produced); ITU recommends that countries attempt to conduct an ICT access/use survey at least once every two years.[15]
- Reference period/s (recall period/s) referred to when asking questions about an individual's ICT use; core ICT indicator standards assume a 12-month reference period (referred to in the model questions as 'the last 12 months'), although country practices vary.[16] A reference period is relevant to indicators HH5, HH7-10 and HH12.
- A particular reference date/s could be used when asking about ICT access (for example, whether the household had Internet access at 31 December). Generally, though, the reference date is the day of interview, with questions asking about the current situation; and
- Time series, that is, a data series derived from surveys that are sufficiently compatible to allow comparison of data over time. Such comparisons are important for monitoring changes in patterns of use and progress in ICT penetration.

Processing and reporting indicator data

61. Most aspects of household survey data processing are general and therefore not covered in this publication. However, some aspects of ICT indicator data processing are specific and include data editing, aggregation of data categories and derivation of the core indicators.

62. In respect of the core household indicators, a number of edits that can be applied to each indicator are suggested in Table 9 of ITU (2009a). They include micro-edits, which are applied to individual records, and macro-edits, which are applied to aggregated data. Micro-edits include checks of consistency across questions (for instance, if an individual uses the Internet and has Internet access at home, that user would be expected to respond that s/he uses the Internet at home). Macro-edits include examination of trends over time (for instance, Internet use should grow fairly rapidly in developing economies compared with use of older technologies, such as radio).

63. Advice is provided here on how to aggregate response category data. The indicators for HH8, HH9, HH11 and HH12 may be constructed using more detailed response categories than those specified. For example, in the 'location of Internet use' question, the response category 'community Internet access facility' might consist of the four sub-categories, public libraries, digital community centres, other government agencies and other community Internet access facilities. It is important to take care when aggregating response categories to construct the categories specified in the core indicators. In the example above, the number of Internet users accessing the Internet at community Internet access facilities is calculated by deriving the number of users who access the Internet at one or more of the locations, public libraries, digital community centres, other government agencies or other community Internet access facilities. Clearly, this aggregation has to be done at the unit record level rather than using aggregated data. The answer will almost always be less than the result received if the numbers accessing the Internet at each of the component locations are summed (this is because individuals who use the Internet at more than one of these locations are counted more than once when the numbers are summed).

64. All the core household indicators are presented as proportions data. They include proportions of the whole population of households/individuals or of sub-populations, such as particular age groups. As we saw in the notes to indicators HH8, HH9, HH11 and HH12, countries may present data for these indi-

cators as a proportion of all households/individuals or as a proportion of those that have access to, or use, the Internet. Having two methods of calculation for some indicators can be potentially confusing to users, so it is important to be clear which denominator has been used to construct a particular indicator.

65. For international reporting purposes, it is recommended that countries report numbers of households and individuals rather than proportions or percentages as this makes it clear what the data mean and facilitates comparison of data across countries. It also enables aggregation of some sub-categories (for example, age groups or frequencies).[17]

66. Population estimates for the total population, and for each sub-population (as indicated by the classificatory variables), also need to be provided so that proportions can be derived. Both sets of numbers should represent the whole target population and not the sample. An example, showing part of a reporting proforma, is provided in Table 7 below. A numerical example can be found in ITU (2009a, Chapter 8).

Table 7. Example of data reporting: partial table

		Male	Female	Total
Population (estimated total in-scope population, not sample number)				
HH5	Number of individuals who used a computer (from any location) in the last 12 months			
HH7	Number of individuals who used the Internet (from any location) in the last 12 months			
HH8	Number of individuals who used the Internet at home in the last 12 months			
HH8	Number of individuals who used the Internet at work in the last 12 months			
HH8	Number of individuals who used the Internet at their place of education in the last 12 months			
HH8	Number of individuals who used the Internet at another person's home in the last 12 months			

Endnotes

[1] These may be abbreviated to 'ICT household indicators'.

[2] These may be surveys that are dedicated to measuring ICT access and use, or surveys such as labour force or 'omnibus' ('general purpose') surveys, where ICT is one of several topics.

[3] *Reference period* is discussed later in this chapter.

[4] Note that each response category of the multiple response indicators, HH8, HH9, HH11 and HH12, forms an indicator. Sub-indicators are those that use the classificatory variables to examine a part of the in-scope population.

[5] Readers wishing to see how the model questions fit into a questionnaire should consult the model questionnaire in Annex 2 of ITU (2009a). The model questionnaire also shows question sequencing and interviewer instructions.

[6] The unit 'household' is defined later in this chapter.

[7] The number will almost always be an estimate based on a sample survey. For simplicity, that is not specified in this publication.

[8] Information on the reference period can be found in *Time-related factors* later in this chapter.

[9] Note that this indicator is slightly different from HH10 described in *Partnership* (2008b, 2009) and ITU (2009a). The earlier versions excluded occasional use by stating that a mobile phone must have been *reasonably available* in the previous 12 months.

[10] OECD's Glossary of Statistical Terms defines statistical standards as providing "… a comprehensive set of guidelines for surveys and administrative sources collecting information on a particular topic. Components of a standard include: definition(s), statistical units, classification(s), coding process(es), questionnaire module(s), output categories." The *Glossary* defines statistical methodology as "Theory and methods of data collection, processing and analysis." (OECD, 2009b).

[11] United Nations Educational, Scientific and Cultural Organization (UNESCO) *International Standard Classification of Education* (UNESCO, 1997).

[12] International Labour Organization (ILO) *International Classification of Status in Employment* (ILO, 1993). The ICSE-93 consists of the following six categories: employees; employers, own account workers, members of producers' cooperatives, contributing family workers, and workers not classifiable by status. The category Self-employed includes the ICSE-93 categories: employers, own account workers, members of producers' cooperatives and contributing family workers.

[13] The potential contributions of children and other young people to development of the information society are discussed in ITU (2008).

[14] The institutional unit 'household'.

[15] Most developed economies that conduct household ICT access/use surveys do so annually. Among developing economies, the situation is complicated by different frequencies for measuring household access and individual ICT use. A small number of countries with a strong interest in ICT issues conduct surveys more frequently than annually (for example, the Republic of Korea and China).

[16] For instance, countries using Eurostat's model questionnaire use both 3- and 12-month reference periods. See ITU (2009a) for further discussion on this point.

[17] ITU's NSO questionnaire now asks for numbers rather than proportions.

Chapter 4

Core indicators on use of ICT by businesses

67. This chapter presents the 12 core indicators on use of ICT by businesses. Note that the concept of ICT access is not used for businesses as it is generally assumed that any ICT in place will be used by someone within the business.[1]

68. Statistics on business use of ICT are usually collected by NSOs using a stand-alone business ICT use survey or through a module of ICT use questions in another business survey. Most OECD and European Union countries have been collecting business ICT use statistics for a number of years and most have stand-alone surveys that are conducted annually. Other economies are starting to collect business ICT use indicators, using the core indicators and associated standards recommended by the *Partnership*. UNCTAD collects business ICT use core indicator data annually.[2]

69. Apart from OECD and European Union countries, data on use of ICT by businesses are not widely available. As with the household indicators, there are several specific comparability issues with respect to the core business ICT use indicators. They include variable industry and business size scope, variations in questions asked and lack of time series data. See *Partnership* (2008a) for a more detailed discussion.

70. The business use indicators are presented as the *proportion of businesses using/with [technology]*. Indicators B7, B8 and B12 refer to the types of activities undertaken using the Internet.

71. The indicators are calculated by dividing the number of in-scope businesses using/with [technology] by the total number of in-scope businesses. For B7 (Proportion of businesses receiving orders over the Internet), B8 (Proportion of businesses placing orders over the Internet) and B12 (Proportion of businesses using the Internet by type of activity), output may be calculated as either the *proportion of in-scope businesses* or the *proportion of businesses using the Internet*.[3]

72. The suggested reference period is 12 months, although a different reference period might be considered appropriate by the statistical agency.

73. By convention, the business ICT use indicators are expressed as a percentage.

74. Sub-indicators for the business use indicators can be constructed using the classificatory variables, industry and business size, for example, the proportion of businesses in the manufacturing industry using computers (sub-indicator of B1, The proportion of businesses using computers).[4]

75. The classificatory variables are presented later in this chapter, along with the other statistical standards associated with the indicators – scope, statistical units and time-related factors. Specific methodological issues covered are some aspects of data processing and reporting.

Core indicators

76. Each of the indicators is presented below, with the following information:

- The name of the indicator and associated response categories;
- A brief description of the indicator;
- Definition of the ICTs covered by the indicator e.g. the Internet, Local Area Network;
- How the indicator is calculated;
- A suggested model question;[5] and
- Explanatory notes (which include question instructions, the population of statistical units that is asked the question, possible variations to the model question and any significant statistical issues).

B1 Proportion of businesses using computers
B1 refers to the use of (not access to) computers by in-scope businesses during the reference period.[6] A *computer* is a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets. The *proportion of businesses using computers* is calculated by dividing the number[7] of in-scope businesses using computers during the reference period by the total number[7] of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.
Suggested model question
Did your business use computer(s) during <reference period>?
Explanatory notes
The question is asked of all in-scope businesses. Use can be at the business's premises or elsewhere. There are no known significant statistical issues for this indicator, although care should be taken with the definition of *computer*.

B2 Proportion of persons employed routinely using computers

B2 refers to the proportion of persons employed (by in-scope businesses) who routinely used a computer during the reference period.

A *computer* is a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets.

The *proportion of persons employed routinely using computers* is calculated by dividing the number of persons employed who routinely used computers (in all in-scope businesses) by the total number of persons employed (in all in-scope businesses). The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

How many persons employed in your business routinely used a computer at work during <reference period>?

Explanatory notes

Persons employed refer to all persons working for the business, not only those working in clerical jobs. They include short-term and casual employees, contributing family workers and self-employed persons, who may be paid or unpaid.

The question is asked of all in-scope businesses that used computers during the reference period.

Use can be at the business's premises or elsewhere but refers to use for work purposes.

The UNCTAD (2009) model questionnaire suggests that if businesses are unable to report the *number* of persons employed who routinely using computers during <reference period>, they provide an estimate of the *percentage* of persons employed that used computers etc. In both cases, information on the number of persons employed must be available for each surveyed business.

This indicator is not equivalent to the employment-weighted indicator 'proportion of persons employed working in businesses with a computer'.

The main statistical issue with this indicator is that the result reflects the industrial profile of the country as much as the level of use of ICT by employed people. This arises because the use of ICT at work varies by industry and occupation. Therefore, a country with a large manufacturing sector may show a lower result on this indicator simply because manufacturing workers are less likely to use ICT than clerical workers. This effect may be more pronounced for developing economies. It is suggested that international comparisons for this indicator show data classified by at least broad industry (for example, manufacturing and other).

Another issue is the interpretation of "routinely". Eurostat's 2009 model questionnaire (Eurostat, 2009a) restricts this question to those persons who used the Internet "at least once a week".

B3 Proportion of businesses using the Internet

B3 refers to the use of the Internet by in-scope businesses during the reference period — whether or not the business used a computer (as the Internet may be accessed in other ways).

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The *proportion of businesses using the Internet* is calculated by dividing the number of in-scope businesses using the Internet by the total number of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business use the Internet during <reference period>?

Explanatory notes

Internet use may be facilitated by any device enabling Internet access (not only a computer). This includes a mobile phone, PDA, games machine and digital TV. Use can be via a fixed or mobile network.

The question is asked of all in-scope businesses — not only those businesses that used a computer.

Use can be at the business's premises or elsewhere. The UNCTAD (2009) model questionnaire distinguishes Internet use that takes place inside the business from use that takes place outside the business premises.

There are no known significant statistical issues with this indicator.

B4 Proportion of persons employed routinely using the Internet

B4 refers to the proportion of persons employed (by in-scope businesses) who routinely used the Internet during the reference period.

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The *proportion of persons employed routinely using the Internet* is calculated by dividing the number of persons employed who routinely used the Internet (in all in-scope businesses) by the total number of persons employed (in all in-scope businesses). The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

How many persons employed in your business routinely used the Internet at work during <reference period>?

Explanatory notes

Internet access is not assumed to be only via a computer — it may also be by mobile phone, PDA, games machine, digital TV etc. It can be via a fixed or mobile network.

Persons employed refer to all persons working for the business, not only those working in clerical jobs. They include short-term and casual employees, contributing family workers and self-employed persons, who may be paid or unpaid.

The question is asked of all in-scope businesses that used the Internet during the reference period.

Use can be at the business's premises or elsewhere but refers to use for work purposes.

The UNCTAD (2009) model questionnaire suggests that if businesses are unable to report the *number* of persons employed who routinely used the Internet during the reference period, they provide an estimate of the *percentage* of persons employed who used the Internet etc. In both cases, information on the number of persons employed must be available for each surveyed business.

This indicator is not equivalent to the employment weighted indicator 'proportion of persons employed working in businesses with Internet access'.

The main statistical issue with this indicator is the same as for B2, that is, the result reflects the industrial profile of the country as much as the level of use of ICT by employed people. The issue of interpreting "routinely" is also the same as for B2.

B5 Proportion of businesses with a web presence

B5 is a measure of the proportion of in-scope businesses with a World Wide Web presence as at the reference date.[8]

A *web presence* includes a website, homepage or presence on another entity's website (including a related business). It excludes inclusion in an online directory and any other web pages where the business does not have control over the content of the page. The term 'web presence' is used rather than 'web site', based on the presumption that a presence on the WWW is more important than a web site *per se*.

The *proportion of businesses with a web presence* is calculated by dividing the number of in-scope businesses with a web presence by the total number of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business have a web presence as at <reference date>?

Explanatory notes

The question is asked of all in-scope businesses that used the Internet during the reference period. In theory, a business could have a web presence without having used the Internet. For most countries, this is expected to be a rare event. Where it is thought to be common, countries could alter the population to all in-scope businesses that used computers during the reference period.

There are no known significant statistical issues with this indicator.

B6 Proportion of businesses with an intranet

B6 is a measure of the proportion of in-scope businesses with an intranet as at the reference date.

An *intranet* refers to an internal communications network using Internet protocols and allowing communication within an organization (and to other authorized persons). It is typically set up behind a firewall to control access.

The *proportion of businesses with an intranet* is calculated by dividing the number of in-scope businesses with an intranet by the total number of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business have an intranet as at <reference date>?

Explanatory notes

The question is asked of all in-scope businesses that used computers during the reference period.

The main statistical issue with this indicator is the definition of intranet. This was revised in 2008 to better reflect the current technical meaning of the term.

B7 Proportion of businesses receiving orders over the Internet

B7 refers to the incidence of selling over the Internet by in-scope businesses during the reference period. It is one of two measures of e-commerce in the set of business use indicators (the other is B8).

Orders received include orders received via the Internet whether or not payment was made online. They include orders received via websites, specialized Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones and e-mail.[9] They also include orders received over the Internet on behalf of other organizations — and orders received over the Internet by other organizations on behalf of the business.

Orders received exclude orders that were cancelled or not completed.

The *proportion of businesses receiving orders over the Internet* is most simply calculated by dividing the number of in-scope businesses receiving orders over the Internet by the total number of in-scope businesses. Alternatively, output can be presented as the proportion of in-scope businesses using the Internet. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business receive orders for goods or services (that is, make sales) via the Internet during <reference period>?

Explanatory notes

The question is asked of all in-scope businesses that used the Internet during the reference period. In theory, businesses without Internet access could receive Internet orders (for example, via agents). Where this is thought to be common, countries could alter the population to all in-scope businesses that used computers during the reference period.

The main statistical issue with this indicator is the definition and interpretation of Internet selling. The OECD defined Internet commerce transactions in 2001 as the sale or purchase of goods or services, whether between businesses, households, individuals, Governments, and other public or private organizations, conducted over the Internet. The goods and services are ordered over the Internet but the payment, and ultimate delivery of the good or service, may be conducted on- or offline (OECD, 2009a). The OECD reviewed the definition of e-commerce in 2009 and it no longer distinguishes the type of network used (Internet or other). However, the central concept — that goods and services are ordered over a network but payment, and ultimate delivery, may be conducted on- or offline — has been retained.[10] The statistical difficulties interpreting Internet commerce include the low incidence of Internet commerce activity in some economies (with consequent high standard errors); the distinction between Internet selling and selling using other computer-mediated networks; and the possibly poor quality of reported data resulting from a misunderstanding of Internet commerce concepts.

B8 Proportion of businesses placing orders over the Internet

B8 refers to the incidence of purchasing over the Internet by in-scope businesses during the reference period. It is one of two measures of e-commerce in the set of business use indicators (the other is B7).

Orders placed include orders placed via the Internet whether or not payment was made online. They include orders placed via websites, specialized Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones and e-mail.[9]

Orders placed exclude orders that were cancelled or not completed.

The *proportion of businesses placing orders over the Internet* is most simply calculated by dividing the number of in-scope businesses placing orders over the Internet by the total number of in-scope businesses. Alternatively, output can be presented as the proportion of in-scope businesses using the Internet. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business place orders for goods or services (that is, make purchases) via the Internet during <reference period>?

Explanatory notes

The question is asked of all in-scope businesses that used the Internet during the reference period. In theory, businesses without Internet access could place Internet orders (for example, via agents). Where this is thought to be common, countries could alter the population to all in-scope businesses that used computers during the reference period.

The main statistical issue with this indicator is the definition and interpretation of Internet purchasing. The OECD defined Internet commerce transactions in 2001 as the sale or purchase of goods or services, whether between businesses, households, individuals, Governments, and other public or private organizations, conducted over the Internet. The goods and services are ordered over the Internet but the payment, and ultimate delivery of the good or service, may be conducted on- or offline (OECD, 2009a). The OECD reviewed the definition of e-commerce in 2009 and it no longer distinguishes the type of network used (Internet or other). However, the central concept — that goods and services are ordered over a network but payment, and ultimate delivery, may be conducted on- or offline — has been retained.[10] The statistical difficulties interpreting Internet commerce include the low incidence of Internet commerce activity in some economies (with consequent high standard errors); the distinction between Internet purchasing and purchasing using other computer-mediated networks; and the possibly poor quality of reported data resulting from a misunderstanding of Internet commerce concepts.

B9 Proportion of businesses using the Internet by type of access

B9 refers to the Internet access service/s used by in-scope businesses during the reference period.

Internet access services are defined in the model question below. They are:

- Narrowband
- Fixed broadband
- Mobile broadband

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

This indicator is generally calculated as the proportion of in-scope Internet-using businesses that use each type of access service, for instance, the proportion of Internet-using businesses that use a fixed broadband service as their means of access. However, it may also be useful to compare with the total population, for instance, the proportion of all businesses with mobile broadband. In either case, the result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

How did your business connect to the Internet during <reference period>? (select all that apply)

Narrowband	*Includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s. Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and i-mode.*
Fixed broadband	*Refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such as DSL (Digital Subscriber Line), cable modem, high speed leased lines, fibre-to-the-home, powerline, satellite, fixed wireless, Wireless Local Area Network and WiMAX.*
Mobile broadband	*Refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such us Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; High-speed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV. Access can be via any device (handheld computer, laptop or mobile phone etc.).*

Explanatory notes

It is expected that countries will collect data at a finer level than shown above. The categories chosen by countries should allow aggregation to total narrowband and total broadband, as well as to fixed and mobile broadband, as defined above.

As businesses can have more than one access service, multiple responses are possible.

The question is asked of all in-scope businesses that used the Internet during the reference period.

The main statistical issue is the technical nature of the categories and the likelihood that some respondents will not know what kind of access service/s they have. Questions should use categories that are relevant to services existing in the country and are likely to be understood by respondents.

B10 Proportion of businesses with a local area network (LAN)

B10 is a measure of the proportion of in-scope businesses with a local area network as at the reference date.

A *local area network* (LAN) refers to a network connecting computers within a localized area such as a single building, department or site; it may be wireless.

The *proportion of businesses with a LAN* is calculated by dividing the number of in-scope businesses with a LAN by the total number of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business have a local area network (LAN) as at <reference date>?

Explanatory notes

The question is asked of all in-scope businesses that used computers during the reference period.

There are no known significant statistical issues with this indicator.

B11 Proportion of businesses with an extranet

B11 is a measure of the proportion of in-scope businesses with an extranet as at the reference date.

An *extranet* is a closed network that uses Internet protocols to securely share a business's information with suppliers, vendors, customers or other businesses partners. It can take the form of a secure extension of an intranet that allows external users to access some parts of the business's intranet. It can also be a private part of the business's website, where business partners can navigate after being authenticated in a login page.

The *proportion of businesses with an extranet* is calculated by dividing the number of in-scope businesses with an extranet by the total number of in-scope businesses. The result is then multiplied by 100 to be expressed as a percentage.

Suggested model question

Did your business have an extranet as at <reference date>?

Explanatory notes

The question is asked of all in-scope businesses that used computers during the reference period.

The main statistical issue with this indicator is the definition of extranet. This was revised in 2008 to better reflect the current technical meaning of the term.

B12 Proportion of businesses using the Internet by type of activity

B12 refers to Internet activities undertaken by in-scope businesses during the reference period.

Activities are defined per the response categories in the model question below. They are:

- 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 organizations
- Interacting with general government organizations
- Internet banking
- Accessing other financial services
- Providing customer services
- Delivering products online
- Internal or external recruitment
- Staff training

The *Internet* is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.

The proportion of businesses that undertook each activity can be calculated as either the proportion of in-scope businesses or the proportion of Internet-using businesses that undertook each activity. In either case, the result is then multiplied by 100 to be expressed as a percentage.

B12 Proportion of businesses using the Internet by type of activity (continued)

Suggested model question

How did your business connect to the Internet during <reference period>? (select all that apply)

Sending or receiving e-mail	
Telephoning over the Internet/VoIP	*Using Skype, iTalk, etc. Includes video calls (via webcam).*
Posting information or instant messaging	*Posting messages or other information to chat sites, blogs, news-groups, online discussion forums and similar; use of instant messaging.*
Getting information about goods or services	
Getting information from general go-vernment organizations	*Government organizations should be explained to respondents in a way that is consistent with the SNA93 (2008 revision) concept of general government. See Explanatory notes below for details. Information may be obtained via websites or e-mail.*
Interacting with general government organizations	*Government organizations should be explained to respondents in a way that is consistent with the SNA93 (2008 revision) concept of general government. See Explanatory notes below for details. nment includes downloading/requesting forms, completing/lodging forms online, making online payments and purchasing from, or selling to, government organizations via the Internet. It excludes getting information from general government organizations.*
Internet banking	*Includes electronic transactions with a bank for payment or trans-fers, or for looking up account information.*
Accessing other financial services	*Includes electronic transactions via the Internet for other types of financial services such as share and insurance purchases.*
Providing customer services	*Includes providing online or e-mailed product catalogues or price lists, product specification or configuration online, after sales sup-port, and order tracking online.*
Delivering products online	*Refers to products delivered over the Internet in digitized form, e.g. reports, software, music, videos, computer games; and online services, such as computer-related services, information services, travel bookings or financial services.*
Internal or external recruitment	*Including having details of vacant positions on an intranet or web-site.*
Staff training	*Includes e-learning applications available on an intranet or from the WWW.*
Other activities (please specify ……..…..)	*'Other activities' is not a core indicator category. However, it is use-ful to include it in questionnaires as it allows respondents to provide a comprehensive response. Activities included in an 'other' category may need to be re-coded to one of the other categories. If this happens frequently, it can indicate problems with category wording. 'Other' categories can also indicate emerging activities.*

B12 Proportion of businesses using the Internet by type of activity (continued)

Explanatory notes

Internet use is not assumed to be only via a computer — it may also be by mobile phone, PDA, games machine, digital TV etc. It can be via a fixed or mobile network.

Businesses should be asked about all Internet activities (that is, the question used by countries should specify multiple responses).

Activities (and therefore response categories) are not mutually exclusive. The activities listed here are recommended by the *Partnership*, although other activities could be added by countries whenever relevant. See the note on country variations below.

General government organizations should be described to respondents in a way that is consistent with the SNA93 (2008 revision) concept of general government. According to the SNA "… the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units. Importantly, they do not include public corporations (legal entities, predominantly owned and controlled by the government that are created for the purpose of producing goods and services for the market and may be a source of profit or other financial gain to their owner/s).

The question is asked of all in-scope businesses that used the Internet during the reference period.

Countries may ask about response categories as a series of yes/no questions, rather than a single 'list' question. Other country variations are: remove categories where items are not feasible; and add or split categories corresponding to country data requirements. Care should be taken when adding or splitting categories that statistical bias is not introduced. Where categories have been split into sub-categories, care needs to be taken when aggregating responses to reflect the response categories of the model question.

There are some statistical issues with this indicator. The main one is using a denominator that is not clear, or comparing indicators that have been compiled using different denominators. In respect of the activity categories, the concept of a general government organization may prove difficult for respondents to understand, especially in a consistent way. Countries could clarify the definition by listing particular general government organizations or functions of those organizations.

Statistical standards and methodologies

77. There are a large number of statistical standards and methodologies associated with business surveys.[11] These are well covered in existing business statistics manuals (for instance, Eurostat, 1997; UNSD, 2008c) and standards documents (for instance, UNSD 2008c; ILO 1993; World Bank 2009). UNCTAD's *Manual for the Production of Statistics on the Information Economy* (UNCTAD, 2009) provides a comprehensive account of statistical standards and methodologies relevant to the collection of business ICT use statistics.[12]

78. This publication describes the statistical standards and methodologies that are specific to the core indicators on ICT use by businesses. They are: classificatory variables, scope, statistical units, time-related issues, and some aspects of processing and reporting of the core indicators.

79. Those standards and methodologies that apply to business surveys more generally are not covered here but information can be found in the sources cited above. Topics include: statistical standards such as concepts and classifications, survey vehicles, collection techniques, general principles of question and questionnaire design, target populations and survey frames, sample design and selection, data processing, data quality and evaluation, and dissemination of data and metadata.

Expressing indicators in algebraic terms

80. The core indicator metadata above describe the formulae for calculating the core indicators. For example, the *proportion of businesses using the Internet* (B3) is calculated by dividing the number[7] of in-scope businesses using the Internet by the total number[7] of in-scope businesses, then multiplying by 100. For

some indicators, there are two ways of calculating the core indicator. For example, the proportion of businesses undertaking various Internet activities (B12) can be calculated as either the proportion of in-scope businesses or the proportion of Internet-using businesses that undertook each activity.

81. The formulae can also be expressed in algebraic terms. For the first example above, the *proportion of businesses using the Internet* can be expressed as:

$$\frac{N_{Inter}}{N_B} * 100$$

where N_{Inter} is the number of in-scope businesses in the population that used the Internet and N_B is the estimated total number of in-scope businesses in the population. The proportion is multiplied by 100 to convert it to a percentage.

82. For the second example, the proportion of businesses undertaking particular Internet activities (B12) can be depicted as either:

$$\frac{N_{Activityi}}{N_B} * 100 \quad \text{or} \quad \frac{N_{Activityi}}{N_{Inter}} * 100 ,$$

where $N_{Activityi}$ is the number of in-scope businesses in the population that undertook a particular activity, denoted as *Activity i* (e.g. using the Internet to get information about goods or services) and N_{Inter} and N_B are as defined above. The result is multiplied by 100 to convert the proportion to a percentage.

Classifying indicator data

83. There are a number of ways that businesses can be classified to make statistical output more relevant. For instance, a business can be classified by its size or location. Like the ICT household indicators, the business use indicators have specified classificatory variables that are a subset of all possible ways that these data can be classified. The classificatory variables chosen are those that are both policy relevant and statistically feasible for international comparison. Some (for instance, geographical area) are highly relevant but very difficult to collect in a consistent manner.

84. For all the business use indicators, sub-indicators may be constructed using the classificatory variables, industry and size (in terms of persons employed).

85. The classifications used for the core indicators are based on standard international classifications. The industry classification is based on the UN standard industry classification, ISIC. The version most commonly used is based on ISIC Revision 3.1 or earlier and includes at least the following sections: Manufacturing (ISIC D); Construction (ISIC F); Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods) (ISIC G); Hotels and restaurants (ISIC H); Transport, storage and communications (ISIC I); and Real estate, renting and business activities (ISIC K).

86. For those countries using ISIC Revision 4, the industry classification is sections: C, F, G, H, I, J, L, M (part) and N (Manufacturing; Construction; Wholesale and retail trade; repair of motor vehicles and motorcycles; Transportation and storage; Accommodation and food service activities; Information and

communication, Real estate activities; Professional, scientific and technical activities (excluding Division 75); and Administrative and support service activities).[13]

87. The size classification for businesses is defined in terms of persons employed and is: *1-9, 10-49, 50-249 and 250 or more persons employed*.[14] While the minimum recommended scope is 10 or more employees, many countries will want to collect data for smaller businesses, therefore a range of 1-9 persons employed was added to the size classification during the 2008 revision of the core indicators. Countries are encouraged to expand the scope to include very small businesses and to tabulate data on that basis. The recommended size categories are less detailed than UNSD size recommendations (UNSD, 2008c).[15]

Scope and statistical units

88. The scope for business ICT use indicators is defined in terms of type of business organization, industry activity and size.

89. In respect of the type of organization, the scope is limited to those businesses (enterprises), from the private and public sectors that are operating in the country. General government organizations are excluded.[16]

90. With respect to the industry (activity) scope applying to these indicators, under ISIC Rev. 3.1, the minimal scope is sections D, F, G, H, I and K.[17] For those countries that have introduced ISIC Rev. 4 (or national equivalent), the minimal scope is sections C, F, G, H, I, J, L, M (part), N and S (part). Section M, Professional, scientific and technical activities, excludes Division 75, Veterinary activities.[18] Section S includes Division 95, Repair of computers and personal and household goods.[18] [19]

91. The size scope is defined in terms of the number of 'persons employed'. According to the ILO (1993), 'persons employed' include employees, employers,[20] own account workers,[21] members of producers' cooperatives and contributing family workers. A person employed may be paid or unpaid (for instance, a contributing family worker may be paid in kind rather than cash). An employee may be employed on a short-term, casual or seasonal basis.

92. The minimum recommended size scope is enterprises with 10 or more persons employed. However, countries are encouraged to survey businesses with fewer than 10 persons employed (including unincorporated businesses). This can provide very useful information on the technological status of very small businesses.

93. The recommended statistical unit is the 'enterprise'. The concept of an enterprise has been aligned with the System of National Accounts, SNA93 (2008 revision, UNSD, 2008a), which describes an enterprise as follows: "An enterprise is the view of an institutional unit as a producer of goods and services. The term enterprise may refer to a corporation, a quasi-corporation, an NPI or an unincorporated enterprise." The UNSD publication *Draft International Recommendations for Industrial Statistics* (UNSD, 2008c) expands on the enterprise concept as follows:

> "An institutional unit in its capacity as a producer of goods and services is known as an enterprise. An enterprise is an economic transactor with autonomy in respect of financial and investment decision-making, as well as authority and responsibility for allocating resources for the production of goods and services. It may be engaged in one or more economic activities at one or more locations. An enterprise may be a sole legal unit.

> The enterprise is the smallest legal unit that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise may, therefore, be a corporation (or quasi-corporation), a non-profit institution, or an unincorporated enterprise. Corporate enterprises and non-profit institutions are complete institutional units. On the other hand, the term "unincorporated enterprise" refers to an institutional unit — a household or government unit — only in its capacity as a producer of goods and services."

94. It should be noted that *enterprise* is quite a broad institutional concept, including public (trading) corporations and unincorporated units that produce goods and services. The *Partnership* recommends that countries include public (trading) corporations within the scope of business ICT use surveys. If they wish to produce data for micro-enterprises (those with fewer than 10 persons employed), they should consider including unincorporated producers of goods and services, including those in the informal sector.[22]

95. It is acknowledged that some countries will use establishment[23] surveys to collect data on business use of ICT. Where this is the case, it should be made clear in survey metadata because proportions data may not be comparable where different types of units are used. As an example, if country A uses the establishment as a unit and country B uses the enterprise, then it is likely that country B will report higher proportions, especially of more sophisticated uses of ICT, such as buying and selling over the Internet, or use of an intranet.

Time-related factors

96. As with the household indicators, there are several time characteristics that are relevant to the core indicators. They are:

- Frequency (how frequently the indicators are produced);[24]
- Reference period/s referred in indicators BI, B2, B3, B4, B7, B8, B9 and B12 when asking questions about a business's ICT use. In order to achieve international comparability, it is recommended that countries use a 12-month reference period (this is generally the 'last 12 months', last calendar year or last fiscal year), and refer to it in the question.[25]
- Reference dates are used for core indicators B5, B6, B10 and B11 and are usually the last day of the reference period or shortly after it.[26]
- Time series, that is, a data series derived from surveys that are sufficiently compatible to allow comparison of data over time. Such comparisons are important for monitoring changes in patterns of use and progress in ICT penetration.

Processing and reporting indicator data

97. As with the household indicators, the general aspects of business survey data processing are not described in this publication. However, some aspects of ICT indicator data processing are specific and include data editing, aggregation of data categories and derivation of the core indicators.

98. In respect of editing business ICT use data, UNCTAD (2009) covers the topic broadly and it is not discussed here.

99. The same advice on aggregation offered for the complex household indicators applies to the business use indicators B9 and B12, that is, care should be taken when aggregating response categories to construct

the categories specified in the core indicators. An example for B9 is the calculation of the proportion of businesses using broadband, which is derived using the two response categories (businesses using) *Fixed broadband* and (businesses using) *Mobile broadband*. The required calculation is the number (or proportion) of businesses which access the Internet using either or both fixed and mobile broadband. Aggregation is done at the unit record level rather than from aggregated data. Note that summing the proportions is incorrect and will result in an overestimate (because many businesses will use both fixed and mobile broadband).

100. All the core business use indicators are presented as proportions data. They include proportions of the whole population of businesses or sub-populations, such as particular industries. For indicators B7, B8, B9 and B12, countries may present data as a proportion of all businesses or as a proportion of those that use the Internet. Having two methods of calculation for these indicators can be potentially confusing to users, so it is important to be clear which denominator has been used to construct a particular indicator.

101. In respect of international reporting purposes, the principles outlined in this section are the same as those for the household indicators, that is, countries should provide numbers rather than proportions or percentages. This makes it clear what the data mean and facilitates comparison of data across countries. It also enables aggregation of sub-categories (for example, industries).

102. Population estimates for the total population, and for each sub-population (as indicated by the classificatory variables), also need to be provided so that proportions can be derived. Both sets of numbers should represent the whole population and not a sample.

Endnotes

[1] However, some model questions are similar to the household access questions, for instance, *Did your business have an intranet as at <date>?*

[2] From NSOs in member countries or other available sources (such as Eurostat).

[3] In theory, indicator B9 (Proportion of businesses using the Internet by type of access) could also be calculated on two bases.

[4] Note that each response category of the multiple response indicators, B9 and B12, forms an indicator. Sub-indicators are those that use the classificatory variables to examine a part of the in-scope population.

[5] Readers wishing to see how the model questions fit into a questionnaire should consult the model questionnaire in Annex 2 of UNCTAD (2009). The model questionnaire also shows question sequencing.

[6] A 12-month reference period is recommended. See *Time-related factors* later in this chapter.

[7] The number will almost always be an estimate based on a sample survey. For simplicity, that is not specified in this publication.

[8] For information about reference dates, see *Time-related factors* later in this chapter.

[9] Note that many developed economies exclude manual e-mail orders from their concept of e-commerce. For example, Eurostat's model business ICT use questionnaire specifically excludes orders received or placed by "manually typed e-mails" (Eurostat, 2009a). The inclusion of e-mail orders in B7 and B8 is likely to be reviewed in future revisions of the core ICT indicators.

[10] The new definition is "An e-commerce transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations." (OECD, 2010).

[11] OECD's Glossary of Statistical Terms defines statistical standards as providing "… a comprehensive set of guidelines for surveys and administrative sources collecting information on a particular topic. Components of a standard include: definition(s), statistical units, classification(s), coding process(es), questionnaire module(s), output categories." The Glossary defines statistical methodology as "Theory and methods of data collection, processing and analysis." (OECD, 2009b).

[12] And statistics on the ICT sector and ICT trade.

[13] Many economies collect data for more industries than this (for instance, including ISIC J/K, Finance/Financial and insurance activities) and at a greater level of detail. The recommended categories should therefore be achievable by most countries that collect business ICT use data.

[14] Businesses with 0-9 employees are usually classified as micro-enterprises; 10-49 employees as small enterprises; 50-249 employees as medium-sized enterprises; and 250 or more employees as large enterprises.

[15] The UNSD splits the 10-49 range into 10-19 and 20-49. It considers this a minimum division of the size range; more detailed classifications, where required, could be used and the results aggregated to conform to the core indicator categories.

[16] General government organizations are defined in terms of the System of National Accounts 1993 (2008 revision). According to the SNA "… the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units. Importantly, they do not include public corporations (legal entities, predominantly owned and controlled by the government that are created for the purpose of producing goods and services for the market and may be a source of profit or other financial gain to their owner/s).

[17] Note that this is a rather narrow scope, which should be achievable by most countries that collect business ICT use data. Many countries include other economic activities.

[18] Veterinary activities are also excluded from the scope under ISIC Rev. 3.1.

[19] This is not a perfect correspondence with the minimal in-scope industries per ISIC Rev. 3.1. See ISIC Rev. 4: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27. Feedback on country plans for the scope of future business ICT use surveys based on ISIC Rev. 4 (or national equivalents) would be useful.

[20] Employers are those working on their own account or with one or more partners, who hold the type of job defined as a 'self-employment job' and, in this capacity engage one or more employee(s).

[21] These are workers who, working on their own account or with one or more partners, hold the type of job defined as a 'self-employment job'.

[22] According to UNSD (2008c), the informal sector as defined by the International Conference of Labour Statisticians "consists of a sub-set of household unincorporated enterprises with *at least some production for sale or barter* and they operate within the production boundary of the SNA. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations, where they exist, are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees. The informal sector thus defined excludes household enterprises producing exclusively for own final use."

[23] SNA93 (2008 revision) defines establishments as follows: "homogeneous units, which the System defines as establishments. An establishment is an enterprise, or part of an enterprise, that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added."

[24] Most developed economies that conduct business use surveys do so annually.

[25] UNCTAD (2009) recommends that respondents should not be asked about the 'last 12 months' if the data collection phase is likely to span several months.

[26] The Eurostat model questionnaire uses two reference periods: the situation during January and the previous calendar year. The January reference period is used in lieu of an exact reference date. The UNCTAD and OECD model questionnaires both refer to a reference period and a reference date.

Chapter 5

Core indicators on the ICT (producing) sector

103. Two core indicators, ICT1 and ICT2, describe activity in the ICT (producing) sector, which is the set of industries whose principal production is ICT goods or services.

104. The sector is defined by the OECD, which updates the definition to conform to the international industry standard, the *International Standard Industrial Classification of All Economic Activities* (ISIC). The current version is based on ISIC Revision 4 (2007), although many countries are still using the version based on ISIC Revision 3.1(2002) or Revision 3 (1998).

105. Particular characteristics of the ICT sector indicators are the definition of the ICT sector, the definition of the total business sector (the denominator for the indicators) and definitions of the variables used in the indicators.

106. Statistics on the ICT sector are usually compiled from the output of sectoral surveys that collect employment, income and expense data for national accounts and other purposes. While some countries specifically survey the ICT sector, most use available industry statistics. OECD and Eurostat compile ICT sector data based on the collections of their member countries. The United Nations Industrial Development Organization (UNIDO) compiles manufacturing industry statistics (including those relevant to the ICT manufacturing industries) for a number of countries. UNCTAD collects ICT sector core indicator data annually.[1]

107. Because the ICT sector indicators (ICT1 and ICT2) are not usually collected via industry surveys designed for the purpose, they almost always involve an approximation of the ICT sector.[2] In many cases, this is a poor approximation. Data comparability problems also affect the definition of the business sector (the denominator in the calculation of the ratios) and concepts such as value added and the definition of the workforce.[3] Differences in the scope of the business sector include whether the financial sector is included or excluded. Other differences no doubt exist but are not generally well described by countries (*Partnership*, 2008a).[4]

108. It should be noted that the 2007 definition of the ICT sector is simpler than the 1988 and 2002 definitions because it is narrower in scope. It is also likely to be better aligned with national equivalent industry classifications, thus reducing one source of non-comparability.[5] More generally, the implementation of ISIC Rev. 4 presents an opportunity for countries to re-design their industrial statistics programs and, in the process, change measurement practices for the ICT sector.

109. The core indicators on the ICT sector are presented as the proportion of workforce/value added attributable to the ICT sector in relation to the total business sector, both expressed as a percentage.

110. Sub-indicators may be able to be produced for activities within the ICT sector. For instance, it is useful to distinguish ICT manufacturing and ICT services.

Core indicators

111. Each of the indicators is presented below, with the following information:

- The name of the indicator and a brief description;
- Definition of terms used e.g. ICT sector, value added;
- How the indicator is calculated; and
- Explanatory notes, which include other definitions and discussion of statistical issues.

ICT1 Proportion of total business sector workforce involved in the ICT sector

ICT1 refers to the ICT sector workforce as a proportion of the total business sector workforce.

The total business sector is defined on an activity (industry) basis per ISIC Rev. 3, 3.1 or 4 (depending on what version countries are using). Definitions are provided under *Statistical standards and methodologies* below.

The *workforce/ICT sector workforce* represents all persons engaged in domestic production in the business/ICT sector.

For countries using ISIC Rev. 3/Rev 3.1 (or national equivalents), the *ICT sector* is defined per the OECD's 2002 definition (Box 1). For countries using ISIC Rev. 4 (or national equivalents), the *ICT sector* is defined per the OECD's 2007 definition (Box 2). Both definitions are discussed in detail in OECD (2009a).

The *proportion of total business sector workforce involved in the ICT sector* is calculated by dividing the workforce associated with the ICT sector by the total business sector workforce. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

There are a number of statistical issues associated with this indicator. They include lack of comparability of definitions (ICT sector, business sector and workforce) and the dated nature of much of the data. These issues are described in *Partnership* (2008a; 2009). UNCTAD asks countries to report the number of persons employed.

ICT2 ICT sector share of gross value added

ICT2 refers to the gross value added of the ICT sector as a proportion of total business sector value added.

The total business sector is defined on an activity (industry) basis per ISIC Rev. 3, 3.1 or 4 (depending on what version countries are using). Definitions are provided under *Statistical standards and methodologies* below.

Gross value added for a particular industry represents its contribution to national GDP. It is sometimes referred to as GDP by industry and is not directly measured (but is estimated in a national accounts framework). In general, it is calculated as the difference between production (gross output) and intermediate inputs (the energy, materials and services required to produce final output).

Definition of the *ICT sector* is per ICT1.

The *ICT sector share of gross value added* is calculated by dividing gross value added attributable to the ICT sector by total business sector value added. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

As with ICT1, there are a number of statistical issues associated with this indicator. They include lack of comparability of definitions (ICT sector, business sector and value added) and the dated nature of much of the data. These issues are described in *Partnership* (2008a; 2009). UNCTAD collects value added in national currency.

Statistical standards and methodologies

112. Because the indicators are usually derived as a by-product of existing industry surveys, there are few recommended survey-specific standards. Useful advice for measuring the ICT sector can be found in UNCTAD (2009).

Definition of the ICT sector

113. The main statistical issue applying to these indicators is conformity with the sectoral definitions. If possible, surveys should be designed to allow derivation of estimates for the ICT sector as defined using ISIC Rev. 3, Rev. 3.1 or Rev. 4 (or national equivalents). The ICT sector definitions used for the ICT sector indicators are those developed by the OECD's Working Party on Indicators for the Information Society (WPIIS). The first WPIIS definition was agreed in 1998 and was based on ISIC Rev. 3. With the revision of ISIC to Rev. 3.1 (UNSD, 2002), a refinement to ICT wholesaling was introduced in 2002 (see Box 1). UNSD recognizes the OECD ICT sector definitions and publishes them as 'alternative aggregations' of ISIC (for example, UNSD 2008d).

114. The guiding principles applied to the 1998 and 2002 definitions of the ICT sector by the OECD were (OECD, 2009a):

- For manufacturing industries, the products of a candidate industry must be intended to fulfil the function of information processing and communication including transmission and display, or must use electronic processing to detect, measure and/or record physical phenomena or to control a physical process.
- For services industries, the products of a candidate industry must be intended to enable the function of information processing and communication by electronic means.

115. The 2007 definition, based on ISIC Rev. 4 (UNSD, 2008d) is shown in Box 2.[6] The guiding principles used to define the ICT sector were amended to remove the principle that products of the ICT sector include those that "…use electronic processing to detect, measure and/or record physical phenomena or to control a physical process."

116. Both the 2002 and 2007 definitions exclude retail trade of ICT goods. The main reason for this is that a large part of the value of such trade is undertaken by non-specialized retailers (such as department stores).

117. UNCTAD (2009) recommends that countries adopt the 2007 definition of the ICT sector, whilst recognizing that it may be some time before all countries are using ISIC Rev. 4 (or a national equivalent) as their industry classification. UNCTAD notes that the introduction of ISIC Rev. 4 provides an opportunity to update national equivalent classifications and conduct surveys of the ICT sector that are compatible with the 2007 definition. In particular, care should be taken not to collapse any of the detailed categories comprising parts of the ICT sector.

118. More information on the definitions of the ICT sector may be found in the OECD's *Guide to Measuring the Information Society* (2009a).

119. UNCTAD (2009) provides general advice on how countries may construct an ICT sector that is compatible with the definitions shown above.

Box 1. The 2002 OECD ICT sector definition (based on ISIC Rev. 3.1)

ICT manufacturing industries

3000	Manufacture of office, accounting and computing machinery
3130	Manufacture of insulated wire and cable*
3210	Manufacture of electronic valves and tubes and other electronic components
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment*
3313	Manufacture of industrial process control equipment*

ICT services industries

5151	Wholesale of computers, computer peripheral equipment and software
5152	Wholesale of electronic and telecommunications parts and equipment
6420	Telecommunications
7123	Renting of office machinery and equipment (including computers)
72	Computer and related activities

* Note that the activities of these classes are excluded from the OECD's 2007 definition of the ICT sector.
Source: *Guide to Measuring the Information Society* (OECD, 2009a).

Box 2. The 2007 OECD ICT sector definition (based on ISIC Rev. 4)

ICT manufacturing industries

2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media

ICT services industries

4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
5820	Software publishing
61	Telecommunications
62	Computer programming, consultancy and related activities
631	Data processing, hosting and related activities; Web portals
951	Repair of computers and communication equipment

Source: *Guide to Measuring the Information Society* (OECD, 2009a).

Definition of the total business sector

120. The total business sector is defined on an activity (industry) basis per ISIC Rev. 3, Rev. 3.1 or Rev. 4. Measures of the ICT sector are usually estimated in the context of National Accounts, therefore using a National Accounts based denominator is preferred. However, as few countries produce National Accounts data with a private/public sector institutional split, an activity-based definition is recommended as a proxy.

ISIC Rev. 3 and Rev. 3.1

121. Under ISIC Rev. 3 and 3.1, the total business sector is non-agricultural businesses, defined as divisions 10-67 and 71-74. The sector was originally conceived by OECD to provide an alternative aggregate of National Accounts output, investment and employment, with productivity measurement in mind. Several issues, including measurement concerns, definitions and data availability were considered in defining the sector. The following industries are excluded:

- Agriculture, hunting and forestry, ISIC divisions 01-05, mainly because of measurement inconsistencies across countries;
- Real estate activities, ISIC Division 70, because a significant proportion of its value added consists of 'imputed rent of owner-occupied dwellings', which has no associated labour input; and
- Community, social and personal services, ISIC divisions 75-93, which mainly consist of non-market activities.

122. In addition, activities of households and extraterritorial organizations, ISIC divisions 95-99, are excluded.

123. The Rev. 3/3.1 aggregate is based on the SNA aggregation, 'A31', mainly due to data availability, the exception being the exclusion of Real estate activities.

ISIC Rev. 4

124. For countries using ISIC Rev. 4, the recommended definition of the total business sector is different in some respects, although the main principles are the same. The definition includes divisions 05 to 36,[7] 41-66, 69-82 and 95-96.[8] The main differences from the ISIC Rev. 3/3.1 definition are:

- Divisions 59 and 60 include activities that are out of scope in the Rev. 3/3.1 definition (they were included in Division 92, Recreational, cultural and sporting activities);
- Division 75, Veterinary activities, is out of scope of the ISIC Rev. 3/3.1 definition (it is included in Section N, Health and social work); and
- Division 96 includes some service activities that are excluded from the ISIC Rev. 3/3.1 definition.

Definition of variables used in ICT1 and ICT2

125. *Workforce* is used in ICT1 and represents all persons engaged in domestic production in the business sector. In a national accounts framework, employment can be measured in terms of headcounts, jobs, full-time equivalents (FTE) or hours worked. ICT workforce (or ICT employment) consists of those persons employed in businesses that are classified as belonging to the ICT sector.

126. The concept *gross value added* is used in the indicator ICT2, and is defined by the SNA 1993, and the 2008 revision of the SNA, as "the value of output less the value of intermediate consumption". Note

that the concept defined here and used in ICT2 is 'gross value added'; 'net value added' is gross value added less the consumption of fixed capital. Value added can be calculated in various ways; most countries appear to use value added at factor costs.[9] For more information, see UNSD 2008a.

Classifying indicator data

127. Sub-indicators may be able to be produced for activities within the ICT sector. Commonly ICT manufacturing and ICT services are distinguished. For international comparability, it is unlikely that a more detailed breakdown than this would be possible.

Scope and statistical units

128. Statistical units and survey scope will generally be determined by requirements other than those for ICT sector data. There appears to be a diversity of units and size scope used in surveys that measure the ICT sector. For example, the metadata for the UNIDO database indicates that the scope and units for manufacturing industry statistics (including ICT manufacturing) are variable, including both enterprises and establishments, many with a size cut-off of 5 or 10 employees. Most countries that undertake Eurostat structural business statistics surveys use the enterprise as the statistical unit.[10]

129. In terms of institutional sector classifications, ideally, ICT sector surveys would include private and public corporations. Countries should also consider including unincorporated units that are enterprise/establishment producing units in ICT sector surveys. This would enable measurement of the ICT production activities of the informal sector (in principle) and other (generally) small businesses.

Processing and reporting indicator data

130. Data processing for the ICT sector core indicators is not covered here but is generally described in UNCTAD's manual (2009).

131. Components (numerator and denominator) of the ICT sector indicators are reported to UNCTAD as numbers and are converted to percentages for publication. UNCTAD requests data for value added as the value in national currency, and for workforce, the number of persons employed. UNCTAD requests ICT sector data at the 4-digit level of ISIC.[11]

132. Given the comparability issues for these indicators, it is particularly important that countries provide detailed metadata on the sectoral and variable definitions used.

133. An issue that will need to be considered by statistical offices and by international agencies that collect ICT sector data is how to treat the break in time series introduced by the change in the definition of the ICT sector (and, to a lesser extent, changes in the definition of the total business sector). The sectoral break arises from differences between ISIC Rev. 3.1 and ISIC Rev. 4 and the narrower scope of the 2007 definition of the ICT sector. At time of writing, an OECD expert group established by the WPIIS is examining the issue and is likely to report in 2010.

Endnotes

[1] From NSOs in member countries or other available sources (such as Eurostat).

[2] Unfortunately, the definition of the ICT sector requires data collection at the detailed (4-digit) industry level and this level of detail is not required for national accounts purposes.

[3] As the core indicators are ratios, it is hoped that differences in these concepts would not have a significant effect on data comparability.

[4] It is recommended that national agencies that collect ICT sector data provide metadata on sectoral and variable definitions used when reporting to international organizations.

[5] ISIC Rev. 4 also deals with ICT industries better than Rev. 3.1 and has fewer 4 digit categories. In the 2007 definition of the ICT sector, there are 2 divisions (2 digit), 8 groups (3 digit) and 2 classes (4 digit); the 2002 definition comprises 3 divisions, 2 groups and 5 classes.

[6] In conjunction with its review of the ICT sector, the OECD defined a *Content and media sector*. It includes: content and related services in the following areas: print material; motion picture, video, TV and radio; music and other audio; games software; and online content. More information can be found in OECD (2009a).

[7] Countries using the intermediate-level SNA/ISIC aggregation, A*38, may not be able to include Division 36 as it is grouped with divisions 37, 38 and 39. In this case, it is recommended that Division 36 be excluded. See UNSD (2008d) for information about A*38.

[8] Countries using the intermediate SNA/ISIC aggregation, A*38, may also need to include Division 94 in their total business sector as it is grouped with divisions 95 and 96.

[9] Based on metadata collected as part of the compilation of *Partnership* (2008a).

[10] Enterprise units have the advantage that certain measures may only be available at enterprise level. Establishments have the advantage of enabling a finer breakdown and are less likely to have multiple activities.

[11] UNCTAD 2010 Questionnaire on ICT usage by enterprises and on the ICT sector.

Chapter 6

Core indicators on international trade in ICT goods

134. The two core ICT indicators for international trade in ICT goods are ICT3 and ICT4. They are based on administrative trade data collected by individual countries for customs purposes. The data are ultimately brought together by the United Nations Statistics Division (UNSD) in the United Nations Commodity Trade Statistics Database (*UN COMTRADE*) (UNSD, 2010).[1] The ICT goods trade indicators are usually compiled by interested international and national agencies using *COMTRADE* data.

135. Particular ICT characteristics of these indicators include the definition of ICT goods, and sources and concepts relating to international trade statistics. *ICT goods* are defined per the OECD ICT goods classification, of which there are two versions. The first dates from 2003 and is based on the 1996 and 2002 *Harmonized System* classification. It may be found at Annex 1a of OECD (2005). A later version is based on the *Central Product Classification Ver. 2* (UNSD, 2008e) and was released by the OECD in 2009 (see Table 8 below). Like the revised ICT sector definition, the most recent goods classification is narrower in scope than the previous (2003) list. This presents challenges for compiling and interpreting time series data.

136. Other statistical concepts associated with the core indicators are those applying to the *COMTRADE* database, including:

- Data are presented in current value US dollars (converted by the UNSD from country currencies).
- UNSD recommends that the statistical value of imports be reported on a CIF (Cost, Insurance, Freight) basis, that is, it includes the transaction value of the goods, the value of services performed to deliver goods to the border of the exporting country and the value of the services performed to deliver the goods from the border of the exporting country to the border of the importing country. UNSD recommends that the statistical value of exports be on a FOB (Free on board) basis, that is, it includes the transaction value of the goods and the value of services performed to deliver goods to the border of the exporting country.

137. The core indicators on international trade in ICT goods are presented as the proportion of total trade by value, both expressed as a percentage.

138. Sub-indicators can be produced for broad categories of ICT goods.

Core indicators

139. Each of the indicators is presented below, with the following information:

- The name of the indicator and a brief description;
- Definition of terms used e.g. ICT goods;
- How the indicator is calculated; and
- Explanatory notes, which include other definitions and discussion of statistical issues.

ICT3 ICT goods imports as a percentage of total imports

ICT3 refers to the share of ICT goods imports as a percentage of total imports, both expressed in monetary value.

ICT goods are defined per the OECD ICT goods classification. There are two versions; one is from 2003, based on the 1996 and 2002 *Harmonized System* classification (see OECD, 2005). A later version is based on the *Central Product Classification Ver. 2* (UNSD, 2008e) and was released by the OECD in 2009 (OECD, 2009a). See tables 8 and 9 below.

ICT goods imports as a percentage of total imports is calculated for each country by dividing the value of its ICT goods imports by the total value of its goods imports. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

Detailed trade data are widely available from country trade statistics. These are collected by the UNSD and published in their *UN COMTRADE* database. The ICT goods trade indicators are usually compiled by interested international and national agencies using *COMTRADE* data. Concepts are therefore consistent with those applying to the *COMTRADE* database.

The main statistical issue associated with this indicator appears to be the different treatment of re-exports and re-imports by countries, depending on whether the *Special* or *General* Trade System is used.[2] Re-imports are separately reported for some countries and the value of ICT re-imports (which is included in the value of ICT imports for those countries) is generally small.

ICT4 ICT goods exports as a percentage of total exports

ICT4 refers to the share of ICT goods exports as a percentage of total exports, both expressed in monetary value.

ICT goods are defined per the OECD ICT goods classification. There are two versions; one is from 2003, based on the 1996 and 2002 *Harmonized System* classification (see OECD, 2005). A later version is based on the *Central Product Classification Ver. 2* (UNSD, 2008e) and was released by the OECD in 2009 (OECD, 2009a). See tables 8 and 9 below.

ICT goods exports as a percentage of total exports is calculated for each country by dividing the value of its ICT goods exports by the total value of its goods exports. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

Detailed trade data are widely available from country trade statistics. These are collected by the UNSD and published in their *UN COMTRADE* database. The ICT goods trade indicators are usually compiled by interested international and national agencies using *COMTRADE* data. Concepts are therefore consistent with those applying to the *COMTRADE* database.

The main statistical issue associated with this indicator appears to be the different treatment of re-exports and re-imports by countries, depending on whether the *Special* or *General* Trade System is used.[2] Re-exports are separately reported for some countries and, in a small number of cases, the value of ICT re-exports (which is included in the value of ICT exports for those countries) is significant.

Statistical standards and methodologies

Definition of ICT goods

140. *ICT goods* are defined per the OECD's ICT goods classifications, of which there are two versions. The classification was first developed in 2003, based on the 1996 and 2002 *Harmonized System* classification (see Annex 1a of OECD, 2005). A later version is based on the UN's *Central Product Classification Ver. 2* (UNSD, 2008e) and was released by the OECD in 2009 as part of an ICT product[3] classification (see Annex 1a of OECD, 2009a). It can be found in Table 8 below, while Table 9 shows a provisional HS equivalent of the goods component of the 2009 classification. It should be noted that the 2009 classification is narrower than the 2003 version. This follows directly from the narrowing of the ICT sector definition when it was redeveloped using ISIC Rev. 4.

Table 8. ICT goods (CPC Version 2)

CPC Ver. 2 code	CPC Version 2 title
Computers and peripheral equipment	
45142	Point-of-sale terminals, ATMs and similar machines
45221	Portable automatic data processing machines weighing not more than 10 kg, such as laptop and note-book computers
45222	Personal digital assistants and similar computers
45230	Automatic data processing machines, comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined
45240	Automatic data processing machines presented in the form of systems
45250	Other automatic data processing machines whether or not containing in the same housing one or two of the following types of units: storage units, input units, output units
45261	Input peripherals (keyboard, joystick, mouse etc.)
45262	Scanners (except combination of printer, scanner, copier and/or fax)
45263	Inkjet printers used with data processing machines
45264	Laser printers used with data processing machines
45265	Other printers used with data processing machines
45266	Units performing two or more of the following functions: printing, scanning, copying, faxing
45269	Other input or output peripheral devices
45271	Fixed media storage units
45272	Removable media storage units
45289	Other units of automatic data processing machines
45290	Parts and accessories of computing machines
47315	Monitors and projectors, principally used in an automatic data processing system
47550	Solid-state non-volatile storage devices
Communication equipment	
46921	Burglar or fire alarms and similar apparatus
47211	Transmission apparatus incorporating reception apparatus
47212	Transmission apparatus not incorporating reception apparatus
47213	Television cameras
47221	Line telephone sets with cordless handsets
47222	Telephones for cellular networks or for other wireless networks
47223	Other telephone sets and apparatus for transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)
47401	Parts for the goods of subclasses 47221 to 47223

Table 8. ICT goods (CPC Version 2) (continued)

Consumer electronic equipment	
38581	Video game consoles
47214	Video camera recorders
47215	Digital cameras
47311	Radio broadcast receivers (except of a kind used in motor vehicles), whether or not combined with sound recording or reproducing apparatus or a clock
47312	Radio broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles
47313	Television receivers, whether or not combined with radio-broadcast receivers or sound or video recording or reproducing apparatus
47314	Monitors and projectors, not incorporating television reception apparatus and not principally used in an automatic data processing system
47321	Sound recording or reproducing apparatus
47323	Video recording or reproducing apparatus
47330	Microphones and stands therefor; loudspeakers; headphones, earphones and combined microphone/speaker sets; audio-frequency electric amplifiers; electric sound amplifier sets
47402	Parts for the goods of subclasses 47321, 47323 and 47330
Miscellaneous ICT components and goods	
45281	Sound, video, network and similar cards for automatic data processing machines
47130	Printed circuits
47140	Thermionic, cold cathode or photo-cathode valves and tubes (including cathode ray tubes)
47150	Diodes, transistors and similar semi-conductor devices; photosensitive semi-conductor devices; light emitting diodes; mounted piezo-electric crystals
47160	Electronic integrated circuits
47173	Parts for the goods of subclasses 47140 to 47160
47403	Parts for the goods of subclasses 47211 to 47213, 47311 to 47315 and 48220
47530	Magnetic media, not recorded, except cards with a magnetic stripe
47540	Optical media, not recorded
47590	Other recording media, including matrices and masters for the production of disks
47910	Cards with a magnetic stripe
47920	"Smart cards"
48315	Liquid crystal devices n.e.c.; lasers, except laser diodes; other optical appliances and instruments n.e.c.
48354	Parts and accessories for the goods of subclass 48315

Source: OECD (2009a), Annex 1a.

Table 9. ICT goods (HS 2007)[4]

HS2007 code	HS title
Computers and peripheral equipment	
8443.31	Other printers, copying machines and facsimile machines, whether or not combined: machines which perform two or more of the functions of printing, copying or facsimile transmission, capable of connecting to an automatic data processing machine or to a network
8443.32	Other printers, copying machines and facsimile machines, whether or not combined: other, capable of connecting to an automatic data processing machine or to a network
8470.50	Cash registers
8471.30	Portable automatic data processing machines, weighing not more than 10 kg, consisting of a least a central processing unit, a keyboard and a display
8471.41	Other automatic data processing machines: comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined
8471.49	Other automatic data processing machines: other, presented in the form of systems
8471.50	Processing units other than those of sub-heading 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units, output units
8471.60	Automatic data processing machines and units, input or output units, whether or not containing storage units in the same housing
8471.70	Automatic data processing machines and units, storage units
8471.80	Other units of automatic data processing machines
8471.90	Magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included
8472.90	Other office machines excluding duplicating machines and mail handling machines
8473.30	Parts and accessories of the machines of heading 84.71
8473.50	Parts and accessories equally suitable for use with machines of two or more of the headings 84.69 to 84.72
8523.51	Discs, tapes, solid-state non-volatile storage devices, "smart cards" and other media for the recording of sound or of other phenomena, whether or not recorded, including matrices and masters for the production of discs, but excluding products of Chapter 37, semiconductor media: solid-state non-volatile storage devices
8528.41	Cathode-ray tube monitors: of a kind solely or principally used in an automatic data processing system of heading 84.71
8528.51	Other monitors: of a kind solely or principally used in an automatic data processing system of heading 84.71
8528.61	Projectors: of a kind solely or principally used in an automatic data processing system of heading 84.71
Communication equipment	
8517.11	Line telephone sets with cordless handsets
8517.12	Telephones for cellular networks or for other wireless networks
8517.18	Telephone sets, including telephones for cellular networks or for other wireless networks: other
8517.61	Base stations for transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)
8517.62	Machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus
8517.69	Other apparatus for transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network): other
8517.70	Parts for telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network), other than transmission or reception apparatus of heading 84.43, 85.25, 85.27 or 85.28.
8525.50	Transmission apparatus for radio-broadcasting or television
8525.60	Transmission apparatus for radio-broadcasting or television incorporating reception apparatus
8531.10	Burglar or fire alarms and similar apparatus

Table 9. ICT goods (HS 2007)[4] (continued)

Consumer electronic equipment	
8518.10	Microphones and stands therefor
8518.21	Single loudspeakers, mounted in their enclosures
8518.22	Multiple loudspeakers, mounted in the same enclosure
8518.29	Loudspeakers, whether or not mounted in their enclosures: other
8518.30	Headphones and earphones, whether or not combined with a microphone, and sets consisting of a microphone and one or more loudspeakers
8518.40	Audio-frequency electric amplifiers
8518.50	Electric sound amplifier sets
8518.90	Parts of the equipment of heading 85.18
8519.20	Sound recording or reproducing apparatus, apparatus operated by coins, banknotes, bank cards, tokens or by other means of payment
8519.30	Turntables (record-decks)
8519.50	Telephone answering machines
8519.81	Sound recording or reproducing apparatus, other apparatus: using magnetic, optical or semiconductor media
8519.89	Sound recording or reproducing apparatus, other apparatus: other
8521.10	Video recording or reproducing apparatus, whether or not incorporating a video tuner, magnetic tape-type
8521.90	Video recording or reproducing apparatus, whether or not incorporating a video tuner, other
8522.10	Parts and accessories suitable for use solely or principally with the apparatus of headings 85.19 to 85.21, pick-up cartridges
8522.90	Parts and accessories suitable for use solely or principally with the apparatus of headings 85.19 to 85.21, other
8525.80	Television cameras, digital cameras and video camera recorders
8527.12	Pocket-size radio cassette-players
8527.13	Radio-broadcast receivers capable of operating without an external source of power, combined with sound recording or reproducing apparatus
8527.19	Radio-broadcast receivers capable of operating without an external source of power: other
8527.21	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles: combined with sound recording or reproducing apparatus
8527.29	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles: other
8527.91	Other reception apparatus for radio-broadcasting, combined with sound recording or reproducing apparatus
8527.92	Other reception apparatus for radio-broadcasting, not combined with sound recording or reproducing apparatus but combined with a clock
8527.99	Other reception apparatus for radio-broadcasting, excluding 8527.91 and 8527.92
8528.49	Other cathode-ray tube monitors, not of a kind solely or principally used in an automatic data processing system of heading 84.71
8528.59	Other monitors, not of a kind solely or principally used in an automatic data processing system of heading 84.71
8528.69	Projectors, not of a kind solely or principally used in an automatic data processing system of heading 84.71
8528.71	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus: not designed to incorporate a video display or screen
8528.72	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus: other, colour
8528.73	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus: other, black and white or other monochrome

Table 9. ICT goods (HS 2007)[4] (continued)

Miscellaneous ICT components and goods	
8523.21	Magnetic media for the recording of sound or of other phenomena, but excluding products of Chapter 37: cards incorporating a magnetic stripe
8523.52	Semi-conductor media for the recording of sound or of other phenomena, but excluding products of Chapter 37: "smart cards"
8523.59	Semi-conductor media for the recording of sound or of other phenomena, but excluding products of Chapter 37: other
8523.80	Discs, tapes, solid-state non-volatile storage devices, "smart cards" and other media for the recording of sound or of other phenomena, whether or not recorded, including matrices and masters for the production of discs, but excluding products of Chapter 37, other
8529.10	Parts suitable for use solely or principally with the apparatus of headings 85.25 to 85.28, aerials and aerial reflectors of all kinds; parts suitable for use therewith
8529.90	Parts suitable for use solely or principally with the apparatus of headings 85.25 to 85.28, other
8534.00	Printed circuits
8540.11	Cathode-ray television picture tubes, including video monitor cathode-ray tubes: colour
8540.12	Cathode-ray television picture tubes, including video monitor cathode-ray tubes: black and white or other monochrome
8540.20	Television camera tubes; image converters and intensifiers; other photo-cathode tubes
8540.40	Data/graphic display tubes, colour, with a phosphor dot screen pitch smaller than 0.4 mm
8540.50	Data/graphic display tubes, black and white or other monochrome
8540.60	Other cathode-ray tubes
8540.71	Magnetrons
8540.72	Klystrons
8540.79	Microwave tubes (for example, magnetrons, klystrons, travelling wave tubes, carcinotrons), excluding grid-controlled tubes: other
8540.81	Other valves and tubes: receiver or amplifier valves and tubes
8540.89	Other valves and tubes: other
8540.91	Parts of the valves and tubes of 85.40: of cathode-ray tubes
8540.99	Parts of the valves and tubes of 85.40: other than cathode-ray tubes
8541.10	Diodes, other than photosensitive or light emitting diodes
8541.21	Transistors, other than photosensitive transistors: with a dissipation rate of less than 1 W
8541.29	Transistors, other than photosensitive transistors: other
8541.30	Thyristors, diacs and triacs, other than photosensitive devices
8541.40	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes
8541.50	Other semiconductor devices
8541.60	Mounted piezo-electric crystals
8541.90	Parts of the devices of 85.41
8542.31	Electronic integrated circuits: processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits
8542.32	Electronic integrated circuits: memories
8542.33	Electronic integrated circuits: amplifiers
8542.39	Electronic integrated circuits: other
8542.90	Electronic integrated circuits, parts
9013.20	Lasers, other than laser diodes

Source: WCO (2007), Sheridan Roberts (*infosocietystats.com*), OECD (personal communication).

141. For time series purposes, agencies compiling ICT goods trade data may need to use an adapted version of the 2003 definition to provide compatible time series data. At time of writing, an OECD expert group established by the WPIIS is examining this issue.

Classifying indicator data

142. Both the OECD ICT goods classifications specify broad groups of goods within the total classification. For the 2003 definition, the broad level HS classification is:

- Telecommunications equipment;
- Computer and related equipment;
- Electronic components;
- Audio and video equipment; and
- Other ICT goods.

143. For the 2009 version, the broad level HS classification is shown in Table 9 and is:

- Computers and peripheral equipment;
- Communication equipment;
- Consumer electronic equipment; and
- Miscellaneous ICT components and goods.

144. The main classification issue for compiling agencies is correctly defining the goods definitions and specifying the correct *COMTRADE* series.

Endnotes

[1] Available at http://comtrade.un.org/.

[2] According to UNSD, the *general trade system* applies when the statistical territory of a country coincides with its economic territory, therefore, imports include all goods entering the economic territory and exports include all goods leaving the economic territory. The *special trade system* applies when a country's statistical territory comprises only a particular part of the economic territory. The *strict definition* is in use when the statistical territory comprises only the free circulation area, that is, imports include all goods entering the free circulation area of a compiling country (i.e. cleared through customs for home use) and exports include all goods leaving the free circulation area. The *relaxed definition* applies when goods that enter a country for, or leave it after, inward processing and goods that enter or leave an industrial free zone are also recorded and included in trade statistics country (UNSD, 2010).

[3] The 2009 classification includes both ICT goods and ICT services.

[4] This classification should be considered provisional, pending a final version expected to be released by the OECD in 2010.

Chapter 7

Core indicators on ICT in education

145. This chapter describes a set of indicators on ICT in education. These indicators are new to the list of core ICT indicators, although they have been in development by the UNESCO[1] Institute for Statistics (UIS) for several years. There are eight *ICT in education* indicators plus a reference indicator on the proportion of schools with electricity.

146. 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).

147. Most of the indicators are collected as administrative data through an annual country-level school census. The censuses may be conducted by the statistical units of ministries of education or, alternatively, national statistical offices. One of the indicators (ED6) may also be collected by a sample survey of schools or households.

148. The indicators are all presented as proportions as follows:

- The proportions of schools with ICT (ED1–ED3 and ED5),
- The proportion of students (learners) with access to ICT (ED4, ED6) and enrolled in ICT fields of study (ED7), and
- The proportion of teachers who are ICT-qualified (ED8).

149. Most of the indicators are split by the level of education (primary, lower secondary and upper secondary education). Other splits are possible.

150. Evidence suggests that ICT can have a positive impact on the expansion of learning opportunities. ICTs are catalysts for improving the teaching/learning process by reforming conventional delivery systems, enhancing quality of learning achievements, facilitating state-of-art skills formation, sustaining lifelong learning, and improving institutional management. It is important to understand that ICTs are supporting tools to conventional teaching and not substitutes for it.

151. ICTs include older technologies that are still affordable and widely available in the majority of countries (for example, radio and television) as well as newer technologies (such as computers and the Internet) that may be expensive to introduce, especially in rural areas of developing economies.

152. Information on the ICT in education indicators has been updated compared with the version shown in *Partnership* (2009). Material from UIS (2009), including the *Prototype Questionnaire on Statistics of ICT in Education* at Appendix 1, has been used extensively for this exercise.

153. Some information on the availability of the indicators can be found in UIS (2008). More background information can be found in UIS (2009).

Core indicators

154. Each of the core indicators is presented below, with the following information:

- The name of the indicator and a brief description;
- Definition of the ICTs covered by the indicator e.g. radio, computer;
- How the indicator is calculated; and
- Explanatory notes, which include further information on the indicator (such as its scope), possible sub-indicators (e.g. splits by type of school, or gender) and any significant statistical issues associated with the indicator.

ED1 Proportion of schools with a radio used for educational purposes

ED1 measures the proportion of schools, for ISCED[2] levels 1 to 3, offering radio-assisted instruction. It does not measure the intensity of use of radios for educational purposes.

A *radio* is defined as a stand-alone device capable of receiving broadcast radio signals, using popular frequencies, such as FM, AM, LW and SW. Unless they are intentionally used for educational purposes, radio sets integrated into other devices (such as a Walkman, car radio, clock radio, audio cassette or CD players/recorders) are excluded.

The *proportion of schools with a radio used for educational purposes* is calculated by dividing the number of schools providing radio-assisted instruction by the total number of schools. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

For the purposes of this indicator, radios used for educational purposes are in working condition.

Radio-assisted instruction includes both radio broadcast education and interactive radio instruction (IRI).

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

There are no known significant statistical issues with this indicator.

ED2 Proportion of schools with a television used for educational purposes

ED2 measures the proportion of schools, for ISCED levels 1 to 3, offering television-assisted instruction. It does not measure the intensity of use of televisions for educational purposes.

A *television* (TV) is defined as a stand-alone device capable of receiving broadcast television signals using popular access means such as over-the-air, cable and satellite. Television broadcast receivers integrated into other devices (such as a computer, PDA, Smartphone or mobile phone) are considered only if their intended use is for educational purposes.

The *proportion of schools with a television used for educational purposes* is calculated by dividing the number of schools providing television-assisted instruction by the total number of schools. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

For the purposes of this indicator, televisions used for educational purposes are in working condition.

Television-assisted instruction is similar to radio broadcast education, with the additional benefit of video. It helps to bring abstract concepts to life through clips, animations, simulations, visual effects and dramatization.

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

There are no known significant statistical issues with this indicator.

ED3 Proportion of schools with a telephone communication facility

ED3 measures the proportion of schools, for ISCED levels 1 to 3, with a telephone communication facility.

A *telephone communication facility* refers to fixed telephone lines, cable connections (i.e. cable telephony) or other sustainable communication technology that connects an educational institution's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and has a dedicated port on a telephone exchange. Access is defined by a subscription to services that allow the physical presence and use of the facilities in a given educational institution.

The *proportion of schools with a with a telephone communication facility* is calculated by dividing the number of schools with a telephone communication facility by the total number of schools. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

For the purposes of this indicator, telephone communication equipment and related services are in working condition.

The indicator refers to telephone facilities that are directly owned by the school. A mobile phone that is owned by an individual working or learning at the school does not constitute a school telephone communication facility.

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

There are no known significant statistical issues with this indicator.

ED4 Learners-to-computer ratio in schools with computer-assisted instruction[3]

ED4 measures the average number of learners entitled to use school computers (as a pedagogical aid) per computer available for pedagogical use in schools that offer computer-assisted instruction (CAI), for ISCED levels 1 to 3. It indicates the potential for the use of computers in CAI schools to promote or expand computer-assisted instruction. It is not a measure of actual use of computers in schools.

A *computer* refers to a programmable electronic device that can store, retrieve and process data, as well as share information in a highly structured manner. It performs high-speed mathematical or logical operations according to a set of instructions. A *computer* includes personal computers (PCs), laptops, notebooks, terminals connected to mainframes and mini-computers intended for shared use.

The *learners-to-computer ratio in schools with CAI* is calculated by dividing the number of learners entitled to use school computers (as a pedagogical aid) by the total number of computers available for pedagogical use in schools providing CAI.

Explanatory notes

For the purposes of this indicator, computers are in working condition.

The restriction to schools that offer computer-assisted instruction should be noted. The indicator is not intended to show the overall learners-to-computer ratio in a country. UIS has also specified a broader indicator ED4bis, *Learners-to-computer ratio*, that is not restricted to learners entitled to use school computers nor to schools with computer-assisted instruction (UIS, 2009).

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

Further methodological work is required to test more robust measures than a simple average (such as median or percentiles) in order to improve cross-country comparisons. There are no other known significant statistical issues with this indicator.

ED5 Proportion of schools with Internet access by type of access

ED5 measures the proportion of schools with access to the Internet, as a proportion of all schools, for ISCED levels 1 to 3. The indicator is split into four parts, as follows:

Proportion of schools with any Internet access
Proportion of schools with access by fixed narrowband only
Proportion of schools with access by fixed broadband only
Proportion of schools with both fixed narrowband and broadband access

The *Internet* refers to worldwide interconnected networks that enable users to share information in an interactive format — referred to as hypertext — through multiple wired or wireless receivers (personal computers, laptops, PDAs, Smartphones, etc.).

Fixed narrowband Internet access refers to connectivity for public use via analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and other forms of fixed access with a download speed of less than 256 kbit/s.

Fixed broadband Internet access refers to high-speed connectivity for public use of at least 256 kbit/s in one or both directions (downloading and uploading). It includes cable modem Internet connections, DSL Internet connections of at least 256 kbit/s, fibre and other fixed broadband technology connections (such as satellite broadband Internet, Ethernet LANs, fixed wireless access, Wireless Local Area Network and WiMAX).

The *proportion of schools with Internet access, by type* is calculated for each type of access (including any access) by dividing the number of schools with Internet access by the total number of schools. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

For the purposes of this indicator, Internet connections are functional, that is, any equipment, software or services needed are in working condition.

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

There are no known significant statistical issues with this indicator.

ED6 Proportion of learners who have access to the Internet at school

ED6 measures the proportion of learners entitled to use Internet laboratories at school as a pedagogical aid, for ISCED levels 1 to 3. It measures the accessibility to Internet use for educational purposes by learners. It does not account for the actual use of the Internet by learners.

The *Internet* refers to worldwide interconnected networks that enable users to share information in an interactive format — referred to as hypertext — through multiple wired or wireless receivers (personal computers, laptops, PDAs, Smartphones, etc.).

The *proportion of learners who have access to the Internet at school* is calculated by dividing the number of learners entitled to use Internet laboratories at school as a pedagogical aid by the total number of learners. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

For the purposes of this indicator, Internet connections are functional, that is, any equipment, software or services needed are in working condition.

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

The indicator may be split by gender.

There are no known significant statistical issues with this indicator.

ED7 Proportion of learners enrolled at the post-secondary level in ICT-related fields

ED7 measures the proportion of learners enrolled in ICT-related fields of study in tertiary education institutions, at ISCED levels 4, or 5 and 6. The indicator has gender sub-indicators, male and female.

Enrolment in ICT-related fields may be constrained by existing capacities at educational institutions and therefore may not represent actual demand.

ICT-related fields include programmes covering any of the following four fields of education and training:

Audiovisual techniques and media production is the study of techniques and the acquisition of skills to produce books, newspapers, radio/television programmes, films/videos, recorded music and graphic reproduction with ICT.

Computer science is the study of the design and development of computer systems and computing environments. It includes the study of the design, maintenance and integration of software applications.

Computer use is the study of using computers, and computer software and applications for different purposes. These programmes are generally of short duration.

Electronics and automation (engineering and engineering trades) is the study of planning, designing, developing, maintaining and monitoring electronic equipment, machinery and systems. It includes designing computers and equipment for communication.

The *proportion of learners enrolled at the post-secondary level in ICT-related fields* is calculated by dividing the number of learners enrolled in ICT-related fields by the number of learners enrolled in educational institutions in any field of study. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

The indicator is split by gender.

Both public and private institutions are included.

The indicator is split by ISCED, with two categories: ISCED level 4 (covering programmes that lie between the upper secondary and tertiary levels of education) and ISCED levels 5 and 6 (covering the first and second stages of tertiary education).[4]

Construction of sub-indicators using particular ICT-related fields may be useful to monitor those fields.

Further mapping and classification work will be required to re-code, within ISCED fields of study, the fields that emerged after 1997. There are no other known significant statistical issues with this indicator.

ED8 Proportion of ICT-qualified teachers in schools

ED8 measures the extent to which primary and secondary school teachers have been trained to teach basic computer skills (or computing), for ISCED levels 1 to 3.

ICT-qualified teachers are those who have trained specifically in pre-service or in-service schemes in ICT according to nationally defined qualification standards.

The indicator only presents the skilled teaching force available to deliver ICT courses. This does not necessarily mean that the teachers recorded as qualified actually teach an ICT course, nor does it ensure that ICT course delivery is effective.

The *proportion of ICT-qualified teachers in schools* is calculated by dividing the number of primary and secondary teachers who have been trained to teach basic computer skills (or computing) by the total number of teachers in primary and secondary schools. The result is then multiplied by 100 to be expressed as a percentage.

Explanatory notes

Both public and private schools are included.

ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.

There are no known significant statistical issues with this indicator.

EDR1 Proportion of schools with electricity
EDR1 is a reference indicator. It measures the availability of electricity – considered a minimum pre-requisite condition for most ICTs to be introduced to schools. The indicator is available for ISCED levels 1 to 3.
Electricity refers to permanent sources of power (e.g. grid/mains connection, wind, water, solar and permanently fuel-powered generator) that enable the adequate and sustainable use of ICT infrastructure for educational purposes.
The *proportion of schools with electricity* is calculated by dividing the number of schools with electricity by the total number of schools. The result is then multiplied by 100 to be expressed as a percentage.
Explanatory notes
Both public and private schools are included.
ISCED levels 1 to 3 cover schools offering primary, lower secondary and upper secondary education.
Many countries will find it trivial to include items on electricity in the school questionnaires. In such a case, national experts should provide estimates of the number of schools with electricity and specify that the data are estimates.
There are no known significant statistical issues with this indicator.

Statistical standards and methodologies

155. According to UIS, the indicators will be collected through a country-level annual school census (or data will be extracted from school records). The censuses are usually conducted by a statistical unit of the Ministry of Education or the national statistical office. One of the indicators (ED6) may also be collected by a sample school survey or household survey (self-reported responses by household members attending school at ISCED levels 1 to 3).

156. UIS (2009) includes a country-level questionnaire at Appendix 1 (*Prototype Questionnaire on Statistics of ICT in Education*). The questionnaire is expected to be used from 2010. Appendix II contains definitions of terms used in the questionnaire.

Classifying indicator data

157. The main classificatory variable used for the ICT in education indicators is the 1997 version of ISCED, the *International Standard Classification of Education* (UNESCO, 1997). ISCED recognizes seven levels of education as follows:

- ISCED Level 0 – Pre-primary education;[5]
- ISCED Level 1 – Primary or first stage of basic education;
- ISCED Level 2 – Lower secondary or second stage of basic education;
- ISCED Level 3 – Upper secondary education;
- ISCED Level 4 – Post-secondary non-tertiary education (programmes that lie between the upper secondary and tertiary levels of education);
- ISCED Level 5 – First stage of tertiary education (not leading directly to an advanced research qualification); and
- ISCED Level 6 – Second stage of tertiary education (leading to an advanced research qualification).

158. Other classificatory variables used are the dichotomous variables:

- Gender, and
- Public/private educational institutions. A public educational institution is usually controlled and ma-

naged by a governmental education authority or agency (national/federal, state/provincial or local), irrespective of the origin of its financial resources. A private educational institution is usually controlled and managed by a non-governmental organization (church, trade union or business enterprise), whether or not it receives financial support from public authorities (UIS, 2009).

159. The application of these classificatory variables to individual indicators will be a function of data availability for individual countries. In particular, it may not be possible to distinguish each ISCED level 1 to 3 for some countries.

Scope and statistical units

160. The scope is defined in terms of educational institutions, their students (learners) and their teachers. The scope varies depending on the requirements of each core indicator, as follows:

- For EDI–3, ED5 and EDR1, the scope is public and private educational institutions at ISCED levels 1, 2 and 3.
- For ED4, the school scope is public and private educational institutions at ISCED levels 1, 2 and 3 that offer computer-assisted instruction. The learner scope is limited to learners entitled to use school computers.
- For ED6, the school scope is public and private educational institutions at ISCED levels 1, 2 and 3. The learner scope is all learners enrolled at those institutions.
- For ED7, the scope of educational institutions is public and private institutions at ISCED levels 4, 5 and 6. The learner scope is all learners enrolled at those institutions.
- For ED8, the school scope is public and private educational institutions at ISCED levels 1, 2 and 3. The teacher scope is all teachers who are teaching at those schools.

161. The data covering ICT facilities, teachers and learners are collected nationally at the aggregate level (by the Ministry of education or NSO) from educational institutions across ISCED levels 1 to 6.

Processing and reporting indicator data

162. Information on derivation of the core indicators may be found in UIS (2009). It is expected that UIS will report indicator values, appropriately classified, by country.

Endnotes

[1] United Nations Educational, Scientific and Cultural Organization.

[2] ISCED is the *International Standard Classification of Education*, 1997, for which UNESCO is responsible. Please see the section *Classificatory variables* for a description of ISCED levels.

[3] Learners refer to students enrolled in programmes at educational institutions.

[4] ISCED level 5 covers the first stage of tertiary education (not leading directly to an advanced research qualification) and ISCED level 6 covers the second stage of tertiary education (leading to an advanced research qualification).

[5] This level is presented for completeness. It is not used in the core indicators.

Chapter 8

Conclusions and recommendations

163. This document describes the core list of ICT indicators, as revised in 2009, and the statistical standards associated with them. The indicators and the standards were developed by the Partnership on Measuring ICT for Development and endorsed by the UN Statistical Commission.

164. Close adherence to the ICT indicator definitions and standards will improve international comparability of ICT data and their policy relevance. Countries are urged to carefully consider the core indicators when designing or re-designing surveys that collect ICT data. These could be ICT-specific surveys or other surveys that collect ICT data (for instance, industry surveys that include industries in the ICT sector).

165. The resources of the *Partnership* are available to assist in these statistical endeavours. Relevant reference works have been cited in this paper and are shown in the Bibliography. In addition, *Partnership* members offer technical assistance for developing economies. Details can be found on the websites of ITU and UNCTAD. See also *Partnership* (2008a) for a detailed discussion of the *Partnership*'s capacity-building efforts.

166. The two manuals on collecting business and household ICT statistics, prepared respectively by UNCTAD and ITU, as well as related training courses, are powerful tools that can help countries to produce ICT statistics based on internationally agreed standards (UNCTAD, 2009; ITU, 2009a).

167. A number of other references mentioned in this publication will also be useful for statisticians and policy-makers. References to statistical standards on ICT include the *Guide to Measuring Information and Communication Technologies (ICT) in Education* by the UNESCO Institute for Statistics (UIS, 2009), the *Telecommunication Indicators Handbook* (ITU, 2007) and the *Guide to Measuring the Information Society* (OECD, 2009a). There are also a number of general statistical references, including to various UNSD statistical standards. These may be found in the Bibliography.

168. The core list of ICT indicators will be revised on a regular basis in order to keep pace with changes in information and communication technologies and their use, as well as policy-makers' needs for relevant data. In particular, future core lists are likely to include new indicators, such as those on e-government.

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