UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

Manual
for the Production of Statistics on the Information Economy

This document will be subject to a global consultation with national statistical offices during 2007-2008 and subsequently submitted to the UN Statistical Commission for approval.

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UNITED NATIONS
New York and Geneva, 2007

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The English version of the *Manual* is currently available on the Internet at the address indicated below. Versions in other languages will be posted as they become available.

Measuring-ict.unctad.org

UNCTAD/SDTE/ECB/2007/2

UNITED NATIONS PUBLICATION

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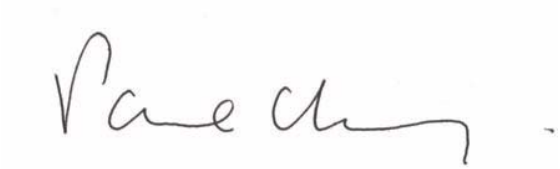
PREFACE

Producing statistics on the information society is becoming an important component of the work programme of national statistical organizations. The demand for ICT statistics has increased tremendously as countries seek to design, monitor and review national policies and strategies to take advantage of the rapid advances in information technology. In addition, business communities require information about access to, and use of, ICTs by various consumer groups, as well as information about the impact of ICTs. This is particularly important for the developing countries, many of which are just starting their statistical work on the information society. At the international level, comparable ICT indicators are critical to cross-country comparisons of ICT development and to monitoring the global digital divide.

The global Partnership on Measuring ICT for Development (see **http://measuring-ict.unctad.org**), of which the United Nations Conference on Trade and Development (UNCTAD) is a member, has been active in promoting the measurement of the information society at the international level. One of the key achievements of the Partnership is the development of a core list of ICT indicators, which was endorsed by the United Nations Statistical Commission at its 38th session in March 2007. The Commission encouraged countries to use that list in their data collection programme.

Within the United Nations system, UNCTAD has actively promoted the production of internationally comparable ICT statistics as part of its work programme on ICT and the information economy. Indeed, it was instrumental in initiating the Partnership. A key component of UNCTAD's work is the provision of technical assistance to developing countries wishing to produce statistics on ICT use in business and on the ICT-producing sector. This *Manual for the Production of Statistics on the Information Economy* was prepared by UNCTAD to guide statisticians from developing countries in all steps involved in the production and dissemination of business ICT statistics. The *Manual* is thus a practical tool for staff of national statistical organizations responsible for measuring the information economy. It is a valuable contribution by UNCTAD to the Partnership in its efforts to promote the measurement of the information society.



Paul Cheung

Director
United Nations Statistics Division

ACKNOWLEDGEMENTS

This *Manual* was prepared by a team consisting of UNCTAD staff members Susan Teltscher (team leader), Scarlett Fondeur Gil, Muriel Guigue, and Sonia Boffa. The main author of the *Manual* was José Luis Cervera Ferri and substantive editing was provided by Sheridan Roberts, both consultants to UNCTAD. The work was carried out under the overall supervision of Geneviève Féraud, Head of UNCTAD's ICT and E-Business Branch, until her change of functions on 1 October 2007.

Monica Morrica provided administrative support and helped in the formatting. The overall layout, graphics and desktop publishing were done by Christophe Manceau. Sophie Combette designed the cover and the text was edited by Graham Grayston.

Useful comments on various aspects of the *Manual* were provided by Aarno Airaksinen (Statistics Finland) and Henri Laurencin, Head of the UNCTAD Central Statistics and Information Retrieval Branch. The UNCTAD team also acknowledges the Partnership on Measuring ICT for Development, the OECD and Eurostat, whose work provided the basis for several of the chapters.

A number of national statistical offices provided useful information to this *Manual*, in particular those of Kazakhstan, Morocco and Thailand.

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LIST OF ABBREVIATIONS

2G, 3G	second, third generation
ADSL	asymmetric digital subscriber line
B2B	business-to-business (transactions conducted over computer-mediated networks)
B2C	business-to-consumer (transactions conducted over computer-mediated networks)
BOP	balance of payments
CAD	computer-aided design
CAM	computer-aided manufacturing
CAPI	computer-assisted personal interviewing
CATI	computer-assisted telephoning interviewing
CPC	Central Product Classification (UN)
CRM	customer relationship management
CV	coefficient of variation
DQAF	Data Quality Assessment Framework (IMF)
DSL	Digital Subscriber Line
EDI	electronic data interchange
ERP	enterprise resource planning
EU	European Union
GDP	gross domestic product
GSM	global system for mobile communications
HS	Harmonized System (WCO)
ICT	information and communication technology
ICTs	information and communication technologies
ILO	International Labour Organization
IMF	International Monetary Fund
IP	internet protocol
ISDN	integrated services digital network
ISIC	International Standard Industrial Classification of All Economic Activities (UN)
ISP	internet service provider
IT	information technology
ITU	International Telecommunication Union
Kbit/s	kilobits per second
LAN	local area network
LDCs	least developed country
Mbit/s	megabits per second
NACE	Nomenclature Générale des Activités Economiques dans l`Union Européenne
NAICS	North American Industry Classification System
NSDS	national strategy for the development of statistics
NSO	national statistical office
OCR	optical character recognition

OECD	Organisation for Economic Co-operation and Development
PDA	personal digital assistant
R&D	research and experimental development
SCM	supply chain management
SDSL	symmetric digital subscriber line
SME	small and medium-sized enterprise
SNA	System of National Accounts
TFSCB	Trust Funds For Statistical Capacity-building
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
UNECLAC	United Nations Regional Commission for Latin America and the Caribbean
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNSC	United Nations Statistical Commission
UNSD	United Nations Statistics Division
URL	uniform resource locator
VDSL	very high speed digital subscriber line
WCO	World Customs Organization
WPIIS	Working Party on Indicators for the Information Society (OECD)
WSIS	World Summit/s on the Information Society
WWW	World Wide Web

PART A. INTRODUCTION

CHAPTER 1

Objectives and overview of the Manual

1. The *Manual* for the Production of Statistics on the Information Economy has been prepared for the benefit of statistical agencies, in particular in developing and transition economies.[1] It is directed towards staff who are responsible for producing official statistics on the information economy. The main aim of the *Manual* is to support the production of information and communication technology (ICT) statistics – more specifically, statistics on the ICT-producing sector, ICT trade and use of ICT by businesses. The *Manual* has been prepared by the United Nations Conference on Trade and Development (UNCTAD) and reflects its mandate to assist developing economies in measuring and monitoring the information economy.

2. The *Manual* is intended to be a practical tool for producing ICT statistics at the national level; these, in turn, serve as key inputs to countries' national ICT policies and strategies. The *Manual* explains the international standards that guide work in this area and offers advice on collecting, processing and disseminating ICT statistics and associated metadata.

3. Statistical systems in developing economies are diverse and reflect, among other things, a country's wealth, culture, and legal and political frameworks. Understandably, the level of statistical capacity is unequal with respect to adherence to internationally recommended standards and methods, data collection systems and collection frequency, and the availability of key social and economic indicators. The *Manual* takes the differing practices and capabilities of national statistical offices (NSOs) into account and highlights specific challenges that some developing economies face in their production of ICT statistics. Its contents are based largely on the work of the members of the Partnership on Measuring ICT for Development. In 2005, the *Partnership* developed a core list of ICT indicators, which was endorsed by the UN Statistical Commission at its 2007 meeting.[2]The Commission encouraged countries to use the list as a basis for their ICT measurement activity. The *Manual* presents the *Partnership* core indicators on ICT use by business and the ICT sector, and provides associated definitions, classifications, methodologies and model questions.

4. The *Manual* will refer to international standards, definitions and model questionnaires on ICT statistics that have been developed by the Organisation for Economic Co-operation and Development (OECD) and Eurostat (both of which are members of the *Partnership*). In addition, it addresses statistical issues that are of particular interest to developing economies and are not extensively covered in the work of the OECD and Eurostat. For example, the *Manual* identifies areas of ICT use in developing economies which should be measured (such as use of e-mail) and provides relevant methodological advice (for instance, on construction of business frames, data collection methods and use of existing surveys where resources are insufficient for carrying out stand-alone ICT surveys).

5. As well as covering these and other technical aspects of ICT statistics, the *Manual* reviews important institutional aspects of the statistical process, such as collaboration with data providers, and cooperation with data users and producers.

[1] Henceforth referred to as "developing economies".

[2] See UNSC Document E/2007/24, E/CN.3/2007/30.

6. The *Manual* is organized as follows:

- Part A introduces the *Manual* and describes the background to the measurement of ICT.
- Part B covers the practical information required for the production of ICT statistics on the information economy, including:
  - Information economy measurement concepts;
  - The core indicators and associated statistical standards;
  - Data sources for business ICT indicators;
  - Model questions and questionnaires;
  - Methodological issues relating to data collection, survey design and processing; and
  - The dissemination of data and metadata.
- Part C deals with institutional issues such as coordination between actors in the national statistical system, the work of international organizations and capacity-building.

7. The *Manual* is supported by seven annexes that provide further technical advice and useful references.

8. The material presented in this *Manual* serves as the basis for the UNCTAD training course on "Measuring the Information Economy". The training course, which was developed in the framework of the UNCTAD *TrainForTrade* project, is broadly organized around modules following the structure of the content of the *Manual*.[3]

9. ICT statistics is a new area of measurement for most countries, as is the development of the necessary statistical standards and collection methodologies. Rapid technological change requires that new indicators be introduced and old ones discarded more frequently than in other areas of statistics. The UNCTAD secretariat will therefore regularly update and revise this *Manual*, with the objective of keeping member States informed of the most recent developments on the subject matter.

[3] Countries interested in the course should contact the UNCTAD secretariat at *emeasurement@unctad.org*. The training course uses the *Manual* as the principal reading material, and complementary course material includes presentation slides, an instructor's guide, tests and evaluation questionnaires.

CHAPTER 2

Background

ICT indicators for policymaking

10. The potential for ICT to increase economic growth and reduce poverty is receiving increasing attention from Governments and the international community. Designing and implementing ICT policies and strategies requires a proper knowledge of the state of ICT in a country and its use by organizations (government as well as business) and individuals (and often, the main barriers to such use). Consequently, calls for ICT statistics have become more frequent, both at the national and the international level (see Box 1). Furthermore, the measurement of ICT access, use and impact enables assessment and monitoring of the digital divide within a country and between countries.

Box 1. The WSIS mandate

The measurement of ICT has been an important part of international debates on ICT for development. While ICTs can present opportunities for economic and social development for developing economies, the digital divide between developed and developing economies also presents new challenges. The UN Millennium Development Goals, for example, include the target of making available the benefits of new technologies, especially ICT, to developing economies.

Measuring ICT for development was a principal concern of the World Summit on the Information Society (WSIS), which was held in two phases, Geneva in 2003 and Tunis in 2005. The 2003 Geneva phase highlighted the importance of benchmarking and measuring progress towards the information society through internationally comparable statistical indicators. The 2005 Tunis phase recognized that the development of ICT indicators is important for measuring the digital divide, and called upon countries and international organizations to allocate appropriate resources for the provision of ICT statistics, and to develop effective measurement methodologies including basic ICT indicators and an analysis of the state of the information society. In particular, member States called for periodic evaluation, using an agreed methodology, such as described in paragraphs 113–120 of the Tunis Agenda for the Information Society, and referring to the work of the Partnership on Measuring ICT for Development.[4]

11. During the last decade or so, a number of countries have made efforts to collect data on ICT in their society.[5] As a result, they are now in a better position to:

- Assess the impact of ICT on their economies;
- Benchmark their economies and social situation against those of other countries;
- Identify the type of qualified people needed to advance their country's information economy; and
- Calculate the investment needed to provide businesses with access to different ICTs.

12. In short, ICT statistics have helped policymakers and business people to make well-informed decisions about public policy measures and private investment in ICT.

[4] Tunis Agenda for the Information Society (2005), WSIS-05/TUNIS/DOC/6(Rev.1)-E.
[5] "Society" is used in a broader context here and covers both social and economic realms.

13. Among developed economies, the NSOs of the members of the OECD have been producing statistics on the ICT sector and use of ICT by businesses in a reasonably harmonized way, on the basis of statistical developments facilitated by the OECD's Working Party on Indicators for the Information Society (WPIIS). As a result of this effort, a comparable set of such statistics is available for most OECD countries.

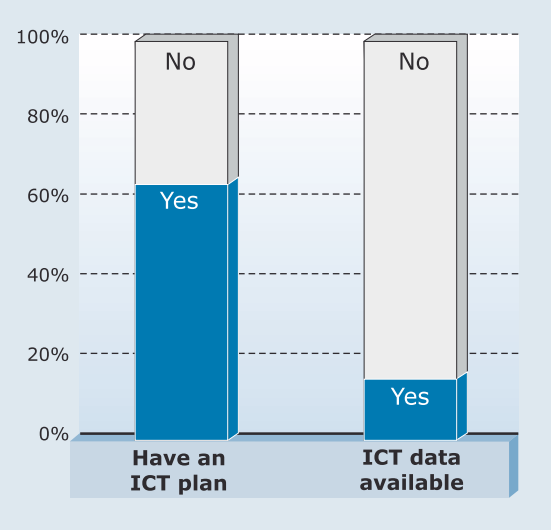
14. However, in developing economies, the availability of ICT indicators is still scarce, even though Governments, civil society and the business sector explicitly recognize the urgent need for this information (see Chart 1). Therefore, many developing economies are preparing ICT-related policies and strategies without the guidance of statistical evidence. Reliable and timely indicators on ICT are needed to maximize its potential to facilitate a range of economic and social developments, including poverty reduction, increases in health and education standards, generation of new industries and employment opportunities, and improvements in competitiveness (see Box 2).

15. In many cases, developing economies need to increase their awareness about the measurement efforts of other countries and may require assistance to incorporate ICT topics into their statistical programmes. With the increasing use of ICT by businesses and households in those countries, it is essential to start measuring ICT now, for at least two reasons:

- First, the development and growth of the information economy is irreversible – organizations and individuals all over the world are increasingly demanding and using ICT; and

- Second, the experiences of countries that have started to collect information economy statistics show that it takes several years to design and implement a good national strategy for measuring the information economy and to incorporate ICT statistics into national strategies for the development of statistics (NSDS). Hence, the earlier that countries begin work on an e-measurement strategy, the more likely it is that they will achieve good results by the time that ICT and e-business have spread to most parts of the developing world.

Chart 1. Data gap in developing economies



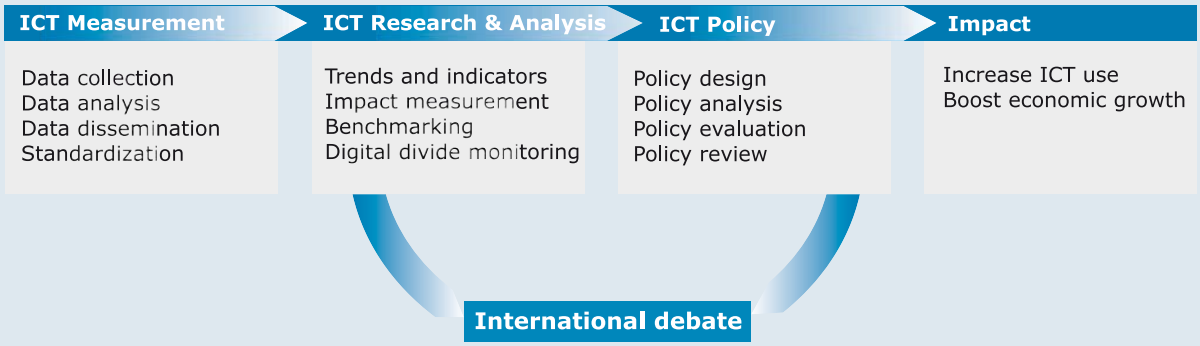
Box 2. Lack of data for ICT policymaking

In many developing economies, ICT policies and strategies have been set up to foster access to, and use of, ICTs by individuals and organizations, and to integrate national markets into the global information economy. According to an UNCTAD survey, in 2006, 116 developing economies had introduced national ICT Master Plans (UNCTAD, 2006). At the same time, only 28 countries already had official statistics on the use of ICT by businesses (Chart 1). Without data on ICT access, use and impact, it will be difficult for policymakers to design, analyse, evaluate and review national ICT policies.

UNCTAD's work on ICT measurement

16. With the aim of improving the ability of developing economies to formulate policies that will enable them to seize the benefits of ICT, the ICT and E-Business Branch of UNCTAD collects and publishes data on ICT use by businesses and on the state of the ICT sector. It also provides technical assistance and undertakes research and analysis (see Chart 2). These activities strengthen the statistical capacity of developing economies, allow UNCTAD to track global progress in the use of ICT and contribute to the evaluation of the WSIS implementation (see Box 1).

Chart 2. UNCTAD and ICT for development



17. Since 2004, UNCTAD has been collecting statistics on ICT business use and the ICT sector through an annual survey. The questionnaire (see Annex 7) is based on the *Partnership*'s core list of ICT indicators (see Chapter 4). Results from the annual survey feed into a database that supports UNCTAD research and analysis, and its advisory work on ICT policies, including ICT policy reviews.

18. UNCTAD analyses trends and developments in ICT access, use and impact in developing economies. In particular, it follows trends in e-commerce, the use of ICT by businesses for management and production, the impact of ICT on productivity, international trade in ICT goods and services, and the ICT sector. The research is published in UNCTAD's annual *Information Economy Report*, and disseminated at national, regional and international events, and through the dedicated website ***http://measuring-ict.unctad.org***. At the same time, UNCTAD raises the awareness of Governments about the importance of ICT statistics for monitoring ICT-related policies and assessing their impact.

19. UNCTAD provides technical assistance to developing economies on the measurement of ICT use by businesses and the ICT sector, focusing on:

- Assisting NSOs in undertaking data collection, analysis and dissemination, including through advisory missions;
- Organizing expert meetings and conducting technical workshops for practitioners in developing economies to enable exchanges of experiences and discussions of methodological, analytical and dissemination issues; and
- Developing training material, guidelines and other technical documentation on the collection of ICT statistics and the production of indicators.

20. UNCTAD is an active member of the *Partnership on Measuring ICT for Development* and a member of its Steering Committee. It also leads the Partnership's task group on capacity-building. This *Manual*, which is a contribution of UNCTAD to the Partnership, is aligned with the Partnership's objectives and recommendations.

The Partnership on Measuring ICT for Development

21. The international, multi-stakeholder *Partnership* was launched during UNCTAD XI in June 2004. It aims to identify and further develop different initiatives regarding the availability and measurement of ICT indicators at regional and international levels. It provides an open framework for coordinating ongoing and future activities, and for developing a coherent and structured approach to advancing the development of ICT indicators globally, and in particular in developing economies.

22. The main objectives of the *Partnership* are:

- To facilitate agreement on internationally comparable ICT indicators and to develop methodologies to collect those indicators;
- To assist in building statistical capacity in developing economies for the production of ICT statistics; and
- To set up a global database on ICT indicators.

23. In 2007, partners were the ITU, the OECD, UNCTAD, the UNESCO Institute for Statistics (UIS), UN Regional Commissions (UNECLAC, UNESCWA, UNESCAP and UNECA), the World Bank and Eurostat. The *Partnership* Steering Committee is composed of the ITU, UNCTAD and UNECLAC.[6]

24. The *Partnership* has developed a core list of ICT indicators in the areas of ICT infrastructure and access, ICT access and use by households and individuals, ICT use by businesses, the ICT sector and trade in ICT goods. The core list was drawn up after an intensive consultation process involving NSOs worldwide and was agreed upon at a global meeting in Geneva (February 2005). It was officially presented during an event at WSIS Tunis (November 2005) and was subsequently endorsed by the United Nations Statistical Commission (UNSC) at its meeting in March 2007.[7]

[6] See List of Abbreviations at the beginning of this *Manual*.
[7] See *http://measuring-ict.unctad.org* for more information on the core list.

25. The core list of ICT indicators is recommended as the basis for the collection of internationally comparable ICT statistics. The *Partnership* publication *Core ICT Indicators* (2005) provides definitions for the indicators and model questions for their collection. The development of ICT indicators is a continuous process, and the *Partnership* will review the list periodically to address evolving policy needs.

26. The *Partnership* also monitors the availability of national statistics on ICT, and its partners collaborate to build the capacities of statisticians in order to help them improve the availability and quality of ICT statistics, as well as their analysis.

27. The ongoing work of the *Partnership* focuses on capacity-building, dissemination and database development, and the development of new ICT indicators, especially in the areas of education and government.

28. More information on the *Partnership*, its members and its activities can be found on UNCTAD's website; see *http://measuring-ict.unctad.org*.

PART B. METHODOLOGICAL ISSUES

CHAPTER 3

Conceptual frameworks for ICT measurement

29. This chapter presents the concepts underlying ICT measurement, with the objective of providing official statisticians, and others with an interest in ICT statistics, with a basic framework for measuring ICT. It includes a conceptual framework for information economy measurement and defines a number of concepts associated with e-business measurement.

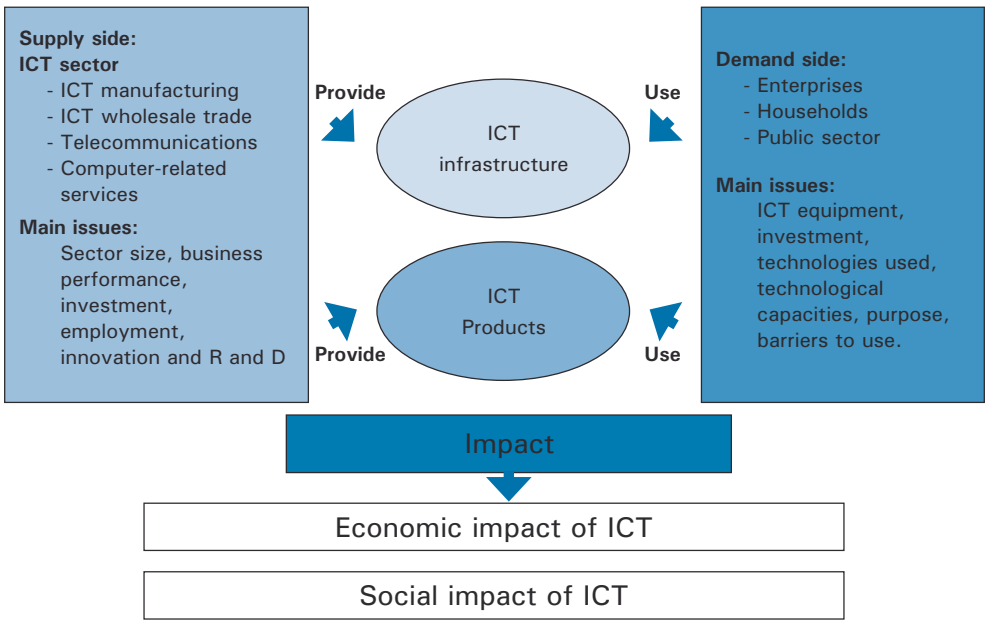
A conceptual framework for the measurement of the information economy

30. A distinctive characteristic of the information economy is the intensive use, by businesses, of ICT for the collection, storage, processing and transmission of information. Business data from some industrialized countries show that improvements in productivity can be explained, at least partly, by use of ICT.

31. Use of ICT is supported by supply of ICT products from an ICT-producing sector and through trade. Additionally, a robust ICT sector can contribute to aggregate labour productivity growth (OECD, 2007; UNCTAD, 2007).

32. The information economy can be defined and measured, based on the 'building blocks' of supply and demand (see Figure 1). Statistical measurement instruments (surveys and other statistical operations) can cover these 'blocks' or conceptual areas.

Figure 1. The building blocks of the information economy

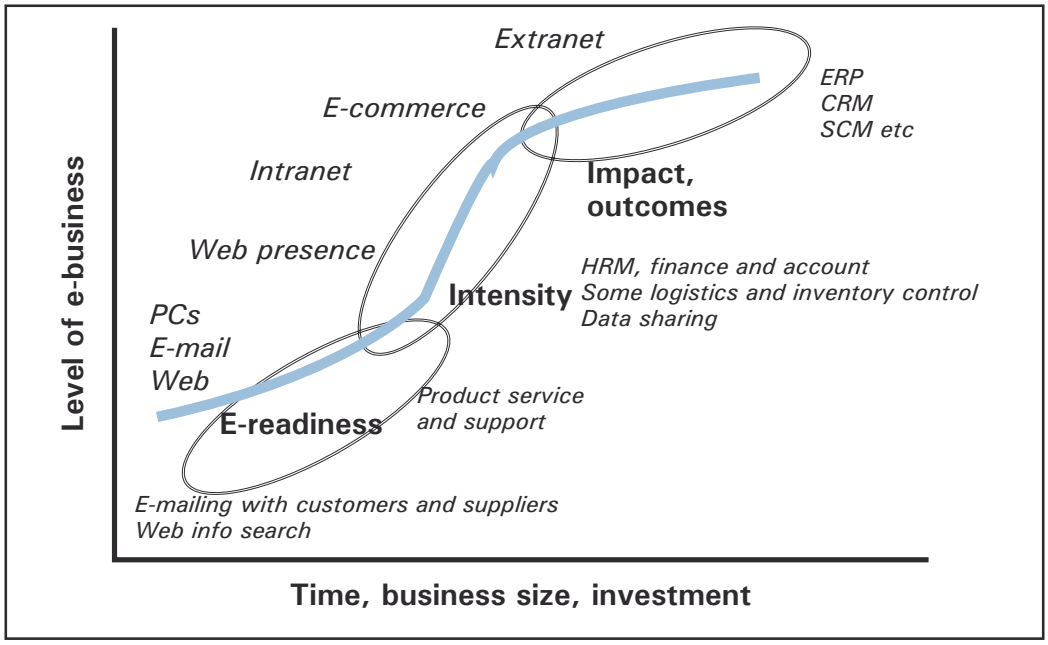


Source: adapted from OECD (2005) and Månsson et al. (2004)

33. Statistical operations can separately investigate the supply of, and demand for, ICT, as well as ICT infrastructure and trade.[8] From the supply side, ICT statistics are collected about the ICT sector, that is, ICT manufacturing and services industries that provide the market with ICT infrastructure, goods and services. The output of the ICT sector in terms of goods can be classified using the World Customs Organization's (WCO) Harmonized System (HS) and equivalent national classifications.[9] ICT services are mainly estimated using the International Monetary Fund's (IMF) Balance of Payments (BOP) classification which is rather broad and only captures transactions between residents and non-residents. The ICT sector is defined in terms of the UN's International Standard Industrial Classification of All Economic Activities (ISIC) and equivalent national classifications.[10] Measurement from the demand side addresses access to, and use of, ICT by businesses, households and government organizations (though this *Manual* will provide methodological advice on demand side measures of the business sector).

34. The use of ICT by businesses can be illustrated by the S-curve (see Figure 2) which depicts the development of ICT in relation to time, business size or investment. Three phases of ICT deployment are considered: ICT readiness, intensity and impact. Different technologies and uses are related to the different levels.[11]

Figure 2. The S-curve



Source: adapted from E-Commerce and Development Report (UNCTAD, 2004) and Industry Canada (1999).

[8] Some countries have surveys for the measurement of other topics relating to the information economy, such as innovation and R&D in firms (based in the OECD/Eurostat Oslo *Manual* and OECD Frascati *Manual*), patents, and human resources in Science and Technology (OECD Canberra *Manual*).

[9] The UN's Central Product Classification will be used for the OECD's revised ICT goods classification (due to be released in 2007).

[10] The ICT sector definition was revised by the OECD in 2006 in order to comply with ISIC Rev. 4. However, implementation of ISIC Rev. 4 will take several years for most countries, which are therefore expected to continue using the 2002 definition (based on ISIC Rev. 3.1) for some time. Discussions on whether the latter should be revised to match changes in 'guiding principles' have begun in OECD countries.

[11] The S-curve was originally developed by Industry Canada to describe indicators describing the evolution of electronic commerce. However, it is often used to describe ICT infrastructure and demand, including e-business.

35. The S-curve can also be used to show the evolution of policymakers' (and other users') needs for ICT indicators during the following stages:

- The readiness of the infrastructure, society, the business sector and the country's economy generally to undertake ICT-related activities. Indicators on e-readiness are of particular interest to policymakers in countries at early stages of ICT maturity, and are likely to lose relevance or evolve as technologies become more prevalent;
- The intensity of the use of ICT and the extent to which ICT-related activities (such as e-commerce) are carried out by businesses and other institutional sectors (households, the Government). Intensity indicators are likely to be of interest to policymakers in countries where ICT is spreading, and
- The outcomes and impacts of ICT on business activities and economic growth in countries with a relatively high level of ICT development.

36. Priorities for statistical work on ICT should follow users' needs. As national ICT policies move from diagnostic or design to implementation and to evaluation, decision makers will be interested in the corresponding phases of the statistical work (see Table 1).

Table 1. Policymaking and corresponding statistical work

Policymaking stages	Phases of statistical work	Main statistical issues
Diagnostic and design	Consultation with policymakers on their data needs Choice of indicators to be collected Data collection activity	Available statistical sources Definition of concepts Definition of indicators and questions Preparation of data collection instruments (questionnaires)
Implementation	Production of statistics Ongoing refinement of statistical needs	Relevance and accuracy of statistics and the resulting indicators Availability of sector, geographical and other breakdowns Accessibility of information (timeliness, metadata)
Evaluation	Data analysis	Coherence with other statistical data Sustainability of statistical series over time International comparability

37. As indicated above, statistical programmes should reflect the evolution of information needs and are generally expected to extend and improve ICT measurement activities as technologies permeate society and the economy.

38. In developing economies, especially the least developed countries (LDCs), ICT infrastructure, supply and use may be at a low level. Data on ICT are therefore likely to be scarce and measurement programmes will probably need to be prioritized. The internationally agreed

core list of ICT indicators (see Chapter 4) should provide guidance on the choice of priorities, while this *Manual* will help countries by providing guidance on the collection of relevant statistics.

Concepts of e-business

E-business

39. E-business refers to the use of ICT to facilitate business processes. Businesses can use ICT to communicate with government organizations, suppliers and clients (via email, for example) or to purchase and sell goods and services on line (e-commerce). ICT can also be used to automate business processes, to manage resources and to implement business policies (in marketing, human resources, finance, etc.). A diversity of business processes as well as barriers that hamper their use can be investigated in statistical surveys (see Example 1).

Example 1. Measurement of e-business processes in Senegal

In 2001, a survey of medium-sized and large industrial enterprises was carried out in Senegal. While almost all of the businesses (92 per cent) were connected to the Internet, in most cases only the head of the enterprise had access (because of the perception of high cost relative to the benefits). The most common use of the Internet was for email, to communicate primarily with suppliers, followed by internal business exchanges and customers. A reason cited for a low level of use of the Internet for other e-business processes (such as customer relationship management, banking and finance management or dealing with government institutions for administrative purposes) was that other partners, such as customers and suppliers, the Government, banks and insurance companies, were not using the Internet (yet) and therefore were not able to interact with them on line. The overall lack of local content useful for entrepreneurs (including business information, legal and regulatory documents, and administrative forms) was noted as a major reason for not using the Internet more frequently. At the same time, business owners felt that, in particular, on-line government could significantly contribute to reducing costs in terms of both time and transport.

Source: E-Commerce and Development Report (UNCTAD, 2004).

40. For a definition of e-business that could be used for statistical purposes, several broad business functions are identified and described in terms of e-business processes (see Box 3). In 2003, an OECD expert group on the measurement of e-business processes proposed a definition of e-business processes as those "(automated) business processes (both intra- and inter-business) over computed mediated networks". In addition, the group proposed that e-businesses processes should integrate tasks and extend beyond a stand-alone or individual application.

Box 3. Definition of e-business processes	
Customer acquisition and retention	Customer relationship management (CRM); marketing campaign management, planning and execution; database marketing, direct marketing and telemarketing; electronic catalogues; web activity analysis and web advertising; call centres; arranging repairs and maintenance; handling customer complaints
E-commerce	Sale or purchase/procurement of goods or services (includes getting estimates, negotiating, ordering, arranging contracts); EDI; mobile commerce; integration of ordering system with that of customers/ suppliers; integrated invoicing and payment by customers; full integration with back-end systems; use of an extranet; secure transactions; automated payment of suppliers
Order fulfilment and order tracking	Order control, product control, order tracking; data processing that relates to order fulfilment or tracking; sales force automation
Logistics (inbound & outbound) and inventory control	Supply chain management (SCM); production and inventory control (including of raw materials, parts, finished goods), distribution control, management of inventory, management of customers' inventory, transportation and shipping, automated warehouse; arranging and managing transport, dispatch of goods, tracking, provision of services
Finance, budget and account management	Enterprise resource planning (ERP); managing, planning and evaluating finance; invoicing and payment systems; software systems
Human resource management	External and internal recruitment, on-line job applications; automation of administrative tasks such as time reporting, payment of salaries and pension schemes, travel reimbursement, tracking working hours and production time; training; tele-working
Product service and support	Website support, frequently asked questions (FAQ), downloadable manuals; on-line queries; after-sales support
Research and development	Research, development and design of products, services or processes; computer-aided design (CAD), computer-aided manufacturing (CAM) and collaborative design
Knowledge management	Systematically aggregating and disseminating information and knowledge within the business; content management system; e-learning

41. For the purpose of preparing a survey questionnaire, a pragmatic approach to the measurement of e-business is to select processes of particular interest for which feasible questions (easily answered as yes/no) could be included in an economy-wide survey. The model questionnaires on ICT use by businesses proposed by OECD and Eurostat include questions that cover some e-business processes. This approach has been also followed in those developing economies that have started to collect ICT data from businesses (see Example 2).

Example 2. ICT business survey in Thailand

Since 2004, the National Statistical Office of Thailand, which reports to the Ministry of ICT, has carried out annual business surveys on the use of ICT. Previously, the NSO included ICT-related questions in the Manufacturing Survey of 2003.

The questionnaires for the stand-alone surveys on the use of ICT investigate different aspects of e-business practices, such as the purposes of the use of Internet, the use of the firm's website and reasons for carrying out Internet purchases and sales. Options that can be recorded in the questionnaire (as yes/no answers) include use of the Internet for information search and monitoring the market, email and other communications, advertising, purchase and sale of goods and services, and, banking and financial services. On the use of a website, the questionnaire allows for multiple responses such as marketing of products, inquiries and contact facilitation, receiving purchase orders, providing after sales service, on-line payment and information networking. On the reasons for carrying out Internet transactions, the questionnaire allows grading the importance of a list of possible reasons. The questionnaire is structured in modules, which makes the response easier for the firm.

The approach followed by the NSO of Thailand can be considered good practice for countries willing to start the collection of ICT indicators. In a first phase, a set of indicators is produced by including a module on ICT in an existing survey. In a second phase, the available information is increased by carrying out a stand-alone survey on the use of ICT.

The 2004 and 2005 Information and Communication Technology Surveys implemented by the National Statistical Office of Thailand can be linked with the Manufacturing Surveys carried out for different reference years (2003, 2006) via the unique 11-digit registration code for firms. ICT variables collected in the Information and Communication Technology Surveys can therefore be linked, at the firm level, with business performance and other (for instance, employment) variables. Econometric models can thus be estimated and tested with microdata, to analyse the relationship between adoption and use of ICT and economic results. An alternative that does not allow for measuring a delayed impact is to jointly analyse the economic and ICT variables contained in only one survey, namely the Manufacturing Survey 2003

Source: 2004 and 2005 Information and Communication Technology Survey *(http://web.nso.go.th/)*.

42. The analysis of the impact of e-business on business performance and growth has so far been supported by statistical evidence consisting of aggregate indicators and business micro-data from developed countries. Developing economies should take into account their requirements for further data analysis when planning investigations on e-business and determining a particular form of data collection. In particular, the need for linking data on e-business from stand-alone ICT surveys with other information on the business' performance (such as information from taxation records and general business surveys) should be taken into account.

43. Developing economies could also consider the possibility of including a module on e-business in current business surveys, thereby enabling the linkage of ICT with economic variables in order to analyse the impact of e-business processes on business performance. These options are further discussed in Chapter 5.

E-commerce

44. Electronic transactions (or e-commerce) are at the core of the statistical measurement of e-business. The great policy interest in measuring the volume and characteristics of e-commerce has driven theoretical work in expert groups (such as the OECD's WPIIS) and practice by statistical offices and other institutions.

45. The need for an operational definition of e-commerce, suitable as a basis for items in statistical questionnaires, was recognized early by expert groups. In 2000, OECD member

countries endorsed two definitions of electronic transactions based on a narrow and a broad definition of the communications infrastructure. According to the OECD definitions, it is the method by which the order is placed or received, not the payment or channel of delivery, which determines whether the transaction is an electronic commerce transaction. The narrow definition of electronic commerce transactions refers to those conducted over the Internet, whilst the broad definition refers to all computer-mediated networks (see Box 4).

Box 4. OECD definitions of electronic commerce transactions and interpretation guidelines

The OECD provides two definitions for e-commerce transactions and guidelines for their interpretation:

Broad definition of e-commerce transactions: An electronic transaction is the sale or purchase of goods or services, whether between businesses, households, individuals, Governments, and other public or private organizations, conducted over computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or off line.

As a guideline for the interpretation of the definition above, the OECD notes that the broad definition includes orders received or placed on any on-line application used in automated transactions, such as Internet applications, EDI or interactive telephone systems.

Narrow definition of e-commerce transactions: An Internet transaction is 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 the ultimate delivery of the good or service may be conducted on or off line.

As a guideline for the interpretation of the definition above, the OECD notes that the narrow definition includes orders received or placed on any Internet application used in automated transactions, such as web pages, extranets and other applications that run over the Internet such as *EDI over the Internet* or over any other web-enabled application regardless on how the Web is accessed (e.g. through a mobile phone or a TV set, etc.). The definition excludes orders received or placed by telephone, facsimile or conventional email.

Source: Adapted (slightly) from OECD, 2005 and 2007.

46. The measurement of electronic transactions presents specific measurement difficulties. In relation to the communications infrastructure over which the transactions are carried out, technological convergence (in particular the inter-operability of communication networks) is making it more difficult to distinguish Internet electronic commerce from electronic commerce conducted over other networks. Potential data collection problems include:

- The small volume of e-commerce activity in the economy, with consequent high standard errors and poor reliability of disaggregated data, and
- Poor quality of reported data resulting from lack of record keeping and often misunderstanding of statistical e-commerce concepts.[12]

47. In order to take into account the different situations in countries in terms of technological development, the *Partnership* recommends collecting data only on whether orders are received or placed *over the Internet*, including by email (the latter is excluded from the OECD definitions).

48. Some countries have collected data on e-commerce by relevant breakdowns such as the nature of products or location of the buyer/seller. The reliability of these splits has been questioned (for instance, a business may not know or have recorded the destination of its

[12] Other statistical difficulties in e-commerce measurement are described in OECD, 2005 and 2007.

on-line sales) and therefore such a breakdown is not recommended for countries starting data collection on the use of ICT by businesses.

CHAPTER 4

Statistical standards for indicators on the information economy

49. This chapter describes the main statistical standards covering the core ICT indicators. It presents the *Partnership*'s core ICT indicators and associated metadata, such as methods of calculation and definitions of terms. Related information can be found in Chapter 6 (model questions and questionnaires for business ICT use surveys) and Chapter 7 (designing business ICT surveys, including questions of scope, coverage, units, sampling and data processing).

The Partnership core list of ICT indicators

50. The need for establishing international comparisons and benchmarks requires comparable sets of statistics across countries. A core list of ICT indicators was agreed upon at the international level and adopted by the participants at the WSIS Thematic Meeting on Measuring the Information Society (Geneva, February 2005). This followed an intensive consultation process by the *Partnership* (see Box 5). The core list provides a starting point for the collection of ICT statistics on ICT infrastructure and access; on access to, and use of, ICT by households and individuals; on use of ICT by businesses; and on the ICT sector and trade in ICT goods.[13]

Box 5. Development of the core list of ICT indicators

Following the stocktaking exercise carried out by the *Partnership* in 2004, the United Nations Regional Commissions hosted several regional statistical workshops on ICT measurement. At these workshops, NSOs discussed the status of ICT statistics in their respective regions, and proposed regional core lists of indicators. The regional lists of indicators were presented for information to the United Nations Statistical Commission (UNSC) at its thirty-sixth session in March 2005. Based on the regional lists, and feedback received from NSOs, the *Partnership* consolidated a core list of ICT indicators. The list was circulated to all NSOs for further comments and suggestions. A final list was discussed, and agreed upon, at the WSIS Thematic Meeting on Measuring the Information Society, held in Geneva from 7 to 9 February 2005. The meeting was attended by 270 delegates from 85 United Nations member countries (primarily NSOs), intergovernmental organizations and non-governmental organizations. The final core list was officially presented at the second phase of WSIS, held in Tunis in November 2005, during a parallel event on "Measuring the Information Society" organized by the *Partnership*. The core list was endorsed by the UNSC at its thirty-eighth session in March 2007; it has been widely disseminated and serves as a basis for the *Partnership*'s work on measuring ICT.

51. The core list is not mandatory and nor is it intended to be limiting – it is expected that national ICT policies may require larger numbers of indicators for planning, monitoring and evaluation (see Example 3). It is also expected that countries with different levels of development will have different priorities for the production of indicators.

Example 3. Inclusion of ICT indicators in household surveys in Latin America

In Latin America, thirteen countries (as of February 2007) are including the necessary questions in their permanent household surveys to collect the information required to calculate the core indicators on access to, and use of, ICT by households and individuals. The collection of these indicators is related to the interest in national policies targeted to providing access to ICT by the population.

Source: Partnership on Measuring ICT for Development, 2007.

[13] The complete list and description of the core ICT indicators has been published by the Partnership and is available on line at *http://measuring-ict.unctad.org.*

Measuring ICT demand (use)

Core indicators on the use of ICT by businesses

52. The core list of ICT indicators includes 12 indicators on the use of ICT by businesses. Two of the core indicators (indicators B9 and B12) are breakdowns of another indicator (B3). For each indicator, a definition of the main concepts involved is provided in Table 2 below, as well as references to the method of calculation. Chapter 6 provides model questions that may be included in questionnaires to collect the necessary information to compute the indicators. A questionnaire provided in Annex 1 shows a logical sequence for the model questions.

53. The core ICT indicators are expressed in terms of *proportions* obtained as quotients of a numerator that refers to the characteristic to be measured and a denominator that refers to the reference population. The use of proportions rather than absolute figures allows ready comparison of the resulting data across industries, size intervals, countries and any other available classificatory variables. Methods for estimating proportions (and their associated statistical errors) from a sample are further discussed in Chapter 7 and Annex 4 of this *Manual*.

54. The denominator of the core indicators on use of ICT by businesses is the population to which the indicator refers (e.g. the total number of businesses or the total number of employees). The population will be determined by the scope (and coverage) of the survey. Ideally, countries should collect indicators in respect of the whole business sector (or at least per the scope recommendations associated with the core indicators). However, countries may decide, according to their industrial structure, policy needs or resources available, to investigate only parts of the business sector (e.g. the manufacturing sector). In any case, the description of the scope (and coverage) of the survey is a key item of metadata (see Chapter 7).

55. For all indicators, sub-indicators may be calculated by using the classificatory variables *economic activity* (referred to as *industry* in many countries) and size (in terms of number of employees). In order to investigate the existence of digital gaps or economic differences between businesses located in *urban* and *rural* areas, countries could also present the results broken down by geographical classification (usually, according to the location of a business' headquarters). This may be difficult where the recommended statistical unit – the enterprise – is used because some enterprises consist of a number of establishments in different locations. In this case, it is recommended that data be presented at the enterprise level (see Chapter 7).

56. The recommended breakdown of indicators on the use of ICT by size of business, economic activity and geographical location is further examined in Chapter 7 and discussed in terms of dissemination in Chapter 8.

Table 2. Core indicators on the use of ICT by businesses[14]

Code	Indicator	Definition and method of calculation	Concepts
B1	Proportion of businesses using computers	The *proportion of businesses using computers* is calculated by dividing the number of (in-scope) businesses using computers during the reference period by the total number of (in-scope) businesses.	A *computer* includes: a desktop, portable or handheld computer (e.g. a personal digital assistant), minicomputer and mainframe. A computer does not include equipment with some embedded computing abilities, such as mobile phones or TV sets, nor does it include computer-controlled machinery or electronic tills.
B2	Proportion of employees using computers	The *proportion of employees using computers* is calculated by dividing the number of employees using computers (in all businesses) by the total number of employees (in all businesses).	*Computer*: as above *Employees* refer to all persons working for the business, not only those working in clerical jobs. They include working proprietors, as well as employees.
B3	Proportion of businesses using the Internet	The *proportion of businesses using the Internet* is calculated by dividing the number of businesses using the Internet by the total number of businesses.	The *Internet* refers to Internet protocol (IP) based networks: WWW (the World Wide Web), an extranet over the Internet, EDI over the Internet, Internet accessed by mobile phones and Internet email.
B4	Proportion of employees using the Internet	The *proportion of employees using the Internet* is calculated by dividing the number of employees using the Internet (in all businesses) by the total number of employees (in all businesses).	*Internet*: as above *Employees*: as above
B5	Proportion of businesses with a web presence	The *proportion of businesses with a web presence* is calculated by dividing the number of businesses with a web presence by the total number of businesses.	*A web presence* includes a website, home page or presence on another entity's website (including a related business). It excludes inclusion in an on-line directory and any other web pages where the business does not have substantial control over the content of the page.
B6	Proportion of businesses with an intranet	The *proportion of businesses with an intranet* is calculated by dividing the number of businesses with an intranet by the total number of businesses.	An *intranet* refers to an internal company communications network using Internet protocol allowing communications within the organization. It is typically set up behind a firewall to control access.

[14] The table includes some minor updates of some of the definitions of the indicators, compared to the original *Partnership* core list.

Code	Indicator	Definition and method of calculation	Concepts
B7	Proportion of businesses receiving orders over the Internet	The *proportion of businesses receiving orders over the Internet* is calculated by dividing the number of businesses receiving orders over the Internet by the total number of businesses. Alternatively, output could be presented in relation to businesses that use the Internet. This requires a denominator equal to the number of businesses that use the Internet. Whichever denominator is chosen, it is important that users are made aware of the reference population.	*Orders received* include orders received via the Internet whether or not payment was made on line. They include orders received via websites, specialized Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones and email. They also include orders received on behalf of other organizations – and orders received by other organizations on behalf of the business. *Orders received* exclude orders that were cancelled or not completed.
B8	Proportion of businesses placing orders over the Internet	The *proportion of businesses placing orders over the Internet* is calculated by dividing the number of businesses placing orders over the Internet by the total number of businesses. Alternatively, output could be presented in relation to businesses that use the Internet. This requires a denominator equal to the number of businesses that use the Internet. Whichever denominator is chosen, it is important that users are made aware of the reference population.	*Orders placed* include orders placed via the Internet whether or not payment was made on line. They include orders placed via websites, specialized Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones and email. *Orders placed* exclude orders that were cancelled or not completed.
B9	Proportion of businesses using the Internet by type of access Response categories *Narrowband:* - Analogue modem (dial-up via standard phone line) - ISDN (Integrated Services Digital Network) - Other narrowband *Broadband:* - DSL (Digital Subscriber Line) - Cable modem - Other broadband	The result is presented as the proportion of businesses using each type of access service, for instance, the proportion of businesses accessing the Internet by DSL. Additionally, output should be available for the aggregations: *proportion of businesses with broadband access to the Internet and proportion of businesses with narrowband access to the Internet.* Alternatively, output could be presented in relation to businesses that use the Internet. This requires a denominator equal to the number of businesses that use the Internet. Whichever denominator is chosen, it is important that users are made aware of the reference population.	*Internet*: as above *Type of access*: the response categories should be chosen to allow aggregation to narrowband and broadband. As businesses can use more than one type of access service, multiple responses are possible. See Box 6 below for definitions of the response categories.

Code	Indicator	Definition and method of calculation	Concepts
B10	Proportion of businesses with a local area network (LAN)	The proportion of businesses with a LAN is calculated by dividing the number of businesses with a LAN by the total number of businesses.	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.
B11	Proportion of businesses with an extranet	The *proportion of businesses with an extranet* is calculated by dividing the number of businesses with an extranet by the total number of businesses.	An *extranet* is a closed network that uses Internet protocols to securely share enterprise'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 enterprise's Intranet. It can also be a private part of the enterprise's website, where business partners can navigate after being authenticated in a login page.
B12	Proportion of businesses using the Internet by type of activity Response categories - For getting information about goods or services - For getting information from government organizations/ public authorities (from websites or via email) - For sending or receiving email - For performing Internet banking or accessing other financial services - For interacting with government organizations/publicauthorities - For providing customer services - For delivering products on line - For other information searches or research activities	The result is presented as the proportion of businesses undertaking each activity, for instance, the proportion of businesses using the Internetforsendingorreceivingemail. Alternatively, output could be presented in relation to businesses that use the Internet. This requires a denominator equal to the number of businesses that use the Internet. Whichever denominator is chosen, it is important that users are made aware of the reference population.	*Internet*: as above *Government organizations/public authorities* are preferably defined per the System of National Accounts (SNA) (1993). They include government organizations at local, regional and national level. Interacting with government organizations includes downloading/requesting forms, completing/lodging forms on line, making on-line payments and purchasing from, or selling to, government organizations. It does not include getting information from government organizations. Customer services include providing on-line or emailed product catalogues or price lists, product specification or configuration on line, after sales support, and order tracking on line. Delivering products on line refers to products delivered over the Internet in digitized form, e.g. reports, software, music, videos, computer games; and on-line services, such as computer-related services, information services, travel bookings or financial services.

57. As the above table shows, some indicators (B7, B8, B9 and B12) may be presented as proportions of the population of businesses that use the Internet. This requires changing the denominator to the total number of businesses that use the Internet and users should be informed of that difference. For international comparisons, it is simpler to compare results when referred to the whole population of businesses.

58. For indicator B9 *Proportion of businesses using the Internet by type of access*, the response categories should cover the range of technological options and should enable aggregation to *total narrowband* and *total broadband*. The interest is usually focused on the bandwidth of the connection, that is, the amount of data that can be sent or downloaded measured in kilobits per second (Kbit/s). There is a distinction between narrowband and broadband, defined as bandwidths below or above 256 Kbit/s respectively. The importance of measuring the bandwidth is related to the significant improvements that the adoption of broadband brings in terms of enabling the full capabilities of Internet-based applications, such as Internet-based telephony (which can significantly reduce the cost of communications); reducing the time required for performing e-business processes; and allowing more users to connect simultaneously to the Internet. Different technological options are presented in Box 6 below (including the distinction between narrowband and broadband), but countries may prefer to collect more or less detail in their questionnaires (see Example 4 for a particular national classification of types of connection).

Box 6. Types of connection to the Internet

Narrowband (download speed of less than 256 Kbit/s, in one or both directions)	Analogue modem (dial-up via standard phone line). The modem converts a digital signal into analogue for transmission by traditional (copper) telephone lines. It also converts analogue transmissions back to digital.
	Integrated Services Digital Network (ISDN). ISDN is a telecommunication service that turns a traditional (copper) telephone line into a higher speed digital link. ISDN is usually considered to be narrowband.
	Other narrowband includes mobile phone and other forms of access. Narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and i-mode. Countries should add appropriate category/ies to questionnaires based on services available.
Broadband (download speed equal to or greater than 256 Kbit/s, in one or both directions)	Digital subscriber line (DSL). DSL is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines. There are different types of DSL classified according to their upstream and downstream bandwidths (such as ADSL, SDSL, RADSL, SHDSL , VDSL, HDSL), but they are all referred to in general as DSL or xDSL.
	Cable modem. A cable modem uses cable TV lines for connecting to the Internet.
	Other broadband includes high speed leased lines, fibre-to-the-home, some mobile phone access (3G and 3.5G), powerline, satellite, fixed wireless, WiMAX etc. Broadband mobile phone access services include Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; High-spped Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA2000 1xEV-DV. Countries should add appropriate category/ies to questionnaires based on services available.

Source: Based on Partnership on Measuring ICT for Development, 2005b.

Example 4. Collection of information about the type of Internet access in Morocco

The Survey for the Collection of ICT Indicators implemented in 2006 by the National Agency for Regulation of the Telecommunications (ANRT) of Morocco offers the following response categories in the questionnaire to the type of access to Internet, based on technology and download speed:

Which are the different types of access to Internet available for your firm?

Narrowband connection
- Classical package
- Forfait package
- Internet package without subscription

ADSL/cable (Kbit/s)
- 128
- 256
- 512
- 1024
- 2048

Digital rented connections (Kbit/s)
- 64
- 128
- 512
- 1024
- 2048

VSAT (Mbit/s)
- 2
- 4
- 8

Mobile connection
- GSM
- GPRS

Other connections

In order to enable compilation of output for the broad categories *narrowband* and *broadband* (which are defined in Box 6 above), the categories of response 'Narrowband connection' and those of 'ADSL/ cable' and 'Digital rented connections' with a speed of less than 256 Kbit/s should be classified as narrowband. The categories 'Mobile connection' and 'Other connections' are probably also narrowband but would ideally be split by narrowband/broadband, especially if they are likely to be statistically significant.

Source: Based on survey questionnaire, ANRT (2006).

Other ICT demand (use) indicators

59. As well as collecting information to produce the core ICT indicators, countries may be interested in information on other aspects of ICT demand, including: the use of mobile phones for business-related activities, current and capital expenditure on ICT, IT security measures and experiences, type and value of goods purchased and sold via e-commerce, and barriers to ICT.

60. The use of mobile phones is increasingly changing the way small businesses in developing countries are conducting their operations, in particular when fixed telephone lines are not available.[15] The potential impact of mobile phones on business performance is therefore gaining increasing attention. Collecting indicators on business mobile phone use is a new

[15] For more information on mobile phone use by businesses, see UNCTAD, 2006 and UNCTAD, 2008 (forthcoming).

area and so far untested by most NSOs. Table 3 offers possible indicators and model questions on business mobile phone use for statistical agencies wishing to include them in their ICT surveys. Mobile phone use indicators and model questions will be further developed as users' needs and mobile services available become clearer. Countries interested in collecting mobile phone indicators may also want to include questions on the use of fixed telephone in businesses, which would allow comparison between the two technologies.

Table 3. Proposed indicators and model questions on mobile phone use in businesses

Code	Indicator	Model question	Notes
M1	Proportion of businesses using a mobile phone	Did your business use a mobile phone during <reference period>?	*Mobile phones* refer to portable telephones subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. Users of both post-paid subscriptions and pre-paid accounts are included.
M2	Proportion of businesses receiving orders via a mobilephone	Did your business receive orders for goods or services (that is, make sales) via a mobile phone during <reference period>?	Mobile phone: as above Orders received include orders received via the mobile phone whether or not payment was made via the mobile phone.
M3	Proportion of businesses placing orders via a mobile phone	Did your business place orders for goods or services (that is, make purchases) via a mobile phone during <reference period>?	Mobile phone: as above Orders placed: as above
M4	Proportion of businesses using a mobile phone by type of activity	For which of the following activities did your business use the mobile phone during <reference period>? Possible response categories - For getting information about goods or services - For sending or receiving email - For accessing the Internet - For accessing banking or other financial services - For interacting with government organizations/ public authorities - For providing customer services - For other information searches - For delivering products over the mobile phone line	Mobile phone: as above

61. The investment in ICT by businesses indicates the effort to update operations of the business sector and can also provide a partial measure of the size of the national ICT market (see Example 5). It is important to recall that in many countries, national policies to foster the use of ICT also provide fiscal benefits to businesses adopting technologies.

Example 5. Measurement of investment in ICT goods and services in the Republic of Moldova

The survey 'Situation regarding the informatisation and availability of computer techniques' carried out by the Department of Statistics of the Republic of Moldova includes a set of quantitative questions on: total expenditure on acquisition of ICT goods (broken down by own budget and governmental grants), investment and current expenditure on ICT projects, purchase and licensing of software, and training of staff in ICT. These values can be aggregated at the firm level and further broken down by economic activity, size of firm and other classification variables recorded on the questionnaire, as well as analysed in relation to the performance of firms, via the linkage of questionnaires from different surveys.

Source: Survey questionnaire, Department of Statistics.

62. IT security measures are included in the OECD and Eurostat 2006 model questionnaires (annexes 2 and 3 respectively) via the inclusion of specific yes/no questions on security measures in place. The OECD model includes the following IT security measures: virus protection software, anti-spyware, firewall, spam filter, secured communication between clients and servers, authentication software or hardware, intrusion detection systems, regular backup of critical data and offsite backup. IT security problems experienced (e.g. virus attacks resulting in loss of data or time) may also be asked about (though businesses may be reluctant to provide information on security breaches).

63. Countries wishing to further explore the extent of e-commerce can ask questions on the type and value of goods purchased or sold via e-commerce. In order to overcome the difficulty of recording exact values, questionnaires could include a question on the percentage of total purchases and/or sales attributable to e-commerce, in intervals (e.g. less than 1 per cent, 1 per cent to 5 per cent, 6 per cent to 10 per cent, 11 per cent to 25 per cent, more than 25 per cent). An alternative that enables aggregation of values for the business sector is to include questions asking for the percentage of value of e-commerce (purchases and/or sales) and the total value of all purchases and/or sales, so that e-commerce values are obtained, at the business level, by multiplication. The resulting values can then be aggregated for the business sector. The OECD model questionnaire also distinguishes the value of physical and digitized products, as well as services ordered on line (but provided off line). The Eurostat 2006 questionnaire asks specifically for a breakdown of value of Internet sales, by country of residence of customers (classified as 'own country', 'other EU countries' and 'rest of the world').

64. The types of indicators described above will not be fully explored in this *Manual*; countries interested in their measurement should refer to existing experiences, such as those of OECD and Eurostat countries and some developing economies with a particular interest in information economy measurement.

Measuring the ICT sector

65. Central to the ICT statistical system is the measurement of the supply side, that is, the ICT sector and its products. This requires the statistical coverage of economic activities such as ICT manufacturing, wholesale trade of ICT goods, telecommunications and computer-related services. As for any other economic activity, key statistical information about the ICT sector requires indicators on production of goods and services, labour force and business performance (income, value added and productivity measures). This

section deals with the statistical definition of the ICT sector and with the relevant core indicators.

66. General business surveys and censuses of manufacturing or service sectors may partly cover the ICT sector, and complementary information can be obtained via the analysis of foreign trade in ICT goods (this is discussed in the following section).

Definition of the ICT sector

67. The definition of the ICT sector used in this *Manual* was established by the OECD's WPIIS. The original definition was agreed in 1998 and based on ISIC Rev. 3. With the revision of ISIC to Rev. 3.1, a refinement to ICT wholesaling was introduced in 2002.

68. In 2006, a WPIIS expert group recommended a revision based on (the then near final) ISIC Rev. 4; the revision was agreed by OECD countries in 2007. An important point to note is that the 2007 definition is different to the 2002 version in respect of the 'guiding principles' used to define the ICT sector. The major change is 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." Both the 2002 and 2006 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).

69. Given that the implementation of ISIC Rev. 4 will take several years for most countries,[16] it is suggested that countries continue to use the 2002 definition (based on ISIC Rev. 3.1) for at least the next 3–4 years. Discussions on whether the latter should be revised to match changes in the OECD's 'guiding principles' have begun in OECD countries.

70. For reasons of practicality described above, this *Manual* will focus on the 2002 definition of the ICT sector. Interested readers will find the 2007 definition in Box 8 below.

71. The principles applied to the 1998 and 2002 definitions of the ICT sector by the OECD were (OECD, 2005):

    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.

72. The ISIC Rev. 3.1 categories comprising the ICT sector (2002) are shown in Box 7 below.

[16] The timetable proposed for countries to adapt national classifications to ISIC Rev. 4 is 2009 and to use it for statistical programmes from 2011. The UNSC has requested that the timeline is reviewed, recognizing the need for flexibility and the desirability of advancing the adoption (UNSC, 2007).

Box 7. The 2002 OECD ICT sector definition (based on ISIC Rev. 3.1)

ICT Manufacturing
- 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
- 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

* The activity of these classes is excluded from the OECD's 2007 definition of the ICT sector (see Box 8).

Source: OECD, 2005 and 2007.

Box 8. 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 trade industries
- 4651 Wholesale of computers, computer peripheral equipment and software
- 4652 Wholesale of electronic and telecommunications equipment and parts

ICT services industries
- 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: OECD, 2007.

73. The United Nations Statistics Division (UNSD) has recognized the OECD ICT sector definitions (both 2002 and 2007) and publishes them as 'alternate structures' of ISIC.[17]

74. In conjunction with its 2006 review of the ICT sector, the OECD defined a *Content and media* sector. Industries included in the sector are: publishing (including music but excluding software); programme activities (motion picture, video and television); sound recording; and programming and broadcasting activities.

[17] The ISIC Rev. 3.1 alternate structure for the ICT sector can be found here: *http://unstats.un.org/unsd/cr/registry/docs/i31_ict.pdf*. The ISIC Rev. 4 alternate structure has been agreed and is expected to be published when the Rev. 4 is released as final.

75. Many countries use national industrial classifications that correspond with ISIC Rev. 3.1. They should establish a definition of the ICT sector based on their national classification, noting that it should be as comparable as possible with the international standard shown in Box 7.

76. It is likely that some countries use national classifications of activities that do not correspond well with ISIC Rev. 3.1, or that the statistics on the ICT sector are based on a business register that does not include an industry code (or at least not at a level of detail enabling identification of all the ISIC classes comprising the ICT sector). In such cases, special efforts should be made by the statistical office to establish the necessary correspondences.[18]

77. The introduction of ISIC Rev. 4 should be taken as an opportunity to update national classifications and classification fields on business registers (or other registers used as population frames for business surveys). The adaptation of international classifications by countries can involve the addition of extra detail in selected areas or the collapse of some categories if certain breakdowns are deemed not to be relevant. In the latter case, care should be taken not to collapse any of the 4-digit categories comprising parts of the ICT sector (for instance, ICT manufacturing). It is proposed that countries adapt national classifications to ISIC Rev. 4 by 2009 at the latest and use it for statistical programmes starting in 2011.[19]

78. To help countries to assess the compliance of a national classification with ISIC (or other international standards), the UNSD has outlined a series of checks which cover compliance with the classification structure and classification principles, comparability of data and use of the national classification in the statistical system (UNSD, 2005).

Core indicators on the ICT sector

79. The core list of ICT indicators recommended by the *Partnership* includes two core indicators on the ICT sector: the proportion of total business sector workforce involved in the ICT sector and the proportion of total value added (see Table 4).

80. In calculating proportions or percentages with respect to the total business sector, a definition based on business activities is recommended in preference to an institutional definition. The business sector, in this case, is defined as ISIC (Rev. 3.1) divisions 10 to 74, excluding 70 (real estate activities[20]), therefore also excluding agriculture, fishing and forestry activities, as well as community, social and personal services.

81. The calculation of value added for a sector is done in the framework of a country's national accounts (in particular the System of National Accounts – SNA93 and its predecessor, SNA68). Value added can be calculated at factor costs, at basic prices or at producers' prices. The numerator and denominator of the indicator should be calculated using the same methodology. The differences between the methods are based on the inclusion of taxes, subsidies on products and production, trade and transport costs and value added taxes (see Table 5 for more detail).

[18] The harmonization of classifications of economic activities goes beyond the scope of this *Manual*.
[19] The UNSC requested the timeline to be reviewed recognizing the need for flexibility and the wish of advancing the adoption at the same time (UNSC, 2007).
[20] It is excluded because a significant proportion of its value added consists of imputed rent of owner-occupied dwellings.

Table 4. Core indicators for the ICT sector

Code	Indicator	Definition	Concepts
ICT1	Proportion of total business sector workforce involved in the ICT sector	The *proportion of total business sector workforce involved in the ICT sector* is calculated by dividing the ICT sector workforce by the total business sector workforce (expressed as a percentage).	*ICT workforce* (or ICT employment) consists of those persons employed in businesses that are classified as belonging to the ICT sector. Total *business workforce* 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. Currently, total headcounts or jobs are used for most countries.
ICT2	Value added in the ICT sector (as a percentage of total business sector value added).	*Value added in the ICT sector* is calculated as the estimated value added of the ICT sector divided by total business sector value added (expressed as a percentage).	*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). See Table 5 below.

Source: Core ICT Indicators, Partnership on Measuring ICT for Development (2005).

Table 5. Valuation of value added

Value added at factor costs + other taxes, less subsidies, on production (1) = Value added at basic prices + taxes less subsidies, on products (2) (not including imports and VAT) = Value added at producers' prices + taxes, less subsidies, on imports + Trade and transport costs + Non-deductible VAT (value added tax) = Value added at market prices (3)	(1). These consist mostly of current taxes (and subsidies) on the labour or capital employed, such as payroll taxes or current taxes on vehicles and buildings. (2). These consist of taxes (and subsidies) payable per unit of some good or service produced, such as turnover taxes and excise duties. (3). Market prices are those that purchasers pay for the goods and services they acquire or use, excluding deductible VAT. The term is usually used in the context of aggregates such as GDP, whereas purchaser prices refer to the individual transactions.

Source: Partnership on Measuring ICT for Development (2005b), based on concepts outlined in both the 1968 and 1993 versions of the System of National Accounts (SNA68 and SNA93).

Measuring trade in ICT goods

82. The ICT goods classification used in this *Manual* was developed by the OECD's WPIIS and released in late 2003. As for the ICT sector, the classification of ICT goods is based on an existing international statistical classification, in this case, the WCO's Harmonized System (HS) for trade statistics (1996 and 2002 versions). The list is available in the OECD's *Guide to Measuring the Information Society* (2005) and is shown at Annex 6.

83. Note that, in late 2007, the OECD expects to finalize a classification of ICT products based on the UN's 2007 Central Product Classification (CPC) Ver. 2. However, like the 2007 ISIC, it is expected that it will be some time before most countries are using the revised CPC. It is therefore recommended that the 2003 version of the goods classification be used for the next few years.

84. WPIIS developed the 2003 classification in accordance with the guiding principle that ICT goods "must either be intended to fulfil the function of information processing and communication by electronic means, including transmission and display, or use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process".

85. The OECD aggregates detailed HS categories for ICT goods into five broad categories for output purposes, as follows:

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

86. The *Partnership* core ICT indicators on trade are *imports* and *exports of ICT goods* expressed as a percentage of *total imports* or *exports*, as described in Table 6 below.

Table 6. Core indicators on trade in ICT goods

Code	Indicator	Definition	Concepts
ICT3	ICT goods imports as a percentage of total imports	ICT3 is calculated as the quotient of the value of imports of all ICT goods divided by the total value of imports (expressed as a percentage).	*ICT goods* are defined by the OECD's ICT goods classification in terms of the 1996 and 2002 HS classification (see Annex 6). Other concepts are per the *UN COMTRADE* database e.g. re-exports and re-imports are not netted out, and data are presented in US dollars (converted by the UN from country currencies).
ICT4	ICT goods exports as a percentage of total exports	ICT4 is calculated as the quotient of the value of exports of all ICT goods divided by the total value of exports (expressed as a percentage).	

87. The usual data source for indicators ICT3 and ICT4 is foreign trade data, which are usually compiled by national customs authorities in collaboration with statistical offices. A high level of harmonization has been achieved in international statistics on foreign trade, which has allowed the production and maintenance of harmonized databases such as the *UN COMTRADE* database.[21]

88. In order to produce the core indicators on trade in ICT goods, countries should investigate the availability of suitable classifications of goods by their customs authority, and establish cooperative procedures between this institution and the NSO. Countries that use national classifications of goods not compatible with the WCO's Harmonized System should establish the necessary correspondence tables (it is, of course, recommended that countries adopt international standards in classifications wherever possible).

89. Statistics on trade in ICT services are also very important. Many ICT services exports, such as those of computer-related services, are growing strongly in some developing economies (UNCTAD, 2006). An OECD definition of ICT services based on the CPC Ver. 2 (2007) was agreed in 2006 (see OECD, 2007). However, the CPC classification is not used to capture trade in services statistics, which are mainly estimated using the IMF's BOP classification. The latter is too broad to capture ICT services trade, which is therefore not covered by the *Partnership*'s core indicators.

[21] See *http://unstats.un.org/unsd/comtrade/default.aspx*.

CHAPTER 5

Data sources and data collection methods

90. This chapter describes and compares potential sources of ICT statistics and explores various data collection methodologies. The major ICT data sources covered by the chapter are:

- Administrative data (such as, telecommunications regulatory information and customs data) and business registers;
- Ongoing economic surveys and censuses which may collect a small amount of ICT use data and often cover at least some of the ICT sector; and
- Stand-alone ICT surveys and substantial ICT modules included in other surveys.

91. Administrative sources and ongoing collections can be useful but are unlikely to completely satisfy policymakers' needs (or deliver all of the core ICT indicators). This leaves stand-alone ICT collections or substantial ICT modules included in 'host' survey vehicles as the main sources of business ICT data (especially for the demand side). The choice of a particular source or survey vehicle for the collection of business ICT data should take into account international practices and standards, as well as national specificities (such as the functioning of the national statistical system), the needs of policymakers, and available technical and financial resources.

92. The data collection methodologies presented in this chapter are based on country practices (in OECD countries as well as in developing economies) and on best practice recommendations that are broadly applicable to business statistics. A number of data collection methodologies are described and compared in terms of cost and effectiveness, from a development point of view. They include face-to-face interviews, personal telephone interviews, questionnaires sent by ordinary mail or forms posted on web pages. Countries' practices depend very much on the costs (of interviewers, transports and communication) and the existing infrastructure (call centres, regional or municipal offices, etc.).

Sources for business ICT use data

93. There are various data sources used by countries that compile data on business use of ICT (see Example 6). They include administrative sources, business registers, questions or modules in host survey vehicles, as well as stand-alone data collections.

Example 6. Types of sources for indicators on the use of ICT by businesses: country examples

The stocktaking exercise on methods and sources for ICT indicators carried out for the WSIS meeting in Tunis (November 2005) identified the following types of sources for indicators on the use of ICT by businesses in African countries: economic censuses (Mauritius, Zimbabwe), general enterprise surveys (Rwanda), stand-alone ICT business surveys (Morocco, Tunisia, Benin, Madagascar) and information collected from the suppliers of ICT (Senegal, United Republic of Tanzania). In Central Asia and the Caucasus, the identified sources included general enterprise surveys (Kyrgyzstan) and stand-alone ICT surveys (Armenia, Kazakhstan).

Source: Partnership on Measuring ICT for Development (2005).

94. These sources do not have equal potential for producing data on the use of ICT by businesses. The appropriateness of each source is largely determined by the balance between the type of information sought (reflecting users' needs) and available resources. Table 7 presents different sources, the indicators for which they are likely to be most suited, and indications of their relative cost.

Table 7. Statistical sources for the collection of indicators on the use of ICT by businesses

Type of source	Indicators that may be collected	Indication of costs
Administrative sources	Limited number of indicators on the availability of basic ICT infrastructure	Not expensive (by-product of administrative activities)
Statistical business registers	Limited number of indicators on the availability of basic ICT infrastructure with selected breakdowns (size, sector)	Medium cost (for establishment and maintenance)
Module or questions on ICT embedded in existing sample surveys or censuses (these are often economic surveys, such as those of the manufacturing sector)	Indicators on the availability of basic ICT infrastructure with selected breakdowns (size, sector). Generally limited number of indicators on use of ICT.	Mainly only marginal costs with respect to the cost of the survey to which it is attached.
Stand-alone ICT survey	Indicators on the availability of basic ICT infrastructure with selected breakdowns (size, sector) Indicators on use of ICT Indicators on barriers to the use of ICT Indicators on costs, value of investments, etc.	High cost for design, data collection (which could include fieldwork) and processing.

95. It should be noted that official business surveys are routinely carried out in most developing economies but that total resources for statistical production are often scarce. Even so, it is unlikely that business ICT use statistics can be produced efficiently outside the national statistical system. In particular, one-off surveys by unofficial agencies are unlikely to be efficient or sustainable over time. They should therefore be avoided and donor organizations that support the strengthening of statistical systems need to be wary of devoting resources to such surveys. The preferred alternative is that business ICT use surveys are included in national statistical programmes.

Administrative sources

96. In some countries, suppliers of ICT services (such as fixed and mobile telephone, and the Internet) compile information about their clients' businesses and supply such information to government regulatory bodies. As a by-product of this regulatory activity, it is possible to produce statistical information on access[22] to ICT by businesses at a low cost.

[22] There is usually a distinction drawn between ICT access and ICT use. The former is whether entities have access to an ICT, and the latter is whether they actually use it. For businesses, the distinction is less important than it is for households. Surveys of business use of ICT tend to measure only use of ICT, whereas household surveys measure access (by the household) and use (by individuals of that household).

However,the indicators that can be produced this way are likely to be limited in number and in other ways as well. For instance, they will usually be restricted in scope to legal entities that have contracted particular ICT services and such entities may not correspond exactly to a business as defined statistically. Additionally, unless the necessary information is required for the contracts, disaggregation by business size or industry is not possible.

97. In many countries, even this source of administrative information will not be available as ICT service providers do not distinguish business from household subscribers and so cannot provide data on business access to ICT.

98. In summary, administrative sources will usually be insufficient for collecting data on use of ICT by businesses.

Statistical business registers

99. Business registers or directories are a key element of the statistical infrastructure of most NSOs. Their role is to maintain an updated record of a country's businesses (usually enterprises and their establishments), with information on the location, contact details and other characteristics such as industry and size. Business registers are used in the statistical process for the compilation of business demographic data and to generate population frames for business surveys. Most NSOs regularly update their business registers using administrative sources, such as tax or social security registers, and through their own statistical operations.

100. The main advantages of using a business register as a source to produce statistical indicators (besides its use as a population frame from which to draw samples) are that:

- Indicators can be quickly aggregated (no fieldwork is required); and
- The marginal cost of statistical production is very low.

101. The main disadvantage is that the number of indicators on the use of ICT that can be produced from statistical business registers is generally limited to basic indicators on the presence of certain technologies such as telephone (fixed and mobile), computers or the presence of email or a website (which may be present for contact purposes). Such indicators will only be feasible, of course, if the business register contains high-quality (complete and updated) information.

102. Administrative sources that are used to update a NSO's business register are usually good for identifying new businesses but less effective at detecting businesses that disappear from the population. The problem of having a high rate of "dormant businesses" (or "dead units") is generally more severe for small businesses.

103. In developing economies, the importance of the informal sector implies that a big share of economic activity occurs outside the administrative framework (for example, activities of retail trade without licensing or tax control). The economic agents involved will usually be excluded from business registers.

104. Coverage problems such as those described above can produce biases in statistical data - for example, underestimation of the total number of businesses (if there is a large share of informal activity) or overestimation (if there is a large proportion of dormant businesses; see Example 7). Developing economies are often faced with both situations.

Example 7. Activity ratios as a measure of quality of business registers in the Western Balkans

The ratio of active to registered firms can provide a measure of the quality of administrative business registers and their suitability for use as population frames for statistical surveys. The activity of firms can be monitored by investigating administrative files that record compulsory activities, such as paying taxes, social security or pension contributions for employees. According to recent statistics, the ratio of active to registered firms in Western Balkan countries is around 40 per cent: Albania (37 per cent in 2004), Croatia (42 per cent in 2004) and Montenegro (38 per cent in 2005). That means that, for those countries, around 60 per cent of units included in the business register are dormant or no longer exist. Surveys that are selected from the register will therefore be inefficient and also suffer from a low response rate (because inactive businesses are unlikely to respond). Resulting estimates are therefore likely to suffer from significant non-response bias (as well as having relatively large standard errors).

Source: Statistical institutes and agencies for small and medium businesses of the countries mentioned.

Economic censuses

105. Economic censuses are exhaustive surveys of the business sector (or parts of it), the objective of which is to collect statistical information from all in-scope businesses in a country. In some countries, they include also the economic activities carried out by households. They are often used to construct population frames for sample surveys.

106. Because of exhaustiveness, economic censuses have a very high cost, due to the cost of collection (which may require a detailed cartography of the country), and therefore, their periodicity is usually very low (5 or 10 years). This makes them inadequate for continuous monitoring of fast-growing phenomena such as Internet access.

107. Countries that have used censuses to investigate the use of ICT have included some questions on the availability of certain technologies in the business (e.g. telephone, fax, computer). However, the number of questions that can generally be included in a census questionnaire is necessarily limited (see Example 8).

108. Because of the limitation on the number of ICT questions that can be included and their low periodicity, economic censuses are not generally well suited to monitoring ICT use by businesses.

Example 8. Use of economic censuses for the collection of ICT indicators: country examples

Countries such as Oman, Qatar and Egypt have included questions on the use of ICT in their economic censuses. Egypt conducted an exhaustive survey of establishments and recorded the presence of fixed telephone, mobile telephone, computers and access to the Internet.

The General Statistics Office of Vietnam introduced several questions on access to ICT by businesses in the Establishment Census of 2002. The establishments recorded the presence of PCs, of a website, the existence of e-commerce activities, and the number of PCs connected to LAN and to the Internet. These indicators may be broken down by different classification variables such as industry, size, type of establishment (headquarters, branches, etc.), detailed geographical level and by any other variable recorded in the Census.

Source: Partnership on Measuring ICT for Development (2005) and General Statistical Office of Vietnam (data disseminated on 01/07/2002) *http://www.gso.gov.vn/.*

Modules and stand-alone surveys on the use of ICT by businesses

109. Collecting data from businesses is usually a costly task that has to be undertaken to the highest technical standards to ensure quality of collected data (and resulting aggregates). The effectiveness and efficiency of a data collection system can be assessed from the viewpoints of different actors in the statistical system, namely data producers, data providers and data users:

- Data producers are interested in obtaining high quality data at the lowest cost and in the shortest possible time. Data collection costs include outlays for preparation of collection instruments (usually, questionnaires), training interviewers and other staff, and the costs of collecting and capturing data; beyond the data collection phases, there are additional costs for data processing and dissemination;

- Data providers (respondents) wish to minimize the burden of data collection in terms of their costs and time (for gathering requested data and completing questionnaires, see Example 9), and

- From the data users' point of view, a data collection system will be satisfactory if it ultimately provides relevant and reliable information, in an accessible way and in a timely manner.

Example 9. Measurement of response burden in the ICT survey in Kazakhstan

The 2006 pilot survey on electronic commerce carried out in the Republic of Kazakhstan routinely recorded the time needed by respondents to fill in a self-administered questionnaire, via a question with closed answers in the form of time intervals: less than 1 hour, 1 to 4 hours, 4 to 8 hours, 8 to 40 hours and more than 40 hours. The intervals are the same as those used in other Kazakhstan business surveys. This information allows comparison of the difficulty of completing the questionnaire on e-commerce with other business surveys.

Source: Survey questionnaire, Agency for Statistics of the Republic of Kazakhstan.

110. Respondents' and users' needs should always be considered when choosing a survey vehicle and data collection methods. Mechanisms for consultation with respondents and users are described in Chapter 9.

111. There are several possibilities for data collection techniques: face-to-face interviews, mailed questionnaires, telephone-assisted interviews, computer-assisted interviews, or a combination of these. Country practice depends very much on the costs (of interviewers, transport and communication), and the existing infrastructure (call centres, regional or municipal offices, reliable business register etc.). Advantages and drawbacks of each method from the developing country perspective, together with quality controls that can be applied to data collection, are reviewed later in this chapter.

112. The majority of OECD countries, as well as many developing countries, have collected data from businesses on the use of ICT through questions included in current business surveys (hereafter referred to as 'modules on the use of ICT') or through stand-alone surveys on the topic. The choice of one or other approach is related to several factors, including policy needs for information on use of ICT by businesses, and the resources and organization of the statistical system.

113. Developing economies may not be able to afford stand-alone surveys on ICT and instead may prefer to include questions in existing surveys that also include background information such as employment and industry. This can also be a useful way to estimate statistical parameters that may be needed later in the design of stand-alone surveys (this is explained in detail in Chapter 7).

114. Stand-alone ICT use surveys are generally necessary for countries that are interested in investigating more sophisticated ICT applications (such as e-business, e-commerce and IT security measures). The decision to carry out a stand-alone ICT survey should take into consideration the inclusion of such a survey in the current national statistical programme (the work programme of surveys, censuses and other statistical operations implemented by the public authorities in a country and usually established by a legal act). This aspect is examined in part C (Institutional issues).

115. The next two sections discuss statistical issues relevant to modules on the use of ICT and stand-alone ICT surveys. Chapter 6 provides further guidance on the design of a module to be embedded in an existing survey by providing model questions to collect the data needed for the production of the core indicators. This is the option that will generally be chosen by developing economies that are starting to collect ICT data in order to produce the core ICT use indicators.

Modules on the use of ICT

116. Many countries regularly carry out statistical surveys with the objective of investigating industry sectors of importance to their economy. Surveys on the manufacturing or trade sectors are two common examples for many developing economies. The maintenance of comparable statistical time-series is favoured by the use of the same or similar questions over several years. However, the introduction of new questions to the questionnaire enables a NSO to be responsive to new information needs, and to relate the newly introduced variables to the ones that are already investigated. Thus, the inclusion of specific modules in existing business surveys is a practice followed by many countries in order to study new interest areas, such as the use of ICT by businesses.

117. The decision to include a module on the use of ICT in an existing survey has to take into account:

- The information needs that can be satisfied with such a module (variables that can be included and variables in the survey vehicle that can be used for analysing ICT data). If the survey vehicle records classification variables such as industry and size, it will be possible to break down ICT indicators by these classificatory variables (see Example 10) and

- The methodology of the candidate survey vehicle in terms of population scope and coverage, periodicity, sample size and distribution. Data collected via the module will reflect the statistical characteristics of the survey vehicle (population frame used, sampling method, factors to weight the observations, collection and processing methods etc.). This may be a significant disadvantage if, for instance, the scope of the survey vehicle is narrower than that recommended for the ICT use core indicators, or the sample size is too small, leading to large sampling errors.

Example 10. Inclusion of questions on ICT in the Manufacturing Survey in Thailand

In Thailand, the inclusion of questions on the use of ICT in the questionnaire of the Manufacturing Survey of 2003 (which records economic and financial information about establishments), has enabled a research programme assessing the impact of ICT on productivity. Econometric models that include ICT variables (such as presence of computers and proportion of employees with access to computers) as explanatory variables for productivity measures can be estimated and interpreted in terms of gains in productivity due to the use of ICT (based on Cobb-Douglas-type models).

The ICT indicators for Thailand reflect the sample design of the Manufacturing Survey – the survey vehicle – which is a stratified random sample, where strata are defined by ISIC classes (4-digit level) and size (12 intervals defined in terms of number of employees). The questions on the use of ICT were included in a section on general information about the establishment (legal form, form of economic organization, registered capital, foreign investment, exporting and importing behaviour).

The questions are presented as yes/no questions or multiple choice questions and filters, as follows:

In 2002, did this establishment use a computer? (yes/no)
If yes, please fill in total number of computers: _____
Number of persons using a computer: _____

In 2002, did this establishment have access to the Internet? (yes/no)
If yes, how did this establishment access the Internet? (circle one or more choices):
- ISP subscriber
- Internet café
- Internet package
- Others (specify)

Which of the following Internet activities did this establishment use? (circle one or more choices)
- Email
- Information searches
- Shopping
- Business promotion such as advertising on website
- Others (specify)

In 2002, did this establishment have a web site presence? (yes/no)
If yes, please fill in:
Primary URL _____
Activities or services on website:
- Advertising of own business (yes/no)
- Selling goods and services (yes/no)

A total of 10 ICT questions are included on the questionnaire though several are answered only if the preceding filter questions are positive.

Source: Questionnaire on the Thai Manufacturing Survey, 2003, National Statistical Office of Thailand.

118. Candidate survey vehicles that have been selected in different countries include:

- *Economy-wide business surveys*: the coverage of all economic sectors allows investigation of the use of ICT in different industries. These surveys are generally carried out to monitor the productive sector and have secondary uses such as the preparation of input-output tables and national accounts. Some countries carry out exhaustive economy-wide surveys (censuses) but the frequency is generally low;

- *Surveys on the Manufacturing Sector*: are implemented in the majority of countries. Some countries further investigate specific manufacturing industries for their relevance to the economy;

- *Surveys on the Services Sector*: in many developing economies, the service sector is investigated via a series of service industry surveys. Important service industries include: wholesale trade, transport and communications, tourism, and financial services, and

- *Innovation and Research and Experimental Development (R&D) surveys*: many countries have implemented stand-alone R&D or innovation surveys to understand the technological behaviour of businesses (see Example 11). The OECD and Eurostat have developed methodologies (described in the *Oslo* and *Frascati Manuals*) and a *Manual* for developing economies (the *Bogotá Manual*) has been prepared and is applied principally in Latin American countries. These surveys can be well suited to the inclusion of a module on ICT use, since the adoption of technology is often associated with innovative processes, especially in developing economies.

Example 11. ICT questions in the Survey on Technological Behaviour of Industrial Businesses, Argentina

The 'Survey on Technological Behaviour of Industrial Businesses' has been carried out by the National Statistical Institute of Argentina (INDEC) since 1993, in response to the information needs of the Federal Ministry of Science and Technology. It uses a methodology based on the OECD/Eurostat *Oslo Manual*.

The survey was enlarged in 2004 to include a module on the use of ICT and thereafter called the 'National Business Survey on Innovation, R&D and ICT'. The module on ICT was designed to produce indicators on the presence of computers, access to the Internet, presence of a website and of an intranet, proportion of employees with access to ICT, and purposes of use of the Internet (including receiving orders). Because ICT questions are included in the Innovation Survey, ICT indicators can be broken down by innovative behaviour of the firm, as well as by other classifications.

Source: Workshop on Measuring the Information Society in Latin America and the Caribbean, Panama (November, 2006).

119. Once an existing business survey has been chosen to serve as vehicle for an ICT module, the focus should be on the design of the module itself (wording of questions and definitions to be used). The sample design may boost the sample size in certain sectors and size classes in order to obtain more reliable estimates. It is important to recall that the methodological recommendations for the design of a stand-alone ICT use survey also apply to modules, in particular, those related to the requirement for a quality business register, definitions of statistical units and use of relevant industry classifications. However, control over the methodology of the survey vehicle may be limited.

120. Where modules on the use of ICT are implemented by developing economies, they generally include a small number of questions in order to limit costs and response burden. In terms of size, they generally consist of 10 to 20 ICT-related variables (see Example 10).

121. The cost of collecting ICT data via modules is generally marginal to that of the survey vehicle, since the most important part of the survey cost is usually for data collection (including fieldwork, where relevant). In addition, the staff involved in data collection and processing are already trained and will require only complementary training on ICT questions. For countries with severe budgetary restrictions, the inclusion of a module should be more cost-efficient than the implementation of a stand-alone ICT survey of businesses (though this will depend on factors such as the size of the survey vehicle and the complexity of the ICT module).

122. The design of the module itself consists of choosing a limited number of relevant questions that can be easily interpreted by respondents. Suggested model questions to collect the necessary data for the production of the core ICT indicators are provided in Chapter 6.

Stand-alone surveys

123. Stand-alone surveys on ICT allow collection of significantly more information than modules in other surveys. Stand-alone surveys are especially designed to collect information on different topics of interest in the measure of ICT use by businesses, such as access to ICT, purposes of use, e-commerce, security, skills, etc. that usually go beyond the possibilities of a module embedded in an existing business survey.

124. A number of developing economies have implemented stand-alone ICT surveys of the business sector (see examples 12 and 13). These countries have relatively widespread access to ICT in comparison with other countries of their region or have an economy increasingly based on ICT. In general, in countries that have carried out stand-alone ICT surveys, there is a high demand for business ICT indicators from policymakers, the market and society.

Example 12. The Survey on Information Technology Usage and Penetration in Hong Kong, China

The Census and Statistics Department of Hong Kong, China (C&SD) conducts an annual *Survey on Information Technology Usage and Penetration in the Business Sector*. Apart from questions on computer and Internet usage, presence and use of a website and e-commerce, it includes items on the IT budget, IT security and use of wireless and mobile technologies, services and applications.
C&SD also measures the ICT sector, with a stand-alone *Manpower Survey of the IT Sector* and compilation of ICT sector statistics from annual economic survey data.

Source: Leung (2004).

125. In some cases, the surveys have been carried out by organizations outside the statistical system and are usually linked with ICT policymaking institutions. There is a risk in carrying out stand-alone ICT surveys outside the national statistical system, due to the limitations on the use of key statistical infrastructure such as business registers, data collection systems (call centres, trained interviewers in regional or municipal offices, etc.), sampling methodology and the possibility that methodologies are not harmonized with those of the national statistical system (which are usually linked to international statistical standards).

126. The coordination of stand-alone surveys on ICT use by businesses with other ongoing or planned work of the national statistical system must be considered from at least two perspectives:

- The first is related to the use of common methodologies. Methodological coordination with existing *business* surveys requires using coherent definitions of statistical units (enterprise, establishment, business, etc.), classifications (such as industry breakdowns) and common concepts (e.g. for income). Such harmonization will often enable comparison of results on ICT use with those of other surveys (for example, those investigating production, financial results, labour costs, etc.).

- The second is related to minimizing the response burden of businesses participating in a large number of surveys. In some countries, the business sector is very intensively surveyed by public and private organizations, and the response burden can be overwhelming. In particular, large businesses are usually included exhaustively (i.e. without sampling) in surveys, thereby having a large number of questionnaires to answer. In addition, some strata may contain a small number of businesses that are therefore relatively intensively surveyed (such as businesses in the telecommunications sector).

127. In relation to methodological coordination, a key issue is the use of comparable business registers from which samples are drawn. For instance, the implementation of stand-alone surveys based on a sample of businesses drawn from commercial directories (e.g. telephone directories such as 'yellow pages') and not statistical business registers can make it impossible to obtain breakdowns comparable to those that would be obtained by using a statistical business register that uses consistent unit concepts and classifies units to the national classification of economic activities.

Example 13. Design of a stand-alone survey on the use of ICT by Brazilian enterprises

In 2005 and 2006, the Brazilian Internet Steering Committee (a private institution that regulates Internet names and IP addresses) carried out stand-alone surveys on the use of ICT by Brazilian enterprises.

Quotas for the sample were calculated from the social security register (RAIS, Relaçao Annual de Informaçoes Sociais) of the Ministry of Labor which includes information about the industry of firms based on the National Classification of Economic Activities (CNAE) that is approved by the National Commission of Classifications, officially adopted by the National Statistical System, and based on the international standard, ISIC.

The questionnaire is based on the OECD and Eurostat questionnaires, and data were collected from a sample of 2,700 enterprises (in 2006) by telephone interviews with the person in the business responsible for ICT. The questionnaire includes items organized in modules that allow collection of information on ICT usage (module A), Internet usage (module B), E-commerce (module C), E-government (module D), E-security (module E) and E-skills (module F), altogether totalling 46 questions in 2005 and 55 in 2006.

The increase in the number of questions is due to adding items on adoption of ERP and CRM systems, of Linux software, on restrictions to use by employees and on skills and training of ICT specialists and other employees. Questions on e-commerce via external computer networks other than the Internet were suppressed. Some questions were simplified, such as the types of access to the Internet, in order to allow for classification into narrowband, fixed broadband and mobile broadband.

Source: Country presentation at the Third Workshop on Measuring the Information Society in Latin America and the Caribbean, Panama (November 2006).

128. Methodological coordination (between surveys and countries) requires using comparable definitions for concepts. In particular, for the calculation of the core indicators on the use of ICT by businesses, it is necessary that surveys adopt the same definition of a business (see Chapter 4) and of an employee (the definition proposed for the indicators *proportion of employees using computers* and *the Internet* includes all persons employed by the business (including working proprietors and employees)).[23]

129. Finally, coordination with existing business surveys is important if, for research purposes, it is required to link data at micro-level (i.e. at the individual business level) in order to analyse the relationship between ICT and other variables, such as those related to performance (labour productivity, value added, etc.). It is of the utmost importance that the confidentiality of individual business information be guaranteed and, if the survey on ICT use is not carried out by the statistical office, that the necessary legal arrangements be made according to national statistical legislation.

130. Ideally, stand-alone ICT surveys would be based on representative samples of the business sector, requiring a sample size that allows for estimation with sufficient precision. Logically, stand-alone surveys usually incur higher costs than modules included in an

[23] The ILO definition of an employed person is anyone who worked for remuneration or was self-employed or was a family worker for at least one hour in the one-week reference period. Also, persons formally having a job and not having performed that job only temporarily within the reference period are considered employed. In countries with a large informal sector, there is an interest in defining employees in the informal sector according to the recommendations of the International Conference of Labour Statisticians (*www.ilo.org/public/english/bureau/stat/download/guidelines/defempl.pdf*).

existing survey, since they require a specific design, dedicated fieldwork with specialized training for the interviewers (if used), independent data processing and dissemination.

131. It is important to recall that, in order to effectively monitor the rapid changes in the information economy, surveys should be conducted reasonably frequently. This will allow the compilation of time series. One-off ICT surveys may quickly lose their relevance and should be avoided due to high costs relative to the validity of results over time. International donors should consider the national statistical programme before funding such surveys, particularly because their sustainability cannot be guaranteed.

Surveys of the ICT sector and ICT trade data

132. In Chapter 4, the ICT sector was defined in terms of the international classification, ISIC (Rev. 3.1). It includes classes in the manufacturing sector, as well as ICT services. Accordingly, surveys of the manufacturing and service sectors will partially cover the ICT sector and may provide useful data if the level of detail is sufficient (noting that much of the ICT sector is defined in terms of 4-digit ISIC classes). Data that are collected in other industry surveys are also useful for the ICT sector. They include the number of enterprises and establishments, turnover and production, value added, labour force information, wages and salaries, capital expenditure, expenditure on R&D and innovation.

133. The level of detail to which the ICT sector is defined may present challenges in terms of sample size for economy-wide surveys, or even surveys covering the whole manufacturing or service sectors (economic censuses would not present this problem). NSOs with a high demand for indicators on the ICT sector may therefore consider the possibility of increasing the sample size in some classes, or running a stand-alone survey of the ICT sector (see Example 14).

Example 14. Statistics on the ICT sector in Hong Kong, China

The coverage of the information technology and telecommunications (IT&T) sector in Hong Kong is defined per the OECD definition of the ICT sector, with local adaptations. The Hong Kong Standard Industrial Classification (HSIC) is used to demarcate the IT&T sector, which covers establishments engaged in the manufacturing, distribution, installation and maintenance of IT&T products, and provision of IT&T services. Statistics on the characteristics of the IT&T sector have been collected in a series of annual economic surveys, recording the number of establishments, persons employed, vacancies, business receipts and value added.

Source: Presentation to the 2004 Asia Pacific Technical Meeting on ICT statistics (Wellington, New Zealand, 2004).

134. Some countries conduct sectoral trade surveys that may cover the wholesale trade of computers, peripheral equipment and software, as well as electronic and telecommunications parts and equipment (classes 5151 and 5152 of ISIC Rev. 3.1). Statistical offices may consider increasing the sample size for these classes in trade surveys.

135. It may be possible to improve coverage of the ICT sector by collaborating with industry associations to identify ICT sector businesses. Further refinement of the classification of these businesses may be obtained by cross-checking with statistical directories and business registers. In some countries, there is a separate register for ICT businesses that helps to define the in-scope population.

136. In the questionnaire for the ICT sector survey, businesses may be asked a question on their activities or be invited to self-classify their activities. This enables exclusion of businesses that are not part of the ICT sector as internationally defined and better

classification of those which are. Questions on products offered by the business may also be of help in establishing the correct industry (using a correspondence between products and industries, such as the existing correspondence between the Central Product Classification, CPC, and ISIC[24]).

137. A particularly good administrative source for ICT trade data are foreign trade registers, which are managed by customs authorities and are often used as a source to compile trade statistics – either by these institutions or by statistical offices. The regulations for declaring import and export transactions depend on national legislation, but there are international standards for compiling foreign trade statistics that are widely used, such as the classification of goods based on the HS. Data on exports and imports of ICT goods can easily be compiled using the 2003 OECD definition of ICT goods as it is based on the HS (1996 and 2002).

Data collection methods and quality control

Data collection methods

138. There are several methods of data collection according to the nature of the contact between the data provider (respondent) and the data producer (statistical office). They are personal (face-to-face) interviews, personal telephone interviews, questionnaires sent by ordinary mail or forms posted on web pages. Combinations of the different data collection methods are also used in some countries, in order to select the most suitable method of contact for different kinds of businesses.

139. Table 8 below describes the relative advantages and disadvantages of each data collection method. In developing economies, the selection of data collection method should take into account the transport and communications infrastructure of the country, including:

- Density and quality of roads and railways (especially if interviewers have to cover rural areas);
- Efficiency of the postal service (in particular in rural areas);
- Easy identification and accuracy of postal addresses, and
- Density of the telephone network.

140. Usually, the best approach is to have a mix of techniques, according to the location of businesses (urban/rural), their size and their industry.

141. For surveys on ICT use by businesses (be they modules of business surveys or stand-alone surveys), the use of a combination of personal and telephone interviews may be the best option. The relative novelty of ICT (and ICT surveys) often necessitates helping respondents to provide accurate answers, and this is largely provided by interviewers and written instructions. Telephone interviews can complement a data collection, particularly with requests to complete missing data. Before choosing a particular data collection method, pilot tests to measure the time needed to complete the questionnaire and the understandability of questions should be carried out on a small sample of businesses from a variety of industries and size classes.

[24] Available at the United Nations Statistical Division website on international economic and social classifications (*http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=17&Lg=1*).

Table 8. Data collection methods

Method	Main advantages	Main disadvantages
Face-to-face personal interview	This is the most direct method of collecting information. It facilitates direct interaction of the interviewer and the interviewee, allowing checking and follow-up questions. An interviewer can also assist respondents to answer complex questions and can clarify concepts such as definitions of particular ICTs. Because the interviewer is in view, s/he can use visual prompts such as prompt cards. In addition, face-to-face interviews are especially useful for questions about opinions or impressions, and for surveys that take a long time to complete. The technique usually produces lower non-response rates. Data collection can be managed efficiently with specific software (Computer Assisted Personal Interviewing – CAPI, see below).	Interviewers are part of the measurement tool and they can induce important biases if they have not received suitable training. High personnel costs may be incurred (for hiring and training interviewers). However, this could be a minor issue in developing economies where salaries of interviewers are low, or agreements are reached with certain institutions to provide part-time interviewers (such as university students). In developing economies with poor quality transport infrastructure, reaching businesses located in some country areas may prove difficult.
Telephone personal interview	Although to a lesser extent than the face-to-face personal interview, telephone interviewing allows direct interaction between the interviewer and interviewee. It is a fast and relatively inexpensive way to collect information, since a small number of interviewers from a single call centre can carry out a great number of interviews. The data collection can be managed efficiently with specific software (Computer Assisted Telephoning Interviewing – CATI, see below).	Correct and comprehensive telephone numbers may not be available, particularly in developing economies where mobile telephony may be more common than fixed telephone. Interviews must be relatively short, since a long telephone conversation can be perceived as an annoyance. Some people also feel that it is intrusive to be interviewed by telephone. Telephone interviews may not be suitable for collecting quantitative information, for which the interviewee may have to check business records. The non-response rate is usually larger than for face-to-face interviews (but lower than for mail-based surveys).
Interview assisted by computer (CAPI/ CATI)	CAPI and CATI systems can eliminate errors of flow and data consistency, and can thus improve input data quality and reduce the time for data capture and validation. Questionnaires can possibly be customized based on available information about the business. Modern IT equipment such as PDAs may present a cheap and comfortable tool for data collection.	CAPI and CATI techniques require interviewers with some technical skills. CAPI and CATI systems are usually based on commercial software that may be costly. Skilled staff are required to adapt the software to the questionnaire. CAPI requires that interviewers carry costly IT equipment, which can be damaged, stolen, etc. during field operations. In developing economies with poor road networks, there is a risk of damaging the equipment.

Method	Main advantages	Main disadvantages
Mail survey	This method is relatively inexpensive and the statistical office can send the same measurement instrument (questionnaire) to a large number of businesses. It allows the respondent to complete the questionnaire at his or her convenience. It eliminates the problem of interviewer bias though note that: interviewer follow-up (e.g. for non-response or inconsistent answers) can potentially introduce bias if not managed properly, and if questionnaires are not properly designed and tested, they can introduce bias to the survey results.	Requires separate data entry unless advanced Optical Character Recognition (OCR) tools are available. It usually suffers from high non-response rates. It is not designed for detailed written responses, but for numerical questions or those that can be answered by selecting a limited list of choices (including yes/no responses). The lack of help from an interviewer can produce information of low quality. It therefore requires clear questions and instructions. Delays in mailing back questionnaires can induce delays in the survey. In developing economies with a low quality postal system, such delays may be prohibitive. Some of the problems inherent to a postal survey can be partially solved by, for instance, use of written or telephone reminders to reduce non-response rates. In addition, data quality can often be improved if a telephone helpline is available.
Electronic survey	With the growth in ICT skills and availability of ICT, possibilities for electronic surveys have increased. Data collection mechanisms can be of several types, but the most common are electronic questionnaires sent by e-mail or posted on web pages that respondents can access. This method has almost all of the advantages of mail surveys, but is usually faster and cheaper. Because respondents complete the questionnaire electronically, manual data entry is not required and edits can be applied at the time of data entry (and resolved by the respondent).	Businesses that can be surveyed this way do not cover the entire business population, in particular in developing economies with low ICT penetration. This will cause either biases in the data, or the necessity of using another method as well (e.g. mail out questionnaires) for data capture. There is an extra need for technology to ensure security and confidentiality of data and for staff with the training and skills to handle the data collection tools. Costs associated with this expertise can offset savings offered by electronic data capture. The technique is in general not suitable to be used as the only channel for collecting data. However, if complemented with other methods, it can be a useful tool.

Quality control of the data collection

142. The quality of the data collected will determine the quality of aggregate ICT indicators, whichever survey vehicle is used. Controls at data entry stage (whether by respondents or interviewers) are more effective than corrections at later stages. In this sense, CAPI or CATI systems enable good quality control, since data collection and entry are simultaneous. Note that controlling for data quality after data capture requires actions that can be costly or introduce bias to the results, for example:

- Re-contacting a business and asking it to respond to, or clarify, questions that were asked perhaps weeks or months before is not always feasible, annoys the respondent and gives a poor image of the statistical office; in addition, it can significantly increase the costs of the operation if the number of re-contacts is high;
- Estimating responses to individual questions that have not been answered, or amending answers which are not valid, can be a complex technical exercise (though should result in unbiased responses if done correctly), and
- Finally, ignoring an incorrect questionnaire, although sometimes the only solution, is an action with consequences, since the effective sample diminishes and bias may be introduced.

143. Although it is impossible to carry out a survey without errors in data collection, there are measures that can be put into practice by statistical offices, which will help to minimize the error rate. Examples of such measures are:

- Establishing good frames that include in-scope businesses and are free of coverage errors such as inactive businesses or erroneous addresses;
- Providing suitable training to interviewers on the questionnaire contents (especially required for complex technical concepts), and on dealing with respondents;
- Preparing questionnaires so that questions are worded in a correct, clear and unambiguous manner, and respondents can perceive a logical flow in the order of questions (especially in self-administered questionnaires);
- Filtering the collected data by a series of controls that are applied at the moment of data capture and in the data entry process; and
- Establishing a policy of incentives and sanctions that encourage the provision of good answers to interviews or questionnaires.

CHAPTER 6

Model questions and questionnaires for measuring ICT use

144. This chapter presents model questions corresponding to the core ICT use indicators that were introduced in Chapter 4. It discusses the structure of modules and questionnaires that could be adapted by countries planning on including an ICT use module in an existing business survey or undertaking a stand-alone survey.

145. The model questions presented in this chapter obviously need to be translated into local languages and adapted for other conditions, such as cultural norms. However, in order to respect international comparability, care must be taken that changes made do not alter the meaning of the questions nor any inherent logic (e.g. the populations to which they refer).

146. A complete model questionnaire for the core ICT use indicators is shown at Annex 1. Countries wishing to go beyond those core indicators are referred to the model questionnaires of the OECD and Eurostat (shown at annexes 2 and 3) and to the suggested model questions on mobile phone use presented in Table 3.

Model questions for a module

147. The inclusion of a module on the use of ICT in existing business surveys ('survey vehicles') is an option that developing economies could consider as an alternative to carrying out stand-alone surveys. The model questions presented in this chapter enable production of the core indicators on ICT use by businesses and have been used by a number of countries that undertake ICT use surveys.[25]

148. The development of a module on the use of ICT consists of choosing a limited number of high priority and measurable topics, selecting appropriate questions and structuring them logically within a module. The module, in turn, should be logically placed within the survey vehicle questionnaire.

149. The ordering of items in a questionnaire is a particularly important issue, as respondents will generally respond better if they perceive a coherent flow of information through the form. In addition, some questions lead to others through logical filters [26](see Example 15).

Example 15. Presentation of a filter question

The question on the proportion (or number) of employees using computers should only be asked if the businesses has a computer(s). Therefore, a logical filter could take the following form:

Question i) Did your business use computer(s) during <reference period>?

Yes ☐ Go to question i+1)

No ☐ Go to question i+2)

Question i+1) What proportion of persons employed in your business routinely used a computer at work during <reference period>? ..... (From 0% to 100%)

Question i+2).....

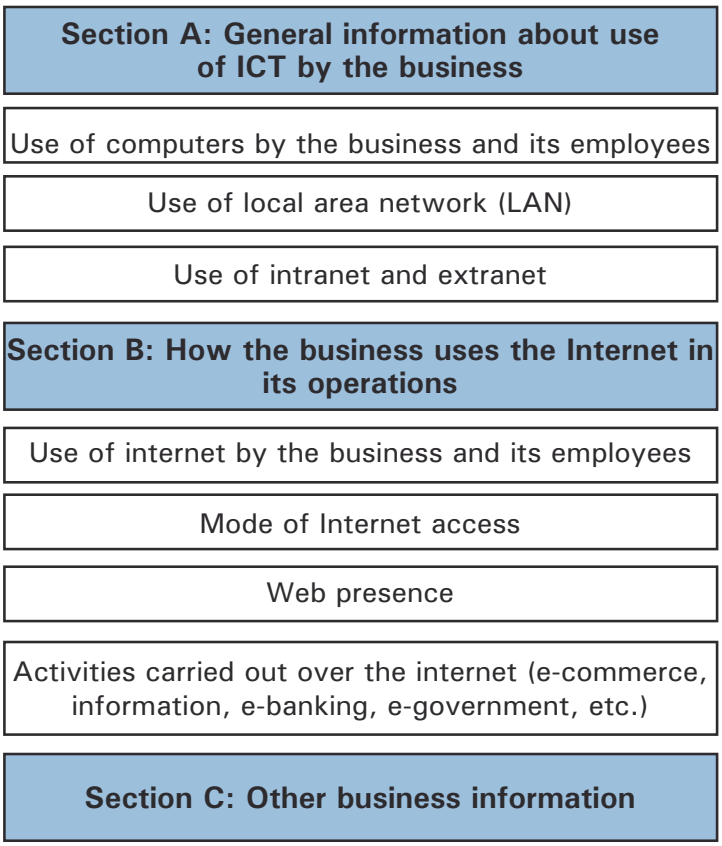
[25] With equivalent meaning though not necessarily with the same wording.

[26] Several assumptions are made for the logical filtering of model questions for the core indicators. If a business does not have a computer, it is still considered that it may be able to use the Internet (e.g. by using a mobile phone or by accessing the Internet through community centres or from home).

150. It is possible to order the model questions into sections (see Figure 3) as follows:

- A section on general information about the use of ICT by the business and the available infrastructure. The related model questions provide data for core indicators B1, B2, B6, B10, and B11.
- A section on how the business uses Internet in its operations, including the activities for which the Internet is used and whether the business has a web presence. The related model questions provide data for core indicators B3, B4, B5, B7, B8, B9, and B12.
- Any background information about the business (such as economic activity, enterprise size, location, etc) which is required but is not included in the survey vehicle.

Figure 3. Schematic structure of a module on the use of ICT by businesses



151. The majority of the core indicators require information in respect of a single reference period (indicators BI, B2, B3, B4, B7, B8, B9 and B12). In order to achieve international comparability, it is recommended that countries use a 12-month reference period, and refer to it in the question. Countries wishing to collect information about other periods as well can do this by using period rows or columns to collect data for consecutive years (*t-1, t, t + 1* referring to the previous, current and next years). 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. As with reference periods, the reference date should be referred to in the question and countries can collect information in respect of more than one reference date (see Example 16).

Example 16. Presentation of a question on ICT activities in multiple years

The question on web presence can be presented in the following way to allow recording of historical information and expectations for the future.

Question: Does your business have a web presence?

Yes, had a web presence as at <ref date, year t-1>	☐ (e.g. 31 December 2006)
Yes, established a web presence during <year t>	☐ (e.g. 2007)
No, but plan to establish a web presence in <year t+1>	☐ (e.g. 2008)
No, do not plan to establish a web presence in <year t+1>	☐ (e.g. 2008)

Note that even though the questions following the first one refer to periods (for ease of understanding), the information is in respect of a reference date, which is the last day of the year.

An alternative presentation for collecting this information is to have a yes/no filter question, where a 'yes' leads to a question with the first two options above and a 'no' leads to one with the third and fourth options.

152. Table 9 below proposes model questions to collect the information for the core indicators (in the order of indicators rather than logical questionnaire order). For each indicator, the following information is provided: a suggested wording for the question (to be translated into the local language, respecting as far as possible its meaning), valid response items, and notes, including the applicable population for each question. Annex 1 shows a model questionnaire, suitable for use as a module in a survey vehicle or as a stand-alone questionnaire.

153. With respect to procedures for calculating the indicators (see Example 17), it should be noted that all core indicators are expressed as proportions of businesses satisfying certain conditions (as indicated by a particular answer or combination of answers to questions). The statistical estimation of a proportion depends on the survey design that has been applied (complete enumeration of businesses, simple random sampling, stratified random sampling or a combination of designs). More information on survey design can be found in Chapter 7, while Annex 4 describes the statistical estimation of a proportion.

Example 17. Selection of responses for the calculation of an indicator

The calculation of the indicator Proportion of businesses with narrowband access to the Internet requires selecting the surveyed businesses that answered 'yes' to the question "Did your business use the Internet during the reference period?" and selected either/both the categories corresponding to narrowband (analogue modem, other narrowband) in the question "How did your business connect to the Internet during <the reference period>?" The estimation formula for the indicator will depend on the sample weights given to each selected business according to the sample design. Note that, as multiple responses to the connection question are possible, a business may report both narrowband and broadband access. The percentage of businesses with narrowband access plus the percentage with broadband access will therefore generally exceed 100 per cent.

154. Core indicators broken down by industry, size and location are compiled by cross-tabulating the information collected through the model questions with that of the background questions (generally present in the main questionnaire of the survey vehicle or as extra questions in a stand-alone survey). The advantage of embedding a module on ICT in an existing business survey is that the number of possible crossing variables is potentially large.

Table 9. Model questions for the core indicators on the use of ICT by businesses

Code	Indicator	Suggested model question and response items	Applicable population and other notes
B1	Proportion of businesses using computers	Did your business use computer(s) during <reference period>[a]? Yes/ No	A *computer* is defined in Table 2.
B2	Proportion of employees using computers	What percentage of persons employed in your business routinely used a computer at work during <reference period>? *Percentage values (no decimals) from 0% to 100%*	The wording refers to actual use of a computer rather than just having access. *Persons employed*[b] are defined in Table 2. *Routinely* refers to at least once a week. The question is only asked of those businesses answering 'yes' to the question *Did your business use computer(s)?* (logical filter)
B3	Proportion of businesses using the Internet	Did your business use the Internet during <reference period>? Yes/ No	Businesses that do not use computers are not filtered out for this question since they can still access the Internet by using other devices (such as mobile telephones). The *Internet* is defined in Table 2.
B4	Proportion of employees using the Internet	What percentage of persons employed in your business routinely used the Internet at work during <reference period>? *Percentage values (no decimals) from 0% to 100%*	The wording refers to actual use of the Internet rather than just having access. The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter)
B5	Proportion of businesses with a web presence	Did your business have a web presence as at <reference date>[c]? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter). A web presence is defined in Table 2. While, in theory, a business could have a web presence without having used the Internet, this is expected to be a rare event for most countries. However, where it is thought not to be rare, countries could alter the scope of the question to those businesses using computer(s).

Code	Indicator	Suggested model question and response items	Applicable population and other notes
B6	Proportion of businesses with an intranet	Did your business have an intranet as at <reference date>? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use computer(s)?* (logical filter) An *intranet* is defined in Table 2.
B7	Proportion of businesses receiving orders over the Internet	Did your business receive orders[d] for goods or services (that is, make sales) via the Internet during <reference period>? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter) *Internet orders received* are defined in Table 2. In theory, a business without access to the Internet could receive Internet orders via agents. Where this is thought to be common, countries could alter the scope of the question to those businesses using computer(s).
B8	Proportion of businesses placing orders over the Internet	Did your business place orders[d] for goods or services (that is, make purchases) via the Internet during <reference period>? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter) *Internet orders placed* are defined in Table 2. In theory, a business without access to the Internet could place Internet orders via agents. Where this is thought to be common, countries could alter the scope of the question to those businesses using computer(s).
B9	Proportion of businesses using the Internet by type of access	How did your business connect to the Internet during <reference period>? - Analogue modem (dial-up via standard phone line) - Other narrowband (including ISDN) - Broadband - Do not know Yes/no or tick box for each response category	The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter) *Type of access* categories are defined in Box 6. The response categories should allow aggregation into *narrowband access* and *broadband access*, which are defined in terms of technologies and speed. Broadband provide advertised download speeds of at least 256Kbit/s, with narrowband less than 256Kbit/s. Multiple responses are possible as a business may use more than one form of Internet access. Possible country variations to the response categories are: remove categories where items are not feasible; add or split categories according to technologies available and country data requirements.

Code	Indicator	Suggested model question and response items	Applicable population and other notes
B10	Proportion of businesses with a local area network (LAN)	Did your business have a local area network (LAN) as at <reference date>? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use computer(s)?* (logical filter). A LAN is defined in Table 2. A LAN is a type of internal network (others include WANs and VPNs). Substituting the question by *Did your business have an internal network?* could provide relevant information on information sharing within businesses rather than the actual technology used.
B11	Proportion of businesses with an extranet	Did your business have an extranet as at <reference date>? Yes/ No	The question is only asked of those businesses answering 'yes' to the question *Did your business use computer(s)?* (logical filter). An extranet is defined in Table 2.
B12	Proportion of businesses using the Internet by type of activity	For which of the following activities did your business use the Internet during <reference period>? - For getting information about goods or services - For getting information from government organizations/public authorities - For sending or receiving emails - For performing Internet banking or accessing other financial services - For interacting with government organizations/public authorities - For providing customer services - For delivering products on line - For other information searches or research activities Yes/no or tick box for each response category	The question is only asked of those businesses answering 'yes' to the question *Did your business use the Internet?* (logical filter) *Internet activities* are defined in Table 2. Multiple responses are possible as the business may use the Internet for various purposes. Possible country variations to response categories are to add or split categories according to country data requirements.

Source: Partnership on Measuring ICT for Development (2005b). Includes some minor updates to some of the questions.

Notes:

a. <reference period> refers to the period used by the NSO (typically the previous 12 months, or the last calendar year).

b. In some businesses, *employees* and *persons employed* are not equal, as the latter includes working owners as well as employees. The question wording therefore uses the broader concept persons employed, while for understandability, the indicator uses the more commonly understood term *employee*.

c. <reference date> would usually be at the end of the reference period, or shortly after.

d. OECD and Eurostat recommend excluding orders placed via conventional email; however, not all OECD non-Eurostat countries comply with this recommendation.

Model questionnaires for a stand-alone ICT use survey

155. Some developing economies will be interested in measuring ICT topics that go beyond the core ICT indicators and would therefore, almost certainly, require a stand-alone survey. Recalling the examples mentioned in Chapter 4, such topics could cover the following areas:

- Business use of mobile phone;
- ICT security measures in place and security problems experienced by the business;
- Current and capital expenditure on ICT goods and services, including the mechanisms for financing them;
- Particular uses of the Web, such as marketing research;
- Availability of ICT skills in the business and provision of training; and
- Barriers to the adoption of ICT.

156. If a country decides to collect more indicators on the use of ICT through a stand-alone business survey, it would be useful to refer to the experiences of OECD and Eurostat countries; the ICT statistics metadata of OECD countries could be of particular value.[27] Most OECD/EU countries have stand-alone ICT surveys that enable compilation of reasonably comparable ICT statistics.

157. The approach followed by the OECD's WPIIS led to a model ICT use questionnaire, dealing with key aspects of readiness and intensity. In some situations, measures of the impact of the ICT use on business performance may be achieved by linking data from ICT use surveys with those collected by economic surveys (measuring turnover, labour, investment, etc.).

158. The OECD model questionnaire (Annex 2) has three sections: A) General information about ICT use by the business, B) How the business uses ICT in its operations, and C) Other information about the business.

159. Section A includes questions on use of computers, Internet and other networks, as well as IT security measures and experiences. Section B goes into more detail about how ICT is used by the business. It covers a range of e-business processes including e-commerce (via the Internet and other computer networks); barriers to, and benefits of, Internet selling; and features of the business' web site.

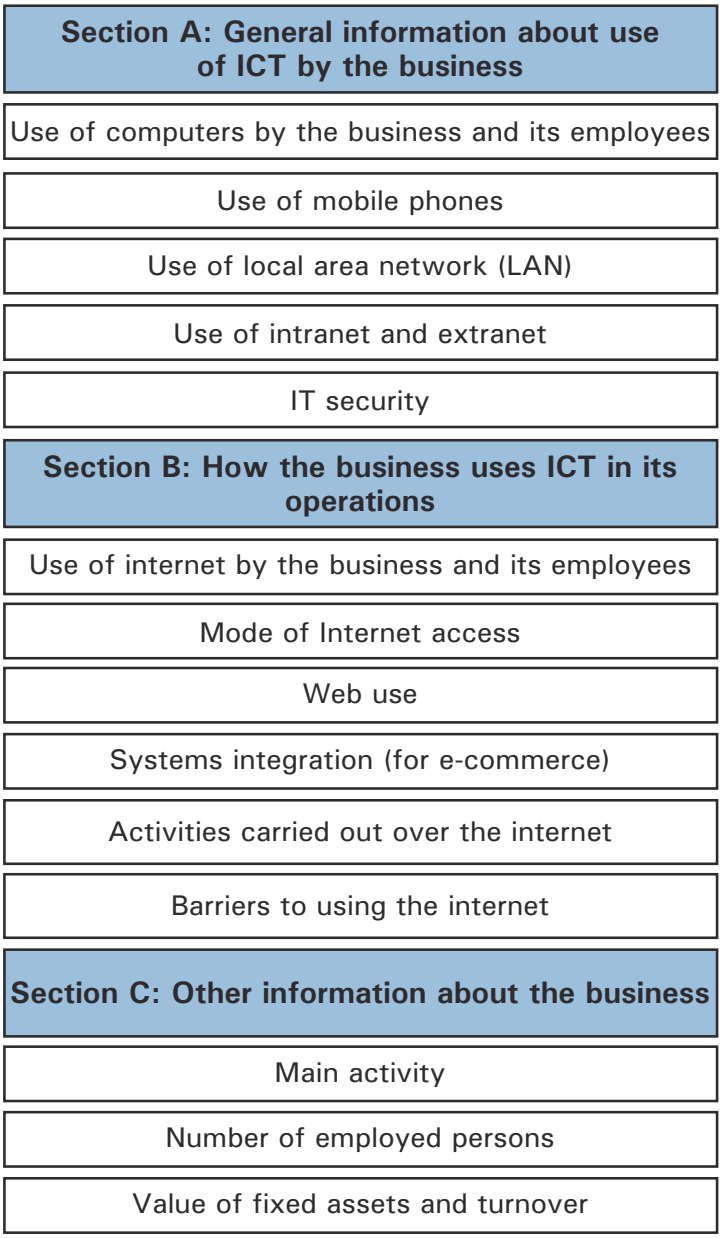
160. Section C collects the background information required to calculate values and to classify data. Not all surveys will need to include background questions, as the information needed may be available from other sources, such as the business register. Questions in Section C are: the main activity of the business (indicating its industry), its size (number of employees) and its turnover (indicating size but mainly used as a denominator to calculate the values associated with e-commerce selling).

161. Figure 4 schematically outlines the questionnaire's contents, adding the topic of mobile phone use. Inherent in its structure is a filtering logic based on certain assumptions (such

[27] Annex 3 of OECD (2005) may be of particular interest to countries undertaking survey development work (it provides metadata for OECD member countries ICT collection work), available at: *http://www.oecd.org/sti/ictmetadata*.

as 'businesses without a computer can still use the Internet') and designed to move respondents efficiently through the questionnaire.

Figure 4. Schematic outline of a model questionnaire on ICT use by businesses



Source: Adapted from "OECD model questionnaire for ICT use by businesses (2005)", (OECD, 2005 and 2007).

162. The OECD model questionnaire is designed to be suitable for a broad range of industries. Where there is interest in a narrower industry scope, the questionnaire modules can be adapted to the characteristics of the sector. An example of possible adaptation is the investigation of the financial sector.

163. Eurostat model questionnaires typically cover more topics than the OECD model and rotate topics between years. For instance, the 2007 model (Annex 3) has a separate module on e-skills. The 2008 model will include more detail on e-business processes

(with separate modules on automated data exchange, electronic sharing of information on supply chain management and sharing of information within the enterprise).

164. Model questions are provided in this *Manual* only for the core ICT indicators. It is suggested that additional questions, if required, be adapted from the model questions presented in Table 9 or from the OECD and Eurostat model questionnaires presented in the annexes.

CHAPTER 7

Designing ICT business surveys and processing data

165. This chapter focuses on the design of ICT use surveys and the processing of collected data. It covers:

a) The design of business surveys of ICT use:

- The definition of target populations and statistical units;
- The preparation of population frames; and
- Sample design and selection.

b) The processing of collected business ICT use data:

- Data editing, the treatment of missing data and misclassified units;
- Weighting (grossing-up) procedures for sample data, to produce aggregates; and
- Calculation of ICT indicators from survey data.

166. Some information on ICT sector surveys is also included where relevant, for instance, the scope of such surveys. While much of the general information presented in this chapter will apply generally to business surveys (and therefore to surveys of the ICT sector), the emphasis is on ICT use surveys.

167. The information on survey design is relevant mainly for stand-alone ICT use surveys. The design of an ICT use module embedded into an existing survey will be strongly influenced by the statistical features of the survey vehicle. However, where possible, the recommendations given here should be considered when designing such modules. Recommendations on data processing will apply to both stand-alone surveys and modules, though in the latter case, survey vehicle practices may also determine some aspects of processing (for instance, treatment of misclassified units and weighting procedures).

Business surveys on the use of ICT

Target population and scope

168. The target population for a statistical collection (whether a sample survey or a census) is the group of statistical units that are of interest. The target population is defined by the scope of the survey, which is based on attributes of the units. In the case of business surveys, the scope (and therefore target population) is usually defined in terms of economic activities performed (i.e. the industries in which the units operate), size of units (expressed in terms of the number of persons employed and/or turnover) and, in some cases, location.

169. Target populations for surveys of ICT use in the business sector vary between countries, and within a country. They may also change over time; for example, a country may decide to investigate the use of ICT in the manufacturing sector in a first phase, and then extend the target population in subsequent surveys to include the services sector. Several

EU countries started by collecting information about ICT use by businesses with 10 or more employees and have, more recently, undertaken surveys on microbusinesses (i.e. those with fewer than 10 employees).

170. As with other business surveys, the scope and target population for statistical investigations on ICT use are usually defined in terms of:

- Economic activity
- Business size and, sometimes
- Geographical location.

171. The use of international classifications, such as ISIC, to define industry of activity enhances comparability of statistical results across countries. Most national classifications[28] have established correspondences with regional classifications (such as the European NACE or the North American NAICS) and with ISIC. At the most detailed level, ISIC codes consist of 4-digit identifiers of economic activities (for ISIC Rev. 3.1, there are approximately 300 classes, hierarchically aggregated into 3-digit groups, 2-digit divisions and an alphabetic character for sections). International working groups continuously revise the adequacy of international classifications and revisions are adopted at the highest level by the UNSC. This *Manual* will describe industries in terms of ISIC codes, in particular, Revision 3.1.[29]

172. OECD recommends that member countries collect ICT use data from businesses operating in manufacturing; construction; wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants; transport, storage and communications; and real estate, renting and business activities. Two industries are proposed by OECD as non-core: financial intermediation services and recreational, cultural and sporting activities. Industries not included in the OECD recommendations are: agriculture, hunting and forestry; fishing; mining and quarrying; electricity, gas and water; community, social and personal services (ISIC sections L, M, N, P except for the non-core Division 92); and extraterritorial organizations and bodies.[30]

173. In developing economies, the scope of business surveys of ICT use may deviate from the OECD recommendation to better suit country requirements (see Example 18). In particular, the agriculture and mining sectors are important in many developing economies and the use of ICT for specific purposes (such as getting price information via mobile phone where Internet and fixed telephone lines are unavailable) can increase economic returns in an important way. Of the sectors within scope of the OECD recommendation, hotels and restaurants (an important element of tourism activities) is an industry which developing economies may have a particular interest in measuring. In particular, the facilities that e-tourism increasingly provides to foreign customers (e.g. information about destinations, reservations and payment on line) has favoured the economic development of new destinations in developing economies.

[28] National classifications are available at *http://unstats.un.org/unsd/cr/ctryreg/ctrylist2.asp*.
[29] ISIC Rev. 3.1 is available at *http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1*.
[30] The scope recommended by OECD for surveys on ICT use by businesses is: Manufacturing (ISIC D., divisions 15 to 37); Construction (ISIC F, division 45); Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (ISIC G, divisions 50 to 52); Hotels and restaurants (ISIC H, division 55); Transport, storage and communications (ISIC I, division 60 to 64); Financial intermediation (ISIC J, divisions 65 to 67) (non-core); Real estate, renting and business activities (ISIC K, divisions 70 to 74); and Recreational, cultural and sporting activities (ISIC O, division 92) (non-core). In this last division, Eurostat only considers the two following classes: Class: 9211 - Motion picture and video production and distribution and Class: 9212 - Motion picture projection.

Example 18. Coverage of the ICT survey in Mauritius

In 2001, the National Computer Board of the Island of Mauritius carried out a survey on the infrastructureand use of ICT by businesses, collecting information from 2,132 establishments selected (as a stratified random sample) from the business register of the Central Statistical Office. The sample covered all sectors, with 48 per cent of the surveyed establishments belonging to the tertiary sector (services), 45 per cent to the secondary sector (manufacturing and construction) and 7 per cent to the agriculture sector.

Source: Government of Mauritius, *www.gov.mu/portal/goc/ncb/file/ictusagesurvey2001.pdf.*

174. For comparability purposes, the *Partnership* recommends a minimum industry scope for business ICT use surveys, consisting of the OECD core industries (therefore excluding ISIC section J and division 92). However, it is recommended in this *Manual* that countries wishing to collect ICT use indicators for the business sector include as many industries as possible. The *Partnership* also encourages a broader scope, suggesting that developing economies could extend the scope to agriculture, hunting and forestry; fishing; mining and quarrying; and recreational, cultural and sporting activities. The use of an ICT use module embedded in an economy-wide business survey may favour a broader scope.

175. A common scope criterion for ICT use surveys is business size based on number of employees. There is no universal categorization of businesses based on the number of employees, but in many countries, businesses are classified as microbusinesses (0 to 9 employees), small (10 to 49), medium (50 to 249) and large (250 or more). This size classification is consistent with OECD and *Partnership* recommendations (although they suggest a minimum size scope of 10 or more employees for international comparability). Maintaining current size information in statistical business registers is generally more difficult for smaller businesses and, in many countries, small businesses without employees do not follow the same registration procedures as employing businesses and so may be difficult to investigate.

176. For reasons of cost and respondent burden, most OECD countries do not include all microbusinesses in the target population (though some include businesses with five or more employees, for example Finland). However, the exclusion of microbusinesses from ICT use surveys in developing economies should be carefully considered for the following reasons:

- Microbusinesses can account for a very high proportion of the total number of businesses (as high as 90 per cent or more);
- They can account for a significant share of total employment, and
- ICT enables businesses of any size, including microbusinesses (for example, in the ICT consultancy sector), to collaborate and generate economic growth.

177. Where microbusinesses are important in the economy, their exclusion would bias results. It is therefore recommended that the establishment of a threshold for the size of businesses in the target population be based on the representativeness of the in-scope population in terms of total employment (see Example 19).

Example 19. Scope of the survey on ICT use in Brazil

The survey on ICT use by businesses in Brazil (carried out from August to September 2005) used the OECD and Eurostat model questionnaires.

The target population of the survey was defined as those businesses with 10 or more employees operating in ISIC sections D, F, G, K, I, H and groups 921 and 922 of section O. The threshold of 10 employees is justified by the poor quality of the business register for smaller firms. With respect to the industry breakdown required by the UNCTAD questionnaire (see Table 10), indicators could not be provided for a number of industries, including the agricultural sector. The industries in scope of the survey represented 75 per cent of enterprises in the population frame, Relação Anual de Informações Sociais (RAIS). Businesses with 10 or more employees represented only 18 per cent of businesses in the surveyed industries, but accounted for 76 per cent of their employment. The scope therefore guarantees a reasonably high level of representativeness with respect to employment.

The population frame for the survey was the RAIS (annual listing of social information) maintained by the Ministry of Labour. This directory provides administrative information on employment and other variables from all registered businesses, employers and persons with economic activities (including those in the agricultural sector), as well as administrative bodies. It is used as an input to the Central Business Register maintained by the National Statistical and Geographical Institute of Brazil (IBGE).

Source: Committee for the Management of Internet in Brazil, *http://www.cetic.br/empresas/index.htm.*

178. In some countries, the legal or administrative definition of business size is based not only on the number of employees, but also on a combination of number of employees and turnover (classified in intervals). Some harmonization of turnover intervals has been achieved at the regional level (for example in the EU, where the above classification of micro, small, medium and large businesses is used, in combination with common thresholds for turnover). However, given the variety of national situations and, within a country, the change over time of appropriate interval values for turnover, it is difficult to make recommendations on the definition of the target population in terms of turnover. Moreover, the ratio of turnover values to size (in number of employees) is highly dependent on the industry of the business.

179. The third variable used to describe units of a survey on ICT use is generally geographical location. The geographical scope of the business sector (and its parts) should in principle include all the economic territory of the country. The geographical scope within a country should ideally include both urban and rural areas. This is likely to be particularly important in countries where there is an urban/rural digital divide. The rural areas of many developing economies suffer from a lack of the basic infrastructure, such as electricity and telephone lines, needed to build a solid ICT base. Consequently, the use of ICT by rural businesses may present an important gap or even be almost non-existent. In such situations, scope limitations to urban areas may be justified, especially in early measurement attempts. However, as the use of ICT spreads throughout a country, it is recommended that rural areas be included within the scope of ICT use surveys (see Example 20).[31]

Example 20. Geographical scope of ICT surveys in Thailand, Kazakhstan and Madagascar

The 2005 ICT Survey in Thailand was addressed to firms with at least one worker, located in fixed premises in Bangkok, Pattaya and municipal areas of the whole country.

The pilot survey on ICT use by businesses in Kazakhstan was run on 500 firms in the city of Almaty and 100 in the city of Aktyubinsk.

The ICT survey implemented in Madagascar covered the agglomeration of Antananarivo.

[31] Clearly, indicators resulting from a survey with such scope limitations will not be representative of the entire country (and would be upwardly biased if they purported to be).

180. The definition of rural and urban locations has not been harmonized at the international level, and therefore international comparisons are problematic. Where there is a statistical definition for urban and rural localities, in a particular country, it is generally based on the number (or density) of inhabitants. The definition of urban agglomerations (which can include localities with a small number of inhabitants but geographically connected to larger cities) is not unique either. Therefore, in order to break down indicators by urban/rural location of the business, it is important to establish a definition at the country level and make it available in the metadata so that users can compare the data across countries.

Population frames and coverage

181. The population frame for a survey is the operational form of the target population and consists of a list of all statistical units. The frame is generally used to extract samples of units (such as random samples of specific sub-populations).

182. In the case of business surveys, the frame population is usually extracted from the business register that lists the economic agents operating in the economy. Business registers for statistical purposes (to be distinguished from registers for other administrative purposes) are generally established and maintained by NSOs and are based on both external sources (such as tax registers) and internal ones (such as the results of ongoing 'unit surveys' or other unit investigations). Business registers are key infrastructure for a statistical system and the quality of business statistics depends heavily on the quality of the underlying register.

183. Common quality problems of business registers in terms of coverage are: duplication of units, overcoverage (i.e. inclusion of units that are not part of the target population) and undercoverage (i.e. non-inclusion of units that should be part of the target population). Ideally, the frame population and the target population will be very close, though this is rare (in developed as well as developing economies). The quality of business statistics is usually sensitive to the quality of the business register, which should therefore be as high as possible. Maintenance of the business register can occur through feedback from periodic enterprise and establishment censuses, ad hoc or regular 'unit surveys' to investigate over and undercoverage, checks of duplicates, and cross-verification against other registers – such as tax or administrative registers.

184. In many developing economies, the inadequacies of statistical business registers include:

- The presence of a large informal sector which is not recorded in administrative systems (such as those dealing with licences or taxes), leading to undercoverage of the business register;
- Microbusinesses (and in particular self-employed persons) may be more difficult to identify and update, since they usually follow different administrative procedures for registration; this could lead to undercoverage;
- The existence of a large number of 'dormant' businesses that were originally registered but not removed from the business register when they ceased business (or merged with other businesses). This is due to the administrative difficulties (or lack of administrative processes) that can be found in some countries in relation to ceasing a business; this leads to overcoverage, and/or

- The content of the business register is not adequate for correctly classifying businesses in terms of industry, size and/or location.

185. Obviously, the improvement of the statistical business register is not a task related to the collection of ICT indicators, but is a responsibility of the entire national statistical system. Usually, the best way of improving the adequacy of the business register is to coordinate general administrative registers (taxes, registrations, licences, social security etc), specific registers (such as licences for operating telecommunications businesses) and statistical databases (updated from economic censuses). In countries with a well-developed tax or social security system, frames generated directly from associated registers could be an option if the law allows for use of registry information for this purpose.

186. In countries where there are no adequate statistical business registers, surveys on ICT use by businesses will suffer because of this lack of infrastructure. It will be necessary to consider the possibility of constructing a population frame from other sources such as lists of live units in economic censuses or external directories such as commercial telephone listings or industry association lists. Since it is unlikely that all businesses will be included in those lists, the frame may suffer from undercoverage, thereby producing biased estimates. It is recommended in that case to compare the coverage of the frame with other sources and, if possible, to adjust estimates by a process of reweighting. In addition, the necessary documentation and metadata should be provided to inform users how the frame was constituted.

187. Countries using a population frame that lacks accurate information on industry should include a supplementary question in the survey to classify the main activity of the respondent unit (using ISIC or the national classification). The same can be done to measure the size of the business. Clearly, samples will not be as efficient in this situation (as samples cannot be stratified by industry and/or size).

Statistical units

188. The statistical unit of a sample survey or census is defined as the basic unit of the target population about which data are compiled. Statistical operations such as estimation, imputation (for non-response) and tabulation are carried out on statistical units. The statistical unit may take the form of an observation unit (for which information is collected) or an analytical unit, information about which is created by statisticians.

189. Business surveys usually use enterprises or establishments (i.e. location units of enterprises) as the statistical unit but other choices are possible (enterprise groups, kind-of-activity units, etc.). The choice of the statistical unit is relevant for ICT indicators, since it is probable that lower order units (such as establishments) will have a lower intensity of ICT use. Importantly, most of the denominators used to calculate the core ICT use indicators are related to the choice of statistical unit (proportion of enterprises or establishments) and should be well documented for international comparability purposes.

190. Since ICT use is not easy to attribute to the different establishments of an enterprise (the very nature of enterprise networks implies sharing some elements of ICT infrastructure, such as networks, between establishments), the enterprise is the statistical unit most commonly adopted by countries that have implemented ICT surveys and is the unit recommended by the *Partnership* and the OECD. Although there is no universally adopted definition of an enterprise (see Box 9), common criteria for defining an enterprise are autonomy of decision-making for allocation of resources, and engagement in one or more productive activities.

Box 9. Definitions of an enterprise

In the framework of ISIC, an enterprise has "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 many productive activities. The enterprise is the level at which financial and balance sheet accounts are maintained and from which international transactions, and international investment position (when applicable) and the consolidated financial position can be derived."

The definition of an enterprise according to the SNA93 methodology is "an institutional unit in its capacity as a producer of goods and services; an enterprise may be a corporation, a quasi-corporation, a non-profit institution, or an unincorporated enterprise."

The definition used by the European Commission for the enterprise is "the smallest combination of legal units that is an organizational 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 carries out one or more activities at one or more locations. An enterprise may be a sole legal unit."

Sources: ISIC (Rev. 3.1), Glossary of SNA terms *(http://unstats.un.org/unsd/sna1993/glossary.asp) and Eurostat (2006).*

191. The *Manual* recommends that countries adopt the European Commission concept of enterprise, in which an enterprise has some degree of autonomy in decision-making, and consists of one or more legal units involved in one or more activities at one or more locations. In some countries, the fact that (registered) legal units have to submit certain financial reports to an administrative or fiscal authority is seen as an operational criterion for determining autonomy. In addition, the sharing of production factors (buildings, capital goods, employees and management) is a strong indication for combining legal units into one enterprise unit.

192. Enterprises (especially larger ones) may be part of a multinational group, consisting of several legal units, operating in several locations and carrying out different activities or producing different goods or services. Note that only the domestic part of the enterprise's activity should be included in national statistics.

193. The definition of the enterprise as the appropriate statistical unit poses some limitations. Many enterprises, especially larger ones, will consist of several establishments. Because of this, a geographical breakdown of the results using the location of the main headquarters of the enterprise may be of limited use. An economic activity breakdown may also be problematic for enterprise units engaged in more than one type of industrial activity.

194. In practice, the preferred statistical unit may not be able to provide data for a survey. In such a case, a reporting unit could be defined as a unit that reports to the survey authority and provides data for the statistical unit (if possible) or otherwise the most practicable alternative unit. An example is where the object of the survey is to collect data at the establishment level (which is therefore the statistical unit) but the parent enterprise (the 'reporting unit' in this case) provides data for each of its establishments.

195. The choice of statistical units for ICT surveys will depend on organizational considerations such as the availability and detail of business registers, the data collection method, and the business sector environment (business legislation, prevalence of small businesses and other considerations based on the country's economic and administrative environment). In developing economies, where the share of micro and small enterprises is high, it may be convenient to collect data at the establishment level, as establishments and enterprises will generally be equivalent. Survey metadata need to specify information about the statistical unit chosen.

Sample design

196. Stand-alone surveys on ICT use by businesses are usually designed to collect information on a large number of topics from businesses across a wide range of industries. For cost and respondent burden reasons, countries will usually wish to select a representative sample of the population of businesses. A complete enumeration of in-scope businesses would usually only be feasible if the number of businesses were small (see Example 21). This could occur, for instance, if the incidence of ICT use in the country were very low (and both ICT and non-ICT using businesses could be identified), or if a high size cut-off were used, thus limiting the scope to large businesses. From this point, we will assume that neither of these situations applies and that countries will be using samples of their population rather than selecting all units.

Example 21. Exhaustive business surveys in the Commonwealth of Independent States

In many countries of the Commonwealth of Independent States, business surveys aim to collect information from all existing businesses in the country. For ICT surveys, only those declaring that they use computers are required to return the questionnaire. In order to derive the proportion of businesses using a specific technology, the estimates will have to be calculated by dividing the number of businesses responding to the survey by the total number of businesses in the country (not by the number of businesses answering the survey).

197. In order to guarantee the representativeness of a sample selection, it should be made using probabilistic techniques. Only probabilistic (random) sampling allows calculation of estimates of the sampling error (also known as 'sample error'), which is defined as the deviation from the true value attributable to the fact that only a sample of the population was observed. The design of a random sample should be based on considerations of the structure of the population of businesses (its stratification), the cost of collecting data and the maximum acceptable statistical error associated with estimates.

198. In the case of modules on ICT use embedded in other survey vehicles, ICT use data may be collected from all selected units or only a portion of them. In either case, the design of the survey vehicle will influence the quality of ICT statistics. Comments and recommendations in this *Manual* will have to be adapted to the particular survey vehicle design.

Stratification of the population

199. Stratification is the technique of dividing the business sector into relatively homogeneous groups (called strata) for the purposes of sample design and estimation. If done properly, stratification will minimize the sample variance of estimates for a given sample size. It allows the use of different sampling ratios (the number of selected businesses divided by the total number of businesses) across strata, reflecting characteristics such as their size, importance or homogeneity.

200. Optimal stratification strategies are based on variables closely related to the variables that are being measured. For the measurement of ICT use in the business sector, the experience of statistical offices of OECD countries shows that at least two criteria are useful for stratification: economic activity and size of business (in terms of number of employees). Use of these stratification variables will generally reduce the overall variance of estimates as well as disaggregations of ICT use statistics by industry and size.

201. A third stratification variable sometimes used is the geographical location of the business.[32]This is especially important if it is anticipated that some areas of the country (such as the capital) have a different intensity of ICT use than other areas. Where location is used for stratification (or as an output classification), the way the location of businesses is determined is important. For example, if the statistical unit is the enterprise and it has a number of locations corresponding to geographically distributed establishments, the criteria for determining location of the enterprise need to be established. In OECD countries, the location will usually be the address of the head office, or equivalent.

202. It is recommended that the design of a sample to collect ICT use statistics take into account at least the stratification of the business sector according to industry and business size.

Sample size

203. The sample size, that is, the number of statistical units from (or about) which information is to be collected, is calculated according to the stratification of the population of businesses for which estimates are to be calculated. If the tabulation plan includes dissemination of data by industry, size and/or location, the sample size will need to be sufficiently large such that disaggregated data estimates have an acceptable level of sampling error.

204. It will be necessary to balance the required precision (reflecting the size of sampling error) of estimates with available resources. A large sample size involves higher costs for data collection and processing.[33] For a given stratum, doubling the precision (i.e. halving the sampling error) for an estimate of a proportion requires multiplying the sampling size in that stratum by four.

205. The sample size and design are derived using bottom-up procedures that calculate the minimum sample size such that output estimates for the most important variables have a specified maximum sampling error. Estimates of the sampling error for these variables may be used to design the sample and may be based on previous surveys or pilot tests (see Example 22).

206. There are no international recommendations for the precision to be achieved for ICT indicators. The precision is usually expressed in terms of the coefficient of variation (i.e. the standard deviation divided by the value of the estimate, usually expressed as a percentage).

Example 22. Use of important variables in the design of a random sample in the Netherlands

In the Netherlands, a qualitative variable used to allocate the sample is the reception of orders on line. Strata with very high or very low proportions of businesses receiving on-line orders are surveyed less intensively than businesses with a proportion close to 50 per cent, in accordance with sampling theory.

207. The final sample size will be the sum of individual strata samples. If the total size is too great, it may be necessary to reconsider the errors of some of the population groups, and to recalculate the total size. The usual approach to setting the precision required for estimates is to fix a maximum sample error for one-dimensional breakdowns of indicators and higher sampling errors for two-dimensional breakdowns. Eurostat recommendations for member States specify a maximum coefficient of variation for overall proportions of

[32] Countries with a strong regional structure (such as federal states) may establish region as a stratification variable. In practical means, it is equivalent to designing independent samples in each region.

[33] The marginal cost of data processing may be small compared with the cost of data collection, because of modern data-processing software.

2 per cent and 5 per cent for proportions relating to different sub-groups of the business population, where these sub-groups constitute at least 5 per cent of the total population in the scope of the survey (see Example 23).

Example 23. Design of a business survey with different levels of precision

A sample survey can be designed to provide a maximum statistical error of, say 5 per cent, for the total number of employees for sections of ISIC, while accepting statistical errors up to 10 per cent for the two-dimensional breakdown of ISIC section by business size interval. The sample will be smaller than that required for a maximum statistical error of 5 per cent for both one- and two- dimensional breakdowns.

208. A top-down procedure that is sometimes useful is to calculate the maximum sample size based on the available budget for the survey and the unit cost for collecting data from one business, and then allocate (distribute) the sample by strata according to some operational rule. The Neyman allocation (based on the cost and the variance of variables in each stratum), for example, guarantees that overall error is minimized.

209. These methods may be modified to adapt them to the survey requirements. Some of the most frequently applied modifications used are: 1) to fix minimum sizes to some strata, with the objective of calculating estimates with a minimum precision; 2) to completely enumerate some important strata (such as those containing large businesses); or 3) to select a larger sample than optimal, to anticipate the reduction of the effective sample caused by non-response.

210. It is important to note that, irrespective of sample size, a high non-response rate means that the calculated estimates are likely to be biased, and that bias will probably increase with the non-response rate (since businesses that have responded are more likely to use ICT than those which have failed to respond). Therefore, one of the important goals of the survey is to minimize the non-response rate.

Sample selection methods

211. Assuming that the population is stratified as described above, we need to consider how to select samples within strata. Two of the simplest and most used methods are systematic sampling and simple random sampling. They are described in Box 10 below.

Box 10. Sample selection methods

Systematic sampling

The simplest method for random selection of businesses is systematic sampling. Units in the stratum must be arranged from 1 to N, where N is the number of units in the stratum. If n is the number of units to be selected, an interval K should be calculated, such that $K = N/n$ (ignoring the remainder). Now, a random number (the starting point) between 1 and K is selected, call it t, and the sample will consist of the units t, $t + K$, $t + 2K$, etc. This method can generate sample sizes of n or $n + 1$ which means that the estimate will be biased, unless the weighting factor is adjusted to reflect the larger sample. The systematic sampling method allows distribution of the sample among the population of firms, by means of introducing some order in the frame. For example if, in each stratum, companies are ordered by geographic code, the systematic sample will gather representative elements of all the localities.

Simple random sampling

Random sampling can be thought of as randomly drawing n numbers between 1 and N, where units in the stratum that correspond to those numbers will be included in the sample. Random numbers can be generated by means of randomization routines present in most statistical software. Another possibility is to use a fixed table of random numbers, but this procedure will be cumbersome. Usually selection will be without replacement, that is, there is no possibility of selecting the same unit more than once.

212. It is important to note that the sample selection method must correspond with the method of estimation. Thus, if it is considered appropriate to select businesses in a given stratum with unequal probabilities (e.g. proportional to their size), the estimates will have to weight the units by a weight that is the reciprocal of those probabilities in their formula.

ICT sector surveys

213. The ideal scope of ICT sector surveys is determined by the OECD definition of the ICT sector (see Chapter 4), but the coverage in individual countries may be more limited.

214. Statistical units for ICT sector surveys are normally determined by the economic surveys that cover the ICT sector. Note that, as ICT sector indicators are ratios of summations, the choice of unit is not as critical as for business ICT use surveys, where most of the indicators are presented as proportions of businesses.

215. Sample design and size for ICT sector surveys will be determined by several factors, including the level of detail of output required. In this context, it should be noted that UNCTAD collects the core indicators for the ICT sector at the most detailed level (4-digit) of the ISIC, as shown in Table 10 below.

Table 10. Breakdown of data by industry for the UNCTAD data collection on the ICT sector

ISIC Rev. 3.1	Activity
Section D	
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
Section G	
5151	Wholesale of computers, computer peripheral equipment and software
5152	Wholesale of electronic and telecommunications parts and equipment
Section I	
6420	Telecommunications
Section K	
7123	Renting of office machinery and equipment (including computers)
7210	Hardware consultancy
7221	Software publishing
7229	Other software consultancy and supply
7230	Data processing
7240	Database activities and online distribution of electronic content
7250	Maintenance and repair of office, accounting and computing machinery
7290	Other computer-related activities

Data processing

216. This section deals with the numerical processes that take place after data collection and before aggregate information is disseminated. These processes include data editing and data weighting. Data processing practices are fairly country-specific, as data producers will usually have defined them for other business surveys. When ICT surveys are embedded into existing business surveys, data processing for ICT-related variables will tend to follow that of the vehicle survey, with the addition of edits that are specific to ICT questions.

Data editing

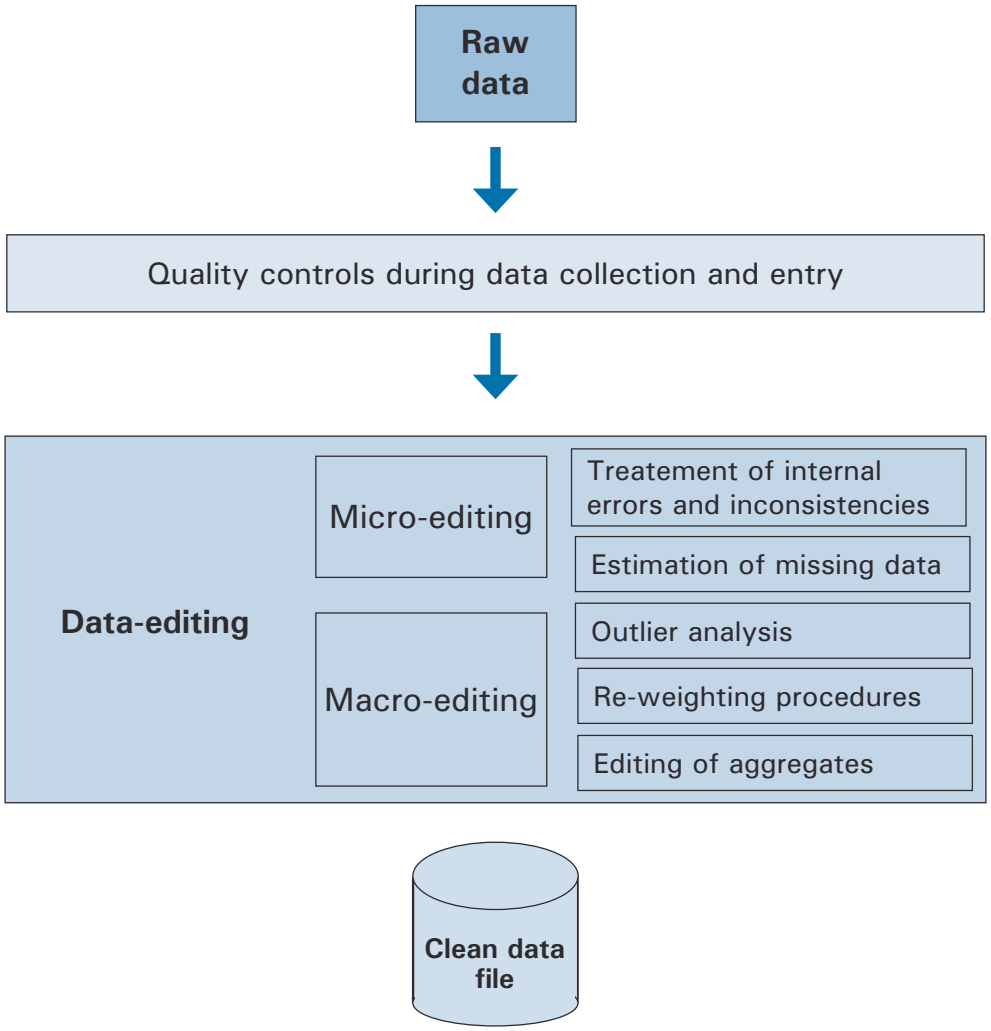
217. For many reasons, statistical information provided by businesses, whatever the instrument of data capture, can contain errors. These include erroneous or missing data, incorrect classifications, and inconsistent or illogical responses. In order to minimize such errors, it is important to apply techniques which optimize the effectiveness of data capture instruments and collection procedures. In addition, robust data editing techniques should be used to transform raw data provided by respondents into valid and coherent ('clean') data that can be used to produce aggregated statistics.

218. In this *Manual*, we use the term "editing" to cover all the phases of data processing, from the inspection of raw information provided by the respondent to the production of a clean data set from which aggregates are generated. Data editing covers the sub-processes referred to as 'micro-editing' and 'macro-editing' (also sometimes referred to as 'input' and 'output' editing, see Figure 5):

- Micro-editing refers to controls, validations and modifications applied to the data of a given business. The process includes the treatment of incomplete or missing data and the detection and treatment of answers that are inconsistent with other questions, and

- Macro-editing refers to controls, validations and modifications of whole datasets by means of the analysis of particular aggregations. The aim of the process is to check whether certain estimates are jointly compatible and are consistent with other knowledge. A sophisticated macro-editing procedure consists of readjusting sample weights according to frame errors detected during the survey. This point is elaborated later in this chapter.

Figure 5. Steps in data validation



Treatment of internal inconsistencies and errors

219. Data editing involves checking and often manipulation of the original data. Such processes can introduce errors that affect aggregate data. Thus, although the process of data editing is essential, it is very important that practices be established that decrease the incidence of incomplete or inconsistent data, so that the impact of data editing is minimized. Quality controls already embedded in data collection instruments or at the data entry stage will directly improve the quality of raw data and reduce the task of data processing.

220. The choice of collection instrument has a direct impact on data quality. Both computer-assisted personal interviewing (CAPI) and computer-assisted telephone interviewing (CATI) can be expected to improve the quality of input data since they provide automatic controls for detecting response errors. Paper questionnaires require validation by statistical staff before and/or after data are entered into a computer to be processed.

221. Validity control of an individual data item consists of checking if the answer belongs to a predefined set (or range) of valid responses. In order to check questions for validity, it is necessary to check them against those defined valid responses. To check the internal consistency of a questionnaire, it is necessary to establish and apply rules that define the relationships between questions, so that certain answers restrict the valid values

that other questions can accept (see Example 24). Arithmetic checks (for instance, that percentage distributions add to 100) may be applied during data entry or later run in batch mode across a set of records.

Example 24. Application of micro-editing rules

The question "How many employees use the Internet?" should only be answered if the business has declared in a previous question that it has used the Internet. In logical terms, the question on the business' use of the Internet can only take two values (0 = No or 1 = Yes, for example). If the answer is *No*, then the second question on the number of employees using the Internet should not be answered by the respondent. If the answer to the business Internet use question is *Yes*, the question on employees' use can only be answered with a numerical value that is more than zero but less than or equal to the number of employees of the business. (Please recall also the discussion earlier about the definition of 'employees' including employed persons such as owners.)

Treatment of missing data

222. Unit non-response refers to the failure to collect any information from some survey units. Item non-response refers to missing data in a returned questionnaire. Since both forms of non-response have the potential to introduce bias, data collection agencies should strive to reduce the extent of non-response, by means of improved questionnaires, high-quality fieldwork (if used) and good non-response follow up. However, even with such controls, a certain level of non-response is unavoidable. Analysis of patterns of non-response in relation to the type of unit (e.g. microbusinesses) or particular questions may enable improvement in data collection tools and procedures. Improvements include modification of question wording or instructions, and introduction of simplified questionnaires for some businesses (e.g. microbusinesses).

Unit non-response

223. The usual statistical practice for correcting unit non-response is to change weights in order to compensate for non-responding units. Two methods are possible: sample-based and population-based (see Examples 25 and 26).

- Sample-based corrective weighting consists of modifying the original sample weights by multiplying them by the inverse of the non-response rate in each affected stratum (or segment); and
- Population-based corrective weighting is equivalent to classical post-stratification in which survey data are benchmarked against known population totals. This method will also correct poor frame coverage if the benchmarks are independent of the population frame.

224. It is important to recall that the hypothesis underlying both treatments for unit non-response is that businesses that do not answer are well represented, within the same homogeneous segment (or stratum), by those that do. When there is a risk that non-response is correlated with the variables of interest, neither method will remove the inherent non-response bias (see Example 26).

225. There are more sophisticated methods to correct the weights, based on econometric models (logit, probit and log-linear models). However, they will not be discussed in this *Manual*.

Example 25. Recalculation of sample weights for unit non-response

A simple example of computation of sample-based non-response weights is presented in the following table. Suppose we have an ICT survey of 200 enterprises selected with simple random sampling out of 100,000 units, broken down in segments that are considered homogeneous in respect of non-response (in a stratified random sample, the segments would usually be strata). In order to account for unit non-response, design weights have to be modified as shown below.

	Enterprises			Weights		
	Population	Sample	Non-response	Design	Non-response	Final
Segment	a	b	c	d = a/b	e = b/(b-c)	d*e
A	90,000	100	5	900	1.053	947.37
B	10,000	100	10	100	1.111	111.11

Example 26. The impact of non-response

A sample of 1,000 businesses selected from a population is formed by two groups of equal size, but with different proportions of Internet use. Group A has 70 per cent and group B has 10 per cent (so 40 per cent of businesses in the whole sample use the Internet). The following table shows the impact on the estimate of Internet access, due to different non-response rates in each group.

	Sample	Non-response (rate)	Effective sample	Sample with Internet use
A	500	90 (18%)	410	287
B	500	10 (2%)	490	49
Total	1,000	100	900	336

Now, the sample estimate of the proportion is 336/1,000 = 33.6%, which has a bias of 6.4% (that is, 40 – 33.6). It can be seen that if the hypothesis of homogeneous non-response ratio fails, the mechanical application of non-response weights leads to biased estimates.

Item non-response

226. The difference between item non-response and unit non-response is not always clear. In particular, if a business has failed to answer many questions, including some important items, it may be more effective from an operational viewpoint to treat that business as a unit non-response, instead of imputing estimates for a large number of item non-responses.

227. Item non-response is generally caused by one of the following:

- The respondent refuses to answer a question (possibly because the information sought is sensitive);
- The respondent does not know the answer (for instance, the information may not be available from business records);
- The respondent misunderstands the question and so does not attempt to answer it; and/or
- The respondent has unintentionally omitted an answer (possibly because the questionnaire has been poorly designed with confusing wording or unclear logic).

228. In the case of more technical ICT questions (such as type of Internet access), non-response may be decreased if it is specified that a person with ICT knowledge (e.g. the chief information officer) should respond for the business.

229. Ignoring missing answers can lead to statistically biased estimates, because the latter are calculated from an unrepresentative part of the sample. Following up item non-response is an obvious solution, especially in cases where the item non-response is extensive, the unit is significant or important questions have been omitted (e.g. those pertaining to the core ICT indicators). Obtaining responses may be easier where the collection is legally mandatory and, in any case, should be carried out as soon as possible after the incomplete response is received.

230. Where it is impractical to re-contact respondents, missing data could be estimated (imputed). Mathematical procedures for imputing missing data are described in Annex 5.

Treatment of misclassified units

231. A frequent problem affecting the quality of business statistics is that some responding businesses may be initially included in the wrong stratum in the population frame from which the sample is drawn. This is more likely when the frame (and the underlying business register) is of poor quality. Statistical business registers maintained by NSOs usually contain information on size (usually in terms of number of employees and/or turnover), industry and location (based on business address). Since ICT indicators are usually broken down by these classification variables, it is important to correct misclassified units.

232. Once the scope (target population) for a survey on ICT in business is defined, a list of 'eligible' ('in-scope') businesses for investigation has to be put together in order to create a population frame. It is possible that misclassified units are erroneously included as eligible, and that eligible units are misclassified such that they do not appear on the frame or appear in the wrong stratum. In the first case, if a surveyed business is eliminated from the sample because of non-eligibility, this will reduce the effective sample size unless a reserve list is prepared. Elimination of misclassified units should only be considered if the rate of misclassification is small.

233. In the second case, the unit is eligible, but was included in the wrong stratum or omitted from the frame altogether. For example, a business selected in the size interval (stratum) of 10 to 20 employees, may report that, in fact, it has only eight employees. The technical solution consists of recalculating sample weights. A new estimate of the size of strata has to be produced and weights corrected accordingly (see Example 27).

234. Clearly, the establishment and maintenance of an up-to-date business register from which to draw a reliable population frame is of utmost importance.

Example 27. Numerical example of the treatment of misclassification

Assume that the business population is stratified into two strata (say urban and rural according to their location), and that the population frame includes 1,000 businesses classified as rural and 2,000 as urban. A sample size of 10 businesses is extracted from each stratum, giving a priori sample weights equal to w_{rural} = 1,000/10 = 100 and w_{urban} = 2,000/10 = 200. Suppose that after data collection, the following ex post classification of sample data is as follows:

	Stratum 1	Stratum 2
Stratum 1 rural	7	1
Stratum 2 urban	3	9
Total	10	10

The table indicates that, out of the 10 businesses that were selected from stratum 1, in fact 3 belonged to stratum 2. A corrected estimate of the total number of rural businesses is:
1,000 × 7/10 + 2,000 × 1/10 = 900;

and an estimate of the total number of urban businesses is:
1,000 × 3/10 + 2,000 × 9/10 = 2,100.

Accordingly, the new sample weights for the rural and urban businesses will be w'_{rural} = 900/10 = 90 and w'_{urban} = 2,100/10 = 210.

Weighting procedures

235. ICT indicators are generally referred to the whole business sector or to a relevant part of it. If only a sample of businesses is surveyed, the data collected have to be weighted in order to obtain estimates in respect of the target population. The procedure by which sample data become population estimates is called 'weighting' (or 'grossing-up'). The weighting mechanism must be consistent with the design of the sample.

236. When the survey is a census - that is, data are collected from all units - there is no need for sample weighting. However, as discussed earlier, censuses are generally expensive and less efficient than sample surveys. Although there are exceptions to this, for example if the country has a population frame that identifies all users of computers, and there is a manageable number of such businesses, they could be completely enumerated.

237. In line with international recommendations for business statistics, surveys on ICT use by businesses are generally based on a stratified random sample design, with strata defined by industry and size (at least). Businesses should be selected at random from strata (except for those that are completely enumerated e.g. large business strata). It is assumed that the sample design is based on random selection, without replacement, within strata. Stratum estimates are therefore calculated based on a simple expansion (weighting) to the total number of businesses in the stratum. The method also applies if the selection is systematic with a random starting point in each stratum. The method explained below can be applied to both qualitative variables (such as the *presence of a website*) and quantitative variables (such as the *number of employees who used the Internet*).

238. In the case of quantitative variables, let y_{hi} be the value of the variable, y, for business *i* in stratum *h* (for example, the *number of employees with access to Internet*). For qualitative variables, y_{hi} will be 1 if the business has a particular characteristic (for example, if it *has a website*) and 0 otherwise. The sample average in stratum h is defined as the sum of all

the sample values in the stratum divided by the number of sampled businesses, say n_h i.e.

$$\bar{y}_h = \frac{1}{n_h}\sum_{i=1}^{n_h} y_{hi}$$

239. If the variables are qualitative and coded as 0 or 1, the answer will represent the sample proportion of businesses with the investigated characteristic. Following the examples, $\bar{y}_h$ would be the estimated average number of employees with access to the Internet in stratum *h* or the proportion of businesses with a website in stratum *h*.

240. The estimate for stratum h is calculated by multiplying the stratum average $\bar{y}_h$ by the total number of businesses in the stratum, i.e.

$$Y'_h = \frac{N_h}{n_h}\sum_{i=1}^{n_h} y_{hi} = N_h \bar{y}_h$$

241. See Example 28 for the calculation of stratum estimates. It should be noted that stratum estimates will generally be further aggregated for dissemination purposes. For example, the stratification variable for industry may be at the 4-digit (class) level but this level is too detailed for dissemination (which might be at the 1 or 2-digit level).

Example 28. Example of a stratified estimate for an ICT indicator

A survey on ICT use in the manufacturing sector has been stratified according to size with two strata: '0 to 19 employees' and '20 or more employees'. The sizes of the strata are 50,000 and 4,000 businesses respectively. A survey with a sample of 500 and 1,000 businesses in each stratum respectively provides the following non-weighted sample data on the question "*Does your business use computers?*"

Businesses that use computers:

0 to 19 employees	125	(out of 500 selected)
20 or more employees	750	(out of 1000 selected)

The stratum estimates for the number of businesses with a computer are given by (50,000/500) × 125 = 12,500 and (4,000/1,000) × 750 = 3,000 (i.e. stratum weights multiplied by stratum estimates of the number of businesses using computers). Note that the weights are the inverse of the sampling rate.

242. The population total of the variable of interest is estimated by addition of the estimates for each stratum i.e. $Y'_1 + Y'_2 + Y'_3 + \ldots + Y'_L$, where L is the number of strata (see Example 29). When estimates are generated by means of standard statistical software, weights equivalent to N_h/n_h are assigned to each unit in the sample. The formula for the estimate for stratum h (given above) can be written in the following way to show the assignment of weights to each unit:

$$Y'_h = \frac{N_h}{n_h}\sum_{i=1}^{n_h} y_{hi} = \sum_{i=1}^{n_h} \frac{N_h}{n_h} y_{hi}$$

Example 29. Example of a stratified estimate with an exhaustive and a sampled stratum

The survey on ICT use in business run in a particular country was stratified with two strata, one exhaustive (businesses with 20 or more employees) and the other sampled with a sampling fraction of 5 per cent (businesses with fewer than 20 employees).
Using information in the table below, the number of businesses having a website in the total business sector is estimated by weighting each business with fewer than 20 employees in the sample by 1/0.05 = 20 and each business with 20 or more employees by 1. The population total is estimated by:

$$Y' = \sum_{h=1}^{2} Y'_h = \sum_{h=1}^{2} \frac{N_h}{n_h} \sum_{i=1}^{n_h} y_{hi} = \frac{200{,}000}{10{,}000} \times 1{,}250 + \frac{3{,}000}{3{,}000} \times 2{,}100 = 27{,}100$$

Or equivalently, an estimated 13.35 per cent of businesses have a website (27,100/203,000 × 100).

Stratum	Number of businesses in the country	Sampling fraction	Sample size	Number of businesses in the sample with a website
Fewer than 20 employees	200,000	5%	10,000	1,250
20 employees or more	3,000	100%	3,000	2,100

243. Weighting procedures for producing estimates that combine qualitative and quantitative variables are also possible. For example, to estimate the *number of employees* (quantitative) who work in businesses that sell via the Internet (qualitative), it is possible to proceed in the following way: let y_{hi} be the number of employees in business *i* of stratum *h* that sells via the Internet (its value is zero for businesses which do not sell via the Internet). The sum of all values y_{hi} in the stratum, multiplied by N_h/n_h is an estimate of the desired stratum value. This weighting procedure allows calculation of estimates for totals, but also for proportions, percentages and ratios (see Example 30 for the estimation of a ratio).

Example 30. Formula for estimating a ratio

To estimate the percentage of employees in businesses that sell via the Internet, out of the total number of employees in the business sector, it can be verified that the procedure for weighting each unit (as described above) is equivalent to estimating the number of employees in businesses that sell via the Internet, the total number of employees in the business sector, and their ratio. Let y_{hi} be the number of employees in business i of stratum h, if that business sells via the Internet (its value is 0 otherwise) and let x_{hi} be the number of employees in business i of stratum h. L is the number of strata. The estimate can be written in the following way:

$$\frac{\sum_{h=1}^{L} Y'_h}{\sum_{h=1}^{L} X'_h} = \frac{\sum_{h=1}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} y_{hi}}{\sum_{h=1}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} x_{hi}} = \frac{\sum_{h=1}^{L} \sum_{i=1}^{n_h} \frac{N_h}{n_h} y_{hi}}{\sum_{h=1}^{L} \sum_{i=1}^{n_h} \frac{N_h}{n_h} x_{hi}}$$

244. The calculation of sample weights is a key step in data processing and should be carefully implemented and documented. Procedures for weighting data will depend *ex ante* on a country's business statistical system including quality of the business register, definition of strata in the business sector and sampling practices (e.g. whether some strata are exhaustively sampled). *Ex post*, once the data collection is carried out, the weights should be revised according to misclassification and non-response.

Calculation of ICT indicators

245. The core ICT indicators are expressed as proportions of businesses or employees that have a particular characteristic (e.g. they use computers). The core indicators can be estimated from samples of businesses following the steps described above, that is, weighting the data from a 'clean' data file obtained by editing collected data. The technicalities of the calculation of weights depend on the design of the sample including sampling fractions in each stratum.

246. Estimation of a proportion and its sampling error is further detailed in Annex 4.

CHAPTER 8

Dissemination

247. This chapter describes the statistical dissemination phase, which takes place once estimates for ICT indicators have been produced. Statistical dissemination activities consist of preparation and distribution of ICT data and associated metadata (meaning 'data about data'). While numerical information is most commonly presented as a set of predefined or tailored tables, metadata usually takes the form of notes to tables and technical reports on data quality. This chapter describes tabulation plans for the presentation of survey results and discusses the related metadata, both at the indicator and survey level.

248. Statistical offices aim to produce statistics that are useful for decision-making and an important aspect of data usability is provision of associated metadata. This is especially important for ICT statistics, given the high level of interest in internationally comparable ICT indicators (for instance, from international conferences such as the WSIS). Agencies that produce and disseminate ICT indicators should therefore enhance their usability by routinely disclosing associated metadata. It is strongly recommended that production of these reports is integrated into the statistical production process and not undertaken as a separate activity. Related institutional issues are discussed in Part C.

249. Various NSOs and international bodies have defined quality frameworks and reports for statistical output. These constitute useful guidelines for determining the metadata that should be disseminated with ICT data. NSOs that have done work in this area include the US Bureau of the Census and the statistical offices of Australia,[34] Canada and Sweden. International efforts include the IMF's Data Quality Assessment Framework, DQAF[35] and Eurostat's quality reporting tools.[36] The latter are well documented and can be used to specify appropriate quality information about ICT use indicators according to six quality dimensions: relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability, and coherence. Between them, the six dimensions cover the range of metadata that result from statistical collection work.

250. Experience suggests that quality reports are best prepared by the same unit that produces the statistical indicators. Some NSOs may have a quality control system that includes standard documentation of all statistical products. Quality reports are needed to improve statistical operations and, for that reason, should be actively used by NSO staff (for instance, as part of an approval process for the release of statistics). At the same time, an adapted version of the report may be prepared for external users and made available along with statistical output.

Tabulation plan

251. The presentation of survey results by NSOs most frequently takes the form of a pre-defined set of tables that are released as paper or electronic publications ('static dissemination'). Users may also request tailored tabulations, which the NSO will prepare for them (often for a fee). Some NSOs have gone further and have adopted web-based technology that

[34] The ABS quality template outlines and explains the six dimensions of quality, see: *http://www.nss.gov.au/nss/*

[35] The DQAF (*http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/*) has been applied to other statistical measurement systems such as National Accounts, Consumer Price index, Producer Price index, monetary statistics, etc. It has also been used by other international organizations such as UNESCO (on education statistics) and the World Bank (on poverty statistics).

[36] See Eurostat's quality reporting tools for the EU at *http://epp.eurostat.ec.europa.eu/*

allows users to specify the tabulation to be displayed ('dynamic dissemination'). This form of dissemination is beyond the scope of this *Manual*.[37]

252. The set of statistical tables to be disseminated must take into account the reliability of figures that will be released. Increasing the number and detail of table cells will decrease the precision of figures displayed, since the effective sample size on which cell estimates are based are lower. Confidentiality problems can also arise if the number of businesses contributing to a statistical aggregate displayed in one table cell is small (see Example 31).

Example 31. Statistical disclosure control rules

In order to decide which cells may be published, some NSOs use a minimum of three contributors as the threshold for the number of businesses that contribute to a cell total.

Other rules for protecting confidentiality are defined in terms of the value that is contributed by each unit in the cell. For instance, a tabulation cell may be 'sensitive' and therefore not published if the contribution of one unit is greater than 80 per cent of the total value. This is especially important for developing economies where there are industries with a small number of competing businesses (for instance, in the telecommunications and energy sectors where very large businesses may be dominant in terms of value).

Possibilities for preventing the disclosure of confidential data include collapsing rows and/or columns, suppressing data (and indicating that data are not available for confidentiality reasons) and more technical approaches (such as microdata alteration) which will not be discussed here.

253. In each table cell, statistical estimates can be presented as absolute figures (*number of businesses using computers, number of businesses using the Internet*, etc.) or as proportions (*proportion of businesses using computers, proportion of businesses using the Internet*, etc.). In the latter case, it is important that the table title specifies the reference population and that the value of denominators used are also available.

254. A basic tabulation plan of ICT indicators in the business sector would take into account the core indicators and the main breakdowns suggested by the *Partnership*, that is, business size and industry. This basic tabulation plan would consist of at least 24 tables (the 12 core indicators, each broken down by size and industry). The breakdown by urban/rural location of the business is very much dependent on the availability of good classificatory data. As discussed earlier, such a breakdown is encouraged where feasible.

255. It is important that output data include some indication of the reliability of data in table cells. This is especially important for countries that base the production of ICT indicators on surveys whose sample size is small. It is recommended that figures with a low level of precision be highlighted (for instance, those that have a coefficient of variation higher than 20 per cent).

256. UNCTAD recommends a breakdown for the size and industry classification variables as shown in Box 11 below.

[37] For an example of this kind of web-based application, several examples are available from developed and developing economies. For instance, the Eurostat database organized by subject matter (available at *http://epp.eurostat.ec.europa.eu/portal/*), or the on-line dissemination systems for population census data implemented by the Statistical Office of Colombia (*http://200.21.49.233/Tot_censo05/inicio_col.htm*).

Box 11. Breakdown by classification variables

For size of business
- TOTAL
- 0–9 employees (microbusinesses)
- 10–49 (small businesses)
- 50–249 (medium-sized businesses)
- 250 or more (large businesses)

For industry (ISIC Rev. 3.1)
- TOTAL
- ISIC A: Agriculture, hunting and forestry
- ISIC B: Fishing
- ISIC C: Mining and quarrying
- ISIC D: Manufacturing
- ISIC E: Electricity, gas and water supply
- ISIC F: Construction
- ISIC G: Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
  - Divisions:
  - 50: Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel,
  - 51: Wholesale trade and commission trade, except of motor vehicles and motorcycles
  - 52: Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
- ISIC H: Hotels and restaurants
- ISIC I: Transport, storage and communications
  - Divisions:
  - 60: Land transport; transport via pipelines
  - 61: Water transport
  - 62: Air transport
  - 63: Supporting and auxiliary transport activities; activities of travel agencies
  - 64: Post and telecommunications
- ISIC J: Financial intermediation
- ISIC K: Real estate, renting and business activities
  - Divisions:
  - 70: Real estate activities
  - 71: Renting of machinery and equipment without operator and of personal and household goods
  - 72: Computer and related activities
  - 73: Research and development
  - 74: Other business activities
- ISIC L: Public administration and defence; compulsory social security
- ISIC M: Education
- ISIC N: Health and social work
- ISIC O: Other community, social and personal service activities
- ISIC P: Activities of private households as employers and undifferentiated production activities of private households

257. The display for the proposed tables could be as shown in tables 11 and 12 below. Indicators are expressed as proportions, consistent with the *Partnership's* core indicators list.

Table 11. Model table for the publication of core ICT indicators broken down by business size

Indicator	All businesses	Number of employees			
		0 - 9	10- 49	50 - 249	≥ 250
Proportion of businesses using computers					
Proportion of employees using computers					
Proportion of businesses using the Internet					
Proportion of employees using the Internet					
Proportion of businesses with a web presence					
Proportion of businesses with an intranet					
Proportion of businesses receiving orders over the Internet					
Proportion of businesses placing orders over the Internet					
Proportion of businesses using the Internet by type of access					
- narrowband access					
- broadband access					
Proportion of businesses with a local area network (LAN)					
Proportion of businesses with an extranet					
Proportion of businesses using the Internet by type of activity					
- for getting information about goods or services					
- for getting information from government organizations/public authorities					
- for other information searches or research activities					
- for sending or receiving email					
- for Internet banking or accessing other financial services					
- for interacting with government organizations/ public authorities					
- for providing customer services					
- for delivering products on line					
- for other types of activity					

258. The proposed tables correspond to UNCTAD's international data collection of indicators on the use of ICT by businesses,[38] and should be complemented by data that correspond to national needs (such as relevant geographical breakdowns or specific details for important industrial sectors).

259. Annex 7 presents UNCTAD's questionnaire for collecting aggregate statistics and metadata on the core ICT indicators.

[38] See *http://new.unctad.org/templates/Page____777.aspx*.

Table 12. Model table for the publication of core ICT indicators broken down by economic activity

Indicators (by economic activity, ISIC Rev.3.1)	A	B	C	D	E	F	G				H	I						J	K						L	M	N	O	P
							50	51	52	Tot		60	61	62	63	64	Tot		70	71	72	73	74	Tot					
Proportion of businesses using computers																													
Proportion of employees using computers																													
Proportion of businesses using the Internet																													
Proportion of employees using the Internet																													
Proportion of businesses with a web presence																													
Proportion of businesses with an intranet																													
Proportion of businesses receiving orders over the Internet																													
Proportion of businesses placing orders over the Internet																													
Proportion of businesses using the Internet by type of access																													
- narrowband access																													
- broadband access																													
Proportion of businesses with a local area network (LAN)																													
Proportion of businesses with an extranet																													

Indicators (by economic activity, ISIC Rev.3.1)	A	B	C	D	E	F	G				H	I						J	K						L	M	N	O	P
							50	51	52	Tot		60	61	62	63	64	Tot		70	71	72	73	74	Tot					
Proportion of businesses using the Internet by type of activity:																													
- for sending or receiving e-mail																													
- for getting information about goods or services																													
- for getting information from government organizations/public authorities																													
- for other information searches or research activities																													
- for Internet banking or accessing other financial services																													
- for interacting with government organizations/public authorities																													
- for providing customer services																													
- for delivering products online																													
- for other types of activity																													

Dissemination of metadata at the indicator level

260. Some quality dimensions of statistical products are related to indicators (such as accuracy, reference date and scope) and others to the whole survey. This section covers indicator level metadata.

Accuracy and precision

261. Accuracy refers to the degree to which an estimate correctly describes the phenomenon it was designed to measure. It covers both sampling error and non-sampling error (bias). Precision is related only to the sampling error and may be measured by the standard error of an estimate (the higher the standard error, the lower the precision). Agencies compiling ICT indicators should publish the precision of published estimates as well as the formulas used to calculate precision. Note that bias, the other element of statistical error, is usually not measurable. However, possible sources of bias should be described, along with efforts to minimize it.

Sampling error

262. As we have seen, sampling error arises as a result of obtaining an estimate based on a sample. Most ICT indicators are expressed as proportions. In order to calculate the variance of the estimates, formulas shown in Annex 4 can be applied. Alternatively, the precision of an estimate can be indicated by the standard error (the square root of the sampling variance), the coefficient of variation or a confidence interval (see Box 12). The coefficient of variation (CV), also called relative standard error, is the ratio of the standard error to the estimate to which it refers; it is usually expressed as a percentage. For proportions, the relative standard error may be a more easily understood measure of precision.

Box 12. Expressions for the precision of an indicator

If an estimate $\hat{Y}$ has a standard error $SE(\hat{Y})$, then the coefficient of variation is calculated as:

$$CV(\hat{Y}) = SE(\hat{Y}) \Big/ \hat{Y}$$

and is usually shown as a percentage.

The 95% confidence interval for $\hat{Y}$ (assuming a normal distribution) is expressed as the approximation,

$$\hat{Y} - 2SE(\hat{Y}) \text{ to } \hat{Y} + 2SE(\hat{Y}).$$

263. Sampling error usually increases as breakdowns become more detailed (see Example 32). Some statistical offices disseminate the precision measures for highly aggregated indicators (e.g. *the proportion of businesses using the Internet* and the same indicator by broad size interval). In addition, NSOs should indicate any cell estimates where the CV is over a particular level (e.g. 20%).

Example 32. Precision levels for an indicator and its breakdowns

A business sample may be designed using information from previous or pilot surveys so that the maximum standard error for the indicator proportion of businesses using computers is 5 per cent for the total business population and less than 10 per cent for any ISIC section.

Bias

264. Bias (often referred to as non-sampling error) in statistical estimates is caused by various imperfections of the measurement system. As it is usually not possible to give a measure of bias, it is necessary to inform users about possible sources of bias and attempts made to minimize it. It is important to recognize that bias errors can be in opposite directions and can therefore cancel to some extent. Bias can arise from:

- Non-response (where the characteristics of the responding population differ from those of the non-responding population);
- Respondent errors (e.g. a tendency to underestimate income);
- Errors in the population frame (e.g. coverage errors, misclassification errors);
- Sub-optimal questionnaire design (e.g. unclear instructions or definitions, poor flow);
- Systematic errors by interviewers (e.g. leading respondents to particular answers); and
- Processing errors (e.g. in data entry or editing).

Reference date and period

265. The reference date and reference period are the date and period (respectively) to which the indicators refer. Characteristics such as *use of the Internet* or *number of employees who use computers* vary over time and therefore questions must refer to specific dates or periods.

266. For ICT indicators, the time references are of two types: reference period (generally last 12 last months, last calendar year or fiscal year) and reference date. Core indicators B1, B2, B3, B4, B7, B8, B9 and B12 (which relate to ICT use) have a 12-month reference period. If the question is asked in respect of the *last 12 months*, then problems can arise if the data collection phase spans several months. For this reason, it is suggested that a particular period (such as the last calendar year or the *year ended 30 June 200X*) is used as the reference period and that the survey date (date of interview or dispatch of questionnaires) is as close as possible to the last day of the reference period.

267. Core indicators B5, B6, B10 and B11 (related to existing infrastructure) have as their time reference a specific day prior to the survey date. This is usually the last day of the reference period, for example *31 December 200X*, or shortly after.

268. Metadata should refer to the reference date and period used, and explain any discrepancies arising from changes or from delays in data collection. Such information would typically be included in table headings, as notes to tables and/or in a survey execution report.

Scope of indicators

269. The scope of an indicator is defined by the population to which it refers. Most indicators on the use of ICT by businesses are proportions, the denominator of which is determined by the scope specification of the survey in terms of size, economic activity, and so forth:

- Indicators B1, B3, B5, B6, B7, B8, B9, B10, B11 and B12 are calculated as proportions with respect to all in-scope businesses, i.e. with respect to the target population of businesses;
- Indicators B2 and B4 are calculated using as denominator the total number of employees of all in-scope businesses; and
- For indicators B7, B8, B9 and B12, an alternative calculation is possible. These indicators can be calculated as a percentage of the subpopulation of businesses that use the Internet (i.e. the numerator of indicator B3).

270. It is especially important that the denominator of indicators B7, B8, B9 and B12 is made quite clear. For international reporting purposes, it is desirable that these indicators are presented as proportions of the whole population of in-scope businesses (or as absolute numbers, per the UNCTAD questionnaire shown in Annex 7).

Dissemination of metadata for surveys

271. At the survey level, there is a variety of metadata of interest to users. All indicators produced from the survey will share these metadata. They are related to the type of data source (be it a stand-alone survey or a module attached to an existing sample survey or census), the scope and coverage of the survey, classifications and definitions, and methodological issues including any technicalities of data collection. All of these metadata are of relevance for assessing comparability with other national and international data. The metadata for a survey can be presented as a 'survey execution report'.

Rationale

272. Usually, a survey to collect ICT indicators derives from user demand and is expressed formally by a decision to include the necessary measurement work in the national statistical programme. The survey execution report should describe any legislation that refers to the origin of the data collection exercise and details of decisions taken to implement the operation (such as a recommendation by a national statistical council).

Description of data sources

273. As we have seen, data sources for indicators on ICT use by businesses can be diverse and include administrative records, stand-alone ICT surveys and modules in existing surveys. For that reason, metadata should refer to the nature of the data source(s) used for the calculation of ICT indicators. This is particularly important in the case of indicators expressed as a proportion since the numerator and denominator may be obtained from different data sources.

Timeliness and punctuality

274. Timeliness can be defined as the time interval between the availability of results and the date of reference of the information presented. Punctuality is the measurement of the delay between the anticipated date of release and the actual date of release. Both characteristics are easy to quantify and a quality report should include appropriate measures.

Data accessibility

275. Data accessibility is related to how easy it is for data users to obtain statistical results and associated metadata. It is related to the physical means available for data publication (paper, electronic, web-based), to the requirements for access (subscription, payment, free of charge, etc.) and how aware users are of available data and how it can be accessed.

Statistical units, scope and coverage

276. Metadata should describe the statistical units used (establishments, enterprises, etc.), and how they have been defined. Any distinctions between reporting, observation and analytical units should be made clear. Impacts on the estimates from deviations from the recommended unit (enterprise) or changes over time should be described, even if it is not possible to quantify them.

277. Scope and coverage of a survey were discussed earlier in this *Manual* (Chapter 7). Metadata should specify the scope of the survey in terms of at least size and economic activity (and often geography). Any coverage limitations related to the scope should be specified e.g. whether there are some geographical areas that have not been included in the survey or have been treated differently.

Response rate

278. An important item of metadata is the final response rate for the survey (overall and for major disaggregations). The response rate is calculated as the proportion of live (eligible) units responding to the survey. Disaggregations of response rate, by size for example, are useful in conveying an indication of non-response bias.

Statistical standards: concepts, classifications and definitions

279. Major concepts used should be described in the metadata set. An example would be concepts underlying the measurement of e-commerce.

280. Classificatory variables are used to break down indicators. The key classifications for ICT indicators are economic activity and size. The metadata for the survey should indicate whether the classifications used correspond to international classifications (ISIC, for example), or whether there are important differences. Metadata should also describe any classificatory concepts that could be ambiguous. For example, descriptions like "small and medium businesses" need to be precisely defined (generally in terms of number of employees).

281. Definitions (for instance, of 'broadband' or 'computer') and classifications are key elements for the assessment of international comparability of ICT indicators and coherence with alternative information sources (such as private surveys). Changes in definitions and classifications can also affect comparability of indicators over time and should be well documented.

Data collection method and questionnaire

282. Users should be informed about the data collection method, in particular, about the sample design and method of data collection used (face-to-face interviews, telephone interviews,

mailed questionnaires). Publishing the questionnaire used to collect data is generally of great help for more advanced users who may benefit from knowing the exact wording of questions.

Metadata reports

283. Many countries have their own reporting proformas for survey reports and indicator-level reporting.[39] It is suggested that metadata reported for ICT use surveys include a description of the topics shown in the following table.

Table 13. Suggested topics to be included in metadata reporting for ICT use surveys

Topic	Description (metadata to be included)
General information	Rationale for survey, data sources used, reference period and date, date of survey, survey vehicle (where applicable), data collection methods, pilot tests undertaken (if any); major methodological differences compared to previous or related data collection exercises; timeliness and punctuality including changes over time; data accessibility.
Statistical units, scope and coverage	Definition of statistical units used: enterprises, establishments, multinational groups etc.; differences between national unit concepts and international standards and an assessment, if available, of the consequences of the differences; use of reporting, observation and analytical units. Definition of scope and target population including economic activity, size and geography; description (and quantification if possible) of any coverage limitations in respect of the scope.
Concepts, classifications and definitions	Concepts and their basis (e.g. OECD information society statistics standards) should be described, along with any deviation or changes over time; classifications used should be stated and any inconsistencies with international standards described (with a broad impact analysis if possible); classification categories should be defined (e.g. size and geographical categories); definitions of key terms (e.g. computer) should be presented and major deviations from international standards and changes over time described.
Information on the questionnaire	The actual questionnaire used in the survey should be included in the report, if possible, with indications of significant changes over time and major deviations from international model questions.
Population frame	Name and description of the population frame or underlying business register used, origin, updating periodicity, available segmentation variables, and any known shortcomings (e.g. size intervals or sector information not reliable; particular under- or over-coverage issues); changes in the frame over time (e.g. introduction of new updating sources for the business register) should be described and their impact indicated (if significant).

[39] For example, see Eurostat's quality reporting tools for the EU at *http://epp.eurostat.ec.europa.eu/portal/*

Topic	Description (metadata to be included)
Sample design	Type of sample design (simple or stratified random sample, systematic sample, multi-stage, clustered etc.), sampling units (one stage, two stages), stratification and sub-stratification criteria, sample size and allocation criteria, sample selection schemes, additional measures taken at the time of sampling design to improve representativeness, sample overlap control and sample rotation.
Weighting procedures	Calculation of weights based on sample design, non-response adjustments, adjustments to external data (level, variables used and sources) and final weights. Types of estimates used for each kind of indicator (percentages, means, percentiles, totals, etc.) and its corresponding breakdowns.
Unit non-response and misclassification	Final response rate (total and for major aggregations), gross sample size (final selected sample), number of misclassification cases and ineligible cases, number of eligible businesses, number of non-contacts, number of cases unable to respond, other non-response, net sample size (final effective sample); additionally, the report can give further detail on the methods used for minimizing non-response as well as the methods for dealing with unit non-response (e.g. telephone follow up or written reminders). Size and distribution of unit non-response. A simple indicator that can be calculated for the whole sample and for significant breakdowns is the ratio between non-responding and live units in the sample; the definition of the ratio is $r = n^*/n$, where n is the number of eligible units in the sample and n^* the number of completed interviews or questionnaires for eligible units. It should be noted that out-of-scope units should be removed from both the numerator and denominator, and if substitutions are made in the case of unit non-response, non-response rates should be provided before and after substitution; if substitution is applied, the following information should be provided: method of selection of substitutes and any major differences in the characteristics of substituted units compared to original units.
Item non-response	Item non-response: details of any variables or items with response rates below a specified break value (50% for instance) and methods used for dealing with item non-response e.g. the form of imputation. An indication of the number and percentage of missing or invalid responses for the main variables of the questionnaire is useful.
Accuracy and precision measures	The report should indicate, at least, the standard error or coefficient of variation (relative standard error) for a selected group of indicators or sub-indicators; other alternatives are to provide some information (e.g. lookup tables) that allows users to calculate approximate errors. The formulas used for calculating sampling errors of main indicators and their corresponding breakdowns should be presented; it is also helpful to provide the effective sample size. In respect of indicator level metadata, it is useful to indicate any table cells that have a high CV (for instance, as notes to tables). While bias is usually not measurable, the report should include likely sources of bias and attempts made to minimize it.

PART C. INSTITUTIONAL ISSUES

CHAPTER 9

Cooperation and coordination

284. Chapter 9 addresses relationships between actors in the statistical system, namely the cooperation and coordination between NSOs and other stakeholders – data providers, other data producers and data users. It also covers the inclusion of ICT statistics in official statistical work programmes; international data collection and methodological work; and capacity-building activities.

285. It is of the utmost importance that ICT statistics be included in official statistical work programmes. Not only is this generally the most efficient way of using statistical infrastructure resources but it also provides strong support for indicators by giving an official "stamp" to the results.

Cooperation among stakeholders of the national statistical system

286. ICT indicators can be produced from a variety of sources and be generated by different national institutions and private organizations. In order to optimize use of existing resources, it is important to foster institutional coordination between data providers, producers and users (see Figure 6). This includes collaboration with data providers (especially regarding response burden), coordination among data producers (to increase the efficiency of technical and financial resources for data production) and cooperation with data users (to help them understand the statistics and to satisfy their data requirements).

287. It is strongly recommended that production of ICT indicators be undertaken by an independent National Statistical Office. (Where a national statistical system is decentralized, there may be several official statistical agencies. For simplicity, this *Manual* refers to them as constituting a *National Statistical Office*.) This will provide advantages in managing relationships within the national statistical system. Additionally, statistical surveys carried out by NSOs often benefit from legislation ensuring compulsory response, which thus reduces non-response. The NSO is usually a central government institution specializing in statistics and able to optimize the efficient use of physical, human and technical resources (such as data collection networks, trained interviewers, statistical specialists, business registers and survey vehicles). Users will also benefit from using official statistics and associated metadata, and will have confidence in the data released.

Figure 6. Stakeholders in the ICT statistical system

Collaboration with data providers

288. As Figure 6 shows, providers of data that can be used to produce ICT indicators (on the use of ICT by businesses, the ICT sector and trade in ICT goods) are potentially diverse. Before planning the collection of ICT indicators, NSOs should take into account the response burden that businesses and other providers would bear, defined as the effort required of them to assemble and communicate data. A high response burden may result in non-response to surveys and, consequently, bias in statistical estimates.

289. Data collection procedures should be designed to minimize the response burden of all data providers, but especially individual businesses. Mechanisms to reduce burden include the use of administrative information, well-designed questionnaires, electronic data collection, and use of rotating and non-overlapping samples (see Example 33). It is in the interests of data quality that response burden be kept reasonable in relation to the usefulness of the information provided and that data providers' requests be taken into account by statistics producers. Frequent consultation with data providers, both in formal settings (e.g. statistical councils where they are represented) and in informal ones (e.g. via NSO operations staff), is useful in improving the relationship with them.

Example 33. Reduction of response burden in Thailand business surveys

The National Statistical Office of Thailand applies a system of non-overlapping samples for business surveys. Thus, firms that are selected in a survey will generally be excluded from others. However, because of their significance, large businesses are selected in all business surveys. While a system of non-overlapping samples reduces the potential response burden by preventing the same firm from receiving a number of statistical questionnaires, it means that data from different surveys can be linked only for large businesses.

290. The collection of data by statistical agencies may be required by law. This is the case in most countries, for at least some of the statistical operations carried out by NSOs and data collections by regulatory authorities. Foreign trade operations (above a certain value threshold) are also recorded on a mandatory basis. Units to be surveyed have to be properly informed of the legal basis of the data collection, including their legal obligations and any penalties for failure to comply.

291. Data confidentiality is a crucial issue in the relationship between data producers and data providers. Decisions on investment and use of ICT by businesses are an integral part of their business strategies, and they may be reluctant to disclose sensitive information to third parties.[40] Statistical laws usually provide a guarantee of data confidentiality and protection. These safeguards need to be effectively communicated to respondents, for instance through explicit mention in questionnaires or covering letters, or by interviewers (see Example 34). Chapter 8 explores the implications of confidentiality protection for dissemination plans.

Example 34. Legal provisions for compulsory response in the Republic of Moldova

The questionnaire for the survey on use of ICT and computational techniques run by the statistical office of the Republic of Moldova refers to relevant statistical legislation on the cover page of the questionnaire. The law provides that State statistical institutions are entitled to ask for data from all physical and legal persons. At the same time, the *Statistical Law* guarantees the confidentiality of individual unit data, and this fact is also indicated on the cover page.

Source: Survey Questionnaire, Department of Statistics.

[40] Anecdotal evidence indicates that sensitivity applies particularly to revealing information about IT security breaches.

292. Some NSOs have put in place incentive systems to foster the cooperation of data providers, thereby minimizing non-response. One such incentive is to provide useful information in exchange for data (such as information comparing the situation of the business with that of others in its industry).

Cooperation and coordination among data producers

293. While it is strongly recommended that indicators on the information economy be produced by NSOs, in a number of developing economies there is currently a variety of public and private producers of ICT data, including relevant ministries, regulatory authorities (issuing licences and supervising markets), private observatories and research organizations (see Example 35). Coordination and cooperation among data producers are thus fundamental to the production of high-quality statistics. Other benefits include reduction of the overall response burden, avoidance of duplication of effort and optimization of the efficient use of resources.

Example 35. Different institutions collecting ICT data in Africa

In a stocktaking survey carried out in 2004, it was noted that in Africa, ministries responsible for telecommunications and their agencies have carried out surveys on ICT use by businesses. In Morocco, for instance, the association of ICT professionals also releases ICT indicators. In sub-Saharan African countries, NSOs were in charge of those operations, while telecommunications regulatory agencies produce ICT-related information in Congo, Rwanda and the United Republic of Tanzania.

Source: Partnership on Measuring ICT for Development (2005a).

294. While technical expertise on ICT subject matter may be more evident in ICT-related institutions, for a number of reasons NSOs are generally in a better position than other organizations to collect statistics. In many countries the NSO is the central point of the national statistical system and plays a coordinating role enshrined by law. The multiplicity of actors involved in national statistical systems, particularly in relation to ICT indicators, necessitates institutional leadership, and, given their area of expertise, NSOs are usually best placed to exercise this.

295. National statistical systems have varying degrees of structure and coordination. Most countries have a system structured within a legal framework, which puts in place coordination bodies (for example, inter-ministerial commissions or national statistical councils) where stakeholders are represented. Such inter-institutional structures may also work in thematic groups (for instance, related to particular topics). In the case of ICT statistics, the existence of formal institutional links between the NSO and relevant ministries is an advantage for the coordination of data production (see Example 36).

296. Other forms of collaboration among data-producing organizations could take the form of thematic cooperation agreements or inter-agency working groups with clearly defined responsibilities for establishing technical standards (e.g. for data collection and analysis, fieldwork and the verification and dissemination of findings). Before starting collection of data on ICT, the NSO should carefully assess the existence, in other governmental organizations, of technical expertise and data infrastructure (such as business or administrative registers).

Example 36. The decentralized system of ICT statistics in the Philippines

The Philippines has a highly decentralized system, where a strong coordination mechanism is in place, namely the National Statistical Co-ordination Board, which issues resolutions calling for the adoption of statistical standards such as economic activity classifications. The ministries responsible for transport and communication and for economic development have also released ICT indicators.

Source: Partnership on Measuring ICT for Development (2005a).

297. The powers of NSOs may be such that, inter alia, other organizations are obliged to consult them before altering administrative records that could be used for statistical purposes or before undertaking statistical work. Also, NSOs confer official status on the data they produce and may have responsibility for the preparation of national statistical plans. Legislation may endow NSOs with certain powers, for instance the power to establish technical procedures and standards, definitions, nomenclatures and survey frameworks.

298. Coordination of statistical activities between NSOs and other agencies in the national statistical system for the production of ICT indicators should include the following:

Technical coordination

- Establishment and coordinated use of definitions of ICT concepts and relevant classifications. These definitions should be based on international standards, but adapted to country conditions;
- Establishment of population frames for business surveys; and
- Establishment of procedures for the preparation and dissemination of standardized metadata by agencies in the national statistical system.

Legal coordination

- Establishment of an adequate institutional framework to represent the institutions that produce information, including (at least) the national authorities, in the areas of technological infrastructure, science, telecommunications and so forth;
- Legal provisions that NSOs can use (following appropriate analysis and consensus) to establish technical standards that are obligatory for other data producers;
- Legal provisions to confer official status on statistics from data collection exercises conducted by institutions that are members of the national statistical system (this is particularly important in the case of statistical operations financed by external agents without prior integration into national programmes of statistical activities); and
- A legal framework to ensure sustainable funding from the national budget (or from donor cooperation, where relevant) for the operation of national statistical systems and for the implementation of programmes of statistical work.

Coordination in resource allocation

- Development of synergies among the different institutions' financial resources for the implementation of large-scale surveys (for example, collaboration with registration offices for the design of business population frames; see Example 37);

- Making good use of the technical capacities of highly qualified staff in the national statistical system, for instance by having them participate in inter-agency task forces and training programmes;

- Efficient use of ICT resources available within different agencies in the national statistical system, and other cooperating organizations, for data collection, processing and dissemination; and

- Coordination of financial resources (from external sources and between agencies involved in the project).

Example 37. Distribution of roles in the collection of ICT statistics in Cameroon

Cameroon implemented a survey on penetration and use of ICT in the framework of the SCAN-ICT project. The institutions in charge were the Ministry of Post and Telecommunication (MINPOSTEL) and the National Statistical Institute (INS). The division of tasks between the two institutions enabled the sharing of technical, human and financial resources.

The responsibilities were as follows:
- Preparation of data collection instruments (INS & MINPOSTEL)
- Recruitment of interviewers (MINPOSTEL)
- Training of interviewers (INS & MINPOSTEL)
- Data collection (MINPOSTEL)
- Data processing (INS)
- Data analysis (INS & MINPOSTEL)
- Dissemination of results (INS & MINPOSTEL)
- Communication to specific users (MINPOSTEL)
- Web dissemination (MINPOSTEL).

Source: Ministry of Post and Telecommunications (www.minpostel.gov.cm/scan-ict2006) and National Statistical Institute *(www.statistics-cameroon.org).*

299. In many countries, private institutions collect ICT data and disseminate estimates on different aspects of the information economy. Unfortunately, they often produce incoherent results, rely on non-transparent methodologies and release unreliable predictions. Many private sources have therefore been deemed unreliable (UNCTAD, 2001).

Cooperation with data users

300. ICT indicators are required by a variety of users: public policymakers to design technology policies, businesses to benchmark against competitors and make informed decisions, researchers to evaluate the impact of ICT use on productivity and working conditions, and the international community to compare the deployment of ICT across a range of countries. Because public resources are devoted to the production of ICT statistics, NSOs and other data producers wish to maximize their dissemination and facilitate their use (see Example 38).

Example 38. Cooperation with ICT data users in Peru

The survey carried out in Peru in 2004 on innovation and use of ICT was the subject of a convention between the National Statistical Institute (INEI), and the National Council of Science and Technology (CONCYTEC), which is an important user of data. The orientation towards users was also present before this agreement: the INEI published a *User Manual of ICT Indicators* which included not only the results of the survey, but also a description of the methodology, a glossary of technological terms related to ICT and a copy of the questionnaire used for data collection.

Source: INEI, *www.inei.gob.pe/biblioineipub/bancopub/Inf/Lib5136/Libro.pdf.*

301. Dissemination of ICT data should be guided by the needs of users and follow best international practices. Data producers should constantly assess the demand for ICT indicators. Contacts with – and feedback from – data users, in the framework of national statistical councils or technical working groups, can help the NSO and other data producers to better understand demand for ICT statistics. In developing economies, civil society groups and NGOs have a major role to play in bridging the digital divide and assisting socially excluded groups. Civil society participation in the specification of data collection, via the participation of business associations, the media, universities and research centres, is more likely to ensure that data will be relevant to the ICT data needs of such groups.

302. Dissemination formats and tools should increase the transparency of methodology. ICT statistics publications (in paper, in electronic format and/or on the Web) should provide not only numerical estimates, but also the metadata that are required in order to understand the data (see Chapter 8 for a discussion of metadata topics to be disseminated). An example is the quality reporting profiles prepared by Eurostat, which cover a number of areas of statistics.[41]

303. Other aspects of cooperation with users relate to the timeliness and accessibility of statistical information. ICT evolution is faster than the evolution of other economic and social processes, and data quickly become outdated. The earliest possible dissemination of data, preferably on the basis of a pre-determined dissemination calendar, will be of great help to users.

304. Equity of access is an important principle that dictates that all users should have equal access to data, irrespective of their economic and social circumstances. Arranging such access is becoming easier with tools such as web-based statistical dissemination. The use of a variety of data dissemination formats (rapid notices, yearbooks, specific publications, electronic databases, etc.) should be considered in order to maximize the use of statistics.

Statistical work programmes

305. As we have seen, effective monitoring of the information economy requires high-quality and timely statistical information. One-off measuring exercises may well provide a picture of the ICT situation at a given point in time, but the rapid evolution of technologies, usage practices and policy interests quickly render one-off estimates outdated. A sustained programme of surveys and analysis is therefore necessary in order to monitor changes.

306. National statistical programmes are coordination and planning tools that are increasingly being adopted by countries. They comprise a set of statistical operations to be carried out and assign responsibilities to the various institutions that constitute the national statistical system. They would normally also include estimates of financial resources required in order to undertake the statistical programme. They can span annual or multi-annual periods and are periodically revised to reflect changes, including users' new data requirements. Usually, statistical programmes are validated by a high-level multi-institutional group, where data producers and users are represented, before their approval and adoption by Governments.

307. ICT collections should be included in national statistical programmes (see Example 39) in order to:

[41] Eurostat has applied quality profiles to various data sets such as those on employment, innovation and research, environment, social cohesion and others. The reports are available at *http://epp.eurostat.ec.europa.eu/*

- Increase the engagement of Governments for funding and other assistance;
- To communicate plans to users, including when data are expected to be available, and
- To coordinate the technical and financial resources of the NSO and other data producers.

308. It is recommended that business ICT statistics collections be coordinated with other business surveys in terms of timing and target populations, so that combined analysis of the use of ICT and other economic variables can be undertaken.

Example 39. Inclusion of ICT surveys in the statistical programme of Chile

The national statistical system of Chile is organized by means of a national statistical programme that is updated annually. The programme includes structured information about all the official statistical operations carried out not only by the NSO (INE) but also by ministries and other public institutions. In particular, it includes the description of statistical operations in terms of responsible institutions, general and specific objectives, targets for data dissemination, periodicity, geographical coverage and sources of information. In the field of ICT indicators, it mentions the different statistical operations that record data on ICT use (surveys on SMEs, surveys of the trade sector and an ICT satellite account).

Source: INE, National Statistical Programme, available at PARIS21 website, *http://www.paris21.org/*

309. Several developing economies are preparing their national strategy for the development of statistics (NSDS) and statistical master plans, which are also being promoted by the international community of donors.[42] NSDSs are intended to encompass all statistical activities of public institutions in a country, not only those of the NSO. They therefore provide a tool for coordination and sustainability of statistical production. Countries that are in the process of preparing master plans and NSDSs should consider the inclusion of ICT measurement work in medium- and long-term planning.

International data collection and methodological work

310. The need for international benchmarking, research and policy advice on ICT issues has led to data collection initiatives by several international organizations. Many countries cooperate with international organizations to compile internationally comparable ICT data, whilst also satisfying national needs for indicators. Several regional and international initiatives on the collection of harmonized ICT data have been undertaken in the past few years by UNCTAD, the ITU, the UN Regional Commissions, OECD and Eurostat, and via specific projects such as the @LIS and SCAN-ICT initiatives.

311. The *Partnership on Measuring ICT for Development* has a coordination and facilitation role in the area of international ICT measurement (see Chapter 2 for more information).

312. At the global level, the UNSC, at its 38th session in March 2007, reviewed the work of the *Partnership*, endorsed the core list of ICT indicators and encouraged countries to adopt the indicators. It also recommended future expansion of the core list to include areas such as government, education and impact measurement.

[42] For instance, the STATCAP and the TFSCB funds managed by the World Bank support the preparation and implementation of statistical master plans.

313. Important initiatives on international ICT data collection include the following:

- An international database has been established by UNCTAD based on a questionnaire sent to countries (starting in 2004), which collects data on the use of ICT by businesses and the ICT sector (see Annex 7 for the 2007 questionnaire).[43] The questionnaire is based on the core ICT indicators. The data collected by UNCTAD are used for policy advice, technical assistance activities, and research and analysis with a focus on developing economies. The results are published in the annual *Information Economy Report*.

- The International Telecommunication Union (ITU) collects a range of ICT indicators on infrastructure and access and has recently started collecting the core ICT indicators on household/individual access and use. Results are made available through the World Telecommunication Indicators Database and are used to calculate other indicators such as the ICT Opportunity Index.[44]

- The OECD and Eurostat collect and disseminate comparable information from member countries on ICT access and use, the ICT sector and the economic impact of ICT. Both organizations also provide statistical standards in the form of model questionnaires and other information.[45]

Capacity-building issues

314. The production of ICT indicators in developing economies has to be seen in the context of the general strengthening of national statistical systems. Countries that are willing to start producing such indicators should coordinate this activity with current or planned national capacity-building activities for statistical infrastructure (e.g. legal frameworks for statistics, business registers, data collection networks) and statistical practices (e.g. implementation of business surveys). Production of indicators on the use of ICT by businesses should not be considered separately from those other issues since duplication of efforts and other inefficiencies can arise. In particular, countries starting the collection of ICT indicators should take into account the following capacity-building issues:

- Improvement of the legal framework for statistical surveys: ICT business surveys (whether dedicated to ICT or vehicles for ICT modules) should ideally be subject to statistical laws that establish obligations such as compulsory provision of data and protection of those data by the NSO and other official statistical agencies. The legislative framework may also establish legal mechanisms for implementation and funding of statistical operations. In some countries, revision of the legal framework for statistical surveys could increase the efficiency of the data collection system (see Example 40).

[43] UNCTAD data are available at the website *http://measuring-ict.unctad.org*.
[44] Available at *http://www.itu.int/ITU-D/ict/publications/ict-oi/2007/index.html*.
[45] OECD data, methodological reports and analytical documents can be found at *http://www.oecd.org/sti/measuring-infoeconomy/guide*. Eurostat data and reports are available at *http://epp.eurostat.ec.europa.eu/*

Example 40. The case for revision of statistical legislation to improve ICT statistics

The statistical legislation of developing economies may be the subject of revision, especially when countries have experienced important political or economic changes. In respect of ICT statistics, such changes might lead to the inclusion, on national statistical councils, of ministries responsible for science and technology or telecommunications, organizations representing the business and research community, and so forth.
In transition economies, the exhaustiveness of business surveys established by statistical laws for centrally planned economies may not be efficient compared with sample surveys if the business sector is developed (in particular, if the small and medium-sized enterprise (SME) sector is very large).
In some countries, respect for the confidentiality of individual data may not be fully reflected in current laws, a fact that should be carefully considered.

- Establishment and improvement of business registers: The process of creating a business register for ICT data collection should be coordinated with general plans to establish a business register or improve an existing one (see Chapter 7).

- Improvement of data collection systems: Capacity-building projects for enhancing ICT data collection should avoid duplication of structures that already exist, such as a network of data collection centres (which are generally spread over the country) that report to the central or regional statistical authorities.

- Coordination of the system of business statistics: Current programmes of capacity-building for business statistics should be coordinated. In many developing economies, there are international cooperation programmes devoted to implementing new business surveys or to adapting international standards within existing systems (see Example 41). These programmes should be taken into account by countries willing to carry out ICT surveys.

Example 41. Reform of business statistics in former centrally planned economies

A number of Central and Eastern European, as well as Central Asian, countries have undergone a political and economic transition from centrally planned to market economies since the 1990s. Business surveys have been redesigned so that samples are used instead of complete enumeration of businesses. Samples for ICT surveys should be coordinated with those of other business surveys (such as manufacturing or service industry surveys) in order to reduce response burden, and increase the coherence and usability of statistical results.

- Training human resources for statistical production: Different types of staff are needed for the production and analysis of ICT statistics: interviewers, data coders, statisticians and economists. Besides specific knowledge (for example, of ICT standards, concepts and definitions), staff will usually need to have statistical expertise (for example, in collecting data, units and classifications, business sampling methods, statistical estimation, data processing techniques and statistical dissemination practices). Capacity-building programmes in business statistics should include staff involved in the production of ICT indicators.

- Enhancing the capacity for data dissemination: The implementation of statistical dissemination systems for ICT indicators such as online databases or web dissemination can be coordinated with similar initiatives for other statistical projects within statistical organizations.

315. There are several international initiatives that support the improvement of ICT statistics in developing economies. The following capacity-building initiatives may be of interest to those economies:

- The *Partnership on Measuring ICT for Development* has a capacity-building task group led by UNCTAD.[46] In the field of business ICT indicators, including indicators on the ICT sector and trade in ICT goods, UNCTAD provides technical assistance to countries interested in improving their ICT data production systems in the form of training and advisory missions. In order to improve the availability of comparable statistics on ICT for development, this technical assistance must be combined with a commitment by countries to collect the recommended core ICT indicators.

- The consortium Partnership for Statistics in the 21st Century, PARIS21 (*www.paris21.org*), provides a reference library for the preparation of statistical development strategies and master plans. PARIS 21 organizes regional seminars to foster the use of statistics for development and provides assistance to countries wishing to apply for funding under programmes such as the Trust Fund for Statistical Capacity Building (TFSCB) (grants) and the lending programme STATCAP managed by the World Bank.[47]

[46] For an overview of the capacity-building activities of the Partnership, see *http://new.unctad.org/templates/Page____605.aspx*.
[47] For information about the TFSCB and STATCAP, see *http://web.worldbank.org/*

ANNEXES

Annex 1

UNCTAD model questionnaire for core indicators on use of ICT by businesses (2007)[48]

Module A: General Information about use of ICT by your business			
A1.	**Did your business use computer/s during** <reference period>[a]**?** *A computer includes: a desktop, portable or handheld computer (e.g. a personal digital assistant), minicomputer, mainframe. A computer does not include equipment with some embedded computing abilities: such as mobile phones or TV sets, nor does it include computer-controlled machinery or electronic tills.*	☐ Yes	☐ No → Go to A6
A2.	**What percentage of persons employed in your business routinely used a computer at work during** <reference period>**?** *Employees refer to all persons working for the business, not only those working in clerical jobs. They include working proprietors as well as employees. Routinely refers to at least once a week.*	␣ ␣ ␣ %	
A3.	**Did your business have in use an internal home page (intranet) as at** <reference date>[b]**?** *An intranet refers to an internal company communications network using Internet protocol allowing communications within the organization. It is typically set up behind a firewall to control access.*	☐ Yes	☐ No
A4.	**Did your business have a local area network (LAN) as at** <reference date>**?** *A LAN refers to a network connecting computers within a localized area such as a single building, department or site; it may be wireless.*	☐ Yes	☐ No
A5.	**Did your business have an extranet (a website or an extension of the Intranet with access restricted to business partners) as at** <reference date>**?** *An extranet is a closed network that uses Internet protocols to securely share enterprise'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 enterprise's Intranet. It can also be a private part of the enterprise's website, where business partners can navigate after being authenticated in a login page.*	☐ Yes	☐ No

[48] This model questionnaire is based on the *Partnership* core list of ICT indicators published in 2005 and includes a small number of modifications and updates.

Module B: How your business uses the Internet in its operations			
B1.	**Did your business use the Internet during** <reference period>**?** *The Internet refers to Internet protocol based networks: WWW (the World Wide Web), an extranet over the Internet, EDI over the Internet, Internet accessed by mobile phones and Internet email.*	☐ Yes	☐ No → Go to C
B2.	**Where did you business use the Internet during <reference period>?**	☐ Inside the business premises ☐ Outside the business premises) - Go to B5 ☐ Both of the above	
B3.	**What percentage of persons employed in your business routinely used the Internet at work during** <reference period>**?**	␣ ␣ ␣ %	
B4.	**How did your business connect to the Internet during** <reference period>**?**	*Multiple responses allowed*	
	Analogue modem (dial-up via phone line) *An analogue modem converts a digital signal into analogue for transmission by traditional (copper) telephone lines. It also converts analogue transmissions back to digital.*	☐ Yes	☐ No
	<Other narrowband>[c]	☐ Yes	☐ No
	< Broadband>[d]	☐ Yes	☐ No
	Do not know	☐	
B5.	**Did your business have a web presence as at** <reference date>**?** *A web presence includes a website, home page 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 substantial control over the content of the page.*	☐ Yes	☐ No
B6.	**Did your business receive orders for goods or services (that is, make sales) via the Internet during** <reference period>**?** *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 email. They also include orders received on behalf of other organizations – and orders received by other organizations on behalf of the business. They exclude orders which were cancelled or not completed.*	☐ Yes	☐ No
B7.	**Did your business place orders for goods or services (that is, make purchases) via the Internet during** <reference period>**?** *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 email. They exclude orders which were cancelled or not completed.*	☐ Yes	☐ No

B8.	**For which of the following activities did your business use the Internet during** <reference period>**?**	*Multiple responses allowed*	
	For getting information about goods or services	☐ Yes	☐ No
	For getting information from government organizations/public authorities *Government organizations/public authorities include government organizations at local, regional and national level.*	☐ Yes	☐ No
	For other information searches or research activities	☐ Yes	☐ No
	For sending or receiving emails	☐ Yes	☐ No
	For performing Internet banking or accessing other financial services	☐ Yes	☐ No
	For interacting with government organizations/public authorities *Includes downloading/requesting forms, completing/lodging forms on line, making on-line payments and purchasing from, or selling to government organizations.*	☐ Yes	☐ No
	For providing customer services *Includes providing on-line or emailed product catalogues or price lists, product specification or configuration on line, after sales support, and order tracking on line.*	☐ Yes	☐ No
	For delivering products online *Products delivered over the Internet in digitized form, e.g. reports, software, music, videos, computer games; and on-line services, such as computer-related services, information services, travel bookings or financial services.*	☐ Yes	☐ No

Module D: Other information about your business[49]		
D1.	Main activity of your business (please describe)	
D2.	Number of persons employed at <reference date>	
D3.	Book value of fixed assets at <reference date>	
D4.	Total turnover (in value terms, excluding VAT) during <reference period>	

a. <reference period> refers to the period used by the NSO (typically the previous 12 months or last calendar year).

b. <reference date> would usually be at the end of the reference period, or shortly after.

c. Including ISDN, most mobile phone access and other forms of access with an advertised download speed of less than 256 Kbit/s (kilobits per second). The wording "other narrowband" would not normally be used on questionnaires - countries should add appropriate category/ies based on services available.

d. Including DSL, cable modem, high speed leased lines, optic fibre cable, some mobile phone access (e.g. UMTS), powerline, satellite, fixed wireless, with an advertised download speed of > = 256 Kbit/s. The wording "broadband" would not normally be used on questionnaires - countries should add appropriate category/ies based on services available.

[49] It is recommended to include financial (value) questions in order to be able to carry out certain types of ICT impact analysis later on. This is particulary relevant if the survey data cannot be linked to other survey data that contain this type of information about the business.

Annex 2

OECD model questionnaire for ICT use by businesses (2005)

Section A: General information about your business> use of ICT		Logic[1]	Definitions and notes
1 **Did your business use computer/s during <period>?**	☐ No ☐ Yes		A computer includes: a desktop, portable or handheld computer (*e.g.* a personal digital assistant), minicomputer and mainframe. A computer does not include computer controlled machinery or electronic tills.
2 **Did your business use the Internet or any other computer network during <period>?**[2]	☐ No ☐ Yes	Go to 25	The Internet refers to Internet Protocol (IP) based networks: WWW, extranets, intranets, Internet EDI, Internet access by mobile phone and Internet e-mail. Other computer networks include internal networks (*e.g.* a LAN), proprietary external networks which are not IP-based (for instance, the networks originally set up for EDI), and automated telephone systems. EDI is electronic data exchange with other organisations via the Internet or other networks. The exchange is in a computer readable specified form based on agreed standards *e.g.* EDIFACT, RosettaNet.
3 **Which of the following information technologies, if any, did your business have at <reference date>?**	Tick all which apply		
Intranet within your business	☐		A network using the same protocol as the Internet and allowing communication within an organisation. It is typically set up behind a firewall to control access.
Extranet between your business and other organisations (including related businesses)	☐		A private, secure extension of the intranet running on Internet protocol that allows selected external users to access some parts of an organisation>s intranet.
Local area network (LAN)	☐		A network connecting computers and associated devices within a localised area such as a single building, department or site; it may be wireless.
Wide area network (WAN)	☐		A network that connects computers and associated devices within a wide geographic area, such as a region or country.
None of the above information technologies	☐		

Section A: General information about your business> use of ICT			Logic	*Definitions and notes*
4	**Did your business use the Internet during <period>?**	☐ **No**	**Go to 19**	The Internet is defined in Question 2. Use of the Internet may be on your business premises or elsewhere.
		☐ **Yes**		
5	**What proportion of persons employed in your business routinely used the Internet at work during <period>?**[3]	**NC** ☐	**%**	This question refers to all persons employed by the business, not only those working in clerical jobs. It includes working proprietors, partners and employees. The Internet is defined in Question 2.
6	**How did your business connect to the Internet during <period>?**[4]			This question refers to the business as the subscriber rather than individual employees.
		Tick all which apply		
	Analog modem (dial-up via standard phone line)	☐		An analog modem converts a digital signal into analog for transmission by traditional (copper) telephone lines. It also converts analog transmissions back to digital.
	ISDN (Integrated Services Digital Network)	☐		ISDN is a telecommunication service that turns a traditional (copper) telephone line into a higher speed digital link. It should be regarded as narrowband.
	Other narrowband[5]	☐		Including most mobile phone access (*e.g.* WAP, i-mode) and other forms of access with an advertised download speed of less than 256 kbps (kilobits per second).
	DSL (ADSL, SDSL, VDSL etc)	☐		Digital subscriber line; it is a high-bandwidth, local loop technology carrying data at high speeds over traditional (copper) telephone lines.
	Cable modem	☐		A modem which uses cable TV lines for connection to the Internet.
	Other broadband[5]	☐		Including optic fibre cable, some mobile phone access (*e.g.* UMTS, EDGE), power line, satellite, fixed wireless, with an advertised download speed of greater than or equal to 256 kbps.

Section A: General information about your business' use of ICT	Logic	Definitions and notes
7 Did your business have any of the following IT security measures in place at <reference date>?		
Tick all which apply		
Virus checking or protection software which is regularly updated ☐		Software which detects and responds to malicious programs such as viruses, trojan horses and worms. Regular update refers to automatic or manual downloading of virus definitions.
Anti-spyware software which is regularly updated[6] **NC** ☐		Software which detects and removes spyware from a computer system (spyware gathers user information through an Internet connection without the user's knowledge). May be standalone or included in security software packages or operating systems.
Firewall ☐		Software or hardware that controls access into and out of a network or computer.
Spam filter ☐		Software that diverts incoming spam (junk e-mail). Spam filters trap messages using various criteria such as e-mail addresses or specific words (or word patterns) in the e-mail.
Secured communication between clients and servers (*e.g.* via SSL, SHTTP) ☐		SSL is an encryption protocol which creates a secure connection between a client and a server. SHTTP supports the secure transmission of individual messages over the WWW.
Authentication software or hardware for internal users ☐		Authentication software or hardware verifies the identity of an internal or external user, user device, or other entity. Forms of credentials include passwords, tokens, PIN codes and digital signatures.
Authentication software or hardware for external users (*e.g.* customers) ☐		
Intrusion detection system ☐		Any system which attempts to detect intrusion into a computer or network by observation of actions, security logs or audit data.
Regular back up of data critical to your business operations[6] **NC** ☐		
Offsite data backup ☐		Backup copies of computer files stored at a different site to your main data store. Includes both automated and non-automated backups.
No IT security measures in place ☐		
8 Did your business experience an attack by a virus or similar (for example, a trojan horse or worm) which has resulted in loss of data or time, or damage to software during <period>?[7] ***Excluding:*** *attacks which were successfully prevented by security measures in place.* **NC** ☐ **No** ☐ **Yes**		A *virus* is a self-replicating, malicious program which attaches itself to a host program. A *Trojan horse* is a program that performs like a real program a user may wish to run, but also performs unauthorised actions. A *worm* is a malicious program that self-replicates across networks.

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
Purchasing and selling goods or services via the Internet		
9 Did your business place orders (make purchases) for goods or services via the Internet during <period>? ***Including:*** *via Web sites, specialised Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones but* ***excluding*** *orders submitted via conventional e-mail* ☐ **No** ☐ **Yes**		An order is a commitment by the business to purchase goods or services, where the commitment was made via the Internet. The order may be with or without online payment and excludes orders which were cancelled or not completed. EDI is defined in Question 2. Purchases include all capital and current purchases (raw materials, components, office items, equipment, maintenance and repair items, services etc).
10 Did your business receive orders (make sales) for goods or services via the Internet during <period>? ☐ **No** **Go to 14** ***Including:*** *via Web sites, specialised Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones but* ***excluding*** *orders submitted via conventional e-mail* ☐ **Yes** ***Including:*** *orders received on behalf of other organisations and orders received by other organisations on behalf of your business*		An order is a commitment to purchase goods or services from the business, where the commitment was made via the Internet. The order may be with or without online payment and excludes orders that were cancelled or not completed. EDI is defined in Question 2.
11 What proportion of your business' total turnover during <period> (excluding value added taxes) did those Internet orders (sales) represent?[8] ☐ **%** ***Note:*** *In respect of Internet orders received on behalf of other organisations,* ***include*** *only fees or commissions earned.* ***Include*** *the value of Internet sales orders received by other organisations on your behalf. For financial services,* ***include*** *only commissions, fees and premiums earned in respect of services offered over the Internet and, in respect of Internet-only accounts, net interest income.* ***Note:*** *Careful estimates are acceptable.*		The Internet and Internet orders are defined in Question 10.

Section B: How your business uses ICT in its operations		Logic	Definitions and notes
12 Please provide percentage breakdowns of the value of those Internet orders (sales), by:[9] ***Note:*** *Careful estimates are acceptable.*		**NC**	
Types of products your business sold			Via the Internet
Physical products (ordered on line and delivered off line)	☐ %		For instance, raw materials, components, stationery, equipment, hardware, books.
Digitised products (downloaded or accessed on line)	☐ %		Products which are delivered over the Internet in digitised form, replacing physical products, *e.g.* reports, software; and new kinds of Web products which are accessed on line (*e.g.* online financial and information services).
Services which are ordered on line but delivered off line	☐ %		These include services which are ordered on line but are delivered, or substantially delivered, off line (*e.g.* accommodation, air travel).
	=100 %		
How orders were received			Via the Internet
Via an online ordering facility on your Web site	☐ %		For instance, a shopping cart facility. Excludes conventional e-mail linked from a Web site.
Through another Web site (*e.g.* specialised Internet marketplace or an agent's site)	☐ %		
Via EDI over the Internet	☐ %		For example XML/EDI. EDI is defined in Question 2.
Via other Internet technologies (please specify)…….……..	☐ %		
	=100 %		
Types of customers your business sold to			Via the Internet
Other businesses	☐ %		Including related businesses.
Individual consumers	☐ %		
Government and other non-business organisations	☐ %		Including non-profit organisations.
	=100 %		

Section B: How your business uses ICT in its operations		Logic	Definitions and notes
12 Please provide percentage breakdowns of the value of those Internet orders (sales), by:[9] (continued)	**NC**		
The location of customers your business sold to			Via the Internet
Customers within your country		%	
Customers outside your country		%	
	100=	%	
13 Which of the following benefits, if any, did your business realise through Internet selling during <period>?[10]			Internet selling (that is receiving orders for goods or services over the Internet) is defined in Question 10.
	Tick all which apply		
Reduced transaction time			
Increased quality of customer service			
Lower business costs			Including transaction and other costs.
Increased sales volume and/or number of customers			
Keeping pace with competitors			
Able to better target customers individually			
Other (please specify)……			
No benefits realised			

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
14 Which of the following factors, if any, limited or prevented Internet selling by your business during <period>?[11]		Internet selling (that is receiving orders for goods or services over the Internet) is defined in Question 10.
	Tick all which apply	
Products of your business are not well suited to sale via the Internet	☐	
Security concerns	☐	Includes concerns the business has and the perceived concerns of customers (*e.g.* on providing credit card details over the Internet).
Privacy concerns	☐	Includes concerns the business has and the perceived concerns of customers (*e.g.* about providing personal information over the Internet).
Prefer to maintain current business model, *e.g.* face to face interaction	☐	
Customers> or suppliers> computer systems are incompatible with yours[12]	NC ☐	Refers to interoperability issues which could also be described as the inability of systems to exchange information.
Insufficient level of customer demand for purchasing via the Internet	☐	
Uncertainty concerning legal/regulatory framework for selling over the Internet	☐	
Cost of development and/or maintenance is too high	☐	
Lack of skilled employees to develop, maintain or use the technology required	☐	
No limitations to selling over the Internet[13]	☐	
Not relevant - as selling over the Internet is currently under development or planned for the near future[14]	☐	
Other (please specify)……	☐	

Section B: How your business uses ICT in its operations		Logic	*Definitions and notes*
Use of the Internet for other business processes within your business			
15 Did your business have a Web site at <reference date>? ***Including:*** *Web site, home page or presence on a third party's site where your business has substantial control over the content of the page/s but* ***excluding*** *inclusion in an online directory and advertising on a third party's site*	☐ **No** ☐ **Yes**	**Go to 17**	Includes the business' Web site/home page or a presence on a third party's site (including a related business) where the business has substantial control over the content of the site/ page. It excludes a listing in an online directory, advertising on a third party's site, or other Web pages where the business does not have substantial control over content.
16 As at <reference date> did your business' Web site have any of the following features?[15]	Tick all which apply		
Product catalogues or price lists	☐		
Customised Web page or information provided for repeat clients	☐		
Facility for collecting customer information on line	☐		
A privacy policy statement[6] **NC**	☐		May be called privacy guidelines, notice or guarantee. It explains the privacy practices of the business regarding handling and using personal information.
A privacy seal or certification[6] **NC**	☐		Refers to third party privacy certification. May also be called a trustmark.
An online ordering facility for your business' products	☐		Ranges from a simple order form which is completed on line to a *shopping cart* system. May involve an intermediary, for example, a transaction processor. Products include goods and services.
Facility for online payment	☐		
Provision of online after sales support	☐		For example, online queries, customer feedback, customer services organised on line, FAQ facility.
Order tracking available on line	☐		
A security policy statement[6] **NC**	☐		A security policy statement explains the business' practices on security of customer information (transmission and/or storage) or financial transactions.
A security seal or certification[6] **NC**	☐		Refers to third party security certification. May also be called a trustmark.

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
17 Did your business use the Internet for dealing with government organisations during <period>?[16]	**NC**	Government organisations are defined by the SNA93 as entities which «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.» They include government organisations at local, regional and national level.
Tick all which apply		
For obtaining information from government organisations (*e.g.* from Web sites or via e-mail) ☐		
For downloading or requesting government forms ☐		Includes downloading from Web sites or e-mailing requests for forms; includes taxation forms, claims, applications for permits etc.
Completing forms on line or sending completed forms ☐		Includes online completion and submission of forms (*e.g.* Web forms) and sending completed forms, for instance, by e-mail; includes taxation forms, applications for permits and tender documents.
For making online payments to government organisations ☐		Includes payment of fees, payments for purchases, taxation remittances etc. Online payments to government organisations may be made via an intermediary, for instance, a bank's Web site.
Other dealings with government (please specify)…….…… ☐		
Did not use the Internet for dealing with government organisations ☐		
18 Did your business use the Internet in any of the following areas of your business during <period>?[17] *__Including:__ the WWW, extranets, intranets, EDI over the Internet but __excluding__ conventional e-mail*	**NC**	
Tick all which apply		
Finance ☐		Includes invoicing and making payments via the Internet, online banking.
Internal or external recruitment ☐		For instance, including details of vacant positions on an intranet or Web site.
Staff training ☐		Includes e-learning applications available on an intranet or from the WWW.
Sharing or distribution of information within your business ☐		Includes via an intranet or knowledge management software.
Sharing or distribution of information with other organisations ☐		For instance, collaboration with business partners.
Did not use the Internet for any of the above business activities ☐		

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
Purchasing and selling goods or services via computer networks other than the Internet		
19 Did your business place orders (make purchases) for goods or services via computer networks other than the Internet during <period>? ***For instance:*** *non-Internet based EDI, automated telephone systems* ☐ **No** ☐ **Yes**		An order is a commitment by the business to purchase goods or services, where the commitment was made via a computer network (other than the Internet). The order may be with or without online payment and excludes orders which were cancelled or not completed. EDI is defined in Question 2. Purchases include all capital and current purchases (raw materials, components, office items, equipment, maintenance and repair items, services etc).
20 Did your business receive orders (make sales) for goods or services via computer networks other than the Internet during <period>? ***For instance:*** *non-Internet based EDI, automated telephone systems* ***Including:*** *orders received on behalf of other organisations and orders received by other organisations on behalf of your business* ☐ **No** ☐ **Yes**	**Go to 22**	An order is a commitment to purchase goods or services from the business, where the commitment was made via a computer network (other than the Internet). The order may be with or without online payment and excludes orders which were cancelled or not completed. EDI is defined in Question 2.
21 What proportion of your business' total turnover during <period> (excluding value added taxes) did those orders (sales) represent?[8] ***Note:*** *In respect of orders received on behalf of other organisations,* ***include*** *only fees or commissions earned.* ***Include*** *the value of sales orders received by other organisations on your behalf. For financial services,* ***include*** *only commissions, fees and premiums earned in respect of services offered over computer networks other than the Internet.* ***Note:*** *Careful estimates are acceptable.* ☐ **%**		Orders are defined in Question 20.
Integration of your business' processes[18]		
22 Did your business place or receive orders for goods or services via any computer networks during <period>?[19] ***Including:*** *the Internet and other computer networks (e.g. non-Internet based EDI) but* ***excluding*** *orders submitted via conventional e-mail* ☐ **No** ☐ **Yes**	**Go to 25**	An order is defined in questions 9, 10, 19 and 20.

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
23 Did your systems for placing orders via computer networks link <u>automatically</u> with any of the following internal or external systems as at <date>?[20]		An automatic link exists if information captured in one system triggers an update in another system or is available in real time in other systems.
	Tick all which apply	
Your suppliers' computer system/s	☐	
Your purchasing partners' computer system/s	☐	
Your business' computer system/s		
For ordering or inventory control	☐	
For accounting functions	☐	For instance, paying suppliers.
For production or service operations	☐	
Other internal or external computer system/s (please specify)…..……	☐	
Your system/s for placing orders via computer networks were not linked automatically to any of the above	☐	

Section B: How your business uses ICT in its operations	Logic	Definitions and notes
24 Did your business' computer systems for receiving orders via computer networks link <u>automatically</u> with any of the following internal or external systems as at <date>?[20]		An automatic link exists if information captured in one system triggers an update in another system or is available in real time in other systems.
Tick all which apply		
Your customers' computer system/s ☐		
Your suppliers' computer system/s ☐		
Your business' computer system/s		
For ordering or inventory control ☐		
For accounting functions ☐		For instance, invoicing customers.
For delivery of products ☐		Including electronic delivery.
For production or service operations ☐		
For marketing or customer relations management ☐		
Other internal or external computer system/s (please specify)…..…… ☐		
Your system/s for receiving orders via computer networks were not linked automatically to any of the above ☐		

Section C: Other information about your business		
25 Main activity of the business *Please describe* ……		
26 **Number of employed persons at <date>**[21]		
27 **Total turnover during <period>** *In national currency, excluding value added taxes*		

Notes to the questions

1 Where there is no 'Go to' direction, the skip is to the next question.

2 This is a filter question only. Its purpose is to allow businesses which do not use networks to go to the last section of the questionnaire.

3 There is contradictory evidence from EC countries regarding the usefulness of this question for policy purposes and its statistical reliability. At least some European countries find that respondents have difficulty with the question. It has therefore been presented as non-core in the model questionnaire.

4 The main aim of this question is to enable estimation of the proportion of businesses with broadband access. Possible country variations are: rename categories where local terms differ (for instance, the term 'DSL' is not used much in some countries); remove categories where items are not feasible; add or split categories according to technologies available and 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 thereby leading to loss of comparability with other countries' data. Note also the comments against the categories 'Other narrowband' and 'Other broadband'. An earlier draft included a split of the broadband categories based on maximum contractual download speed (equivalent to advertised speed). That split was removed because of concerns about respondent knowledge and because it is considered that any cut-off chosen will be obsolete in a relatively short time. Individual countries may wish to include such a split, with a possible model being based on questions included by Eurostat on its 2006 model questionnaire.

5 This <other> item would not appear on questionnaires - countries should add appropriate category/ies based on services available. In particular, there is anecdotal evidence that the term 'broadband' may not be well understood in all countries.

6 This response category is non-core because it is relatively untested in member country official surveys.

7 This question is non-core because it is relatively untested in member country official surveys.

8 Countries can also ask the question as ranges or absolute values as long as an estimated total value can be calculated for each business.

9 This question is non-core because three of its components are either relatively untested in member countries (types of products and how orders were received) or are believed to be difficult statistically (location of customers). Countries may prefer to ask each component of the question as a separate question. Other issues relevant to this question include the statistical reliability of disaggregated data. An alternative to percentage splits is to ask for absolute values. The component 'type of customers' is known to be fairly stable so could be asked every second year rather than annually.

10 Categories and order are based on analysis of responses from Australia, Canada and Eurostat. Possible country variations are to add or split categories according to country data requirements. Note that responses to barriers and benefits questions tend to be fairly stable over time therefore they may be rotated in and out of an annual collection.

11 Categories have been revised and ordered based on data from Canada (Internet commerce), Australia (Internet selling) and Eurostat (Internet selling – both sellers and non-sellers). Note that this question is asked of both sellers and non-sellers though countries may prefer to ask the question separately of sellers (as a limitations question) and non-sellers (as a barriers question). Possible country variations are to add or split categories according to country data requirements. It is possible to ask barriers questions in a variety of ways. They include asking for all reasons, asking respondents to rate the importance of each reason or asking for the main plus a secondary reason, or the main reason only. The approach taken here is probably one of the least burdensome presentations. Where countries use a different approach to the collection of these data, for the purposes of international comparability, data should be tabulated to show the main reason most commonly reported or the reason most commonly selected as the most important reason. Note that responses to barriers and benefits questions tend to be fairly stable therefore they can be rotated in and out of an annual collection.

12 This is a new item designed to capture interoperability as a barrier. It is non-core because it is untested.

13 This would be a valid response for businesses which are already selling over the Internet.

14 This would be a valid response for businesses which are not currently selling over the Internet but are planning to do so.

15 This question offers the potential to cross-classify categories and produce useful information on e-business and trust functions on a business' Web site. For instance, cross classifying whether a site collects information against privacy characteristics or cross-classifying an online order facility against security characteristics. Possible country variations are to add or split categories according to country data requirements.

16 Questions relating to government units in demand surveys are complicated because respondents do not have a common idea of what constitutes a government organisation (this is exacerbated when results are compared across countries). The question has been made non-core because of these statistical difficulties. WPIIS delegates have generally supported use of the SNA definition of government units so that has been specified in this question. The SNA93 definition includes government organisations at local, regional and national level and may be found here: *http://unstats.un.org/unsd/sna1993/glossform.asp?getitem=219*. Countries should tailor this question to best convey the SNA concept of a government organisation.

17 This question is experimental and has not been asked in this form by NSOs. It is therefore non-core. It is partly based on a question tested by Statistics Canada but additional response categories have been added.

18 This section is currently limited to links between e-commerce and other systems. In the future, it could include questions about links between other business systems such as other (non e-commerce) purchases and sales, logistics etc.

19 A business should respond positively if it answered yes to any of the e-commerce purchasing or selling questions (9, 10, 19 or 20).

20 Interested countries can ask the linkages questions separately for Internet and non-Internet purchasing and selling.

21 The date would usually be the end of the reference period. To simplify the question, the date used could be that of the last pay date in the reference period.

Annex 3

Eurostat questionnaire on ICT usage and e-commerce in enterprises (2007)

Community Survey on ICT Usage and e-Commerce in Enterprises 2007[50]

General outline of the survey

Sampling unit: Enterprise.

Scope / Target Population:

Economic activity:

Enterprises classified in the following categories of NACE-Rev.1:

- Section D – *"Manufacturing"*;
- Section F – *"Construction"*;
- Section G – *"Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods"*;
- Groups 55.1 and 55.2 – *"Hotels"* and *"Camping sites and other provision of short-stay accommodation"*;
- Section I – *"Transport, storage and communication"*;
- Section K – *"Real estate, renting and business activities"*;
- Groups 92.1 and 92.2 – *"Motion picture and video activities"* and *"Radio and television activities"*.

Only for modules A, B, E and X (X1, X2 and X5):

- Classes 65.12, 65.22; 66 except 66.02 – *"Banking, financial leasing and insurance"*.

Optional:

- Section E – *"Electricity, gas and water supply"*;
- Groups from 55.3 to 55.5 inclusive;
- Groups from 92.3 to 92.7 inclusive; and
- Division 93 – *"Other service activities"*.

Only for modules A, B, E and X (X1, X2 and X5):

- Classes 67.12, 67.13, 67.2 – *"Activities auxiliary to financial intermediation, except administration of financial markets"*.

Enterprise size:

Enterprises with 10 or more persons employed;
Optional: enterprises with number of persons employed between 1 and 9.

Geographic scope:

Enterprises located in any part of the territory of the Country.

Reference period: Year 2006 for the % of sales/orders data and where specified.
January 2007 for the other data.

[50] The 2006 questionnaire can be found in Eurostat's 2006 Methodological manual for statistics on the Information Society, *http://epp.eurostat.ec.europa.eu/portal/page? pageid=1073,46587259& schema=portal&p product code=KS-BG-06-004*

Questionnaire:

The layout of the national questionnaire should be defined by the country. However, countries should follow the order of the list of variable enclosed, if possible. The background information (Module X) should be placed at the end of the questionnaire. This information can be obtained in 3 different ways: from national registers, from Structural Business Statistics or collected directly with the ICT usage survey. Every effort should be made to obtain them from the most recent SBS survey. Countries can include additional questions.

Note on the use of "Don't know" response categories:
In general "Don't know" response categories are not recommended as it is considered that such an answer would provide the same information as a blank one. Even if the respondent doesn't have the information, it should be possible to gather it from records or from someone else in the enterprise. However, there are a few exceptions in which cases a "Don't know" response category is used in the model questionnaire.

Target respondent:

A decision maker with major responsibility for IT-related issues in the enterprise (the IT manager or a senior professional in the IT department). In smaller enterprises, the respondent may be someone at the level of managing director or the owner.

Sample size, stratification:

The sampling design and the resulting sample size should be appropriate for obtaining accurate, reliable and representative results on the variables and items in the model questionnaire.

This objective should be achieved for the overall proportions as well as for the proportions for the different breakdowns of the population defined below: NACE, size class and geographic. NACE breakdown and enterprise size class breakdown are not required to be cross-tabulated.

This requirement aims at ensuring the collection of a complete dataset – without empty, confidential or unreliable cells - for these indicators.

NACE breakdown:

(To be applied to: all variables; enterprises with 10 or more persons employed; whole territory of the Country.)

Data should be broken down by the following NACE aggregates:

1 DA+DB+DC+DD+DE
2 DF+DG+DH
3 DI+DJ
4 DK+DL+DM+DN
5 45
6 50
7 51
8 52
9 55.1+55.2
10 60+61+62+63
11 64
12 72
13 70+71+73+74
14 92.1+92.2

Only for modules A, B, E and X (X1, X2 and X5):

F1 65.12+65.22
F2 66.01+66.03

Optional:

17 22
18 40+41
19 55.3+55.4+55.5
20 92.3 to 92.7
21 93

Only for modules A, B, E and X (X1, X2 and X5):

F3 67.12+67.13+67.2

Size class breakdown:

(To be applied to: all variables; aggregate of all mandatory NACE aggregates [1 to 14 defined above]; whole territory of the Country.)

Data should be broken down by the following size classes of the number of persons employed:

1 10 or more
2 10 - 49 (small enterprises)
3 50 - 249 (medium enterprises)
4 250 or more (large enterprises)

Optional:

5 1-4
6 5-9

Geographic breakdown:

(To be applied to: all variables; aggregate of all mandatory NACE aggregates [1 to 14 defined above]; enterprises with 10 or more and less than 250 persons employed [small and medium enterprises as defined above].)

Data should be broken down by the following regional groups:

1 convergence regions (ex-objective 1 regions)
2 non-convergence regions (ex-non-objective 1 regions)

Note: See glossary for the list of convergence in each country.

Weighting of results:

Results should in general be weighted by number of enterprises.
Turnover/Purchases weighting should be also used for turnover/orders related questions (Turnover: C4, C6, D4; Purchases: C2, D2: if possible purchases weighting, otherwise turnover weighting).
Weighting by the Number of Persons Employed should be also applied for questions A2, A3, B2 and for % using the Internet, % using broadband, % using xDSL, % using a website or homepage, % purchasing via the Internet, % receiving orders via the Internet, % receiving orders via the Internet or other computer mediated networks.

Treatment of non-response/ 'Do not know':

Unit non-response:
The non-respondent units should be assumed to resemble those who have responded to the survey and be treated as non-selected units. For this, the weighting or the grossing up factors should be adjusted: the design weight N_h / n_h is replaced by N_h / m_h where N_h is the size of stratum h, n_h is the sample size in stratum h and m_h is the number of respondents in stratum h.

Item non-response:
Logical corrections should be made, when information can be deducted from other variables, and priority given to further contacts with enterprises to collect the missing information.
For the categorical variables (e.g. the YES/NO questions), respondents with item non response or 'do not know' should not be imputed with values from respondents who answered the question.
Numerical variables shouldn't also be imputed with the exception of C7 (breakdown of Internet sales by type of client) and C8 (breakdown of Internet sales by destination). The imputation of these two variables should take into account, at least, the breakdowns by size class and NACE in the tabulated results.

Tabulation of results:

For the categorical variables, estimates should be made for the total number of enterprises for each response category, broken down by the NACE categories and size classes specified above.

For the quantitative variables (turnover, purchases and number of persons employed), when collected in absolute or percentage terms (and not in percentage classes), estimates should be made for the total values in absolute terms, broken down by the NACE categories and size classes specified above.

Data transmission:

Results are to be sent to Eurostat following the transmission format described in another Eurostat document.

Community Survey on ICT Usage and e-Commerce in Enterprises 2007

Final Model Questionnaire

(Questions relating to the i2010 Benchmarking Indicators are marked with an asterisk *)

	Module A: General information about ICT systems			
A1.	**Did your enterprise use computers, during January 2007?** (Filter question)	Yes ☐	No ☐ ☐ Go to X	
A2.	**How many persons employed used computers at least once a week, during January 2007? - Optional** If you can't provide this value, **Please indicate an estimate of the percentage of the number of persons employed used computers at least once a week, during January 2007. - Optional**	*(Number)* ☐☐☐ %		
A3.*	**Did your enterprise have the following information and communication technologies, during January 2007?**	Yes	No	
	a) Wireless LAN	☐	☐	
	b) Wire based LAN	☐	☐	
	c) Intranet	☐	☐	
	d) Extranet	☐	☐	
A4.*	**Did your enterprise have in use, in January 2007, any software application to manage the placing and/or receipt of orders?** (Filter question)	Yes ☐	No ☐ ☐ Go to A6	
A5.*	**Did that software application to manage orders link automatically with any of the following, as of January 2007?**	Yes	No	
	a) Internal system for re-ordering replacement supplies	☐	☐	
	b) Invoicing and payment systems	☐	☐	
	c) Your system for managing production, logistics or service operations	☐	☐	
	d) Your suppliers' business systems (for suppliers outside your enterprise group)	☐	☐	
	e)Your customers' business systems (for customers outside your enterprise group)	☐	☐	
A6.*	**Did your enterprise have in use, in January 2007, an ERP software package to share information on sales and purchases with other internal functional areas (for example, finance, planning, marketing, etc.)?**	Yes ☐	No ☐	Don't know ☐

A7.*	**Did your enterprise have in use, in January 2007, any software application for managing information about clients (so called CRM) that allows it to:**	Yes	No
	a) Capture, store and make available to other business functions the information about its clients?	☐	☐
	b) Make analysis of the information about clients for marketing purposes (setting prices, make sales promotion, choose distribution channels, etc.)?	☐	☐
A8.*	**Did your enterprise have in use, in January 2007, third party free or open source operating systems, such as Linux ? (i.e. with its source code available, no copyright cost, and the possibility to modify and/or (re)distribute it)**	Yes ☐	No ☐
A9.*	**Was your enterprise, in January 2007, sending e-invoices in a digital format which allows its automatic processing?**	Yes ☐	No ☐
A10.*	**Was your enterprise, in January 2007, receiving e-invoices in a digital format which allows its automatic processing?**	Yes ☐	No ☐
A11.*	**Was your enterprise, in January 2007, using a digital signature in any message sent, i.e. using encryption methods that assure the authenticity and integrity of the message (uniquely linked to and capable of identifying the signatory and where any subsequent change to the message is detectable)?**	Yes ☐	No ☐
	Module B: Use of Internet (asking enterprises with ICT)		
B1.	**Did your enterprise have access to Internet, during January 2007?** (Filter question)	Yes ☐	No ☐ ☐ Go to D1
B2.*	**How many persons employed used computers connected to the World Wide Web at least once a week, during January 2007?** If you can't provide this value, **Please indicate an estimate of the percentage of the number of persons employed used computers connected to the World Wide Web at least once a week, during January 2007.**	*(Number)* ☐☐☐ %	

B3.*	**Did your enterprise have the following types of external connection to the Internet, during January 2007?**	Yes	No
	a) Traditional Modem (dial-up access over normal telephone line)	☐	☐
	b) ISDN connection	☐	☐
	c) DSL (xDSL, ADSL, SDSL etc) connection	☐	☐
	d) Other fixed internet connection (e.g. cable, leased line (e.g. E1 or E3 at level 1 and ATM at level 2), Frame Relay, Metro-Ethernet, PLC - Powerline comunication, etc.)	☐	☐
	e) Mobile connection (e.g. e.g. analogue mobile phone, GSM, GPRS, UMTS, EDGE, CDMA2000 1xEVDO)	☐	☐
B4.	**Did your enterprise use the Internet for the following purposes, during January 2007?**		
	(<u>as consumer</u> of Internet services)	Yes	No
	a) Banking and financial services	☐	☐
	b) Training and education	☐	☐
	c) Market monitoring (e.g. prices)	☐	☐
B5.*	**Did your enterprise use the Internet for interaction with public authorities, during 2006?** (Filter question)	Yes ☐	No ☐ ☐ Go to B8
B6.*	**Did your enterprise interact with public authorities in the following ways, during 2006?**	Yes	No
	a) For obtaining information	☐	☐
	b) For obtaining forms, e.g. tax forms	☐	☐
	c) For returning filled in forms, e.g. provision of statistical information to public authorities	☐	☐
	d) Submitted a proposal in an electronic tender system (e-procurement)	☐	☐
B7.	**Did your enterprise have a Web Site / Home Page, during January 2007?** (Filter question)	Yes ☐	No ☐ ☐ Go to B10
B8.	**Did the Web Site of your enterprise provide the following facilities, during January 2007?**		
	(your enterprise <u>as provider</u> of Internet services)	Yes	No
	a) Marketing the enterprise's products	☐	☐
	b) Facilitating access to product catalogues and price lists	☐	☐
	c) Providing after sales support	☐	☐

	Module C: e-commerce via Internet (asking enterprises with Internet access) **Orders placed via Internet (Purchases)**		
C1.*	**Did your enterprise order products/services via the Internet, during 2006 (excluding manually typed e-mails)?** (Filter question)	Yes ☐	No ☐ ☐ Go to C3
C2.*	**Please indicate for 2006 the percentage of the Internet orders in relation to the total purchases (in monetary terms, excluding VAT).**	Less than 1% ☐ 1% or more and less than 5% ☐ 5% or more and less than 10% ☐ 10% or more and less than 25% ☐	
	Alternative Question:	25% or more ☐	
	Please state the value of the purchases resulted from orders placed via Internet (in monetary terms, excluding VAT), in 2006. If you can't provide this value, **Please indicate an estimate of the percentage of the total purchases resulted from orders placed via Internet, in 2006.**	*(National Currency)* ☐☐☐ %	
	Orders received via Internet (Sales)		
C3.*	**Did your enterprise receive orders via the internet, during 2006 (excluding manually typed e-mails)?** (Filter question)	Yes ☐	No ☐ ☐ Go to D1
C4.*	**Please state the value of the turnover resulted from orders received via Internet (in monetary terms, excluding VAT), in 2006.** If you can't provide this value, **Please indicate an estimate of the percentage of the total turnover resulted from orders received via Internet, in 2006.**	*(National Currency)* ☐☐☐ %	
C5.*	**Was your enterprise using a secure protocol, such as SSL and TLS, for the reception of orders via Internet, in January 2007?**	Yes ☐	No ☐

	Module D: E-commerce via external computer networks other than Internet (asking enterprises with ICT) **Orders placed via external computer networks other than Internet (Purchases)**		
D1.*	**Did your enterprise order products/services via external computer networks other than Internet, during 2006?** (Filter question)	Yes ☐	No ☐ ▫Go to D3
D2.*	**Please indicate for 2006 the percentage of the orders placed or transmitted via computer networks other than Internet, in relation to the total purchases (in monetary terms, excluding VAT).**	Less than 1% ☐ 1% or more and less than 25% ☐ 25% or more and less than 50% ☐ 50% or more and less than 75% ☐ 75% or more ☐	
	Alternative Question: **Please state the value of the purchases resulted from orders placed via external computer networks other than Internet (in monetary terms, excluding VAT), in 2006.** If you can't provide this value, **Please indicate an estimate of the percentage of the total purchases resulted from orders placed via external computer networks other than Internet, in 2006.**	*(National Currency)* ___ ___ ___ %	
	Orders received via external computer networks other than Internet (Sales)		
D3.*	**Did your enterprise receive orders via external computer networks other than Internet, during 2006?** (Filter question)	Yes ☐	No ☐ ▫Go to E1
D4.*	**Please state the value of the turnover resulted from orders received via computer networks other than Internet (in monetary terms, excluding VAT), in 2006.** If you can't provide this value, **Please indicate an estimate of the percentage of the total turnover resulted from orders received via computer networks other than Internet, in 2006.**	*(National Currency)* ___ ___ ___ %	
	Module E*: e-Skills – ICT competence in the enterprise unit and the demand for ICT skills (asking enterprises with ICT)		
E1.	**Did your enterprise employ ICT/IT specialists, in January 2007?** (Filter question)	Yes ☐	No ☐ ▫Go to E3
	Definition ICT/IT specialists **:** *ICT specialists or IT specialists have the capability to specify, design, develop, install, operate, support, maintain, manage, evaluate and research ICT and ICT systems. ICT is the main job.*		
E2.	**How many ICT/IT specialists were employed by your enterprise, during January 2007?** If you can't provide this value, **Please indicate an estimate of the percentage of the number of ICT/IT specialists in relation to the total number of persons employed, during January 2007.**	*(Number)* ___ ___ ___ %	

E3.	**Did your enterprise recruit or try to recruit personnel for jobs requiring ICT specialist skills, during 2006?** (Filter question)	Yes ☐	No ☐ ☐ Go to E6
E4.	**Did your enterprise have hard-to-fill vacancies for jobs requiring ICT specialist skills, during 2006?** (Filter question)	Yes ☐	No ☐ ☐ Go to E6

E5.	**What do you believe were the main reasons of having hard-to-fill vacancies for jobs requiring ICT specialist skills, during 2006?**	Yes	No
	a) Lack or too low number of applicants with ICT specialist skills	☐	☐
	b) Lack of ICT related qualifications from education and/or training	☐	☐
	c) Lack of work experience in the field of ICT	☐	☐
	d) Salary requests too high	☐	☐
	e) Other **- Optional**	☐	☐

E6.	**Did your enterprise recruit or try to recruit personnel for jobs requiring skills in the use of ICT, during 2006?** (Filter question)	Yes ☐	No ☐ ☐ Go to E8

***Definition ICT user skills*:** *Capabilities enabling the effective use of common, generic software tools (basic user skills) or advanced, often sector-specific, software tools (advanced user skills). Jobs requiring ICT user skills: ICT is an important tool for the job and is used to produce work output and/or used intensively at work (in day-to-day activities)*

E7.	**Did your enterprise have hard-to-fill vacancies due to applicants' lack of skills in the use of ICT, during 2006?**	Yes ☐	No ☐

E8.	**Did your enterprise provide training to develop or upgrade ICT related skills of your personnel, during 2006?**	Yes	No
	a) Training for ICT/IT specialists	☐	☐
	b) Training for users of ICT	☐	☐

E9.	**Were any ICT functions requiring ICT/IT specialists performed by external suppliers (fully or partly), during 2006?**	Yes ☐	No ☐

Definition External Suppliers: *Suppliers in a foreign country or foreign suppliers includes 1) foreign affiliates, usually legal entities, established by the enterprise (internal suppliers from abroad), and 2) other foreign enterprises (external suppliers from abroad).*

E10.	**Were any ICT functions requiring ICT/IT specialists performed by suppliers in a foreign country (fully or partly), during 2006?** (Filter question) ***Definition Suppliers in a foreign country****: Suppliers in a foreign country or foreign suppliers can be 1) foreign affiliates, usually legal entities, established by the enterprise (internal suppliers from abroad) and/or 2) other foreign enterprises (external suppliers from abroad).*	Yes by foreign affiliates established by the enterprise	Yes by other foreign enterprises	No
		☐	☐	☐ ☐ Go to E13/X

E11.	**Which ICT functions were performed by suppliers' ICT/IT specialists in a foreign country, during 2006? - Optional**	Yes	No
	a) ICT management (includes e-business and ICT systems management)	☐	☐
	b) ICT development and implementation (includes business software development, programming, web development, database development, communication network development, systems integration and installation)	☐	☐
	c) ICT operations (includes technical support, user help and support, network administration, web administration, database administration)	☐	☐
	d) Other ICT functions	☐	☐
E12.	**From which of the following geographical regions did your enterprise engage suppliers' ICT/IT specialists, during 2006?**	Yes	No
	a) other EU Member States	☐	☐
	b) Non-EU Countries	☐	☐
E13.	**Were any business functions requiring users of ICT performed by external suppliers (fully or partly), during 2006? - Optional**	Yes ☐	No ☐

E14.	**Were any business functions requiring users of ICT performed by suppliers in a foreign country (fully or partly), during 2006? - Optional** (Filter question)	Yes by foreign affiliates established by the enterprise	Yes by other foreign enterprises	No
		☐	☐	☐ ▫ Go to X

E15.	**Which business functions (non-ICT) were performed by suppliers' ICT users in a foreign country, during 2006? - Optional**	Yes	No
	a) Sales and marketing, customer services	☐	☐
	b) Research and development, product design and engineering	☐	☐
	c) Other (non-ICT) business functions	☐	☐
E16.	**Please indicate the geographical regions from where you engaged business services requiring ICT users, during 2006. - Optional**	Yes	No
	a) other EU Member States	☐	☐
	b) Non-EU Countries	☐	☐

	Module X: Background information (X1-X5) available in some countries from SBS and thus not to be included; latest available information should be provided	
X1.	**Main economic activity of the enterprise, during 2006**	
X2.	**Average number of persons employed, during 2006**	
X3.	**Total purchases of goods and services (in value terms, excluding VAT), for 2006**	
X4.	**Total turnover (in value terms, excluding VAT), for 2006**	
X5.	**Location (Convergence/ non-Convergence region), in 2006**	

Community Survey on ICT Usage and e-Commerce in Enterprises 2007

Glossary

ERP (New)

Enterprise Resource Planning (ERP) consists of one or of a set of software applications that integrate information and processes across the several business functions of the enterprise. Typically ERP integrates planning, procurement, sales, marketing, customer relationship, finance and human resources.

ERP software can be customised or package software. These latter are single-vendor, enterprise wide, software packages, but they are built in a modular way allowing enterprises to customise the system to their specific activity implementing only some of those modules.

ERP systems typically have the following characteristics:

1. are designed for client server environment (traditional or web-based);
2. integrate the majority of a business's processes;
3. process a large majority of an organization's transactions;
4. use enterprise-wide database that stores each piece of data only once;
5. allow access to the data in real time.

CRM (New)

Customer Relationship Management (CRM) is a management methodology which places the customer at the centre of the business activity, based in an intensive use of information technologies to collect, integrate, process and analyse information related to the customers.

One can distinguish between:

1. Operational CRM – Integration of the front office business processes that are in contact with the customer.

2. Analytical CRM – Analysis, through data mining, of the information available in the enterprise on its customers. This aims to gather in depth knowledge of the customer and how to answer to its needs.

e-Invoice (New)

An **e-invoice** is an invoice where all data is in digital format and it can be processed automatically. A distinctive feature of an e-invoice is automation. E-invoice will be transferred automatically in inter-company invoicing from the invoice issuer's or service provider's system directly into the recipient's financial or other application.

The transmission protocol might be XML, EDI or other similar format.

e-Signature (New)

An **e-signature** is some kind of electronic information attached to or associated with a contract or another message used as the legal equivalent to a written signature. Electronic signature is often used to mean either a signature imputed to a text via one or more of several electronic means, or cryptographic means to add non-repudiation and message integrity features to a document. Digital signature usually refers specifically to a cryptographic signature, either on a document, or on a lower-level data structure.

For either of them to be considered a signature they must have a legal value, otherwise they are just a piece of communication.

Some web pages and software EULAs claim that various electronic actions are legally binding signatures, and so are an instance of electronic signature. For example, a web page might announce that, by accessing the site at all, you have agreed to a certain set of terms and conditions. The legal status of such claims is uncertain.

An electronic signature can also be a digital signature if it uses cryptographic methods to assure both message integrity and authenticity. Because of the use of message integrity mechanisms, any changes to a digitally signed document will be readily detectable if tested for, and the attached signature cannot be taken as valid.

It is important to understand the cryptographic signatures are much more than an error checking technique akin to checksum algorithms, or even high reliability error detection and correction algorithms such as Reed-Solomon. These can offer no assurance that the text has not been tampered with, as all can be regenerated as needed by a tamperer. In addition, no message integrity protocols include error correction, for to do so would destroy the tampering detection feature.

Popular electronic signature standards include the OpenPGP standard supported by PGP and GnuPG, and some of the S/MIME standards (available in Microsoft Outlook). All current cryptographic digital signature schemes require that the recipient have a way to obtain the sender's public key with assurances of some kind that the public key and sender identity belong together, and message integrity measures (also digital signatures) which assure that neither the attestation nor the value of the public key can be surreptitiously changed. A secure channel is not required.

A digitally signed text may also be encrypted for protection during transmission, but this is not required when the digital signature has been properly carried out. Confidentiality requirements will be the guiding consideration.

SSL/TLS (New)

Secure Sockets Layer (SSL) and Transport Layer Security (TLS) are cryptographic protocols which provide secure communications on the Internet. SSL provides endpoint authentication and communications privacy over the Internet using cryptography. In typical use, only the server is authenticated (i.e. its identity is ensured) while the client remains unauthenticated; mutual authentication requires PKI deployment to clients. The protocols allow client/server applications to communicate in a way designed to prevent eavesdropping, tampering, and message forgery.

Free / Open Source (New)

Open source software refers to computer software under an open source license. An open-source license is a copyright license for computer software that makes the source code available under terms that allow for modification and redistribution without having to pay the original author. Such licenses may have additional restrictions such as a requirement to preserve the name of the authors and the copyright statement within the code.

Related to the Open Source Definition is the Free Software definition by the Free Software Foundation, which attempts to capture what is required for a program license to qualify as being free-libre software. In practice, licenses meet the open source definition almost always also meet the Free software definition. All licenses reported to meet the free software definition as of 2005 also meet the open source definition.

B2B

Business-to-Business transactions conducted over IP based networks and over other computer-mediated networks.

B2C	Transactions conducted between Business and private Consumer over IP based networks and over other computer-mediated networks.
Broadband	No generally accepted definition of broadband can be given. Common definitions refer to either: a) the connection speeds measured in kbps or mbps (in at least the downstream direction) or bandwidth measured by the amount of digital bits that one can transmit per second, measured in kbps or mbps; b) the type of connection, of which the following provide broadband access: xDSL (ADSL, SDSL, etc), Cable TV network (cable modem), UMTS (mobile phone), or other (e.g. satellite, fixed wireless); c) the content that is provided with the examples of high definition movie trailers, short films, flash animation, three dimensional video games, video on demand, internet radio, streaming video, video conferencing and so on.
Computer-mediated networks other than Internet	Minitel or interactive telephone systems Networks that are employed for communication between computers but that are not publicly accessible Wide Area Networks such as the Internet. They are usually proprietary networks made up of leased lines and can cover local and wide geographical areas. Examples are EDI over private networks, Minitel or interactive telephone systems. They exclude all IP/Internet Protocol based networks (www, extranet, EDI over Internet, virtual private network over Internet, internet enabled mobile phones).
Digital products or services	Goods/services that can be ordered and delivered directly to a computer over the Internet, e.g. music, videos, games, computer software, online newspapers, consulting services, etc.
DSL (Digital Subscriber Line)	A high-bandwidth (broadband), local loop technology to carry data at high speeds over traditional (copper) telephone lines.
xDSL, ADSL etc.	DSL technologies designed to increase bandwidth over standard copper telephone wires; includes ADSL (Asymmetric Digital Subscriber Line) etc.
Electronic commerce (e-commerce)	Transactions conducted over Internet Protocol-based networks and over other computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or off-line. Orders received via telephone, facsimile, or manually typed e-mails are not counted as electronic commerce.
E-mail	Electronic transmission of messages, including text and attachments, from one computer to another located within or outside of the organisation. This includes electronic mail by Internet or other computer networks.
Extranet	A secure extension of an Intranet that allows external users to access some parts of an organisation's Intranet.
e-Skills / ICT Skills	Two main types of e-skills can be distinguished: • ICT specialist skills: specifying, designing, developing, installing, operating, supporting, maintaining, managing, evaluating and researching ICT systems. • ICT users skills: apply systems to support own work, use of generic software tools and use of specialised tools supporting business functions within industry (see for more details below *ICT user skills*).

e-Skills / External Suppliers / (Outsourcing e-skills) (New)	Other enterprises, includes also foreign enterprises/legal entities, associated or not associated to a group of enterprises. (e-skills sourced from external suppliers address the phenomena of outsourcing, i.e. activities are contracted out to other enterprises in the same country or abroad.)
e-Skills / Foreign Suppliers / Suppliers in a foreign country / (Offshoring e-skills) (New)	Suppliers in a foreign country can be 1) foreign affiliates, usually legal entities, established by the enterprise (internal suppliers from abroad) or 2) other foreign enterprises (external suppliers from abroad). (e-skills sourced from suppliers in a foreign country address the phenomena of offshoring. E-skills sourced from foreign affiliates address offshore insourcing. E-skills sourced from other foreign enterprises address offshore outsourcing.)
ICT/IT Specialists (New)	ICT specialists or IT specialists have the capability to specify, design, develop, install, operate, support, maintain, manage, evaluate and research ICT and ICT systems. ICT is the main job. Related ISCO-88 classification codes: 1236 Computing services managers 2131 Computer systems designers, analysts and programmers 2139 Computing professionals not elsewhere classified 2144 Electronics and telecommunications engineers 3114 Electronics and telecommunications engineering technicians 3121 Computer assistants 3122 Computer equipment operators 3132 Broadcasting and telecommunications equipment operators
ICT User Skills (New)	Capabilities enabling the effective use of common, generic software tools (basic user skills) or advanced, often sector-specific, software tools (advanced user skills). ICT is an important tool for the job and is used to produce work output and/or is used intensively at work (in day-to-day activities)
ISDN	Integrated Services Digital Network.
Internet	Relates to Internet Protocol based networks: www, Extranet over the Internet, EDI over the Internet, Internet-enabled mobile phones.
Intranet	An internal company communications network using Internet protocol allowing communications within an organisation.
LAN (Local Area Network)	A network for communication between computers confined to a single building or in closely located group of buildings, permitting users to exchange data, share a common printer or master a common computer, etc.
Modem	Device that modulates outgoing digital signals from a computer or other digital device to analogue signals for a conventional copper twisted pair telephone line and demodulates the incoming analogue signal and converts it to a digital signal for the digital device.
Web site	Location on the World Wide Web identified by a Web address. Collection of Web files on a particular subject that includes a beginning file called a home page. Information is encoded with specific languages (Hypertext mark-up language (HTML), XML, Java) readable with a Web browser, like Netscape's Navigator or Microsoft's Internet Explorer.

xDSL

Digital Subscriber Line. DSL technologies are designed to increase bandwidth available over standard copper telephone wires. Includes IDSL, HDSL, SDSL, ADSL, RADSL, VDSL, DSL-Lite.

Convergence regions

In 2007 the list of objective 1 regions (valid until end 2006) is substituted by the new list of convergence regions eligible for funding from the Structural Funds. Structural Funds promote the development and structural adjustment of regions whose development is lagging behind. It defines convergence regions as those where average per capita GDP is below 75% of the European Union average.

Countries *composed entirely* **of Convergence regions:**
Bulgaria
Estonia (the whole country counts as one single region at NUTS2)
Ireland (Southern and Eastern under transitional support)
Latvia (the whole country counts as one single region at NUTS2)
Lithuania (the whole country counts as one single region at NUTS2)
Malta (the whole country counts as one single region at NUTS2)
Poland
Romania
Slovenia (the whole country counts as one single region at NUTS2)

Countries *partially composed* **of Convergence regions:**
Belgium: Hainaut
Czech Republic: Střední Čechy, Jihozápad, Severozápad, Severovýchod, Jihovýchod, Střední Morava, Moravskoslezsko (i.e. the whole country except Praha)
Germany: Brandenburg Nord-Ost, Brandenburg Süd-West, Mecklenburg-Vorpommern, Lüneburg, Chemnitz, Dresden, Leipzig, Dessau, Halle, Magdeburg, Thüringen
Greece: Anatoliki Makedonia, Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ipeiros, Ionia Nisia, Dytiki Ellada, Peloponnisos, Attiki, Voreio Aigaio, Kriti
Spain: Galicia, Principado de Asturias, Castilla-La Mancha, Extremadura, Andalucía, Región de Murcia, Ceuta, Melilla
France: Guadeloupe, Martinique, French Guyana, Réunion
Italy: Campania, Puglia, Basilicata, Calabria, Sicilia
Hungary: Közép-Dunántúl, Nyugat-Dunántúl, Dél-Dunántúl, Észak-Magyarország, Észak-Alföld, Dél-Alföld
Austria: Burgenland
Portugal: Norte, Algarve, Centro, Alentejo, R. A. Açores
Slovakia: Západné Slovensko, Stredné Slovensko, Východné Slovensko (i.e. the whole country except Bratislavsky kraj)
United Kingdom: West Wales and the Valleys, Cornwall and Isles of Scilly, Highlands and Islands

Countries with *no* Convergence regions:

Denmark (the whole country counts as one single region at NUTS2)

Cyprus (the whole country counts as one single region at NUTS2)

Luxembourg (whole country counts as one single region at NUTS2)

The Netherlands

Finland

Sweden

The list of convergence regions was published in OJ L 243/44 (6.9.2006), "Commission Decision of 4 August 2006 drawing up the list of regions eligible for funding from the Structural Funds under the Convergence objective for the period 2007-2013"

Type of the External Internet Connection

By term an external connection it is meant the type of the (last mile) connection of the enterprise (e.g. enterprise's computer-mediated network) to the network of the Internet access 'service' provider 'ISP'.

"The last mile is the final leg of delivering communications connectivity to a resident or customer (enterprise)."

Type of external Internet connection:

a) Dial-up is a temporary connection to the Internet via an analogue (standard) modem and standard telephone line (Public switched telephone network PSTN), which requires that the modem dial a phone number when Internet access is needed (to dial the Internet service provider's node to establish a modem-to-modem link, which is then routed to the internet).

"Dial-up pertains to a telephone connection in a system of many lines shared by many users. A dial-up connection is established and maintained for limited time duration. A dial-up connection can be initiated manually or automatically by your computer's modem or other device. This once most common used type of the Internet connection is capable of carrying up to 56 kilobits per second (Kbit/s) and is consider as typical example of the low capacity 'speed' connection (narowband)."

b) ISDN (Integrated Services Digital Network) connection is a temporary connection to the Internet using a type of circuit switched telephone network system (a set of CCITT/ITU standards), designed to allow digital (as opposed to analog) transmission of voice and data over ordinary telephone copper wires (enables digital transmission over the public switched telephone network), resulting in better quality and higher speeds, than available with analog systems.

"Enterprise that installs an ISDN adapter (in place of a telephone modem) receives up to 128 Kbps compared with the maximum 56 Kbps rate of an analog (standard) modem connection. ISDN services can simultaneously transmit voice, data and video. ISDN is also consider as the low capacity 'speed' connection (narowband)."

"It includes Basic Rate Interface BRI**)** - consisting of two B channels, each with bandwidth of 64 Kbit/s, and one D channel with a bandwitdth of 16 Kbit/s."

"This category does not include Primary-Rate Interface, a type of ISDN service designed for larger organizations. PRI includes 23 B-channels (30 in Europe) and one D-Channel. PRI service is generally transmitted through a T-1 line (or an E1 line in Europe). This type of connection belongs under alternative e)."

c) Connection via low capacity 'speed' mobile phone networks is an access to the Internet using a long range wireless transmission of the mobile network technologies as High-Speed Circuit-Switched Data (HSCSD) or General Packet Radio Service (GPRS) that is sometimes called as 2,5 mobile generation technology (2,5 G).

Access to the Internet via mobile phone networks should be consider as low capacity 'speed' mobile connection (narowband) if it is being equal to, or greater than 256 Kbit/s, as the sum of the capacity in both directions (download or upload).

However for the Enterprise survey definition based on the type of the "mobile Internet connection" is decisive factor for an identification if the particular Internet connection belongs to the low capacity 'speed'' connection. See following two examples:

HSCSD is a development of Circuit Switched Data, the original data transmission mechanism of the GSM mobile phone system. As with CSD channel allocation is done in circuit switched mode. The difference comes from the ability to use different coding methods and even multiple time slots to increase data throughput. HSCSD is a temporary mobile connection.

"2.5G is a stepping stone between 2G and 3G cellular (mobile) wireless technologies. The term "second and a half generation" is used to describe 2G-systems that have implemented a packet switched domain in addition to the circuit switched domain. While the terms "2G" and "3G" are officially defined, "2.5G" is not. It was invented for marketing purposes only. 2.5G provides some of the benefits of 3G (e.g. it is packet-switched) and can use some of the existing 2G infrastructure in GSM and CDMA networks. The most commonly known 2.5G technique is GPRS."

GPRS is a 2.5G mobile standard typically adopted by GSM operators as a migration step towards 3G (W-CDMA). GPRS is based on packet-switched technology enabling high-speed data transmission.

Examples of some most common spread standards of low capacity 'speed' mobile network connection and their bandwidth (can be different between the countries and also within the same country):

	download	upload
GPRS 4+1	57.6 kbit/s	14.4 kbit/s
GPRS 3+2	43.2 kbit/s	28.8 kbit/s
CSD	9.6 kbit/s	9.6 kbit/s
HSCSD	28.8 kbit/s	14.4 kbit/s
HSCSD	43.2 kbit/s	14.4 kbit/s

"Connection via low capacity 'speed' mobile phone networks belongs to the category of the 'mobile' wireless Internet connection (mobile Internet) compare with the 'fixed' wireless Internet connection (FWA). It is also considered as the narrowband."

d) xDSL (Digital Subscriber Line*)* refers to a family of a high-bandwidth (broadband), local loop technologies that provide a digital permanent Internet connection over the copper wires of the local telephone network.

"Asymmetric Digital Subscriber Line (ADSL) where more bandwidth is allocated to download than upload and High Rate Digital Subscriber Line (HDSL) are

considering as dominant DSL technologies. Typically, individual connections will provide from 1.544 Mbps to 512 Kbps downstream and about 128 Kbps upstream. Actual bandwidth may vary significantly between the states as wells as within the state. A DSL line can carry both data and voice signals and the data part of the line is continuously connected. DSL connection is considered as one of the high capacity 'speed' permanent 'fixed' Internet connection (broadband)."

e) Other high capacity 'speed' fixed (wire or wireless) connection includes following types of the Internet connection: Cable modem 'cable TV network connection'; High capacity leased lines 'Frame Relay, ATM, Digital Multiplex'; Ethernet LANs connection; Optical fibre connection; Satellite connection; Wi-fi connection, other FWA connections etc..

Cable modem is using modems attached to cable television networks (cable TV lines) for permanent 'fixed' access to the Internet.

"The term cable internet (or simply cable) refers to the delivery of internet service over this infrastructure. A cable modem is a device that enables you to hook up your PC to a local cable TV line and receive data at about 1.5 Mbps. It is considered as one of the high capacity 'speed' permanent 'fixed' Internet connection (broadband)."

High capacity leased line is a permanent telephone connection between two points set up by a telecommunications common carrier. Typically, leased lines are used by businesses to connect geographically distant offices.

"Unlike normal dial-up connections, a leased line is always active. Because the connection doesn't carry anybody else's communications, the carrier can assure a given level of quality. For example, a T-1 channel is a type of leased line that provides a maximum transmission speed of 1.544 Mbps. You can divide the connection into different lines for data and voice communication or use the channel for one high speed data circuit. Dividing the connection is called multiplexing. Increasingly, leased lines are being used by companies, and even individuals, for Internet access because they afford faster data transfer rates and are cost-effective if the Internet is used heavily.

"A leased line is a telephone line that has been leased for private use. In some contexts, it's called a dedicated line. A leased line is usually contrasted with a switched line or dial-up line". Leased lines are usually available at speeds of 64k, 128k, 256k, 512k, 2Mb and provided to the customer on X.21 presentation. Frame relay protocol and T-1 and T-3 (in Europe called E-1 and E-3) lines are used for the Internet connection via a leased lines. Higher speeds are available on alternative interfaces.

"Frame relay is an efficient Data transmission technique used to send digital information quickly and cheaply to one or many destinations from one point. It is a packet-switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks in the U.S. support data transfer rates at T-1 (1.544 Mbps) and T-3 (45 Mbps) speeds. In fact, you can think of Frame Relay as a way of utilizing existing T-1 and T-3 lines owned by a service provider. Most telephone companies now provide Frame Relay service for customers who want connections at 56 Kbps to T-1 speeds. (In Europe, Frame Relay speeds vary from 64 Kbps to 2 Mbps. Frame relay is being displaced by ATM and native IP based products, including IP virtual private networks."

Fixed wireless Internet connection (FWA) are technologies using radio-frequency, infrared, microwave, or other types of electromagnetic or acoustic

waves in place of wires, cables, or fibre optics to transmit signals or data (provide Internet access) between stationary (fixed) points. It includes e.g. a satellite Internet connection (long range wireless transmission) or Wi-fi (medium range wireless transmission).

Wi-Fi (or Wi-fi, WiFi, Wifi, wifi), short for "Wireless Fidelity", is a set of Ethernet standards for wireless local area network (WLAN) currently based on the IEEE 802.11 specifications. New standards beyond the 802.11 specifications, such as 802.16 are currently in the works, they offer many enhancements, anywhere from longer range to greater transfer speeds. Wi-Fi was intended to be used for wireless devices and LANs, but is now often used for Internet access (one of the main international standards for wireless broadband Internet access and networking, with widespread use in business, homes and public spaces). It is based on radio signals with a frequency of 2.4 Ghz and capable of speeds of up to 11 Mbps. It enables a person with a wireless-enabled computer or personal digital assistant to connect to the Internet when in proximity of an access point called a hotspot.

Under this category is not included the Internet connection via high capacity 'speed' mobile phone networks - see next alternative f).

f) Connection via high capacity 'speed' mobile phone networks is an access to the Internet using a long range wireless transmission of the 3rd generation (3G) mobile network technologies based on the CDMA (Code Division Multiple Access) as UMTS (Universal Mobile Telephone System - Wideband 'W'-CDMA); CDMA2000x; CDMA 2000 1x EV-DO; CDMA 2000 1x EV-DV; or some other high capacity mobile technologies based on the GPRS as EDGE (Enhanced Data rates for Global Evolution - EGPRS) etc.

"3G (or 3-G) is short for third-generation mobile telephone technology. The services associated with 3G provide the ability to transfer both voice data (a telephone call) and non-voice data (such as downloading information, exchanging email, and instant messaging). It includes high-speed mobile networks (e.g., CDMA2000 1X, WCDMA, CDMA2000 1xEV-DO, etc.)."

Universal Mobile Telecommunications System (UMTS) is one of the third-generation (3G) mobile phone technologies. It uses W-CDMA as the underlying standard, is standardized by the 3GPP, and represents the European answer to the ITU IMT-2000 requirements for 3G Cellular radio systems. It presently delivers packet switched data transmission speeds up to 384 kbps and up to 2 Mbps when fully implemented.

CDMA2000 1x is an IMT-2000 3G mobile network technology, based on CDMA that delivers packet switched data transmission speeds of up to 144 kbps. Also referred to as 1XRTT.

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

Enhanced Data rates for Global Evolution (EDGE) is an intermediate technology that brings second-generation GSM closer to third-generation capacity for handling data speeds up to 384 kbits/s. The standard is based on the GSM standard and uses TDMA multiplexing technology.

Narrowband defined by type of the Internet connection (tiacc_nrb) includes:

Dial-up (connection via standard telephone line 'PSTN using analog modem)

and ISDN (Integrated Services Digital Network)

Connection via low capacity 'speed' mobile phone networks (HSCSD, GPRS etc) – mobile Internet narrowband

Broadband defined by type of the Internet connection (tiacc_broad) includes:

xDSL (Digital Subscriber Line) technologies as ADSL, HDSL, SDSL, VDSL that form core broadband;

Other high capacity 'speed' fixed (wire or wireless) connection (Cable modem 'cable TV network connection'; Leased lines 'Frame Relay, ATM, Digital Multiplex'; Ethernet LANs connection; Optical fibre connection; Satellite connection; Wi-fi connection etc) – extendend fixed wire based and wireless broadband

Connection via high capacity 'speed' mobile phone networks (UMTS 'W-CDMA'; EDGE 'EGPRS'; CDMA 2000x etc) – mobile Internet broadband

Mobile Internet - connection via mobile phone network (tiaac_mph) includes:

Connection via low capacity 'speed' mobile phone networks (HSCSD, GPRS etc) – mobile Internet narrowband

Connection via high capacity 'speed' mobile phone networks (UMTS 'W-CDMA'; EDGE 'EGPRS'; CDMA 2000x etc) – mobile Internet broadband

Annex 4

Estimation of a proportion under different sampling schemes

Many indicators are expressed as percentages or proportions of businesses satisfying a certain condition: using computers, using the Internet, having a website, etc. In statistical terminology, these indicators are estimates of a population proportion, defined as:

$$p = \frac{A}{N} \quad (1)$$

where N is the number of businesses (units) in the population, and A is the number of businesses satisfying the given condition.

Different estimates for p are possible and the choice should be based on the design of the sample from which data are collected. Usually, statistical investigations will be designed to collect data from a sample of businesses and not from the total population. The target population will usually be segmented into *strata*, defined by economic activity and size (and possibly geographical variables, such as head office location). Different sampling methods will yield different *sampling errors* (with respect to the 'true' proportion p).

Every sampling method assigns unit *weights* that reflect the number of population units represented by each sample unit. For an exhaustive survey (census) or stratum, weights are equal to one.
The total number of firms (size of the target population or in-scope businesses) may be known (by the Statistical Business Register) or is estimated.

CASE 1. Simple random sampling of a non-stratified population

In this case, n businesses out of N have been randomly selected with equal probability and without replacement (that is, a business cannot be selected twice to be interviewed). The sample weight is equal to $w = N/n$, that is, the sample is "grossed up" in proportion to the population size. The indicator may be calculated as the *sample proportion:*

$$\hat{p} = \frac{\sum_{i=1}^{n} w_i a_i}{\sum_{i=1}^{n} w_i} = \frac{\sum_{i=1}^{n} (N/n) a_i}{\sum_{i=1}^{n} (N/n)} = \frac{(N/n)\sum_{i=1}^{n} a_i}{N} = \frac{\sum_{i=1}^{n} a_i}{n} \quad (2)$$

where a_i is a dichotomous variable that is 0 if the answer is "No" and 1 if "Yes".
The standard error of the sample proportion is estimated by:

$$SE(\hat{p}) = \sqrt{\frac{N-n}{(N-1)n}\hat{p}(1-\hat{p})} \quad (3)$$

Now, if N is much larger than n, that is to say the sampling fraction n/N is low, the standard error can be approximated by a simpler expression:

$$SE(\hat{p}) \cong \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \quad (4)$$

A sampling fraction of 10 per cent or less is a requirement for using this last expression.

CASE 2. Stratified random sampling

In stratified random sampling, the population is broken down into strata that are expected to be more homogeneous than the whole population with respect to the variable of interest. Every population unit must belong to one and only one stratum. Sample selection is done independently in each stratum, which will have a sampling fraction determined by factors such as stratum size, variability and significance.

Let L be the number of strata and let N_h and n_h be the population and sample size respectively, in stratum h ($h = 1, 2, \ldots L$).

An unbiased estimate of $p = \frac{A}{N}$ is:

$$\hat{p} = \frac{\sum_{h=1}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} a_{hi}}{N} = \sum_{h=1}^{L} \frac{N_h}{N} \hat{p}_h \quad (5)$$

where a_{hi} is a dichotomous variable that is 0 if the answer is "No" and 1 if "Yes"; and $\hat{p}_h$ is an estimate of the proportion p_h in stratum h, analogous to expression (2). It can be seen that the weight assigned to each unit in stratum h is $w_h = \frac{N_h}{n_h}$.

As sampling is independent between strata, and the estimate is a weighted sum of estimates, the sampling variance can be calculated as a weighted sum of variances.

The estimate of the standard error of $\hat{p}$ is:

$$SE(\hat{p}) = \sqrt{\sum_{h=1}^{L} \left(\frac{N_h}{N}\right)^2 V(\hat{p}_h)} \quad (6)$$

Where $V(\hat{p}_h)$ is the estimated variance of $\hat{p}_h$ in stratum h, and can be calculated as the square of expression (3) or (4), according to the size of the sampling fraction in each stratum.

CASE 2a. Stratified random sampling with one or several strata exhaustively investigated

One or more strata (for example, those containing large businesses) may be exhaustively sampled (that is, all units are selected). For those strata, there is no sampling error, and overall estimates of standard error need to take this into account.

For simplicity, it can be supposed that just one stratum, the first, is exhaustively investigated. The general case is an easy extension of this.

An estimate of p is:

$$\hat{p} = \frac{\sum_{i=1}^{N_1} a_{1i} + \sum_{h=2}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} a_{hi}}{N} = \frac{N_1}{N} p_1 + \sum_{h=2}^{L} \frac{N_h}{N} \hat{p}_h \quad (7)$$

and an estimate of the standard error is:

$$SE(\hat{p}) = \sqrt{\sum_{h=2}^{L} \left(\frac{N_h}{N} \right)^2 V(\hat{p}_h)} \quad (8)$$

Note that the true proportion of stratum 1 is included in expression (7), but stratum 1 is omitted from expression (8).

In this case, the weight for any unit in stratum *h* is $w_h = \frac{N_h}{n_h}$, if $h \neq 1$, and $w_1 = 1$.

CASE 3. Ratio estimates with simple random sampling

Ratio estimates of a proportion can appear when the denominator of a proportion is not known and must be estimated from the sample. For example, the proportion of employees that have Internet access out of the total number of employees; or the ratio of the number of businesses that sell by Internet to the number of businesses that have Internet access.

For unit i, let y_i and x_i be the values of the characteristics that must be compared. For example, y_i could be the number of employees that have Internet access and x_i the total number of employees (or, for the second example, y_i is 1 if it sells by Internet, and 0 otherwise; and x_i is 1 if it has Internet access, and 0 otherwise). Thus, we are interested in estimating the following indicator:

$$p = \frac{Y}{X} = \frac{\sum_{i=1}^{N} y_i}{\sum_{i=1}^{N} x_i} \quad (9)$$

A natural estimate of p (let us call it $\hat{r}$ to indicate that it is a ratio) is the sample version of expression (9), that is to say, weighting all units with the same weights, $\frac{N}{n}$:

$$\hat{r} = \frac{\hat{Y}}{\hat{X}} = \frac{\frac{N}{n} \sum_{i=1}^{n} y_i}{\frac{N}{n} \sum_{i=1}^{n} x_i} = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i} \quad (10)$$

This estimate is not unbiased, but, for most of the population, the bias will not be important if the sample size is reasonably large (usually, 20 or more units).

There is no unbiased estimate with a closed form of the standard error, but an expression that can be successfully used as an approximation is:

$$SE(\hat{r}) \cong \frac{1}{\bar{x}} \sqrt{\frac{N-n}{Nn} \frac{\sum_{i=1}^{n} (y_i - \hat{r}x_i)^2}{n-1}} \quad (11)$$

Where $\bar{x}$ is the sample average of characteristic x, that is,

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad (12)$$

CASE 4. Ratio estimates with stratified random sampling

With stratified random sampling, ratio estimates can be used if an estimate of a proportion of unknown denominator is desired. In this appendix, only the "combined ratio estimate" will be dealt with.

Following the same notation as above, we are interested in estimating the following indicator:

$$r = \frac{\sum_{h=1}^{L} \sum_{i=1}^{N_h} y_{hi}}{\sum_{h=1}^{L} \sum_{i=1}^{N_h} x_{hi}} \quad (13)$$

An estimate of the ratio will be:

$$\hat{r} = \frac{\sum_{h=1}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} y_{hi}}{\sum_{h=1}^{L} \frac{N_h}{n_h} \sum_{i=1}^{n_h} x_{hi}} \quad (14)$$

As estimate of the standard error of $\hat{r}$, the following expression can be used:

$$SE(\hat{r}) \cong \frac{1}{\hat{X}} \sqrt{\sum_{h=1}^{L} \frac{N_h(N_h - n_h)}{n_h} \sum_{i=1}^{n_h} \frac{(y_{hi} - \hat{r}x_{hi})^2}{n_h - 1}} \quad (15)$$

where $\hat{X}$ is the population total estimate.

Annex 5

Imputation of missing data in ICT surveys

If re-contacting the interviewed business is out of the question for cost or time reasons, item non-response can be treated by mathematical techniques for data imputation. **Imputation** consists of assigning a plausible value to a question for which the selected unit has not provided a response, or to a question whose answer is logically or arithmetically inconsistent with answers in the rest of the questionnaire.

When the answer to different questions is inconsistent, the problem of deciding which one is incorrect may be very difficult. Usually, a hierarchy among questions, or blocks of questions, is established, so that answers to some of them are considered "dominant".

Example:

Suppose the following two questions and responses are found in a questionnaire:

A) Did your business have a website/home page, during January 200X?

Yes ☐

No ☒

B) Did your website/homepage provide any of the following facilities, during January 200X?

a) Marketing the business' products	☒
b) Facilitating access to product catalogues and price lists	☒
c) Providing after sales support	☐

Clearly, responses to questions A and B are inconsistent. However, it is more likely that the respondent made a mistake in question A) than in question B), because he or she was able to specify two web facilities. The most plausible conclusion is that his or her business had a website or home page, and therefore that question A) should be imputed as "Yes".

It is important to recall that imputation does not intend to establish a «true» answer, but to assign a value for a missing answer that is consistent with the rest of the questionnaire. Frequently used methods for data imputation in business surveys are deterministic imputation, «hot deck» and «cold deck» techniques. The choice among them should be in accordance with the current practice for other business surveys in the statistical office, and so these should be reviewed before selecting one method for surveys of ICT use.

Deterministic imputation

Deterministic imputation of missing data consists of assigning a valid answer by means of the application of fixed rules that relate questions' values to each other. Under the same conditions, the mechanism will always generate the same imputed value.

Example:

A simple deterministic rule to assign a missing number of employees who use e-mail is to assign the value of the number of employees who have access to the Internet, if the business uses e-mail and 0 otherwise.

Hot deck imputation

For each business with item non-response, the hot deck procedure searches a set of businesses with similar characteristics, called "donors", that have responded to the item. The method consists of randomly selecting one of the donors, and assigning the answer of the chosen donor to the business with item non-response.

Example:

The following table shows some raw data from a survey on ICT use by businesses. Each row (register) represents a different business, and characteristics of the businesses are shown in the columns. "Missing" means item non-response. An imputed value for presence of a website for business 6 is sought.

Assume that two businesses are defined as "similar" if they have the same level of Internet use (that is, they both used or did not use the Internet) and if their main activity is the same at the 3-digit level of ISIC. According to these criteria, in the example, business #6 is similar only to businesses #1, #2 and #5. Thus, businesses #1, #2 and #5 are donors for business #6, and one of them is randomly selected. If #1 is drawn, the value to the question "Presence of a website" for business #1 will be imputed to business #6 (that is, "Yes"). If #2 or #5 are drawn, "No" will be imputed to business #6.

Business ID	Internet access	ISIC code of main activity	Presence of a website	% of employees with Internet access
#1	Yes	ABCD	Yes	10%
#2	Yes	ABCD	No	15%
#3	No	ABCD	No	0%
#4	Yes	ABXY	No	25%
#5	Yes	ABCD	No	20%
#6	Yes	ABCD	Missing	Missing

It is worth noting that if each donor has the same probability of being selected, then the relative frequencies of the imputed values will tend to replicate those of the valid values.

The hot deck procedure is one of the most frequently used methods of imputation and its main operational problem is how to delimit the set of donors, i.e. which variables determine that two units are "similar". A very restrictive rule will produce few donors (or none). The variables size and economic activity should generally be used to define similarity. Additionally, basic ICT variables such as the use of computer, use of Internet and presence of website should be used to identify donors where the missing answer relates to those variables (e.g. refer to the relationship in the example above where use, or non-use, of the Internet is used as a criterion for a donor).

This procedure tends to reduce the variance of the responses since by its own operational mechanism (replication of answers), it makes the sample more homogeneous. The bias towards homogeneity may be balanced by its simplicity.

Cold deck imputation

The cold deck procedure is similar to hot deck imputation, except that the donors are not actual survey responses, but are logical combinations of responses that are constructed (often on the basis of experiences learned from past surveys). The problems of this method include those of the hot deck method, but it also requires some information on which the construction of a donor table is based. Such information may not be available for those developing economies that are measuring ICT for the first time.

Other imputation techniques

Other imputation methods are mean (for quantitative variables) or modal (for qualitative variables) value imputation. The method consists of imputing the mean or the modal (i.e. most frequent) value of the set of donors.

Example:

Using raw data from the example above, and considering the same definition of similarity, the imputed value of *percentage of employees with Internet access* of business #6 would be 15% = (10% + 15% + 20%)/3 (the simple mean of the value for donors #1, #2 and #5). In the example, if business #6 had responded that 10 per cent of its *employees used computers*, an imputed value of 15 per cent for the *percentage of employees with Internet access* could be considered contradictory.

A problem common to all imputation methods is in ensuring the logical and arithmetic coherence of imputed values with other responses in the same questionnaire. For instance, the imputed value may be inconsistent with the response to another question. To avoid this situation, a check for validity can be made after each imputation, selecting another donor if necessary.

Another method of imputation is to assign the answer given by the same unit in a previous survey (historical imputation). The same principle can be applied to unit non-response. This technique would be applied more frequently to large businesses, because they are more likely to be in successive surveys.

Annex 6

List of ICT goods (2003)

HS 2002	HS 1996	Telecommunications equipment	Notes
851711	851711	Line telephone sets with cordless handsets	
851719	851719	Other telephone sets, video phones	
851721	851721	Facsimile machines	
851722	851722	Teleprinters	
851730	851730	Telephonic or telegraphic switching apparatus	
851750	851750	Other apparatus, for carrier-current line systems or for digital line systems	
851780	851780	Other electrical apparatus for line telephony or line telegraphy	
851790	851790	Parts for other electrical apparatus for line telephony or line telegraphy	
852020	852020	Telephone answering machines	
852510	852510	Transmission apparatus for radio-telephony, radio-telegraphy, radio-broadcasting or television not incorporating reception apparatus	
852520	852520	Transmission apparatus for radio-telephony, radio-telegraphy, radio-broadcasting or television incorporating reception apparatus	
852530	852530	Television cameras	
852610	852610	Radar apparatus	
852790	852790	Reception apparatus for radio-telephony, radio-telegraphy or radio-broadcasting, whether or not combined, in the same housing, with sound recording or reproducing apparatus or a clock, n.e.s	
852910	852910	Aerials and aerial reflectors of all kinds; parts suitable for use therewith	
853110	853110	Burglar or fire alarms and similar apparatus	(1)
854420	854420	Co-axial cable and other co-axial electric conductors	
854470	854470	Optical fibre cables	
		Computer and related equipment	
847110	847110	Analogue or hybrid automatic data processing machines	
847130	847130	Portable digital automatic data processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display	
847141	847141	Digital 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	
847149	847149	Other digital automatic data processing machines, presented in the form of systems	
847150	847150	Digital processing units other than those of subheadings 8471.41 and 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	
847160	847160	Automatic data processing machines, input or output units, whether or not containing storage units in the same housing	
847170	847170	Automatic data processing machines, storage units	
847180	847180	Other units of automatic data processing machines	
847190	847190	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	
847330	847330	Parts and accessories of the machines of heading No. 84.71	

HS 2002	HS 1996	Electronic components	Notes
850431	850431	Electrical transformers having a power handling capacity not exceeding 1 kVA	(1)
850450	850450	Inductors	(1)
850490	850490	Parts of: electrical transformers, static converters (for example, rectifiers) and inductors	(1)
852330	852330	Cards incorporating a magnetic stripe, unrecorded	(1)
852460	852460	Cards incorporating a magnetic stripe, recorded	(1)
852990	852990	Parts suitable for use solely or principally with the apparatus of headings Nos. 85.25 to 85.28 except aerials and aerials reflectors	
853221	853221	Capacitors, fixed, tantalum having a reactive power handling capacity of less than 0.5 kvar	
853224	853224	Capacitors, fixed, ceramic dielectric, multilayer having a reactive power handling capacity of less than 0.5 kvar	
853230	853230	Variable or adjustable (pre-set) capacitors	
853310	853310	Fixed carbon resistors, composition or film types	
853321	853321	Electrical resistors, fixed, (including rheostats and potentiometers), other than heating resistors, for a power handling capacity <= 20 W	
853329	853329	Electrical resistors, fixed, (including rheostats and potentiometers), other than heating resistors, n.e.s..	
853331	853331	Wirewound variable resistors, for a power handling capacity <= 20 W	
853339	853339	Resistors, wirewound, variable, n.e.s.	
853340	853340	Other variable resistors, including rheostats and potentiometers	
853390	853390	Parts for electrical resistors (including rheostats and potentiometers), other than heating resistors	
853400	853400	Printed circuits	
854011	854011	Cathode-ray television picture tubes, including video monitor tubes, colour	
854012	854012	Cathode-ray television picture tubes, including video monitor tubes, black and white or other monochrome	
854020	854020	Television camera tubes; image converters and intensifiers; other photo-cathode tubes	
854040	854040	Data/graphic display tubes, colour, with a phosphor dot screen pitch smaller than 0.4 mm	
854050	854050	Data/graphic display tubes, black and white or other monochrome	
854060	854060	Other cathode-ray tubes	
854071	854071	Microwave tubes, magnetrons, excluding grid-controlled tubes	
854072	854072	Microwave tubes – klystrons, excluding grid-controlled tubes	
854079	854079	Microwave tubes, other, excluding grid-controlled tubes	
854081	854081	Receiver or amplifier valves and tubes	
854089	854089	Valve and tubes, n.e.s.	
854091	854091	Parts of cathode-ray tubes	
854099	854099	Parts of thermionic or photo-cathode, valve and tubes, other than cathode-ray tubes	
854110	854110	Diodes, other than photosensitive or light emitting diodes	
854121	854121	Transistors, other than photosensitive, dissipation rate < 1 W	
854129	854129	Transistors, other than photosensitive transistors, n.e.s.	
854130	854130	Thyristors, diacs and triacs, other than photosensitive devices	
854140	854140	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes	
854150	854150	Other semiconductor devices	
854160	854160	Mounted piezo-electric crystals	
854190	854190	Parts for semiconductor devices	
854210	854212	Cards incorporating electronic integrated circuits (‘smart’ cards)	(2)
854221	854213-19	Digital monolitihic integrated circuits	(2)
854229	854230	Other monolithic integrated circuits	(2)
854260	854240	Hybrid integrated circuits	(2)
854270	854250	Electronic microassemblies	(2)
854290	854290	Parts for electronic integrated circuits and microassemblies	

HS 2002	HS 1996	Audio and video equipment	Notes
851810	851810	Microphones and stands therefor	
851821	851821	Single loudspeakers, mounted in their enclosures	
851822	851822	Multiple loudspeakers, mounted in the same enclosure	
851829	851829	Other loudspeakers, n.e.s	
851830	851830	Headphones and earphones, whether or not combined with a microphone, and sets consisting of a microphone and one or more loudspeakers	
851840	851840	Audio-frequency electric amplifiers	
851850	851850	Electric sound amplifier sets	
851890	851890	Parts of microphones, loudspeakers, headphones, earphones, combined microphone/ loudspeaker sets, audio-frequency electric amplifiers and electric sound amplifier sets	
851910	851910	Coin- or disc-operated record-players	
851921	851921	Record-players, without loudspeaker	
851929	851929	Record-players, n.e.s.	
851931	851931	Turntables with automatic record changing mechanism	
851939	851939	Turntables, n.e.s.	
851940	851940	Transcribing machines	
851992	851992	Pocket-size cassette-players	
851993	851993	Other sound reproducing apparatus, cassette-type	
851999	851999	Sound reproducing apparatus, not incorporating a sound recording device, n.e.s.	
852010	852010	Dictating machines not capable of operating without an external source of power	
852032	852032	Other magnetic tape recorders incorporating sound reproducing apparatus, Digital audio type	
852033	852033	Other magnetic tape recorders incorporating sound reproducing apparatus, cassette-type	
852039	852039	Other magnetic tape recorders incorporating sound reproducing apparatus	
852090	852090	Magnetic tape recorders and other sound recording apparatus, whether or not incorporating a sound reproducing device, n.e.s.	
852110	852110	Video recording or reproducing apparatus, whether or not incorporating a video tuner – magnetic tape-type	
852190	852190	Video recording or reproducing apparatus, whether or not incorporating a video tuner – other type	
852210	852210	Parts and accessories suitable for use solely or principally with the apparatus of headings Nos. 85.19 to 85.21 – pick-up cartridges	
852290	852290	Parts and accessories suitable for use solely or principally with the apparatus of headings Nos. 85.19 to 85.21 – other	
852311	852311	Magnetic tapes, unrecorded, width <= 4 mm (1/6 in.)	(1)
852312	852312	Magnetic tapes, unrecorded, width > 4 mm (1/6 in.) but <= 6.5 mm (1/4 in.)	(1)
852313	852313	Magnetic tapes, unrecorded, width > 6.5 mm (1/4 in.)	(1)
852320	852320	Magnetic discs, unrecorded	(1)
852390	852390	Other prepared unrecorded media for sound recording or similar recording of other phenomena, other than products of Chapter 37	(1)
852540	852540	Still image video cameras and other video camera recorders, digital cameras	
852712	852712	Pocket-size radio cassette-players capable of operating without an external source of power	
852713	852713	Radio-broadcast receivers, capable of operating without an external source of power, combined with sound recording or reproducing apparatus	
852719	852719	Other radio-broadcast receivers, capable of operating without an external source of power, not combined with sound recording or reproducing apparatus	
852721	852721	Radio-broadcast receivers with sound recording or reproducing apparatus, for motor vehicles, requiring external source of power	
852729	852729	Other radio-broadcast receivers for motor vehicles, not combined with sound recording or reproducing apparatus	
852731	852731	Other radio-broadcast receivers, including apparatus capable of receiving also radio-telephony or radio-telegraphy, combined with sound recording or reproducing apparatus	
852732	852732	Other radio-broadcast receivers, including apparatus capable of receiving also radio-telephony or radio-telegraphy, not combined with sound recording or reproducing apparatus but combined with a clock	

HS 2002	HS 1996	Audio and video equipment (continued)	Notes
852739	852739	Other radio-broadcast receivers, including apparatus capable of receiving radio-telephony or radio-telegraphy, n.e.s.	
852812	852812	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus, colour	
852813	852813	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus, black and white or other monochrome	
852821	852821	Video monitors, colour	
852822	852822	Video monitors, black and white or other monochrome	
852830	852830	Video projectors	
		Other ICT goods	
846911	846911	Word-processing machines	
847010	847010	Electronic calculators capable of operation without an external source of electric power and pocket-size data recording, reproducing and displaying machines with calculating functions	
847021	847021	Other electronic calculating machines incorporating a printing device	
847029	847029	Other electronic calculating machines	
847040	847040	Accounting machines	
847050	847050	Cash registers	
847310	847310	Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of heading No. 84.69	
847321	847321	Parts and accessories of the electronic calculating machines of subheading No. 8470.10, 8470.21 or 8470.29	
847350	847350	Parts and accessories equally suitable for use with machines of two or more of the headings Nos. 84.69 to 84.72	
852691	852691	Radio navigational aid apparatus	
852692	852692	Radio remote control apparatus	
901041	901041	Apparatus for the projection or drawing of circuit patterns on sensitised semiconductor materials – direct write-on-wafer apparatus	(1)
901042	901042	Apparatus for the projection or drawing of circuit patterns on sensitised semiconductor materials – step and repeat aligners	(1)
901049	901049	Apparatus for the projection or drawing of circuit patterns on sensitised semiconductor materials – other	(1)
901410	901410	Direction finding compasses	
901420	901420	Instruments and appliances for aeronautical or space navigation (other than compasses)	
901480	901480	Other navigational instruments and appliances	
901490	901490	Parts and accessories of direction finding compasses, other navigational instruments and appliances	
901540	901540	Photogrammetrical surveying instruments and appliances	
901580	901580	Other surveying instruments and appliances	
901811	901811	Electro-cardiographs	(1)
901812	901812	Ultrasonic scanning apparatus	(1)
901813	901813	Magnetic resonance imaging apparatus	(1)
901814	901814	Scintigraphic apparatus	(1)
901819	901819	Other electro-diagnostic apparatus (including apparatus for functional exploratory examination or for checking physiological parameters)	(1)
902212	902212	Computed tomography apparatus	(1)
902213	902213	Other apparatus based on the use of X-rays, for dental uses	(1)
902214	902214	Other apparatus based on the use of X-rays, for medical, surgical or veterinary uses	(1)
902219	902219	Other apparatus based on the use of X-rays, for other uses	(1)
902410	902410	Machines and appliances for testing the hardness, strength, compressibility, elasticity or other mechanical properties of materials, metals	
902480	902480	Other machines and appliances for testing the hardness, strength, compressibility, elasticity or other mechanical properties of materials	
902490	902490	Parts and accessories for machines and appliances for testing the hardness, strength, compressibility, elasticity or other mechanical properties of materials	

HS 2002	HS 1996	Other ICT goods (continued)	Notes
902620	902620	Instruments and apparatus for measuring or checking the pressure of liquids or gases, excluding instruments and apparatus of heading Nos. 9014, 9015, 9028 or 9032	
902710	902710	Instruments and apparatus for physical or chemical analysis, gas or smoke analysis apparatus	
902730	902730	Spectrometers, spectrophotometers and spectrographs using optical radiations (UV, visible, IR)	
902740	902740	Instruments and apparatus for measuring or checking quantities of heat, sound or light, exposure meters	
902750	902750	Other instruments and apparatus using optical radiations (UV, visible, IR)	
902780	902780	Other instruments and apparatus for physical or chemical analysis	
902810	902810	Gas meters	
902820	902820	Liquid meters	
902830	902830	Electricity meters	
902890	902890	Parts for gas, liquid or electricity supply or production meters, including calibrating meters therefor	
902910	902910	Revolution counters, production counters, taximeters, mileometers, pedometers and the like	
902920	902920	Speed indicators and tachometers; stroboscopes	
902990	902990	Parts and accessories for revolution counters, production counters, taximeters, mileometers, pedometers and the like; speed indicators and tachometers, other than those of heading No. 90.14 or 90.15; stroboscopes	
903010	903010	Instruments and apparatus for measuring or detecting ionising radiations	
903020	903020	Cathode-ray oscilloscopes and cathode-ray oscillographs	
903031	903031	Multimeters without a recording device	
903039	903039	Other instruments and apparatus for measuring or checking voltage, current, etc. without a recording device	
903040	903040	Other instruments and apparatus, specially designed for telecommunications (for example, cross-talk meters, gain measuring instruments, distortion factor meters, psophometers)	
903082	903082	Other instruments for measuring or checking semiconductor wafers or devices	
903083	903083	Other instruments for measuring or checking semiconductor wafers or devices with a recording device	
903110	903110	Measuring or checking instruments, appliances and machines n.e.s, machines for balancing mechanical parts	
903120	903120	Measuring or checking instruments, appliances and machines n.e.s, test benches	
903130	903130	Measuring or checking instruments, appliances and machines n.e.s, profile projectors	
903141	903141	Other optical instruments and appliances, for inspecting semiconductor wafers or devices or for inspecting photomasks or reticles used in manufacturing semiconductor devices	
903180	903180	Other measuring or checking instruments, appliances and machines, n.e.s.	
903190	903190	Parts and accessories for measuring or checking instruments, appliances and machines, n.e.s.	
903210	903210	Thermostats	
903220	903220	Manostats	
903289	903289	Other automatic regulating or controlling instruments and apparatus, n.e.s.	
903290	903290	Parts and accessories for automatic regulating or controlling instruments and apparatus	

Source:	*Guide to Measuring the Information Society* (OECD, 2005). The list was first released by the OECD in 2003.
Notes	
Titles are according to the 2002 Harmonized System. Some have been changed slightly in the interests of clarity and space	
(1)	Industry of origin not in the OECD ICT sector (2002).
(2)	HS 1996 and HS 2002 codes differ. Titles are according to the 2002 Harmonized System. Some have been changed slightly in the interests of clarity and space

Annex 7

UNCTAD questionnaire (2007) to National Statistical Offices

	UNCTAD
	Questionnaire on ICT usage by enterprises and on the ICT sector
	Please fill in the information below:
Country:	
Date:	
Organisation:	
Name of Respondant:	
Address:	
Postbox:	
Postal code:	
City:	
Telephone:	
Fax:	
E-mail:	

UNCTAD is collecting official statistical data on the use of ICTs in enterprises and on the ICT sector from national statistical offices in selected developing countries. The information will feature in UNCTAD's Information Economy Report (IER) 2007/2008.

We are interested in receiving data referring to the **last two years** (2006 and 2005) or, if not available, referring to the **two most recent** statistical operations available for your country since 2003. We are also requesting information on methodologies, sources, etc. of your data collection.

The requested data are in accordance with the list of core indicators on access and use of ICTs by enterprises proposed by the global Partnership on Measuring ICT for Development, and agreed upon at the WSIS Thematic Meeting on "Measuring the Information Society" (Geneva, 7-9 February 2005).

The definitions of the indicators included in this questionnaire are provided in the publication Core ICT Indicators of the Partnership on Measuring ICT for Development. The publication is available online at http://measuring-ict.unctad.org.

In order to allow for the timely inclusion of the information in this year's IER, we would appreciate receiving your completed questionnaire **no later than 14 April 2007**. The questionnaire should be sent, **preferably in electronic form**, to Ms. Scarlett Fondeur Gil, E-mail: scarlett.fondeur.gil@unctad.org, Tel: +41 22 907 4895, Fax: +41 22 907 0052.

THANK YOU VERY MUCH FOR YOUR COOPERATION.

UNCTAD/SDTE/ECB/MISC/2006/1/Rev.1

Instructions	
These are the instructions to fill in this questionnaire.	
This file is designed to collect statistics on ICT usage by enterprises and on the ICT sector.	
It includes the following worksheets:	
Name of sheet:	**Description/Instructions:**
Cover	In this sheet, please include your country, the date when the questionnaire was filled in, and the contact details of the person (respondent) who filled in this questionnaire.
Instructions	This sheet gives instructions on how to fill in this questionnaire.
Survey Information	In this sheet, please include **information on every survey** that has been a source of data for this questionnaire. The reference number at the top of each column will be used to identify the source for the data that will be included in the Indicator worksheets (1a, 1b, 1c, 2a, 2b).
1a) ICT Usage Indicators	In this sheet, please indicate the **number of enterprises for each indicator on ICT usage**, broken down **by enterprise size scope** (number of employees). **Target population** is the total population or 'universe' of enterprises about which the survey seeks information (the scope of the survey). To introduce data from more than one survey, please click on the upper right-hand button "Click here to enter data from more surveys". The worksheet will be reproduced. Please indicate the reference number of each survey, as per the Survey Information worksheet.
1b) ICT Usage Indicators	In this sheet, please indicate the **number of enterprises for each indicator on ICT usage**, broken down **by geographic scope (urban/rural)**. If applicable, please also include here your office's definition for urban/rural classification. To introduce data from more than one survey, please click on the upper right-hand button "Click here to enter data from more surveys". The worksheet will be reproduced. Please indicate the reference number of each survey, as per the Survey Information worksheet.
1c) ICT Usage Indicators	In this sheet, please indicate **the number of enterprises for each indicator on ICT usage**, broken down **by industrial classification**, at the two-digit level (ISIC Rev. 3.1). To introduce data from more than one survey, please click on the upper right-hand button "Click here to enter data from more surveys". The worksheet will be reproduced. Please indicate the reference number of each survey, as per the Survey Information worksheet.
2a) ICT Sector Indicators	In this sheet, please indicate the **ICT sector workforce** (number of employees), broken down by industrial classification, at the four-digit level (ISIC Rev. 3.1). Please also indicate the **whole business sector workforce** (number of employees). It is recommended that countries use the definition of the ICT sector agreed by the OECD Working Party on Indicators for the Information Society (WPIIS): **manufacturing** and **services** industries whose products capture, transmit or display data and information electronically. This definition and the codes are contained in the ICT Sector Concordance worksheet.
	To introduce data from more than one survey, please click on the upper right-hand button "Click here to enter data from more surveys". The worksheet will be reproduced. Please indicate the reference number of each survey, as per the Survey Information worksheet.
2b) ICT Sector Indicators	In this sheet, please indicate the **value added in the ICT sector in national currency**, broken down by industrial classification, at the four-digit level (ISIC Rev. 3.1). See the ICT Sector Concordance worksheet for the codes. Please also indicate **the value added of the whole business sector**. In general, the value added is calculated as the difference between production (gross output) and intermediate inputs (the energy, materials and services required to produce final output). The valuation can be made at factor costs, at basic prices or at producers' prices.
Notes	This sheet contains the description of a few standard notes that can be used in the Indicator worksheets (1a, 1b, 1c, 2a, 2b). You can also add new notes that apply to your data, or to indicate differences in the definition of indicators.
Industry Concordance	If you use a national industrial classification instead of ISIC Rev.3.1., please include here the concordance (correspondence) between the national classification categories and the ISIC Rev. 3.1 categories.
ICT Sector Concordance	If you use a national industrial classification instead of ISIC Rev.3.1., please include here the concordance (correspondence) between the ICT sector categories in the national classification and in ISIC Rev. 3.1. at the four-digit level.
NOTE:	Cells with the upper right-hand corner in **red** have comments. The comments can be seen by placing your cursor over the cell in question.

Reference Material:

Core ICT indicators
Classifications Registry of UN Statistics Division
Measuring ICT website, hosted by UNCTAD

Survey Information

In this sheet, please include information on every survey that has been a source of data for this questionnaire.

Reference number: A single column/reference number must refer to a single survey. The reference number will be used in the Indicators sheets (1a, 1b, 1c, 2a, 2b) to refer to the respective survey.

Name of survey: Please provide the name of the survey

Contact: Name of contact person and/or service responsible for the survey. You may also include telephone and/or electronic mail.

Survey vehicle: E.g. module of an economy-wide survey, dedicated ICT use survey, industry survey, etc. Or administrative data.

Collection technique: E.g. personal interview survey (face-to-face, telephone), mail survey, drop-off survey, online survey, etc.

Reference year: The year to which the data refer to.

Sampling unit: E.g. enterprise, establishment, etc.

Sampling frame: E.g. business register.

Sample size, stratification: Include here the size of the sample, sectoral coverage, and other relevant criteria to defining the sample (e.g. geographic scope, enterprises with 10 or more persons employed).

Response rate: The proportion of sampling units that responded to the survey.

Non response treatment: Indicate whether imputations are made for non-response.

Links to other surveys: Please indicate any relevant links to other surveys; e.g. if the survey is a supplement to another survey, or a follow-up to a previous survey.

Website URL: Write here the addresses of the website/s where results, questionnaire and methodological information are published.

Reference Number	1	2	3	4	5	6
Name of survey						
Source (Organisation/department)						
Contact						
Survey vehicle						
Collection technique						
Reference year						
Sampling unit						
Sampling frame						
Sample size, stratification						
Response rate						
Non response treatment						
Links to other surveys						
Website URL						

1a) ICT Usage Indicators

List breakdown: enterprise size scope (by number of employees)

For each indicator, please provide the number of enterprises classified by size.										
Ref. No.		Please indicate the Reference Number as per the Survey Information worksheet								
No.		**Indicators (in total numbers)**	**Notes**			**All enterprises**	**Number of employees**			
							0-9	**10-49**	**50-249**	**250+**
		Total number of enterprises in the target population								
		Total number of employees of enterprises in the target population								
B1		Number of enterprises using computers								
B2		Number of employees using computers								
B3		Number of enterprises using the Internet								
B4		Number of employees using the Internet								
B5		Number of enterprises with a website (or web presence where the business has control over the content)								
B6		Number of enterprises with an intranet								
B7		Number of enterprises **receiving** orders over the Internet								
B8		Number of enterprises **placing** orders over the Internet								
B9	**a**	Number of enterprises accessing the Internet by **analogue modem**								
	b	Number of enterprises accessing the Internet by **ISDN**								
	c	Number of enterprises accessing the Internet by fixed line connection **under 2 Mbps**								
	d	Number of enterprises accessing the Internet by fixed line connection **of 2 Mbps or more**								
	e	Number of enterprises accessing the Internet by **other** modes of access								
B10		Number of enterprises with a Local Area Network **(LAN)**								
B11		Number of enterprises with an **extranet**								
B12	**a**	Number of enterprises using the Internet for **sending and receiving e-mail**								
	b.i	Number of enterprises using the Internet for getting **information about goods or services**								
	b.ii	Number of enterprises using the Internet for getting **information from Government organisations/public authorities**								
	b.iii	Number of enterprises using the Internet for **other information searches or research activities**								
	c	Number of enterprises using the Internet for **Internet banking or accessing other financial services**								
	d	Number of enterprises using the Internet for **transacting with Government organisations/public authorities**								
	e	Number of enterprises using the Internet for **providing customer services**								
	f	Number of enterprises using the Internet for **delivering products online**								
	g	Number of enterprises using the Internet for **other types of activity**								

1b) ICT Usage Indicators

List breakdown: geographic scope (urban/rural)

If applicable, please provide your office's definition for urban/rural classification:

Ref. No.		Please indicate the Reference Number as per the Survey Information worksheet

No.		Indicators (in total numbers)	Notes			Geographic scope	
						Urban	Rural
		Total number of enterprises in the target population					
		Total number of employees of enterprises in the target population					
B1		Number of enterprises using computers					
B2		Number of employees using computers					
B3		Number of enterprises using the Internet					
B4		Number of employees using the Internet					
B5		Number of enterprises with a website (or web presence where the business has control over the content)					
B6		Number of enterprises with an intranet					
B7		Number of enterprises **receiving** orders over the Internet					
B8		Number of enterprises **placing** orders over the Internet					
B9	a	Number of enterprises accessing the Internet by **analogue modem**					
	b	Number of enterprises accessing the Internet by **ISDN**					
	c	Number of enterprises accessing the Internet by fixed line connection **under 2 Mbps**					
	d	Number of enterprises accessing the Internet by fixed line connection **of 2 Mbps or more**					
	e	Number of enterprises accessing the Internet by **other** modes of access					
B10		Number of enterprises with a Local Area Network **(LAN)**					
B11		Number of enterprises with an **extranet**					
B12	a	Number of enterprises using the Internet for **sending and receiving e-mail**					
	b.i	Number of enterprises using the Internet for **getting information about goods or services**					
	b.ii	Number of enterprises using the Internet for getting **information from Government organisations/public authorities**					
	b.iii	Number of enterprises using the Internet for **other information searches or research activities**					
	c	Number of enterprises using the Internet for **Internet banking or accessing other financial services**					
	d	Number of enterprises using the Internet for **transacting with Government organisations/public authorities**					
	e	Number of enterprises using the Internet for **providing customer services**					
	f	Number of enterprises using the Internet for **delivering products online**					
	g	Number of enterprises using the Internet for **other types of activity**					

1c) ICT Usage Indicators

List breakdown: industrial classification (ISIC Rev. 3.1)

See Industry Concordance worksheet for a description of the ISIC Rev. 3.1 codes.

Ref. No.		Please indicate the Reference Number as per the Survey Information worksheet																																				
No.		Indicators (in total numbers)	Notes			ISIC Rev. 3.1																																		
						A	B	C	D	E	F	G			G	H	I					I	J	K						K	L	M	N	O	P					
												50	51	52			60	61	62	63	64			70	71	72	73	74											
		Total number of enterprises in the target population																																				
		Total number of employees of enterprises in the target population																																				
B1		Number of enterprises using computers																																				
B2		Number of employees using computers																																				
B3		Number of enterprises using the Internet																																				
B4		Number of employees using the Internet																																				
B5		Number of enterprises with a website (or web presence where the business has control over the content)																																				
B6		Number of enterprises with an **intranet**																																				
B7		Number of enterprises **receiving** orders over the Internet																																				
B8		Number of enterprises **placing** orders over the Internet																																				
B9	a	Number of enterprises accessing the Internet by **analogue modem**																																				
	b	Number of enterprises accessing the Internet by **ISDN**																																				
	c	Number of enterprises accessing the Internet by fixed line connection **under 2 Mbps**																																				
	d	Number of enterprises accessing the Internet by fixed line connection **of 2 Mbps or more**																																				
	e	Number of enterprises accessing the Internet by **other** modes of access																																				
B10		Number of enterprises with a Local Area Network **(LAN)**																																				
B11		Number of enterprises with an **extranet**																																				

No.		Indicators (in total numbers)	Notes			ISIC Rev. 3.1																											
						A	B	C	D	E	F	G			G	H	I					I	J	K					K	L	M	N	O	P
												50	51	52			60	61	62	63	64			70	71	72	73	74						
B12	a	Number of enterprises using the Internet for **sending or receiving e-mail**																															
	b.i	Number of enterprises using the Internet for **getting information about goods or services**																															
	b.ii	Number of enterprises using the Internet for **getting information from Government organisations/public authorities**																															
	b.iii	Number of enterprises using the Internet for **other information searches or research activities**																															
	c	Number of enterprises using the Internet for **Internet banking or accessing other financial services**																															
	d	Number of enterprises using the Internet for **transacting with Government organisations/public authorities**																															
	e	Number of enterprises using the Internet for **providing customer services**																															
	f	Number of enterprises using the Internet for **delivering products online**																															
	g	Number of enterprises using the Internet for **other** types of activity																															

2a) ICT Sector Indicators

ICT sector workforce out of the total business sector workforce

See ICT Sector Concordance worksheet for a description of the ISIC Rev. 3.1 codes.

Ref. No.		Please indicate the Reference Number as per the Survey Information worksheet

No.	Indicator	Notes			Total	ISIC Rev. 3.1																
						D							G		I	K						
						3000	3130	3210	3220	3230	3312	3313	5151	5152	6420	7123	7210	7221	7229	7230	7240	7250	7290
ICT1	ICT sector workforce (number of employees)																					
	Business sector workforce (number of employees)																					

NOTE: The Business Sector definition is based on the OECD definition, which is activity-based rather than institution-based, as per the ISIC Rev.3.1 activities 10 to 74, excluding 70. Consequently, the total workforce of the business sector would be the sum of the workforce in all ISIC Rev.3.1. categories except categories A, B, K70, L, M, N, O, and P.

2b) ICT Sector Indicators

Value added in the ICT sector

See ICT Sector Concordance worksheet for a description of the ISIC Rev. 3.1 codes.

Ref. No.		Please indicate the Reference Number as per the Survey Information worksheet

No.	Indicator	Notes			National Currency	Total	ISIC Rev. 3.1																
							D							G		I	K						
							3000	3130	3210	3220	3230	3312	3313	5151	5152	6420	7123	7210	7221	7229	7230	7240	7250	7290
ICT2	Value added in the ICT sector (in national currency)																						
	Value added in the business sector (in national currency)																						

NOTE: The Business Sector definition is based on the OECD definition, which is activity-based rather than institution-based, as per the ISIC Rev.3.1 activities 10 to 74, excluding 70. Consequently, the total value added of the business sector would be the sum of the value added in all ISIC Rev.3.1. categories except categories A, B, K70, L, M, N, O, and P.

Notes

Please use the standard notes below as applicable to the information provided in the Indicator worksheets (1a, 1b, 1c, 2a, 2b). You can also add new notes that apply to your data, or to indicate differences in the definition of indicators.	
Standard Notes	
a	Included elsewhere.
b	Includes other classes.
c	Provisional.
d	Incomplete breakdown. The sum of the elements does not add to the total.
e	Estimates.
f	Forecasts.
g	
h	
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	

Industry Concordance

Concordance to national classification

If you use a national industrial classification instead of ISIC Rev.3.1., please include here the concordance (correspondence) between the national classification categories and the ISIC Rev. 3.1 categories.

Category	Division	ISIC Rev. 3.1	Name of national classification:		
			Comments:		
		Title	Code	Title	Comments
A		Agriculture, hunting and forestry			
B		Fishing			
C		Mining and quarrying			
D		Manufacturing			
E		Electricity, gas and water supply			
F		Construction			
G	50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel			
	51	Wholesale trade and commission trade, except of motor vehicles and motorcycles			
	52	Retail trade, except of motor vehicles and motor-cycles; repair of personal and household goods			
H		Hotels and restaurants			
I	60	Land transport; transport via pipelines			
	61	Water transport			
	62	Air transport			
	63	Supporting and auxiliary transport activities; activities of travel agencies			
	64	Post and telecommunications			
J		Financial intermediation			
K	70	Real estate activities			
	71	Renting of machinery and equipment without operator and of personal and household goods			
	72	Computer and related activities			
	73	Research and development			
	74	Other business activities			
L		Public administration and defence; compulsory social security			
M		Education			
N		Health and social work			
O		Other community, social and personal service activities			
P		Private households with employed persons			

ICT Sector Concordance

Concordance to national classification

If you use a national industrial classification instead of ISIC Rev.3.1., please include here the concordance (correspondence) between the ICT sector categories in the national classification and in ISIC Rev. 3.1. at the four-digit level.

Category	Class	ISIC Rev. 3.1 Title	Name of national classification: / Comments: Code	Title	Comments
D	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			
G	5151	Wholesale of computers, computer peripheral equipment and software			
	5152	Wholesale of electronic and telecommunications parts and equipment			
I	6420	Telecommunications			
K	7123	Renting of office machinery and equipment (including computers)			
	7210	Hardware consultancy			
	7221	Software publishing			
	7229	Other software consultancy and supply			
	7230	Data processing			
	7240	Database activities and online distribution of electronic content			
	7250	Maintenance and repair of office, accounting and computing machinery			
	7290	Other computer-related activities			

REFERENCES

Eurostat (2006). *Methodological Manual for Statistics on the Information Society.* Luxembourg: Office for Official Publications of the European Communities, *http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BG-06-004/EN/KS-BG-06-004-EN.PDF*.

Leung, Stephen K. (2004). Progress Report of Hong Kong, China. Paper presented at the Asia Pacific Technical Meeting on Information and Communication Technology Statistics (30 November - 2 December 2004, Wellington, New Zealand), *http://www.unescap.org/stat/ict/ict2004/3.Country_report-Hong_Kong.pdf*.

OECD (2005). *Guide to Measuring the Information Society*. DSTI/ICCP/IIS(2005)6/FINAL, *http://www.oecd.org/dataoecd/41/12/36177203.pdf*.

OECD (2007). *Guide to Measuring the Information Society*. Forthcoming.

Partnership on Measuring ICT for Development (2005a). *Measuring ICT: The Global Status of ICT Indicators*, *http://measuring-ict.unctad.org*.

Partnership on Measuring ICT for Development (2005b). *Core ICT Indicators*, *http://measuring-ict.unctad.org*.

Partnership on Measuring ICT for Development (2007). Report of the Partnership to the 38th session of the United Nations Statistical Commission (27 February - 2 March 2007, New York). E/CN.3/2007/5, *http://unstats.un.org/unsd/statcom/doc07/2007-5e-ICT.pdf*

UNCTAD (2004). *E-Commerce and Development Report*. New York and Geneva: United Nations.

UNCTAD (2006). *Information Economy Report*. New York and Geneva: United Nations.

UNSC (2007). Report on the thirty-eighth session (27 February - 2 March 2007, New York). Economic and Social Council, Official Records 2007, Supplement No. 4, E/2007/24 and E/CN.3/2007/30, *http://unstats.un.org/unsd/statcom/doc07/Report-English.pdf*.

UNSD (2005). Measuring compliance of national classifications with international standards. Paper presented at the Meeting of the Expert Group on International Economic and Social Classifications, 20 - 24 June 2005, New York, ESA/STAT/AC.103/9, *http://unstats.un.org/unsd/class/intercop/expertgroup/2005/ac103-9.pdf*.

WSIS (2005). Tunis Agenda for the Information Society. WSIS-05/TUNIS/DOC/6(Rev.1)-E., *http://www.itu.int/wsis/docs2/tunis/off/6rev1.html*.