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GUIDE TO MEASURING THE INFORMATION SOCIETY, 2009

FOREWORD

The Working Party on Indicators for the Information Society (WPIIS) first discussed the *Guide for Measuring the Information Society* at its April 2005 meeting. A number of WPIIS delegates and others provided comments, both before and after the meeting.

The *Guide* was first published at the end of 2005. It was prepared by Sheridan Roberts of the OECD with substantial input from a number of other contributors. This revision was also prepared by Sheridan Roberts (as a consultant to the OECD), again with the assistance of other contributors (see *Acknowledgements* for details). A draft was presented to the 2007 WPIIS meeting and delegates were invited to provide comments. Further changes were made during 2008 and 2009, mainly reflecting finalisation of the information economy product classifications (affecting Chapters 2 and 7, and Annex 1a).

The *Guide* is published under the responsibility of the Secretary-General of the OECD.

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PREFACE

For the last decade or so, developments in information and communication technology (ICT) have attracted increasing attention. The need for statistics and analysis to support and inform policy making in this area has grown in parallel. In June 1997, OECD member countries convened the *Ad Hoc* Meeting on Indicators for the Information Society under the aegis of the newly created ICCP (Information, Computer and Communications Policy) Statistical Panel. The aim of the Panel was "to establish a set of definitions and methodologies to facilitate the compilation of internationally comparable data for measuring various aspects of the information society, the information economy and electronic commerce". From 1999, the panel became the Working Party on Indicators for the Information Society (WPIIS) and meetings have been held each year since then.

The WPIIS provides a forum for national experts to come together, share experiences and advance information society statistical issues. Its main methodological achievements to date are: an activity-based ICT sector definition; narrower and broader definitions of electronic commerce transactions; model surveys of ICT use by businesses and households/individuals; an ICT products classification; a Content and media sector definition; and, a Content and media products classification.

The *Guide to Measuring the Information Society* documents the statistical work of the WPIIS and related work being done in the OECD and elsewhere. It is hoped that the *Guide* will become a standard reference for statisticians and others working in this field. In particular, the *Guide* should assist newly participating countries to start or further develop information society measurement programmes. It should be noted that the *Guide* deals primarily with so-called official statistics. Other data collections are generally outside the scope of the document.

The WPIIS works closely with the Committee for Information, Computer and Communications Policy (ICCP) and its three other subsidiary bodies. The Working Party on Telecommunication and Information Services Policies (TISP), undertakes work in the area of telecommunication and Internet infrastructure and services. The Working Party on the Information Economy (WPIE) examines the economic and social implications of the development, diffusion and use of ICT, the Internet and electronic commerce. The Working Party on Information Security and Privacy (WPISP) promotes a global, co-ordinated approach to policy making in these areas to help build trust on line.

The 2009 revision of the *Guide* reflects changes in the field of information society measurement since the first edition was released in 2005. The most significant revisions are to information economy classifications, reflecting the considerable changes in that area that occurred between 2006 and 2009, and a substantial update of Annex 5 (*Measurement issues for developing economies*). Notes on revised text are shown as footnotes on the first page of each chapter and annex.

Both editions of the *Guide* are published on the World Wide Web, see: http://www.oecd.org/sti/measuring-infoeconomy/guide.[1]

1. The 2005 edition is included as it contains material that is not included in the current edition but is still relevant for some countries (for instance, the 2003 classification of ICT goods that will remain relevant until countries have implemented the new classification based on the CPC Ver. 2).

Acknowledgements

The first (2005) edition of the *Guide* was prepared by Sheridan Roberts of the OECD with substantial input from the following: George Sciadas of Statistics Canada; Jack Triplett of the Brookings Institution (whose Handbook on Hedonic indexes forms the basis for an article in Chapter 2); Simon Ellis and Subramaniyam Venkatraman of the UNESCO Institute for Statistics (UIS); Sam Paltridge, Dirk Pilat, Martin Schaaper and Mosahid Khan of the OECD's Economic Analysis and Statistics Division; and Sacha Wunsch-Vincent of the OECD's Information, Computer and Communications Policy Division. Many others contributed valuable comments and suggestions, including: Daniel April of Statistics Canada; Martin Lundø and Henrik Lynge Hansen of Statistics Denmark; Christophe Demunter of Eurostat; Lea Parjo of Statistics Finland; Esperanza Magpantay and Tim Kelly of the International Telecommunication Union; Ivan Bishop from the UK Department of Trade and Industry; Patricia Buckley of the US Department of Commerce; and from the OECD: Colin Webb of the Economic Analysis and Statistics Division; Michael Davidson of the Education Directorate; Graham Vickery, Desirée van Welsum and Andrew Wyckoff of the Information, Computer and Communications Policy Division; and Seppo Varjonen of the Statistics Directorate.

The 2009 revision of the *Guide* was also prepared by Sheridan Roberts (as a consultant to the OECD) and substantial input was received from the following contributors: Vanessa Gray and Roopa Joshi (ITU), Chapter 3; Hélène Dernis (OECD), Chapter 4; Fernando Reis and Heidi Seybert (Eurostat), Chapters 5, 6 and Annexes 1c and 1d; Sacha Wunsch-Vincent (OECD), Chapter 8; Martin Schaaper (OECD), Chapter 9 and Annex 4; Brigitte van Beuzekom, Julie Branco-Marinho and Beatrice Jeffries (OECD), and many WPIIS delegates, Annex 3; Susan Teltscher (UNCTAD), Vanessa Gray and Roopa Joshi (ITU) and Subramaniyam Venkatraman (UIS), Annex 5. Revisions to sections dealing with information economy classifications drew heavily on the work of Daniel April (Statistics Canada) and Martin Mana (the Czech Statistical Office), who, with the help of the WPIIS Classifications Expert Group, produced new or revised classifications for the ICT and Content and media sectors (Chapters 4 and 7, and Annex 1b). Sheridan Roberts co-ordinated the work of the Expert Group in arriving at corresponding classifications for ICT and Content and media products (Chapters 2 and 7, and Annex 1a).

Past and present delegates and Secretariat staff of the WPIIS have contributed greatly to the body of knowledge presented in both editions of the *Guide*. They include: Alessandra Colecchia, John Dryden, Pierre Montagnier, Sam Paltridge and Andrew Wyckoff from the WPIIS Secretariat; Bill Pattinson and Sheridan Roberts from the Australian Bureau of Statistics (and both also of the Secretariat, then later consultants to OECD); Fred Gault (Chair of WPIIS from 1997 to 2001), Daniel April and George Sciadas from Statistics Canada; Andre Leduc from Industry Canada; Martin Mana (also of the Secretariat) from the Czech Statistical Office; Peter Böegh-Nielsen (Chair of WPIIS in 2002 and 2003) and Martin Lundø from Statistics Denmark; Olof Gardin from Eurostat; Lea Parjo from Statistics Finland; Jean-Marie Nivlet and Marc Aufrant from the Direction du Développement des Médias, France; Fabiola Riccardini from ISTAT; Annemieke Alenius, Anders Hintze (also of the Secretariat) and Anders Sundstrom from Statistics Sweden; Ivan Bishop and Nick Rudoe from the UK Department of Trade and Industry; Tony Clayton from the UK Office for National Statistics (Chair of WPIIS from 2006); Barbara Atrostic from the US Bureau of the Census; and Patricia Buckley from the US Department of Commerce (Chair of WPIIS in 2004 and 2005). Many useful statistical and policy insights have also been contributed over the years by delegates and Secretariat staff of the ICCP Committee and its other subsidiary bodies, TISP, WPIE and WPISP.

CHAPTER 1: INTRODUCTION[2]

1. There is little doubt that information and communication technology (ICT) has promoted profound economic and social change over the past decade or so. The need for statistics and analysis to support and inform policy-making has grown alongside the rapid emergence of new ways of communicating, processing and storing information.

2. The *Guide to Measuring the Information Society* documents the work of the OECD and others in developing statistical standards for measuring the information society. While, the main focus of the *Guide* is on the work of the OECD's Working Party on Indicators for the Information Society (WPIIS), relevant statistical work in other areas of the OECD, National Statistical Offices (NSOs) and other organisations is also included.

3. The introductory chapter to the *Guide* provides answers to the following key questions:

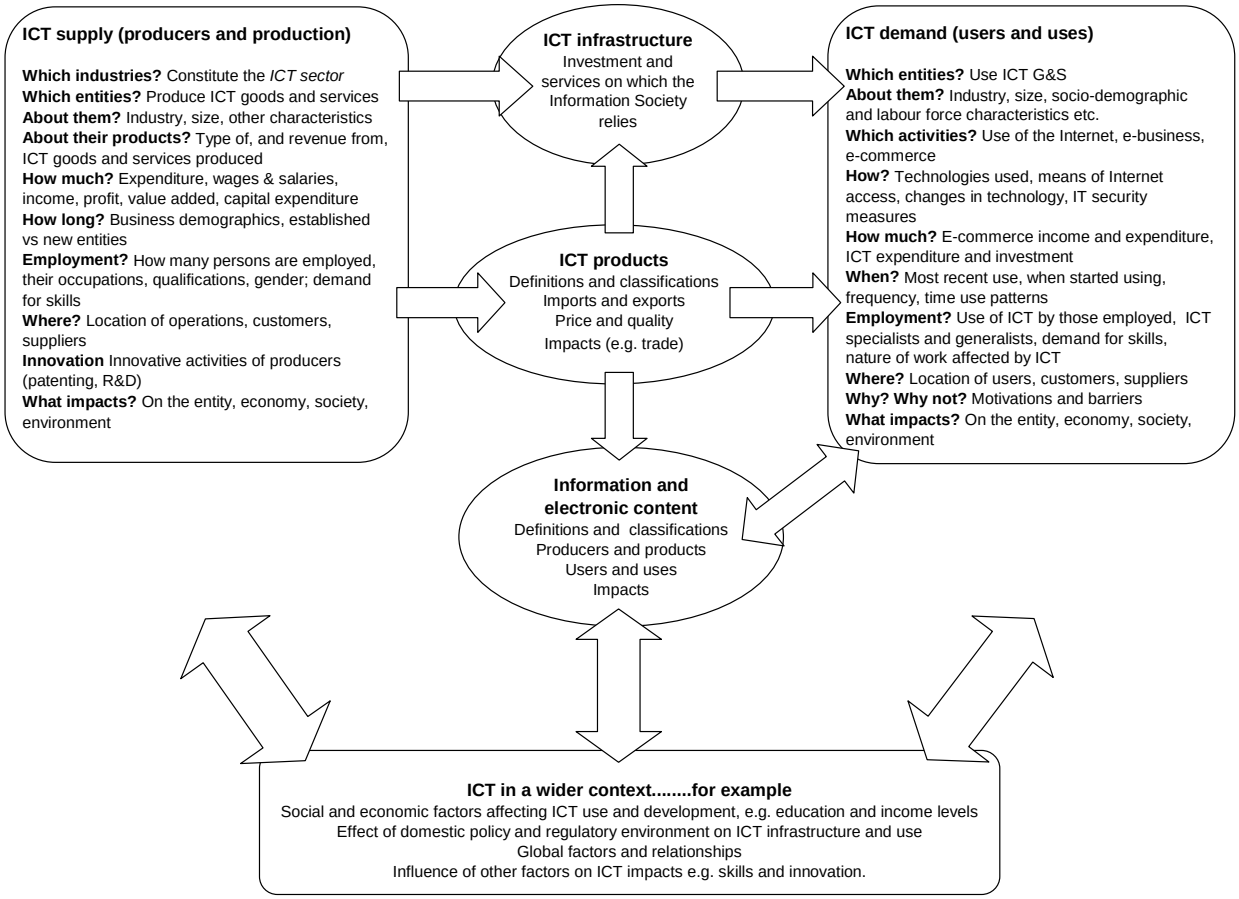
- What is the *information society*, in statistical terms?
- Why has the *Guide* been produced?
- Who is the intended audience for the *Guide*?
- What does the *Guide* contain?

The information society, in statistical terms

4. There is no agreed comprehensive statistical framework of the information society. One possible conceptual model is shown in Figure 1 and encompasses the widely agreed elements of ICT supply, ICT demand, ICT infrastructure, ICT products and 'content'.

2. Revisions to the *Introduction* have been minimal, with the main ones being minor changes to Figure 1 and some amendments to the content outline.

Figure 1. Information society statistics conceptual model



5. A complementary framework is the well-known S curve (Figure 2 below), developed to describe indicators for electronic commerce.[3] It considers three stages as follows:

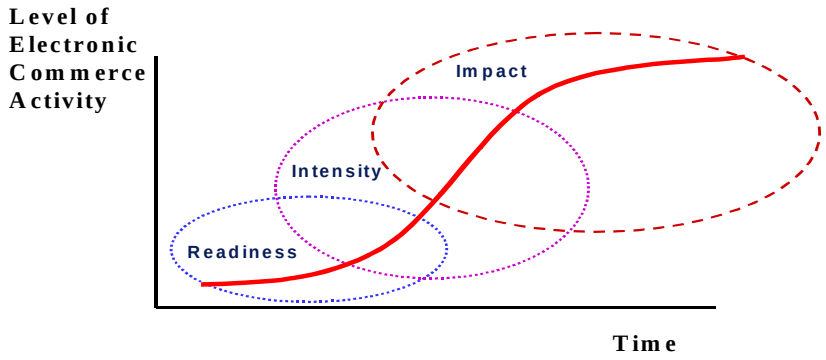
- **E-readiness** – preparing the technical, commercial and social infrastructures necessary to support *e-commerce*. E-readiness indicators allow each country to construct a statistical picture of the state of readiness of the infrastructure necessary to engage in *e-commerce*.

- **E-intensity** – the state of *e-commerce* use, volume, value and nature of the transactions. E-intensity indicators permit countries to profile who is exploiting e-commerce possibilities and who is not, and to identify leading sectors and applications.

- **E-impact** – the value added potentially created by *e-commerce*. Statistics are needed to evaluate whether and to what extent *e-commerce* makes a difference in terms of efficiency and/or the creation of new sources of wealth.

3. But often used to describe ICT infrastructure and demand more generally.

Figure 2. Development of *e-commerce* markets and measurement priorities: the S-curve[4]



The *Guide* and its rationale

6. The *Guide* is a compilation of concepts, definitions, classifications and methods for information society measurement and analysis.

7. Much of what is contained in the *Guide* comes in the form of recommended guidelines for statistical measurement that, in this context, refers to the production of statistical indicators from mainly official sources such as surveys of businesses and households, and international trade data.

8. The *Guide* describes areas of work sufficiently advanced in their conceptual and definitional underpinnings, and for which sufficient experiences have been accumulated, to provide guidelines that will enable the collection of internationally comparable statistics. It also includes areas of work that are in early stages of development and therefore represent work-in-progress.

9. For the benefit of both practitioners and newcomers, the *Guide* includes background information on the policy context and the debates that occurred during the development of OECD standards on information society measurement.

The information society

10. That we live in a period of unprecedented technological change, both in terms of the extent and speed of change, has been discussed extensively. Many of the underlying transformations are undoubtedly associated with the set of interrelated and, more recently, converging technologies that have come to be known as ICT. They permeate every aspect of life – economic, social, political, cultural and otherwise – and have created great interest regarding their actual and potential impact.

11. The last two decades, in particular, have witnessed the widespread adoption of a great number of such technologies, notably the personal computer, the cell phone and the Internet. Together with their

4. From "Defining electronic commerce: A Discussion paper" [OECD Internal Working Document, DSTI/ICCP/IE/IIS(2000)1], a Secretariat paper presented to a joint WPIE/WPIIS meeting held in 2000. The figure's original source is Industry Canada.

multitude of applications, ICT touches on nearly every known economic and societal norm. Today, in many OECD and other countries, the majority of businesses use computers and the Internet as a matter of routine. Unheard of until fairly recently, life without e-mail and the World Wide Web seems like an anomaly today.

The economic dimension

12. ICT has had, and will continue to have, significant economic implications. Businesses are transforming their supply and demand chains, as well as their internal organisation to fully exploit ICT. Governments are restructuring their internal functions and the way they deliver services and generally interact with citizens and businesses. People are modifying their consumption and spending patterns, as well as their behaviour. In the process, nearly every economic variable of interest is affected.

13. ICT has greatly contributed to the process of creative destruction, through the birth of new firms – and industries – and the death of others, with visible impacts on industrial organisational structures and obvious implications for employment. Directly and indirectly, ICT can reduce market friction and transaction costs and affect competitive positioning, with resulting implications for productivity improvement and economic growth.

The social dimension

14. The nature of ICT is such that its use and impacts extend well beyond the economic domain. This is so because ICTs are general purpose technologies that can be used for a broad range of everyday activities. New modes of individual behaviour have emerged, including new or modified means of personal communication and interaction. The rapid increase in use of Short Message Service (SMS) in some parts of the world represents but one such manifestation of these phenomena. The phenomenon of the so-called *digital divide*, which arises from uneven access to new technology, is a very important aspect of the social dimension. In light of this interest, a special article on this topic is included in the *Guide* (see Chapter 8).

Rationale

15. While new research interests emerge periodically as our societies evolve, they are often definable within rather specific boundaries – an important activity, an industry or a phenomenon. The information society is not so simple. A host of questions, and even controversy, have surrounded it ranging from the economic (both macro and micro), to the social (exclusion, cohesion), the socio-economic (the digital divide), the political (e-democracy), the cultural and beyond.

16. If decision making on these issues is to be informed, the production of relevant and reliable quantitative information is imperative. For example, without statistics on business use of ICT, the productivity paradox could not be understood; e-commerce could not be placed in proper perspective without measurement of both consumer participation and firm activity; the digital divide cannot be meaningfully addressed without measures of what divides whom and where; national e-strategies aimed at growth and economic development can neither be designed nor evaluated without appropriate indicators.

17. The need for measurement brings with it the need for statistical standards and, perhaps as importantly, broad access to – and understanding of – those standards. However, the need for statistical standards does not, by itself, provide the impetus for a work such as this. A critical mass of knowledge is also required and, as shall become clear in the chapters to follow, a considerable amount of new knowledge has been generated in a relatively short time.

18. Significant progress has also been achieved with respect to use of that knowledge by a number of countries. The OECD definition and quantification of e-commerce, for instance, has played a key role in

policy developments internationally. The original (1998) definition of the ICT sector replaced several competing and incompatible ones and its 2006 revision, along with revised classifications of its products, are poised to do the same. Finally, the model surveys of ICT use have set standards for such surveys in both OECD and non-member countries.

Expected benefits

19. It is hoped that the *Guide* will facilitate improved harmonisation of practices in this area of statistics. This, in turn, will enable better international comparability of data, a key requirement for benchmarking, identification of relative strengths and weakness, and tracking progress.

20. The *Guide* will be useful for countries that already have measurement programmes and those yet to start. Newcomers to the field can expect to progress more quickly than they might have in its absence. They can benefit from work already advanced and be assured that the outputs of their efforts will be as comparable as possible to those of other countries.

21. It is envisaged that as work continues, the *Guide* will develop and improve in order to better serve the needs of OECD member countries and the international community at large.

Users of the *Guide*

22. Official statisticians form the heart of the intended audience of this *Guide*. Its content is intended to assist in the consistent application of concepts and definitions, as well as the collection of comparable data via statistical surveys.

23. There are other users too, of course, and they include:

- Analysts who interpret the statistical information provided by statisticians will benefit by having insights into the standards that underlie that information.

- Policy makers and governments are members of the user community for the proposed *Guide*. They were quick to try to find appropriate responses to developments associated with ICT and form a major part of the demand for information.

- Businesses are also likely users. More than ever, in a period of widespread technological evolution, benchmarking is important as a means of assessing comparative performance and strategy. This is true both at the industry and firm level.

- Researchers in many disciplines are active in this new area too. In particular, those involved in measuring ICT will benefit from the dissemination of statistical standards; and

- Finally, international organisations, whose information requirements centre on comparability across countries, are expected to make good use of this *Guide*.

Scope and content of the *Guide*

24. The *Guide* broadly covers measurement of the information society as outlined in Figure 1 above, but does not attempt to detail all aspects of it. It focuses most attention on the work done by the OECD's WPIIS, including definition of the ICT and Content and media sectors and their products; measurement of ICT use by households/individuals and businesses; as well as work on the definition and measurement of

e-commerce. It includes WPIIS work undertaken on e-business measurement, e-government, trust in the online environment and ICT investment. It also covers other selected work on ICT measurement, from within the OECD and elsewhere, including: infrastructure, prices, patents, digital content, the *digital divide*, skills, education, occupations, and impacts of ICT.

25. It is clear from Figure 1 that, while measurement and analysis are applicable to every aspect of the information society, the statistical information and methodologies involved are diverse. In recognition of this, the WPIIS has adopted a pragmatic approach, where priority and statistical feasibility determine the order in which information society issues are examined. Priorities are set in close collaboration with data users – particularly policy makers. Through the same process, components of interest will continue to be added and revised. Future outputs of the WPIIS and others will be incorporated into subsequent revisions of this *Guide*.

26. Following this introductory chapter, the contents of the *Guide* are organised as follows:

Chapter 2 – ICT products – describes definitions and classifications relating to ICT goods and services, measurement of international trade in ICT goods, and the price and quality of ICT products.

Chapter 3 – ICT infrastructure – addresses the infrastructure of the information society – access services, their quality, investment in such services, and tariffs.

Chapter 4 – ICT supply – deals with the supply side of ICT, namely the ICT sector, its impacts, other ICT-producing entities, and ICT patenting activity.

Chapter 5 – ICT demand by businesses – describes the OECD model survey of ICT use by businesses and includes definitions and discussion of statistical standards for e-business and e-commerce. It also looks at the topics of ICT investment and expenditure by business, and the economic impacts of ICT investment and use.

Chapter 6 – ICT demand by households and individuals – describes the OECD model survey of ICT access and use by households and individuals. It also includes discussion of e-commerce and the social and economic impacts of ICT use by households and individuals.

Chapter 7 – Content – describes statistical issues relating to information and electronic content and more recent work on defining a Content and media sector and its products.

Chapter 8 – Cross-cutting topics in information society measurement – contains special articles on selected topics: e-government, trust in the online environment and the digital divide as well as overviews of OECD work on ICT skills and ICT in education. It also considers a broader view of ICT within a social, economic and environmental context.

Chapter 9 – The road ahead – concludes with an examination of the international scene and future challenges.

27. Detailed material is presented in annexes as follows:

Annex 1 – OECD standards for ICT statistics – presents recommended definitions and operational guidelines, and details classifications, definitions and model surveys developed by the WPIIS.

Annex 2 – Output – chronicles the development of, and provides links to, OECD output data. It also includes a discussion of technical issues relating to the presentation of information society statistical output.

Annex 3 – Member countries – offers a Web-based inventory of ICT statistics work by member countries, including survey metadata, contacts and main outputs. It extends to cover strategies and analytical outputs where these are available.

Annex 4 – Non-member economies – contains an overview of activity in non-member economies, including regional initiatives and activities of international organisations in the field of ICT statistics.

Annex 5 – Measurement issues for developing economies – an article originally contributed by the UNESCO Institute for Statistics and revised for this edition of the *Guide*. Annex 5 aims to facilitate applicability of the *Guide* to developing economies.

28. The *Guide* concludes with a Bibliography.

CHAPTER 2: ICT PRODUCTS[5]

Introduction

29. Product statistics and associated classifications play an important role in basic economic analysis. In relation to ICT, the measurement of consumption, domestic production, market size, investments and trade all potentially make use of ICT product[6] data, which includes statistics on:

- International trade in ICT goods and services.
- Household expenditure on ICT goods and services.
- Business and government current and capital expenditure on ICT goods and services; and
- Domestic production of ICT goods and services.

30. In order to compile statistics on ICT products, statisticians require definitions and classifications. The guiding principles for defining ICT products are based on those for the ICT sector (see Chapter 4). This is reasonable since the latter concept is based on characteristics of products rather than industries. The ICT sector definition was revised in 2006-07, leading to a definition of its products as follows (OECD, 2008a):

> ICT products must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display.

31. The difficulties in establishing a classification of ICT products had been recognised by the WPIIS since 1998. These difficulties are related to the rapidly changing character of ICT goods and services, challenges in relating the definition to available classifications and the dated nature of product classifications such as the United Nations *Central Product Classification* (CPC).[7]

32. An ICT goods classification based on the *Harmonized System* used for trade statistics was first agreed by OECD member countries in 2003. It was revised by WPIIS[8] in 2008 and was based on subclasses of the 2008 Central Product Classification, Version 2 (UNSD, 2008b). A proposal for a classification of ICT services, based on an earlier draft of the CPC Ver. 2, had been agreed by WPIIS in 2006 (OECD, 2006a). During preparation of the ICT goods classification based on the CPC Ver. 2, the ICT

5. This chapter was revised in 2007 and 2009, with the main changes reflecting the finalisation of an ICT product classification based on the United Nations Central Product Classification Version 2 (2008). Note that the Section, *The price and quality of ICT products* has not been revised.

6. "Product" refers to both goods and services. An alternative term for "product" which is sometimes used is "commodity".

7. This is less of an issue for the 2008 version of the ICT product classification as it is based on the CPC Version 2, completed in 2008.

8. The development work was undertaken by the WPIIS Classifications Expert Group (established to make recommendations on information economy classifications to the broader membership).

services classification was reviewed and amended, resulting in a single ICT product classification. Details of the changes made can be found in Annex 1a.

The ICT product classification

33. A history of WPIIS work on developing ICT product classifications can be found in Annex 1a. In respect of goods, the main changes between the ICT goods classification of 2003 and the goods component of the ICT product classification of 2008 were:

- The change in the underlying classification (from the HS to the CPC), and
- A narrowing of scope, consistent with the changes to the definition of the ICT sector, to remove from the definition goods that "… use electronic processing to detect, measure and/or record physical phenomena or to control a physical process." (see Chapter 4 and Annex 1b for more information).

34. The main features of the 2008 ICT product classification, and its relationship with both the ICT sector definition and the Content and media product classification, can be summarised as follows: (OECD, 2008a)

- One product of the ICT manufacturing industry[9] was excluded from the classification. Four products that are linked to an ICT and a non-ICT manufacturing industry, and two products with one link (of several) to an ICT manufacturing industry, were also excluded.
- Two goods that are not products of an ICT industry were included in the classification based on strong majority support and for consistency with other inclusions. They are *Digital cameras* and *Other recording media, including matrices and masters for the production of disks*.
- All of the products of ICT service industries are in either the ICT or the Content and media product classification.
- Four ICT services were included in the Content and media product classification because the expert group considered that they are more similar to content than ICT. They are the three games software products and *Web search portal content*.
- A small number of services that are not products of ICT industries were included in the ICT product classification for consistency. They are: three leasing or rental services, *Business process management services, Engineering services for telecommunications and broadcasting projects* and two ICT installation services.
- The ICT product classification does not have a specific goods/services split (though, for trade statistics purposes, it is clear which products are goods).

35. In respect of ICT services, a classification based on an early draft of the CPC Ver. 2 was released in early 2007 and later revised when a complete ICT products classification was developed. The changes are explained in some detail in Annex 1a.

36. Annex 1a contains the full list of ICT products and groups them into the broad categories shown in Table 1 below.

9. A product is taken to be a product of an industry if its CPC code (subclass) is linked (in the CPC) to the ISIC class representing that industry.

Table 1. Broad level categories for ICT products

Broad level categories	Number of CPC subclasses (products)
Computers and peripheral equipment	19
Communication equipment	8
Consumer electronic equipment	11
Miscellaneous ICT components and goods	14
Manufacturing services for ICT equipment	5
Business and productivity software and licensing services	11
Information technology consultancy and services	10
Telecommunications services	12
Leasing or rental services for ICT equipment	3
Other ICT services	6
Total	**99**

37. This broad structure plays an important role in the usefulness of the classification. It is hoped that the structure will allow grouping of product data into broad categories that will be publishable by member countries.

International trade in ICT products

38. The 2003 classification of ICT goods was based on the international Harmonized System classification of traded goods (HS). It was therefore relatively easy to measure trade in ICT goods using available trade statistics (for example, from the OECD's International Trade in Commodity Statistics database or the UN's Comtrade database (UNSD, 2009)).

39. With the revision of ICT products, this simple link no longer exists. A correspondence between the goods component of the 2008 ICT product classification and the 2007 Harmonized System (HS) is necessary in order to apply the classification to trade statistics. This is expected to be prepared in 2009 and will provide countries with a revised classification for measuring trade in ICT goods.

40. Because the scope of ICT goods has narrowed compared with 2003 (see discussion above), there will be a break in the time series of ICT trade data.

41. Data on trade in ICT services are currently limited in their detail compared with data on trade in ICT goods. A revised *Manual on Statistics of International Trade in Services* is due to be released in 2009 and is expected to include a slightly more detailed classification of ICT services. The current services classification used by UNSD in its UN Service Trade Database is the Extended Balance of Payments Services classification (EBOPS), which includes *Computer services* and *Telecommunications services*.

The price and quality of ICT products

42. The report of the meeting of the 2002 IAOS Conference *Official Statistics and the New Economy* (ONS, 2002a) identified measurement methodologies relating to the price and quality of ICT products as among the most pressing issues in the field of new economy measurement.

43. While this is an area not directly examined by the WPIIS, it is a topic that concerns OECD, NSOs and other groups such as the Voorburg Group on Services Statistics.

44. For a brief overview of the conceptual issues relating to the price and quality of ICT products, readers are referred to work by Ahmad, Schreyer and Wölfl (2004) and Pilat, Ahmad and Schreyer (2004). These papers summarise the challenges involved in constructing price indices for ICT products, which include:

- Incorporating the rapid price fall and quality increase of ICT components since about the mid-1990s.

- The use of hedonic functions that link the price of ICT equipment and software to quality characteristics (such as speed and memory); and

- Differences between price indices of the three types of software – own account, customised and pre-packaged.

45. A more detailed OECD study on hedonic indexes, *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products*, was published in late 2004 (Triplett, 2004). The *Handbook* was the result of work undertaken by Jack Triplett of the Brookings Institution for the OECD. For the benefit of readers, extracts of relevant parts of the paper have been included as a short article below.

Hedonic indexes and quality adjustments in price indexes for IT products

Introduction

46. The objective of the *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to information Technology Products* is to "contribute to a better understanding of the merits and shortcomings of conventional and hedonic methods, and to provide an analytic basis for choosing among them." It compares and contrasts the logic and statistical properties of hedonic methods and conventional methods and the results of employing them in different circumstances. In Chapter IV, it reviews empirical evidence on the difference that alternative methods make in practice, and offers an evaluation framework for determining which is better. In Chapters III, V, and VI, the handbook sets out principles for 'best practice' hedonic indexes. These principles are drawn from experience with hedonic studies on a wide variety of products. Although most of the examples in the handbook are drawn from ICT products, the principles in it are very general and apply as well to price indexes for non-ICT products that experience rapid quality change, and also to price indexes for services, which are affected by quality changes fully as much as price indexes for goods. Some objections that have been raised to hedonic indexes are presented and analysed in Chapter VII. An appendix discusses issues of price index theory that apply to quality change, and presents the economic theory of hedonic functions and hedonic price indexes.

47. The *Handbook* project was initiated by the Statistical Working Party of the OECD's Industry Committee.[10] Its objectives were to:

- Provide an accessible guide to the different approaches towards constructing ICT deflators, to permit officials involved in producing and using them to make informed choices.

10. Now the Committee on Industry and Business Environment (CIBE).

- Discuss, in particular, some of the arguments that have surrounded the construction and use of hedonic methods in deriving price indices and compare them with more traditional practices; and

- Improve international harmonisation by increasing transparency about different country practices in this field and by providing methodological guidance for new work.

48. Deflators for output, input, and investment – for producing productivity measures or value added in national accounts – are derived primarily from price indexes estimated by statistical agencies. Whether the deflators are consumer (retail) price indexes (CPI or RPI) or producer (wholesale) price indexes (PPI or WPI), quality change has long been recognised as perhaps the most serious measurement problem in estimating price indexes.

49. In national accounts, any error in the deflators creates an exactly equivalent error of opposite sign in the real output, real input, real investment and real consumption measures (which are referred to in the *Handbook* as 'quantity indexes'). For this reason, discussing the problems posed by quality change in price indexes is the same thing as discussing the problems of quality change in quantity indexes, and therefore in measures of productivity change as well.

50. Different quality adjustment methodologies are employed for ICT products across OECD countries, and they seemingly make large differences in the trends of price movements for these products. A Eurostat Task Force (Eurostat, 1999), reviewing ICT indexes for the early 1990s, found a smaller dispersion among European countries' ICT deflators. But still, price declines recorded by national computer deflators in Europe ranged from 10% to 47%, and again, the largest price decline was based on a hedonic price index (France). The Task Force calculated that price variation in this range could affect GDP growth rates by as much as 0.2%-0.3% per year, depending on the size of a country's ICT sector. International comparisons of productivity growth would be affected by approximately the same magnitude.

51. If different quality adjustment procedures among OECD countries make the data non comparable, then the measured growth of ICT investment and of ICT capital stocks will not be comparable either. Data non-comparability for ICT deflators, investment and capital stocks therefore creates serious limitations to making international comparisons of economic growth and understanding international differences in productivity trends and levels and sources of growth. When ICT data are not internationally comparable, estimates of the impact of ICT on economic growth in different OECD countries have limited, if any, meaningfulness.

52. The *Handbook* reviews the methods employed in price indexes to adjust for quality change. A natural division is between 'conventional' methods typically employed by the statistical agencies of many OECD countries (discussed in Chapter II), and hedonic methods for adjusting for quality change (alternatively known as hedonic price indexes). The latter have a prominent place in price indexes for ICT products in several OECD countries. Hedonic methods for producing quality-adjusted price indexes are reviewed in Chapter III. The *Handbook* also sets out principles for 'best practice' hedonic indexes (in Chapters III, V, and VI). These principles are drawn from experience with hedonic studies on a wide variety of products.

Conventional price index methodology

53. Agencies that estimate price indexes employ, nearly universally, one fundamental methodological principle. The agency chooses a sample of sellers (retail outlets in the case of consumer price indexes, or CPIs, producers for producer price indexes, or PPIs) and of products. It collects a price in the initial period for each of the products selected. Then, at some second period, it collects the price for exactly the same product, from the same seller, that was selected in the initial period. The price index is

computed by matching the price for the second period with the initial price, observation by observation, or 'model by model'.

54. The full rationale for this 'matched model' methodology is seldom explicitly stated, and its advantages sometimes are not fully appreciated. Matching, it is well known, is a device for holding constant the quality of the goods and services priced for the index. Indeed, one significant source of price index error occurs when the matching methodology breaks down for some reason – some undetected change in the product makes the match inexact or the product observed in the initial period disappears and cannot be matched in the second. These situations impart quality change errors into the ostensibly matched price comparisons. Analysis of quality change errors is a major topic of the *Handbook*.

55. Another aspect of the matched model methodology is less commonly perceived. Matching also holds constant many other price determining factors that are usually not directly observable. For example, matching on sellers holds constant, approximately, retailer characteristics such as customer service, location, or in-store amenities for CPI price quotations. For the PPI, matching holds constant, again approximately, unobserved reliability of the product, the reputation of the manufacturer for after-market service, willingness to put defects right or to respond to implicit warranties, and so forth. Although controlling for quality change is one of its objectives, matching the price quotes model by model is not just a methodology for holding quality constant in the *items selected for pricing*. It is also a methodology for holding constant non-observable aspects of the *transactions* that might otherwise bias the measure of price change.

56. The problem of quality change potentially arises in price indexes whenever transactions are not homogeneous. It thus affects all price indexes, not just price indexes for high technology products, or price indexes for goods and services that are thought, by some measure, to experience rapid quality change. Even if the product is homogeneous, *transactions* are not homogeneous and it is transactions that matter in a price index. The matched model method is a device that is intended to hold constant the characteristics of transactions.

57. Moreover, buyers switch from one seller to another in search of a more favourable price/service combination. For example, personal computers (PCs) are increasingly sold over the Internet, rather than in retail computer stores. Consumers on average evidently value the retailing services provided by 'brick and mortar' stores by less than the price differential between them and online sellers. When buyers switch between distribution outlets, they may experience true price changes that are more favourable than the ones that the matched model, matched-outlet method measures.

58. Some methods that have been proposed for computing quality-adjusted price indexes imply modifying or replacing the matched model methodology. Price index agencies have been reluctant to adopt alternatives that require abandoning the matched model methodology.

Hedonic price index methodology

59. According to the *Handbook* "A *hedonic price index* is **any** price index that makes use of a *hedonic function*. A *hedonic function* is a relation between the prices of different varieties of a product, such as the various models of personal computers, and the quantities of *characteristics* in them." As implied by this definition, hedonic indexes may be computed in a number of ways. For example, a hedonic function for computer equipment is typically estimated using an ordinary least squares regression and describes a relationship between, at a minimum, price, speed and memory.

60. Four major methods of calculating hedonic price indexes have been developed for estimating ICT price indexes. Each of these methods uses a different kind of information from the hedonic function. The

first two described in the *Handbook* (the 'time dummy variable method' and the 'characteristics price index method') are sometimes referred to as 'direct' methods, because all their price information comes from the hedonic function; no prices come from an alternative source. Direct methods require that a hedonic function be estimated for each period for which a price index is needed.

61. The second two hedonic price index methods (the 'hedonic price imputation method' and the 'hedonic quality adjustment method') have been described as 'indirect' or 'composite' methods. They are often called 'imputation' methods, because the hedonic function is used only to impute prices or to adjust for quality changes in the sample of computers in cases where matched comparisons break down. The rest of the index is computed according to conventional matched model methods, using the prices that are collected in the statistical agency's usual sample.

62. The *Handbook* describes the four methods in detail and compares them with each other and with conventional methods. In practice, statistical agencies that have implemented hedonic indexes have mostly used the hedonic quality adjustment method, partly because of the necessity for producing a timely index. The hedonic quality adjustment method can be estimated using a hedonic function from a prior period, where the dummy variable method (and other methods) requires the current period's hedonic function as well. But there is no reason why the dummy variable method should not be employed when it is feasible. Its major liability is the difficulty in introducing weights into the dummy variable index.

63. For more information, readers are referred to the *Handbook*, available on the OECD Web site.[11]

11. http://www.oecd.org/dataoecd/37/31/33789552.pdf.

CHAPTER 3: ICT INFRASTRUCTURE[12]

Introduction

64. In the late 1980s, the OECD started work on defining performance indicators for the telecommunication industry, with the aim of enabling international comparison and informing policy. The report *Performance Indicators for Public Telecommunications Operators* (OECD, 1990) summarised the initial set of indicators used by the OECD to compare the development of telecommunication services in member countries. The report also included a summary of the initial OECD methodology for comparing telecommunication tariffs. This methodology formed the basis for analysing the telecommunication sector in the biennial *Communications Outlook* (OECD, 1991 onwards).

65. The International Telecommunication Union's (ITU) *Telecommunication Indicators Handbook* (ITU, 2007a) identifies and defines key telecommunication/ICT indicators for analysing the sector (*e.g.* number of telephone lines, cellular mobile subscribers, Internet subscribers and users, etc).[13] Its goal is to assist the standardisation of statistics in order to improve analysis and comparisons within and across countries and telecommunication operators. Given that the telecommunication/ICT sector continues to change rapidly, the indicators to measure the telecommunication/ICT sector need to be adapted regularly. The impressive growth and changes in the mobile and Internet sectors over the last few years, for example, have called for the revision of existing definitions. Since its first publication in 1997, Telecommunication/ICT regulators, operators and international agencies have provided valuable comments on the *Indicators Handbook.* These changes are discussed and the indicators considered and adopted at the ITU's World Telecommunication/ICT Indicators meeting, which is organised regularly. The last (fifth) World Telecommunication/ICT Indicators meeting took place in October 2006 and approved a revised version of the indicators (ITU, 2007b).

66. ITU's definition of public telecommunication infrastructure originally excluded broadcasting. Given the interest in platforms other than circuit switched telecommunication networks, which can now provide 'like-services', the ITU later appended definitions for broadcasting (*e.g.* cable television connections, homes passed by cable, direct to home satellite antennas and so forth). It should be noted that not all services defined in the *Indicators Handbook* continue to be offered in OECD countries (*e.g.* telegrams) and new infrastructures and services have emerged that are not yet covered by the *Handbook*.

67. At the time that the ITU's *Indicators Handbook* was created, the public telecommunication sector excluded private networks that either did not automatically connect to the public network or that had limitations on membership. Prior to widespread liberalisation, networks such as the Internet that operated

12. This chapter was updated in 2007 and, by 2009, is somewhat out of date. The main changes in 2007 were revisions provided by the ITU.

13. Historically, the term 'public telecommunication sector' referred to telecommunication infrastructure over which services were provided for the public at large. Traditionally, this included telecommunication networks (*e.g.* telephone, telex, telegraph, data) which consisted of exchanges (switches) linked by transmission circuits that connect subscribers to each other and with subscribers abroad. The term 'public' referred to the access arrangement (anyone could subscribe to the network) rather than the ownership of the network.

in parallel with or overlaid telecommunication infrastructures, were not considered part of the public telecommunication sector. They were used by 'closed user groups', such as academia, and were not accessible by the public. When the Internet was commercialised and became a mainstream part of the public telecommunication market, ITU started to collect data to capture this development. Today the Internet market is captured in the ITU's *Indicators Handbook* through several indicators, including Internet subscribers, Internet users and international Internet bandwidth. Internet subscriber data are defined by modes of access, and a distinction is made between dial up and broadband access. The latter is divided by access technology, including DSL, cable and other broadband technologies.

68. The OECD's main publications in this area are the *Communications Outlook*, the *Information Technology Outlook* and the *Science Technology and Industry Scoreboard*. OECD publications can be purchased or freely read on line (see Bibliography and Annex 2 for details). Reports in the area of Communication Policy can also be freely downloaded from the OECD Web site.[14] ITU publishes its data in a number of formats, including in electronic format, and particularly through its World Telecommunication Indicators Database, and in various publications. Leading ITU publications in this area include the *World Telecommunication Development Report*, the *Yearbook of Statistics*, as well as the Regional Telecommunication Indicators Reports.[15]

Public switched telecommunication networks (PSTN)

69. In most countries, ministries dealing with telecommunications or telecommunication regulatory authorities collect a basic set of indicators, which allows them to monitor market development, inform policy and ensure efficient regulation of the communications sector. For the most part, these indicators are tied to a service (*e.g.* telephony) provided over a specific infrastructure (*e.g.* PSTN). Increasingly, it has become evident that the diffusion of the Internet and the increased penetration of broadband services necessitate a more comprehensive list of indicators.

70. ITU's *Indicators Handbook* defines a range of traffic measures for the PSTN. The measurements used across countries are generally one or more of: minutes, units of time or number of calls. The measure chosen generally relates to the structure of tariffs in a particular country (*e.g.* unmetered local calls are generally counted by calls rather than minutes). PSTN traffic may also be recorded in relation to whether it is local, domestic long distance or international. These categories are increasingly less applicable to the way that telecommunication prices are structured, in that tariffs are becoming less sensitive to distance and time. An improvement in traffic indicators has been to include and distinguish fixed and mobile originating calls, including those that are on- and off-Internet calls. This has been particularly important in view of the accelerating usage of mobile telephony, especially in developing economies.

The Internet

A note on infrastructure technologies

71. For a variety of reasons, most analysts expect a transition from circuit switched networks to IP networks (*i.e.* those that use the Internet Protocol). Sometimes these are referred to as 'next generation networks'. These networks are expected to – and increasingly can – provide any service that might once have needed a specialised or dedicated infrastructure. Telecommunication carriers, for example, which once specialised in telephony, are beginning to provide television services over DSL connections. At the same time, an increasing number of cable television networks are providing Internet telephony. In fact, any

14. They are available at: www.oecd.org/sti/telecom.

15. Information on ITU publications can be found at: http://www.itu.int/ITU-D/ict/publications/.

platform that can provide broadband access to the Internet enables the user, with the appropriate terminal equipment and software, to access Internet telephony services. As a result of these developments, services are no longer tied to specific platforms. A household without a fixed telephone line may still have a telephony service provided by a different platform.

72. The Internet, of course, uses some elements of the infrastructures created for PSTNs *e.g.* dial-up services use local loops. In that sense, the Internet and other private networks that overlaid public networks, were recorded during historical data collection.

73. Notwithstanding this, a range of new access technologies has emerged that use upgraded elements of infrastructures built for circuit switched and alternative networks. In the case of telecommunication networks, the primary development has been the deployment of digital subscriber lines (DSL). Cable modem access is enabled by networks that have been upgraded from their original purpose of providing cable television. A range of terrestrial fixed wireless and cellular mobile platforms can also provide broadband access. In respect of cellular service, UMTS (Universal Mobile Telecommunications System) represents an evolution in terms of services and data speeds from 'second generation' mobile networks to 'third generation' (3G) mobile technologies. At the same time, a range of fixed wireless access platforms can provide broadband access within a local area (*e.g.* WiFi) or over a wider area (*e.g.* Wimax and Mesh Wireless Networks).

74. A distinction between cellular and fixed wireless is that some fixed systems require an antenna fixed on a building to receive service. Cellular networks provide a greater ability for users to roam between cells than do fixed wireless networks (though fixed wireless networks can provide mobility within their coverage areas). Two-way broadband access via satellite requires a user to have a receiver capable of downstream and upstream communication. One-way satellite broadband access, and broadband access provided via digital television, require an alternative uplink technology (generally via an analogue or ISDN telephone line). Broadband access via power lines is another emerging platform. Finally, combinations of these networks can be used to provide broadband access. For example a satellite or power line might be used to provide a connection to a location, with local access provided with WiFi. In terms of definition, this group of access technologies is generally referred to as broadband (or high speed Internet access). A major emerging issue is that of capturing voice traffic over IP (VoIP) based platforms. The accelerating pace of VoIP has posed challenges for traffic measurement.

Broadband measurement

75. There is no standard definition of the threshold speed for broadband. Recommendation I.113 of the ITU Standardization Sector (ITU-T) defines broadband as a transmission capacity that is faster than primary rate ISDN, at 1.5 or 2.0 mbps (ITU, 2004). In the United States, the Federal Communications Commission (FCC) established one of the first thresholds for reporting on the deployment of advanced telecommunications. The FCC set the speed for broadband access at 200 kbps in one or both directions.

76. When the OECD first began to collect data on the take-up of DSL and cable modem access, there was no DSL or cable modem service advertised at less that 256 kbps for downstream connectivity. As this threshold was higher than basic ISDN (*i.e.* 128 kbps) it seemed a convenient benchmark by which to exclude ISDN, which was counted elsewhere, and record the new services that had become widely known under the collective term of broadband access. For the purpose of statistical collections, ITU's broadband indicator is called "Total fixed (wideband and) broadband Internet subscribers" and defined at speeds equal to, or greater than 256 kbit/s, in one or both directions.

77. In June 2002, the European Commission's Communications Committee (COCOM), established a working definition for the collection of broadband data in the European Union area. The threshold speed

for both incumbent telecommunication carriers and new entrants was set by COCOM at 144 kbps. The objective was also to exclude basic ISDN lines (that, is, 128 kbps).

78. The issue of setting a baseline speed for broadband, in so far as measurement for OECD countries is concerned, is a transient one. In 2003, Telecom New Zealand and France Telecom's baseline speeds were both 128 kbps. At the close of 2004 they were increased to 256 kbps and 512 kbps respectively. In 2003, the highest speed offered by France Telecom to residential users was 1 mbps. At the close of 2004 an 18 mbps service was introduced for a similar price. In the United Kingdom, the cable operator NTL raised its baseline speed from 128 kbps to 10 mbps between 2003 and 2005.

79. Policy makers have an interest in the take-up of various broadband speeds because some services can be better utilised at higher speeds. However, once a DSL, cable modem or other broadband connection is in place it can be upgraded to a higher speed. Accordingly, it seems unproductive to exclude a connection at one speed that might be increased as competition in the market increases. An alternative for the near future would be to set a speed over which services that require high speed can perform at a reasonable level. While this will no doubt change over time, the original ITU definition of 1.5 or 2.0 mbps might be a useful starting point. If this approach were adopted, broadband connections could be classified by two categories with services advertised at up to or above 1.5 or 2.0 mbps.

Internet network statistics

80. The Internet, by its very nature, enables data to be collected about itself through online surveys of computers and servers connected to it and interactive exchanges between applications. Examples include surveys of Internet hosts, secure servers and permanent connections.[16] Programs such as anti-virus software and firewalls can also remit information to a central point where these data are aggregated to provide information on security of networks.[17]

81. An increasing area of information in the realm of Internet statistics lies in the collection of domain names registered. These in turn provide an insight into the growing ubiquity and diffusion in Internet usage both in the developing and developed world. These categories primarily relate to the use of identifiers such as domain names, Autonomous System Numbers (ASNs) and IP addresses. ICANN and most organisations with responsibility for country code domain names make statistics available on registration.[18] Regional Internet Registries that include RIPE (Europe), ARIN (North America), LACNIC (Latin America and Caribbean), APNIC (Asia-Pacific) and AFRINIC (Africa) also generate statistics on their activities.[19] The Internet Society also maintains a site with links to various sites containing information related to the Internet.[20]

16. The longest running survey of Internet hosts, sponsored by ISC, can be found at: http://www.isc.org/index.pl?/ops/ds/. Netcraft conducts surveys of secure servers and leased line connections to the Internet. Their Web site is at: http://news.netcraft.com/.

17. See, for example, DShield which provides a platform for users of firewalls to share intrusion information at: http://www.dshield.org/, or McAfee's Virus map at: http://us.mcafee.com/virusInfo/default.asp.

18. Registry reports to ICANN for generic top level domains are at: http://www.icann.org/tlds/monthly-reports/.

19. ARIN's statistics are available at: http://www.arin.net/statistics/. APNIC statistics can be found at: http://www.apnic.net/stats/. LACNIC statistics are at: http://lacnic.net/en/est.html.

20. http://www.isoc.org/internet/stats/.

Internet traffic exchange measures

82. In most countries there are no data recording the 'national total' for traffic carried by networks using the Internet protocol. Australia is one of the few countries where there are official data available on Internet traffic. These data are generated from the Australian Bureau of Statistics annual Internet Activity Survey (ABS, 2007). The survey collects data on the number of megabytes downloaded by users subscribing to ISPs in Australia.

83. In other countries, data may be available for individual operators and a number of Internet Exchange Points (IXPs) publish statistics about traffic passing through their infrastructure.[21] Data are also sometimes available about which networks have direct traffic exchange relationships. These can either be seen in the peering tables at IXPs or via other sources.[22]

84. The "Weekly Routing Table Report" is an automated weekly e-mail describing the state of the Internet Routing Table as seen from APNIC's router in Japan.[23] The report is posted weekly to several mailing lists dealing with technical aspects of the Internet. It includes a number of indicators for the global Internet, such as the number of autonomous systems in the routing table, and these data broken out by RIR region. Autonomous Systems are networks with their own distinctive routing policies that appear in the Internet routing table. In October 2005, there were more than 20 600 Autonomous Systems (ASes) in the world – up from less than 3 000 at the close of 1997.

85. In the United States, the Cooperative Association for Internet Data Analysis (CAIDA) is a collaborative undertaking among organisations in the commercial, government, and research sectors aimed at promoting greater co-operation in the engineering and maintenance of a robust, scalable global Internet infrastructure.[24] This includes the creation of Internet traffic metrics (in collaboration with the Internet Engineering Task Force/IP Performance Metrics group and other organisations) and work with industry, consumer, regulatory, and other representatives to assure their utility and acceptance. Another United States based institution is the Packet Clearing House (PCH). PCH is a non-profit research institute that supports operations and empirical analysis in the areas of Internet traffic exchange, routing economics, and global network development.[25]

Quality of services

86. In 1990, the OECD defined a list of indicators for monitoring quality of service in respect of the PSTN (OECD, 1990). The ITU includes three quality of service indicators in its *Indicators Handbook*, all of which refer to the PSTN. Over time, some of these indicators have become less relevant for many OECD countries. In most OECD countries, for example, there is no waiting list for a fixed telephone line and service can be provided on demand. Since the original indicators were defined, new services have been introduced (*e.g.* broadband Internet access) or have increased in importance (*e.g.* mobile telephony).

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21. See, for example, the Amsterdam Internet Exchange at http://www.ams-ix.net/technical/stats/.

22. The Swiss Internet exchange matrix is at: http://www.swissix.net/peermatrix.php. A traceroute between any two ISPs will generally show if they have a direct traffic exchange relationship or exchange traffic via additional networks.

23. For example, the report is posted to the North American Network Operators Group (NANOG) Mailing list, the archives of which are at: http://www.merit.edu/mail.archives/nanog/. Refer also to the weekly CIDR report at http://www.cidr-report.org/.

24. http://www.caida.org/.

25. http://www.pch.net/.

Telecommunications regulators in some countries monitor these services but there has not been any international harmonisation of methodologies and definitions. Some regulatory authorities have begun to measure the quality of broadband connections but, at the time of writing, this was not widespread.

Infrastructure investment

87. The OECD and ITU both collect data on investment in public telecommunication networks and use the definition in the ITU's *Indicators Handbook*. The key word in this definition is 'public', which refers to offering services to the public rather than ownership of the network. This indicator does not record expenditure by business on telecommunications equipment or facilities that are not used to provide services to the public. It is aimed at collecting the capital expenditures of network operators offering services to the public (*e.g.* telephony and Internet access).

Tariffs

88. The OECD has developed a methodology for comparing tariffs for telecommunication services in respect of fixed line telephony (residential and small business), cellular mobile services (low, medium and high user), international fixed line telephony tariffs and leased lines.[26] In all these cases, a basket of services is included. For example, the residential fixed line basket includes a standard line rental and 1 200 calls per annum spread over different distances and times of the day/week. Variations include adding the costs of calls to mobile networks and international calls to the basket. ITU collects tariff information on telecommunication services through its telecommunication indicators questionnaire, which is addressed to countries (usually the regulatory authority or the Ministry in charge of telecommunications/ICT). Reported tariff data, particularly in respect of mobile and Internet services, are complemented by research. In order to facilitate international comparison, data for fixed and mobile telephone tariffs are based on a three-minute call for both peak and off peak hours. Comparisons are also undertaken, by both the OECD and ITU, on prices for Internet access.

26. "OECD Telecommunication Basket Definitions, 2000", http://www.oecd.org/dataoecd/52/33/1914445.pdf.

CHAPTER 4: ICT SUPPLY[27]

Introduction

89. The first major achievement of the WPIIS[28] came in 1998, when OECD member countries agreed on a definition of the ICT sector as a combination of manufacturing and services industries whose products capture, transmit or display data and information electronically. The definition was based on the International Standard Industrial Classification of All Economic Activities, Revision 3 (ISIC Rev. 3) and was considered to be a first step in obtaining initial measurement of the ICT sector. The definition was revised slightly in 2002, reflecting the release of ISIC Rev. 3.1 (UNSD, 2002).

90. Recognising the importance of continually reviewing statistical standards, delegates agreed at the outset that periodic reviews of definitions would allow WPIIS to "re-assess the conceptual foundation of its standards, take account of the lessons learned with their implementation and make good use of improvements in the underlying classification systems." (OECD, 2006b). A good opportunity to review the ICT sector definition was presented in 2006, with the completion of revisions to ISIC Rev. 4 (UNSD, 2008a). The OECD was an active participant in the ISIC revision process and the classification includes improvements to ICT-related categories. In 2007, a revised definition of the ICT sector based on ISIC Rev. 4 was agreed by OECD member countries (OECD, 2006b).

The ICT sector definition

91. ICT production takes place in many industries, either as a principal or secondary output. It is therefore not possible to use industry statistics to get a complete measure of ICT production. Nevertheless, the identification of industries whose principal production is ICT goods or services was thought to be an essential component of an information society statistical framework. It allows for international comparison of the relative importance of these industries and analysis of differences in the industrial structures of countries.

92. The list of ICT sector activities (industries) was originally decided on the basis of the following set of principles.

- 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.

27. Revisions made to the first part of this chapter mainly reflect changes to the ICT sector definition (per OECD, 2006a). Revisions to information on ICT patenting activity were provided by Hélène Dernis of the OECD. The Section, *The impacts of an ICT sector*, was not revised.

28. Then the *Ad Hoc* Meeting on Indicators for the Information Society under the aegis of the ICCP Statistical Panel.

93. Changes to the principles were discussed during 2006 and finally agreed in 2007. The main difference was the removal of the second element for manufacturing industries, leading to a narrower definition of the ICT sector, as follows:

> The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display.

94. When the first ICT sector definition was developed in 1988, it was recognised that the preferred procedure would have been to first define ICT goods and services, and then to formulate the ISIC classes that had activities (manufacturing, wholesaling etc.) involving those goods and services. However, in order to obtain an initial set of indicators for the ICT sector in a limited amount of time, the approach taken was to first define the activities, and subsequently work on a list of ICT goods and services that could complement and help to refine the activity-based definition.

95. At its 2002 meeting, the WPIIS reviewed the definition. The group decided that the definition should not be changed, except to take into account the split of ISIC 5150 *Wholesale of machinery, equipment and supplies* that was introduced in the 2002 ISIC revision (Rev. 3.1). The change made to the ICT sector definition was to replace ISIC 5150 with the two new classes 5151 *Wholesale of computers, computer peripheral equipment and software* and 5152 *Wholesale of electronic and telecommunications parts and equipment*.

96. The United Nations Statistics Division starting revising the ISIC in 2001. The WPIIS Secretariat examined the May 2004 draft of ISIC Rev. 4 and, in late 2004, in consultation with interested member countries, put a submission to the United Nations Technical Subgroup (of the Expert Group on International Economic and Social Classifications) on classes with ICT activities. The OECD submission was generally supportive of the proposed changes affecting the ICT sector, supported proposals previously made (by OECD or others) and proposed some splits, where feasible, to other classes. The OECD submission was generally accepted by the Technical Subgroup.

97. With the changes to ISIC nearly final, WPIIS started work in 2006 on reviewing the definition. The work was finalised and released in 2007, with the result being an ICT definition that looks significantly different from the original 1998 definition. Agreed changes included:

- Changes to the principles as outlined above, resulting in the omission of Class 2651 – Manufacture of measuring, testing, navigating and control equipment.

- Changes resulting from changes to ISIC Rev. 4, for instance, more ICT-specific classes, especially in Manufacturing; and

- The removal of Manufacture of fibre optic cable from the definition.

98. The United Nations Statistics Division has explicitly recognised the OECD ICT sector definitions as alternative structures of information and communication technology industries.[29]

99. Annex 1b provides more information on WPIIS work on the ICT sector including deliberations leading to its agreement, the original (1998), revised (2002) and current (2006-07) definitions of the sector, and some practical notes on data collection.

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29. For example, http://unstats.un.org/unsd/cr/registry/docs/i31_ict.pdf.

Production of ICT goods and services outside the ICT sector

100. While the WPIIS has focused on the production activity of businesses that comprise the ICT sector, it is acknowledged that they are not the only entities in the economy to produce ICT goods and services. The latter may be produced by other sectors, for instance general government, and by businesses outside the ICT sector. Their output may be ICT products produced for sale or for own use.

101. Additionally, ICT products that primarily originate from the ICT sector may be produced by organisations in other industries for sale or own use. In particular, 'own account' software, that is software development work done by entities for their own use, may be significant for some businesses outside the ICT sector and for general government organisations. Attempts are underway in a number of countries to measure the investment in 'own account' software. More information on this subject can be found in Chapter 5.

The impacts of an ICT sector

102. The ICT sector may have considerable impacts on economic performance, as it is characterised by very high rates of technological progress, output and productivity growth. These characteristics imply a considerable contribution of the sector to economy-wide performance.

103. The impacts of the sector can be examined in several ways – directly, through its contribution to output, employment or productivity growth, or indirectly, for example as a source of technological change affecting other parts of the economy.

Empirical work

104. OECD work has primarily focused on the direct impacts of the ICT sector. For example, in most OECD countries, the contribution of ICT manufacturing to overall labour productivity growth rose over the 1990s (Pilat and Wölfl, 2004). OECD estimates show that ICT manufacturing made the largest contributions in Finland, Hungary, Ireland and Korea, where close to 1 percentage point of aggregate labour productivity growth in the 1995-2001 period was due to ICT manufacturing. The ICT-producing services sector (Telecommunications and Computer services industries) plays a smaller role in aggregate productivity growth, but has also been characterised by rapid progress (OECD, 2003c). Some of the growth in ICT-producing services is also due to the emergence of the computer services industry, which has accompanied the diffusion of ICT in OECD countries. The development of these services has been important in implementing ICT, as the firms in these sectors offer key advisory and training services and also help develop appropriate software to be used in combination with ICT hardware.

Measurement issues

105. A number of problems affect the measurement of the economic impacts of the ICT sector. First, the official OECD definition of the ICT sector cannot be easily applied to the analysis of output and productivity growth. Analysis of productivity growth requires time series of value added and/or production in constant prices, which implies price deflators for the appropriate industries. These are typically not available for detailed categories and OECD work has therefore primarily focused on the main categories that can be distinguished in the national accounts by activity, *i.e.* ISIC 30-33 (Electrical and Optical Equipment), ISIC 64 (Post and Telecommunications) and ISIC 72 (Computer and Related Activities).[30]

30. These are references to the 2002 definition of the ICT sector.

106. Second, the available deflators are not always comparable across countries. Several countries use hedonic methods to deflate output for the computer industry (*e.g.* Canada, Denmark, France, Sweden and the United States), whereas other countries use standard deflators. Adjusting for these methodological differences in computer deflators for the purpose of a cross-country comparison is difficult since there are considerable cross-country differences in industrial specialisation. For example, only few OECD countries produce computers, where price falls have been very rapid; many only produce peripheral equipment, such as computer terminals. The differences in the composition of output are typically larger than in computer investment, where standardised approaches have been applied (*e.g.* Schreyer *et al*., 2003).

Future developments

107. There are several issues related to the economic impacts of the ICT sector that would benefit from further analysis. For example, questions can be raised regarding the link between having an ICT sector and benefiting from ICT investment and use. Some analysts have used the experience of a country such as Australia to suggest that having a large ICT manufacturing sector might not always be necessary. However, this hypothesis would benefit from more research as there could be spill-over effects associated with having an ICT manufacturing sector. Moreover, in order to benefit from ICT use, it might be important to have a well-developed domestic industry providing software and computer services to firms using the technology. This hypothesis would also benefit from further analysis.

ICT patenting activity

Introduction

108. Patents are an intellectual property right issued by authorised bodies to inventors allowing them to make use of, and exploit, their inventions for a limited period of time (generally 20 years). Patents are granted to firms, individuals or other entities as long as the invention fulfils certain criteria: it must be novel, involve an inventive step (*i.e.* be non-obvious) and be capable of industrial application. The patent holder has the legal authority to exclude others from commercially exploiting the invention during the duration of the patent life. In return for the ownership rights, the applicant must disclose information relating to the invention for which protection is sought. The disclosure of the information is thus an important aspect of the patenting system.

Statistical and policy use of patent indicators

109. Patents are a key measure of innovation output. They can be used to measure R&D output, knowledge spillovers, inventive performance, as a tool to assess the direction of research, and the strategic aims of companies. Patents can also provide an insight into the level of internationalisation (of innovative activities), co-operation (of R&D activities) and mobility of researchers. Patents data are widely used as a proxy for innovation and Griliches (1990) refers to patents as “a good index of inventive activity”.

110. Since there are many advantages associated with patents as statistical indicators, they are frequently used, along with other science and technology (S&T) indicators, to measure technical change and inventive activity. It has become standard practice to include a section on patents in national and international S&T publications. Statisticians and researchers are not the only users of patent documents, however. Business managers are increasingly utilising patent documents to monitor the latest technological developments and examine the strategies and directions of competitors.

Strengths and limitations of using patent documents for statistical analysis

111. Like most statistical indicators, patent indicators have strengths and limitations. The main strengths of patent indicators are:

- A patent document is a rich source of information. It provides a detailed description of the invention; the technological areas to which the invention belongs (*i.e.* patent classes); the scope of the legal protection (*i.e.* claims); citations to previous patents and non-patent literature; information about the inventor and the right holder (*e.g.* name and address); and timeline of the invention (*e.g.* various dates recorded in a patent document).

- Each year a large number of patents are filed with national and regional patent offices. For example, patent applications at the European Patent Office (EPO) and US Patent and Trademark Office (USPTO) account for around 110,000 and 330,000 per year (2000-2004), respectively. This makes patent documents the largest data source on innovation activity. In addition, unlike other data sources, patent data are available for a long time period (*e.g.* the first patent issued by the USPTO dates back to 1836); and

- Patent documents are public and increasingly available over the Internet. This makes them a unique data source from which to gather statistical information at relatively low cost.

112. However, there are some limitations to the use of patent data, especially for statistical analysis. The main weaknesses of patent indicators are:

- Not all inventions are patentable.

- In many instances, inventors prefer to use other means to protect the invention (*e.g.* secrecy).

- The value distribution of patents is highly skewed, *i.e.* some patents are of considerable (technical and economic) value, but many have little or no value. However, various weighting procedures have been devised to overcome this limitation (*e.g.* citations, patent families, use of renewal data, etc.).

- The propensity to patent differs across countries and industries. This makes it harder to compare and interpret indicators across countries and industries. However, it is possible to deal with this shortcoming by focusing on specific industries and/or by using dummy variables.

- Patents are administrative documents and are not designed for statistical purposes. Therefore certain manipulations are necessary to make the information suitable for statistical use. For example, patent examiners assign patent classification codes to each patent document. The primary aim of this process is to facilitate prior-art searches (not for statistical needs). Therefore, certain manipulation of the classification information is needed to make the information suitable for statistical purposes (*e.g.* deriving patent indicators for specific technological areas).

113. Despite all these limitations, patents are one of the best available data sources for measuring innovative activity, as highlighted by Griliches (1990): "…patents statistics remain a unique resource for the analysis of the process of technical change. Nothing else even comes close in the quantity of the available data, accessibility, and the potential industrial, organisational, and technological detail."

Designing indicators to measure innovative activity: selection of appropriate criteria

114. Patent documents are a rich source of information. They include detailed information about the invention (scope of the invention, inventors, owners, etc.), as well as information about the administrative process of the patent office (*e.g.* date of application, the procedure used to file the application, search report, whether an application has been successful or not). The large amount of information can also be problematic, especially in identifying and extracting the relevant information from a complex patent document. For example, many dates are recorded in a patent document (*e.g.* priority date, application date, publication date, grant date). Similarly, for statistical purposes, a patent can be attributed to the country of the inventor, the country of the applicant and the country of the priority application. Which criteria should be used to develop patent indicators to measure innovative activity?

115. The selection of appropriate criteria for calculating patent indicators is crucial in conveying the correct message. The decision on the selection of the criteria depends on user needs. For example, if the intention is to use patent indicators to measure ownership of patents, then the relevant geographical distribution criterion is the applicant's country of residence. However, if the intention is to measure inventive activity, then the inventor's country of residence is the most appropriate criterion. OECD's patent indicators are constructed to reflect innovative performance, therefore the appropriate criteria used to develop OECD patent indicators are: inventor's country of residence, priority date, and fractional counting (explained in Dernis *et al*., 2001 and OECD, 2006c).

116. It should be noted that in many S&T publications, patent indicators are reported according to the grant date. This is party due to lack of methodological guidelines and the misconception that grant date data are timely relative to the application (or priority) date. However, drawing conclusions about the innovative activity using grant date patent indicators can be extremely misleading because the total number of patents granted is not only a function of the inflow of patent applications, but is also dependent on the number of patent examiners, the budget of the patent office, and other external factors.

Patent indicators by industry

117. Unfortunately, patent documents do not include information about the industry to which the patent belongs. This hampers the ability of researchers to develop patent data by industry. Nevertheless, it is "primarily a technical problem" (Griliches, 1990) that can be solved by exploiting the available information from patent documents. For example, patent classification codes[31] that are assigned to each patent document by patent examiners are frequently used to develop industry–patent classification concordances.

118. There have been a number of endeavours to develop concordance tables to translate patent classification codes into industry classification codes. Although several researchers have attempted to develop a reliable patent–industry classifications concordance table, so far this has proved to be difficult to achieve. Schmookler (1966) was one of the earliest researchers to construct patent data by industries. His approach consisted of reviewing carefully a set of subclasses, sampling a number of patents, and allocating the patents to relevant industries. A similar approach was taken by Scherer (1982), where around 15 000 patents granted by the USPTO were examined to determine the nature of the invention, the industry of

31. The most widely used patent classification system is the International Patent Classification (IPC), which is a hierarchical system that divides technology into eight sections with almost 70 000 fields or groups. However, other patent classifications are also in use at the national and regional level. For example, EPO patent documents are classified according to ECLA codes (the patent classification system of the EPO). Similarly, USPTO patent documents are classified according to USPC codes (the patent classification system of the USPTO).

origin of the invention, and the anticipated industry of use of the invention. Evenson and Putnam (1988) used data from the Canadian Intellectual Property Office (CIPO)[32] to construct a patent–industry concordance table,[33] widely referred to as the Yale Technology Concordance (YTC). The focus of this article is not to survey the literature therefore other concordance tables[34] based on similar methodologies are not covered here.

119. The National Bureau of Economic Research (NBER) took a different approach for allocating patents by industries. They started "from patent totals for particular firms and then grouped them into industries according to the firm's primary activity" (Griliches, 1990). However, the main weakness of this approach is that large companies are active in many fields, therefore assigning all the patents of a firm to the sector of its main economic activity may provide a blurred image of the patenting activity.

Definition of ICT-related patents

120. Rather than developing a concordance table between patent and industrial classifications, the OECD adopted a different approach for the definition of ICT-related patents. The strategy is to identify a list of International Patent Classification (IPC) codes that are assigned to ICT-related patents.[35] However, before attempting to identify the IPC codes associated with ICT-related patents, it is necessary to specify what is meant by the ICT sector. The definition of the manufacturing component of the ICT sector developed by the OECD in 1998 (see Chapter 4 for details) has been adopted here for defining ICT patents. OECD's definition of the ICT sector includes: telecommunications equipment; consumer electronics; computers and office machinery; instruments and appliances for measuring, checking and industrial process control; and electronic components.[36]

121. In the initial phase (2001), the definition of ICT-related patents (*i.e.* the identification of a list of IPC codes associated with ICT patents) was developed on the basis of the following strategies: keyword search, analysis of IPC classes of well-known ICT-related patents and analysis of a sample of patents of companies that are active in the ICT field.[37] The following IPC classes were proposed to be included in the provisional definition of ICT-related patents: G06 (Computing; Calculating; Counting); G11 (Information Storage); and H04 (Electric Communication Technique).[38] This definition was considered to be provisional and further work was expected to be conducted in order to refine the definition. Nevertheless, based on the

32. The Canadian Intellectual Property Office (CIPO) simultaneously assigned codes for the technology field (IPC codes), the industry of manufacture (IOM) and the sector of use (IOU) to each granted patent (around 30 000 patents) during 1975-95.

33. This was based on the tabulated information on all 30 000 patents to determine the probability that a patent with a specific IPC code has a particular IOM-SOU combination.

34. Notable examples are: Verspagen *et al*. (1994); Johnson (2002); Schmoch *et al.* (2003), and USPTO USPC-SIC concordance table (see Hirabayashi, 2003).

35. The advantage of using the IPC classification system is that it is used by a large number of patent offices, which makes it possible to derive internationally comparable ICT-related patent statistics for a large number of countries and/or patent offices.

36. The OECD definition of the ICT sector was revised in 2006 (reflecting the revision to ISIC Rev. 4) and no longer includes manufacturing of instruments and appliances for measuring, checking and industrial process control.

37. This work was conducted by a patent examiner from the Japanese Patent Office (JPO) who was on secondment to the OECD.

38. For full details of IPC codes, see: www.wipo.int/classifications/ipc/en/.

provisional definition, ICT-related patent indicators were reported in OECD publications (*e.g.* OECD, 2001a).

122. In 2003, a consultant,[39] with an extensive knowledge of patent classification systems, was engaged by the OECD to undertake further work to refine the definition of ICT-related patents. The aim was to develop a definition at a more detailed level of IPC codes than the earlier definition (which is at a highly aggregated level). The search strategy adopted for identifying ICT-related patents was based on the consultant's identification of the relevant IPC codes rather than the keyword searches that are based on official public documents.[40] For identifying the appropriate IPC codes for ICT-related patents, the consultant scanned the whole IPC classification using a top-down approach. The search started at the section level, followed by sub-sections, classes, sub-classes, groups, and finally sub-groups. This resulted in the identification of the appropriate IPC codes that should be included in the definition of ICT-related patents.

123. Table 2 below provides the details of the IPC codes included in the OECD's current definition of ICT-related patents.[41] This definition is more detailed than the earlier one, developed in 2001, and like the OECD's definition of the ICT sector, it covers a wider range of ICT domains. ICT patent indicators, based on this definition, have appeared in several OECD publications (for instance, OECD, 2003b, 2005a and 2006c).

Future developments

124. Since mid-2003, the OECD has been disseminating ICT patent statistics that are calculated according to the definition shown in Table 2 and it intends to use this definition for the near future. A new IPC classification system (IPC 8th edition) entered into force on January 1, 2006. The new edition of the IPC will be subject to continuous revisions at the advanced level and these will be directly applied to patent documents retrospectively. Therefore, the accuracy of the present definition of ICT patents needs to be checked on a regular basis.

125. Future reviews will also take into account the revisions to the OECD definition of the ICT sector finalised in 2006 (see this chapter) as well as revisions to the OECD classification of ICT products finalised in 2007 (see Chapter 2).

39. Dr. Ulrich Schmoch from Fraunhofer Institute Systems and Innovation Research, Karlsruhe, Germany (Schmoch, 2003).

40. The keyword search strategy is not preferred here because the legal requirements of disclosure with regard to titles and abstracts are not very strict. In certain circumstances, keyword searches might be preferable because the patent classification does not cover new technology areas (classification systems tend to lag behind the development of technology areas). If a keyword search is necessary, then it should be conducted on databases with good facilities for such searches.

41. Note that in some cases there was no clear cut association between IPC codes and ICT industries. In particular for the following cases: H03B, H03C, H03D, H03H, H03M, H04L, G11B, H03F, H03G, H03J, H04H, H04N, H03K, H03L; the decision to assign the IPC codes to a particular sector (*e.g.* H03B to telecommunications rather than consumer electronics) was taken according to the main focus of the code.

Table 2. Definition of ICT-related patents, based on IPC codes[42]

IPC code	*Details[43]*
Telecommunications	
G01S	Radio navigation
G08C	Transmission systems for measured values
G09C	Ciphering apparatus
H01P, H01Q	Waveguides, resonators, aerials
H01S003-025, H01S003-043, H01S003-06, H01S003-085, H01S003-0915, H01S003-0941, H01S003-103, H01S003-133, H01S003-18, H01S003-19, H01S003-25, H01S005	Semiconductor lasers
H03B-D	Generation of oscillations, modulation, demodulation
H03H	Impedance networks, resonators
H03M	Coding, decoding
H04B	Transmission
H04J	Multiplex communication
H04K	Secret communication
H04L	Transmission of digital information
H04M	Telephonic communication
H04Q	Selecting, public switching
Consumer electronics	
G11B	Information storage with relative movement between record carrier and transducer
H03F, H03G	Amplifiers, control of amplification
H03J	Tuning resonant circuits
H04H	Broadcast communication
H04N	Pictorial communication, television
H04R	Electromechanical transducers
H04S	Stereophonic systems
Computers, office machinery	
B07C	Postal sorting
B41J	Typewriters
B41K	Stamping apparatus
G02F	Control of light parameters
G03G	Electrography
G05F	Electric regulation
G06	Computing
G07	Checking devices
G09G	Control of variable information devices
G10L	Speech analysis and synthesis
G11C	Static stores
H03K, H03L	Pulse technique, control of electronic oscillations or pulses
Other ICT	
G01B, G01C, G01D, G01F, G01G, G01H, G01J, G01K, G01L, G01M, G01N, G01P, G01R, G01V, G01W	Measuring, testing
G02B006	Light guides
G05B	Control and regulating systems
G08G	Traffic control systems
G09B	Educational or demonstration appliances
H01B011	Communication cables
H01J011, H01J013, H01J015, H01J017, H01J019, H01J021, H01J023, H01J025, H01J027, H01J029, H01J031, H01J033, H01J040, H01J041, H01J043, H01J045	Electric discharge tubes
H01L	Semiconductor devices

42. This definition was developed, on behalf of the OECD, by Ulrich Schmoch, Fraunhofer Institute for Systems and Innovation Research (Schmoch, 2003). Only three sub-classes were affected by the changes in IPC (8th edition): H01S003-06 replaces H01S003-063 and H01S003-067; H01S003-0915.

43. For full details of the IPC codes, see: www.wipo.int/classifications/ipc/en/.

CHAPTER 5: ICT DEMAND BY BUSINESSES[44]

Introduction

126. One of the more important areas of WPIIS work is the development of statistical standards for measuring ICT use and e-commerce by businesses. Statistics on the diffusion of new information technologies among businesses are important for evaluating the extent to which the use of information technology has an impact on overall economic performance. Greater use of ICT in the production process may, for example, help raise the overall efficiency of the use of capital and labour, for instance, by reducing inventories and transaction costs.

127. This chapter considers the OECD model survey of ICT use by businesses, development of statistical standards for e-commerce and the challenges of doing the same for e-business. In addition, it includes articles on measurement of ICT investment and expenditure, and the economic impacts of ICT investment and use.

OECD model survey of ICT use by businesses[45]

128. The WPIIS started working in 1999 with the Voorburg Group and individual member countries to develop a model survey on the use of ICT goods and services by businesses. The underlying idea was to guide the collection of internationally comparable statistics of ICT use and e-commerce in businesses across OECD member countries. After two years experience of sharing and testing some of the questions by several OECD member countries, a final proposal for a model questionnaire on ICT use in enterprises was discussed and adopted by the WPIIS at its meeting in 2001 (OECD, 2001b).

129. The model survey was revised in 2005 to improve harmonisation with member country ICT use surveys and to reorient the surveys towards current areas of high policy relevance. More information on the development of the model, as well as the model itself, can be found in Annex 1c.

130. The revised model survey is intended to provide guidance for the collection of statistics on business use of ICT, including IT security, e-business and e-commerce. It has been designed as an economy-wide survey vehicle but can also be used in surveys covering specific sectors. Countries are encouraged to use the model as a core part of their survey development in order to improve the international comparability of information collected and compiled on this topic.

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44. This chapter was revised slightly in 2007, therefore references to some country practices may be out of date. Most of the changes were contributed by Eurostat and were updates of its activities in this area of measurement.

45. A note on terminology: the *Guide* uses the terms “model survey” and “model questionnaire”. The latter refers specifically to the questionnaire provided as a model to participating countries. The former refers to the questionnaire plus associated information, such as recommendations on methodology, scope and classificatory variables.

131. Measurement of e-commerce is discussed below. Discussion of other topics included in the revised model questionnaire can be found in this *Guide* as follows:

- Trust in the online environment (including IT security) – a special article has been included in Chapter 8. Statistical challenges are also discussed in Annex 1c.
- E-business – in this chapter.
- Digitised products – in Chapter 7 and Annex 1c.
- E-government – a special article can be found in Chapter 8.

E-commerce

132. The 2001 model survey paper suggested that more work be done on income concepts relating to electronic transactions. Since then, a number of conceptual issues relating to e-commerce and electronic finance have been discussed but not necessarily resolved. This section outlines those issues and recommends a solution to many of them. The model questionnaire in Annex 1c incorporates definitions and instructions consistent with those recommendations.

133. Because of the great policy interest in e-commerce, WPIIS has devoted a lot of effort to its measurement. In 2000, OECD member countries endorsed two definitions of electronic transactions based on narrower and broader definitions of the communications infrastructure. According to the OECD definitions, it is the method by which the order is placed or received, not the payment nor channel of delivery, which determines whether the transaction is an e-commerce transaction. The narrow definition of e-commerce transactions refers to those conducted over the Internet, while the broad definition refers to all computer-mediated networks.

134. In April 2001, OECD proposed operational guidelines for the interpretation of the two e-commerce definitions. The definitions and guidelines are shown in Figure 3 below.[46]

46. This figure comes from the Summary Record of the 2001 WPIIS meeting which also contains a report of the discussion [OECD Internal Working Document, DSTI/ICCP/IIS(2001)M].

Figure 3. The OECD definitions of e-commerce transactions and interpretation guidelines

E-commerce transactions	OECD definitions	Guidelines for the Interpretation of the Definitions (WPIIS proposal April 2001)
BROAD definition	An **electronic transaction** is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, 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.	**Include**: orders received or placed on any online application used in automated transactions such as Internet applications, EDI, Minitel or interactive telephone systems.
NARROW definition	An **Internet transaction** is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, 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.	**Include**: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, Minitel over the Internet, or over any other Web enabled application regardless of how the Web is accessed (e.g. through a mobile or a TV set, etc.) **Exclude**: orders received or placed by telephone, facsimile, or conventional e-mail.

135. Of the issues raised since the definition of e-commerce transactions was agreed in 2000, those described below are considered to be significant in either conceptual terms or in terms of the feasibility of data collection. Where possible, they have been addressed in questions and definitions associated with relevant questions in the model questionnaire.

Technological convergence

136. Technological convergence makes it more difficult to distinguish Internet e-commerce from other e-commerce. For instance, different technologies may be used simultaneously, and integrated to the extent that it can be very difficult for the respondent to calculate the value of sales they should include for each technology. This issue was discussed (but not resolved) at an April 2004 expert group meeting in response to a Nordic proposal[47] to consider other approaches to defining e-commerce (and, in particular, Internet commerce). The model questionnaire in Annex 1c attempts to better define the types of e-commerce and includes a non-core question on the split between Internet sales, according to whether they occurred over a business' Web site, a third party Web site and/or EDI over the Internet. Additionally, a definition of EDI is included in the model questionnaire with the aim of clarifying the difference between Internet and non-Internet EDI.[48]

47. "Defining e-commerce. Towards a 'technology-free' definition."

48. Eurostat has included an e-commerce module in its 2008 model questionnaire and, for the first time, did not have a split between e-commerce via the Internet and other computer networks.

Commitment and timing issues

137. There are several issues here and they include:

- The expensive items question (*e.g.* sales/purchases of automobiles and real estate) where a contract is usually not completed over the Internet.

- Pre-existing arrangements, which could have occurred over any medium but where the order is received (or activated) over the Internet.

- Renewal of subscriptions or memberships. Where the initial commitment to join was not made over the Internet then ongoing payments made via the Internet do not constitute Internet commerce. However, if the member **chooses** to renew the subscription or membership and pays the renewal over the Internet, it could be argued that the commitment to join is being renewed and the Internet transaction could therefore be interpreted as Internet commerce.

- Difficulty in reporting ongoing payments (whether via the Internet or not) resulting from orders initially received via the Internet, but in a previous reporting period; such payments should be regarded as Internet commerce transactions but it is unlikely that businesses would have this information available.

138. At least two OECD countries (Australia and Canada) have attempted to clarify the commitment issues by referring to an order as a 'commitment to purchase goods or services'. The question on inclusion or exclusion of certain sales then becomes one of whether the commitment was made via the Internet or by another mode. The 'commitment' concept has been adopted in the revised model questionnaire.

139. Reporting period issues (the last dot point above) may cause difficulty from a collection point of view, as a business is unlikely to retain records of whether the first order occurred via the Internet.

Conventional e-mail transactions

140. The question of whether transactions conducted by conventional e-mail are Internet commerce has proved to be quite controversial. While the proposal presented to the April 2001 WPIIS meeting (and shown in Figure 3 above) excluded conventional e-mails, it did not resolve the issue. The topic was debated further at the 2002 WPIIS meeting where there was agreement that conventional e-mail would be excluded subject to reconsideration in the light of future work on measuring e-business processes. In the context of consultations for the 2005 revision of the model survey, the issue was raised again and most countries preferred to exclude conventional e-mail transactions. It has therefore been excluded in the relevant questions of the model questionnaire. For comparability purposes, it is suggested that countries that do include conventional e-mail transactions separately estimate their value. It is likely that this will be a diminishing problem; it is assumed that transactions by conventional e-mail will become less prevalent with the growth in Web sites and the increasing availability of relatively inexpensive e-commerce solutions.

Selling by agents

141. The issue here is how Internet sales made by agents should be treated. For example, should businesses that are acting as agents report the value of Internet sales *or* the value of commissions earned on those sales? The advice offered in this paper (and incorporated in the model questionnaire) is that agents should report the value of commissions or fees earned on the Internet transaction and that their clients should report the value of the Internet sale. This enables the allocation of Internet revenue to the correct

industry and is consistent with other concepts for reporting income. Regarding collection feasibility, it is possible that businesses will not always know the value of Internet transactions undertaken on their behalf by agents.

The finance sector

142. A related issue is reporting of the value of e-commerce transactions in the finance sector. A WPIIS expert Group presented some ideas to the 2003 meeting on the principles to be followed. After some discussion, it was decided to monitor the work of Eurostat in this area given that they had a strong policy impetus to develop a survey of ICT use by businesses in the finance sector. There was a general European survey of the sector conducted in 2006. The OECD model questionnaire attempts to define Internet income relating to financial transactions as follows: "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." It is possible that this definition will change with more experience by member countries, especially those conducting the 2006 Eurostat survey of the finance sector.[49] Note that the finance sector (ISIC J) has been included as non-core for the purposes of scope.

Reliability of splits of the value of Internet commerce transactions

143. The model questionnaire, like its predecessor, asks for several percentage splits of the value of Internet commerce. Reliability of one of those splits has been questioned, namely the value of Internet commerce transactions by location of customer (international versus domestic). Anecdotal evidence indicates that businesses have trouble reporting these splits as firstly, they will not necessarily know the destination of their sales, and secondly, even if they did, would not necessarily record this information in a way that is readily retrievable.

144. The revised model questionnaire has four splits (including new splits on the types of products sold and how orders were received). All these splits have been marked as non-core questions (either because of known reporting problems or the experimental nature of the question).

Online purchases data

145. The reliability of the reported value of online purchases has long been a concern to statisticians. There is significant anecdotal evidence to suggest that businesses will often not have this information available as purchasing tends to be a diverse and decentralised activity. For these reasons, the questions were removed from the model survey. Especially for Internet purchasing, it has been argued that a value question is important as an intensity measure. A new question on linkages between purchase transactions over computer networks and other systems has been included in the model questionnaire and it is hoped that it will provide useful and more reliable intensity information.

Data collection issues

146. These include the small volume of e-commerce activity in the economy and consequent measurement issues such as: high standard errors and the reliability of disaggregated data; confidentiality issues at industry level; the general quality of reported data; and dealing with statistical outliers (typically small units with a large weight reporting high e-commerce values).

49. Eurostat has decided to discontinue its financial sector questionnaire for lack of support from member states.

E-business

147. Measurement of e-business is of particular interest to policy makers because of the potential productivity impacts of ICT use on business functions.[50] However, the ongoing challenges in this measurement field are significant and include problems associated with measuring a subject that is both complex and changing rapidly. These difficulties are exacerbated by limitations imposed by the statistical vehicles used to collect ICT use data (usually, economy-wide, mail-based survey vehicles for which simple 'yes/no' questions work best).

History of WPIIS work on measuring e-business

148. In 1999, the WPIIS established an *Expert Group on Defining and Measuring E-commerce* to "compile definitions of e-commerce which are policy relevant and statistically feasible". By 2000, work of the Group had resulted in definitions for e-commerce transactions but not e-business processes. In 2001, the first model questionnaire on the use of ICT/E-commerce in the business sector was agreed by the WPIIS but it did not comprehensively cover the range of an enterprise's possible e-business processes. In 2002, it was agreed that a module on e-business processes be developed and the *Expert Group on the Measurement of E-business Processes* was established.

149. At the 2003 WPIIS meeting, the expert group proposed a definition of e-business processes based on functionality rather than technology: '(automated) business processes (both intra- and inter-firm) over computer mediated networks'. In addition, the group proposed that e-businesses processes should integrate tasks and extend beyond a stand-alone or individual application. Nine broad business functions were identified and described in terms of e-business processes, *e.g.* customer acquisition and retention; e-commerce; finance, budget and account management; logistics (inbound & outbound); and inventory control.

150. An expert meeting on measuring e-business was hosted by the OECD in December 2003.[51] The meeting involved delegates from national statistical offices, government policy organisations, the private sector (including computer services firms) and academia. The discussion was useful and wide-ranging but the outcome was not conclusive. The major issues raised and discussed were:

- Definition of e-business. There were diverse views expressed and the question of whether a definition was necessary was raised.
- Framework for describing and classifying e-business processes. Is a classification possible given the integrating and evolving nature of e-business processes? Is it necessary?
- Which broad business functions are important and measurable? Are they generalisable across industries, firm size and countries?
- Networks. What kind of networks (Internet Protocol or all computer-mediated networks) are we interested in measuring? The main policy focus seems to be on IP networks.

50. Note that e-commerce is an example of e-business.

51. Details can be found in the Summary Record of the meeting, OECD Internal Working Document, DSTI/ICCP/IE/IIS/M(2003)1.

Conceptual model for measuring e-business

151. Ideally, we would establish a conceptual model for e-business before attempting to frame questions to measure it. Indeed, this was one of the goals of the December 2003 meeting, which looked at issues such as broad frameworks, classifications and definitions. While a conceptual model for e-business did not emerge from that work, some components of one are available from more general models of business processes (for instance, the Porter value chain model). A classification of e-business processes (as distinct from business processes) is considered problematic, partly because of the integrating nature of e-business.

Model questions for measuring e-business

152. The December 2003 meeting debated the definition of e-business and eventually concluded that, for questionnaire purposes, a definition may be less useful than targeting processes of particular interest for which feasible questions could be included on an economy-wide survey vehicle. This has therefore been the approach taken and, as a result, e-business questions are asked in the most appropriate way in the model questionnaire (Annex 1c). For instance, customer relation functions have been included in a question on Web site features (question 16) and questions 23 and 24 ask businesses that purchased or sold over computer networks about linkages with other systems. Note that the term 'e-business' is not used in the model questionnaire (because it is a term that does not have a firm definition and is likely to be interpreted differently by different respondents).

153. It is assumed that the benefits of e-business will be realised where there is a greater degree of integration between functions. The model questionnaire has questions on linkages associated with e-commerce, that is, whether systems used to receive/place orders over computer networks are linked with internal systems, customers' systems and/or suppliers' systems. There is an emphasis on e-commerce linkages because of the significant interest still in e-commerce and the potential productivity gains from automatically linking electronic transactions with downstream processes such as inventory ordering, delivery, accounting functions etc. In addition, questions such as these are fairly well defined in a statistical sense and have been used (though not necessarily in the exact form as on the model questionnaire) reasonably successfully by at least two member countries (the United Kingdom and Australia).

154. Regarding other e-business questions, there are specific questions on use of the Internet in business processes in question 16 (Web site functions) and question 18 (use of Internet in finance, HRM (recruitment and training) and sharing and distribution of information (within the business and with other businesses)).

155. More work needs to be done on so-called 'integrated e-business processes', in particular, to probe areas of integration that are often referred to using terms such as 'supply chain management', 'enterprise resource planning' and 'customer relationship management'. Delegates have generally preferred not to use such terms in questionnaires as such technical terms present a problem in a mail-based survey where they cannot be explained. This is exacerbated by the fact that these terms may not be understood in the same way by all businesses and that the meanings themselves may change over time as applications become more sophisticated.[52]

156. Unfortunately, there are very few statistical models available on which to base integration questions and when the 2005 model questionnaire was being debated, WPIIS delegates felt that the inclusion of very experimental questions on integrated e-business processes should be avoided at this stage.

52. Despite these reservations, the 2007 Eurostat model questionnaire included questions on the use of ERP and CRM software.

The European Commission and Eurostat are collecting data on e-business from 2008 (in modules on automated data exchange and information sharing).

157. There are several possible approaches that could be considered in measuring the use of integrated e-business processes. They include:

- Directly ask the business whether it uses applications such as SCM (supply chain management), ERP (enterprise resource planning) or CRM (customer relationship management). Following the arguments presented above, the best statistical approach is probably to describe those processes rather than to use the precise terms and expect that respondents will understand them in the same way. Denmark used a descriptive approach in its 2005 survey to ask about use of ERP and CRM applications. However, it is considering changing that approach to ask about processes rather than systems. This is because it is thought that respondents might not uniformly understand terms that describe specific systems (as ICT systems could integrate several processes). The 2007 Eurostat model questionnaire included a question on the use of ERP software and another on the use of CRM software. The question on ERP referred to it as a "type of software application" in order to avoid the difficulty of defining it. Eurostat considered that enterprises using ERP software would be aware of it and would be able to answer the question accurately. The same principle and assumptions applied to the question on CRM.

- Follow the Statistics Canada approach to asking about integrated business processes. The questions tested by Canada[53] were: whether a browser-based system is used to manage functions associated with online sales, online purchases, customer relations and logistics. Supplementary questions asked about automatic linkages with backend systems, customers' systems and suppliers' systems.

- Ask about sales and purchases transactions generally and whether those transactions generate an automatic update in other systems such as backend systems, customers' systems and suppliers' systems. This approach has the advantage that it covers all sales and purchase transactions not just those that constitute e-commerce. It also focuses on functions that are common to most businesses (that is, purchasing and selling goods or services). Eurostat has included such questions, on internal sales and purchase transactions, in its 2008 model questionnaire.

- Consider Denmark's approach (used in its 2005 survey) for obtaining information on external integration. Denmark asked about the electronic exchange of data between the business' systems and other entities' systems. It specified that these exchanges use structured messages and agreed message standards. More information is provided in the form of a classification of the types of documents and transactions for which data are exchanged (they include salary transactions, electronic invoicing, product descriptions, transport documents, data for public authorities and financial transactions).

158. All these approaches present a problem that also occurs in other areas of ICT use measurement and that is 'how can the significance of the activity be ascertained'? It would almost certainly be problematic to ask businesses about the number of 'linked transactions', their value or other measures of intensity. Therefore the data obtained from approaches such as those described above are generally a series of 'yes/no' responses. This means that if a business is using particular e-business processes for a minor part

53. The testing consisted of 26 cognitive interviews with a selection of respondents from the 2004 Statistics Canada *Survey of Electronic Commerce and Technology*. The work was undertaken with the support of WPIIS and one of its aims was to provide input to the work on revising the OECD model survey.

of its business or in respect of a small number of transactions, its reply has the same significance as a business that has used ICT to completely transform the way it does all its business.

159. The Eurostat 2008 model questionnaire includes questions on the external integration of business processes (between different enterprises) and internal integration of business processes (within the enterprise). In order to measure external integration, the concept of automated data exchange is used (the exchange of messages via the Internet or other computer networks in an agreed format that allows its automatic processing without the individual message being manually typed). This is a concept similar to EDI although the term "EDI" was not used because of its interchangeable use to identify data transmission methodologies and types of networks. Internal integration is measured using an experimental concept of electronic automatic share of information on sales orders and purchase orders.

ICT investment and expenditure by business

160. A very readable discussion of the measurement issues in this area can be found in Ahmad, Schreyer and Wölfl (2004) whose paper covers:

- The definition of ICT goods to be included in investment measures.
- International and sectoral comparability issues.
- Software measurement (in particular, the proportion of software expenditure that is capitalised); and
- Price deflation of expenditure and investment (this topic is also dealt with in Chapter 2).

161. WPIIS work has started in this area of measurement in partnership with the OECD's SWIC group (Statistical Working Party of the Committee on Industry and Business Environment). A joint expert group on ICT investment and expenditure has been formed and work is building on prior efforts by OECD and Eurostat to improve the measurement of ICT investment in the national accounts, notably in the area of software investment.

162. Experts from 13 countries, Eurostat and the OECD participated in an expert meeting on the subject held in April 2004. Conceptual and methodological issues covering ICT investment and expenditure were discussed at length. The report of the meeting[54] indicated continued work and sharing of best practice in the following areas:

- **Definitions and classifications of ICT products.** The 2003 classification of ICT goods was considered too detailed and complicated for use in business surveys, with a more aggregated list preferred. The revised ICT goods classification (2007) is both less detailed and has a narrower scope than the previous definition. It should therefore be better suited for measuring ICT investment and expenditure. In addition, a classification of ICT services has been finalised. Both classifications are based on the CPC Version 2.
- **Software investment.** Good survey data are considered essential to complement supply-side information. Regarding own account software, countries considered that more than one approach was required to develop estimates. They include asking questions in business surveys on labour

54. Room document for the 2004 WPIIS meeting: "Measuring ICT Investment and Expenditure – Conclusions and follow-up to the expert group meeting of 27 April 2004", OECD Internal Working Document, DSTI/ICCP/IISRD(2004)18.

inputs used in the production of own account software (*e.g.* FTEs, hours worked), as well as estimates of labour costs. From the national accounts perspective, it is important to separate own account from other types of software (pre-packaged and customised) since life and price characteristics differ. Providing estimates of bundled and embedded software was not regarded feasible, even though desirable. However, bundled and embedded software will be included under other types of investment, notably ICT hardware. Data on leasing were considered problematic and could perhaps also be obtained from companies that engage in leasing.

- **Hardware investment.** The main problem in this area is a lack of clear guidance on what should be counted as ICT and the lack of workable definitions. Focusing collection on broad types of ICT hardware, *e.g.* networked technologies or technologies that primarily process information, was considered useful. The follow-up work on definitions and classifications can help address this problem. Bundled and embedded hardware would typically be included in other investment categories, but this is standard practice with investment data – for example, an elevator would be considered part of a building, not a separate piece of equipment. Another important problem that was noted was the difficulty in unbundling hardware investment from computer services and consultancy, *e.g.* in counting the investment related to installing a large computer system. Firms typically have difficulty in separating such information. To help address this issue, the group noted the importance of having more data and experience on current expenditure, to complement the information on investment.

- **Survey issues.** Countries have a diversity of survey instruments that capture information on ICT investment and expenditure. Most countries use the enterprise as the core statistical unit, although some countries also have good experience with the establishment. It is thought that establishments may know better when equipment is being installed and may know more about current expenditure, while enterprises may know more about investment. Where countries collect information on both ICT expenditure and investment, it was considered helpful to do this in the same survey, as this would ensure consistency, for example, regarding the definitions used.

- **Inconsistency between firm accounting standards and national accounting rules.** In many cases, problems in measuring ICT investment and expenditure were linked to differences between firm accounting standards and statistical rules, including national accounting rules. This problem was considered beyond the scope of the expert group, but could be addressed by the OECD in other work, for example, planned work on intangibles.

163. The WPIIS meeting of 2005 included a session devoted to this topic and delegates provided updates on their work in resolving the issues outlined above.[55] Issues that were discussed included:

- Separating expenditure on hardware and software where they are bundled into a single product.

- Measurement of international trade in computer software.

- Methods for modelling or directly measuring investment in own account software.

- Production of ICT products outside the ICT sector; and

- The appropriate classification of ICT goods.

55. See Summary Record of the 2005 WPIIS meeting, OECD Internal Working Document, DSTI/ICCP/IIS/M(2005)1.

164. Several countries have done work in this area, including: Australia's work on compiling an ICT satellite account; Denmark's survey on ICT expenditures and investments; the work by the United Kingdom in confronting and adjusting existing data on ICT capital expenditure; and Eurostat's work on surveys of ICT investment and expenditure in the private and public sectors.

The economic impacts of ICT investment and ICT use

165. Investment in ICT contributes to capital deepening and can therefore help raise labour productivity. The use of ICT throughout the economy may also help firms increase their overall efficiency, thus raising multi-factor productivity (MFP) growth. Moreover, ICT use may contribute to network effects, such as lower transaction costs and more rapid innovation, which should also improve MFP.

Empirical analysis

166. These impacts can be examined at different levels of analysis, that is, using macroeconomic data, industry data or data at the level of individual firms or establishments.

167. Several studies have examined the impact of ICT at the macroeconomic level (*e.g.* Colecchia and Schreyer, 2001; van Ark *et al.*, 2003; Jorgenson, 2003; Schreyer *et al.*, 2003). These studies show that ICT investment contributed to capital deepening and growth in most OECD countries in the 1990s, though with considerable variation across countries. ICT investment typically accounted for between 0.3 and 0.9 percentage points of growth in GDP per capita over the 1995-2003 period (OECD, 2005b). Sweden, Denmark, Australia, the United States and the United Kingdom received the largest boost; Canada and Japan a more modest one, and Germany, France and Italy a much smaller one.

168. Several studies have also been undertaken at the industry level (van Ark *et al.*, 2002; Pilat *et al.*, 2002; O'Mahony and van Ark, 2003; Pilat and Wölfl, 2004) and some have distinguished an ICT-using sector, composed of industries that are intensive users of ICT. Examining the performance of these sectors over time and comparing them with sectors of the economy that do not use ICT may help point to the role of ICT in aggregate performance. Studies along these lines show that ICT-using services in the United States and Australia experienced an increase in productivity growth in the second half of the 1990s, which seems partially associated with their use of ICT. Few other countries have thus far experienced similar productivity gains in ICT-using services (OECD, 2003c). Moreover, the European Union lags behind the United States in this sector (O'Mahony and van Ark, 2003).

169. Over the past decade, analysis of the impact of ICT use has also benefited from the establishment of longitudinal databases in statistical offices. These databases allow firms to be tracked over time and may contain information from several surveys and data sources. They typically cover large and statistically representative samples of firms, which is important given the enormous heterogeneity in firm characteristics and performance (Bartelsman and Doms, 2000). In recent years, longitudinal databases have increasingly incorporated links to data on firm use of ICT; the linked data can subsequently be explored in analytical studies. Other types of data can be integrated too, which is important since empirical studies suggest that the impact of ICT depends on a range of complementary investments and factors, such as the availability of skills, organisational factors, innovation and competition (OECD, 2003c).

170. The evidence emerging from firm-level studies suggests that the use of ICT does have positive impacts on firm performance and productivity, even in countries and industries for which little evidence is available at more aggregate levels of analysis (OECD, 2004c; Pilat, 2005). However, these impacts occur primarily, or only, when accompanied by other changes and investments. For example, many empirical studies suggest that ICT primarily benefits firms where skills have been improved and organisational changes have been introduced. Another important factor is innovation, since users often help make

investment in technologies, such as ICT, more valuable through their own experimentation and invention. Without this process of 'co-invention', which often has a slower pace than technological invention, the economic impact of ICT may be limited. The firm-level evidence also suggests that the uptake and impact of ICT differs across firms, varying according to size of firm, age of the firm, activity, etc.

Measurement and comparability

171. The measurement of the economic impacts of ICT investment at the aggregate level is relatively straightforward and has been outlined in detail in Colecchia and Schreyer (2001) and Schreyer *et al.* (2003). It is based on growth accounting, which involves the estimation of the productive capital stock, followed by the estimation of the capital services flowing from that stock. The method can be applied at both the macroeconomic and industry level, providing the appropriate data are available. One important element in this respect is having the appropriate deflators for ICT investment that adjust for quality change, *i.e.* so-called hedonic deflators. To address problems of international comparability, empirical studies often use United States hedonic deflators to represent price changes in other countries. This is only a second-best solution as countries should ideally develop deflators that properly account for quality change of ICT products in their own national context. A particularly important area is hedonic deflators for software investment; the United States is one of the few OECD countries to use hedonic deflators for pre-packaged software. For more information, readers are referred to the *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products* (Triplett, 2004) and Chapter 2 of this *Guide* (*The price and quality of ICT products*).

172. Another challenge concerns the basic data; measures of ICT investment are not available for all OECD countries and when they are, they are not necessarily comparable across countries. Data on software investment are particularly problematic since countries vary in how much total software spending is counted as investment. Measuring software has been the subject of an OECD/Eurostat Taskforce that has produced a range of recommendations to improve measurement (see Ahmad, 2003). Measurement of ICT investment and expenditure by business is also a current concern of the WPIIS. See the previous section of this chapter for details.

173. Several problems also affect the measurement of productivity in ICT-using services (Wölfl, 2003). First, output measures are not straightforward. There is little agreement, for example, on the output of banking, insurance, medical care and retailing. In addition, some services are not sold in the market, so it is hard to establish prices. In practice, these constraints mean that output in some services is measured on the basis of relatively simple indicators. Moreover, best practices in measuring services output have not yet spread widely. While some new approaches to measurement in these sectors are being developed (Bosworth and Triplett, 2003), only few countries have thus far made substantial changes in their official statistics to improve measurement. Work is underway at OECD in some areas, *e.g.* finance and insurance.

Future developments

174. Solid evidence on the economic impacts of ICT, and the conditions under which these impacts occur, is important in underpinning evidence-based policy formulation. Therefore, further progress in both measurement and economic analysis is feasible and desirable. One important area concerns the measures of economic impacts that are available at the aggregate or industry level. This will require more comparable investment data, a greater use of quality-adjusted deflators, including for software investment, and improved output measures for services. Much more analytical work can also be done, *e.g.* in linking ICT investment more systematically to economic impacts, for example through regression analysis at the aggregate or industry level.

175. However, the largest potential for further work probably lies with firm-level data. There are at least two aspects to this. First, cross-country studies on the impact of ICT at the firm level are still relatively scarce, primarily since comparable data sources are still relatively new. Some studies have engaged in international comparisons (Atrostic *et al.*, 2004; Hempell *et al.*, 2004; Haltiwanger *et al.*, 2003). Understanding the reasons for the cross-country differences in the impacts of ICT reported in such studies would benefit from further work, and could lead to helpful insights for policy.

176. Second, there are several key issues that remain poorly analysed and that offer scope for progress. For example, further work with firm-level data could provide greater insights into the contribution of firm dynamics to productivity gains, *e.g.* the role of new firms, the conditions that lead to successful survival and the factors determining firm exit. Moreover, the link between innovation and ICT has only been examined for some OECD countries. Understanding this link is of great importance as long-term growth largely depends on the future pace of innovation. Moreover, quantitative analysis of the price and productivity impacts of e-commerce and e-business processes more broadly is still in its early stages, but is a promising area of further work, as suggested in a study for the United Kingdom (Clayton *et al.*, 2004). Finally, while there is good evidence for some OECD countries that ICT can help transform the service sector and make it more innovative and productive, a good understanding of ICT's impact on the service sector is still lacking, partly because of the measurement problems outlined above but also due to lack of cross-country empirical analysis.

177. Recent work in this area is summarised in a paper prepared for the 2007 WPIIS meeting (OECD, 2007a).

Subjective measurement of impacts

178. Another approach to measuring impacts of ICT on firm performance is to ask firms directly about those impacts. While this approach offers the advantage of providing direct causal information, it is usually considered less objective than the empirical measurement techniques outlined above. A number of OECD countries include impacts questions in their national surveys of ICT use/e-commerce. Such questions typically ask about the benefits of particular ICTs such as Internet commerce technologies for purchasing or selling goods or services.

179. The OECD model survey of ICT use by businesses includes a question on the benefits of selling over the Internet (see question 13 of the model questionnaire in Annex 1c). Response categories for the question include: reduced transaction time, increased quality of customer service and lower business costs.

180. Similarly, the 2008 Eurostat model questionnaire includes a question on the perceived benefits of the use of ICT. The approach is different as the question is not directed to the benefits of the use of a specific technology, but the benefits of ICT projects in general. The implementation of an ICT project refers to the introduction of a new or updated ICT (*e.g.* a new/updated software application or new/updated hardware) or a change in the use of an existing ICT. Examples of ICT projects are: a new or a restructured Web site, a new internal homepage, starting use of automated data exchange or starting to receive orders via computer networks. The goal is to cross-tabulate the results on benefits with the use of several ICTs.

CHAPTER 6: ICT DEMAND BY HOUSEHOLDS AND INDIVIDUALS[56]

Introduction

181. The other major WPIIS effort on the demand side has been the development of a model survey for measuring ICT access and use by households and individuals. The impetus for such work has been a strong policy interest in issues such as equality of access to ICT and the potential for ICT (and, in particular, the Internet) to significantly change society – in both positive and negative ways.

182. This chapter discusses the OECD model survey of ICT access and use by households and individuals, e-commerce activity undertaken by individuals, and social and economic impacts of ICT use by households and individuals.

OECD model survey of ICT access and use by households and individuals[57]

183. In late 2002, the WPIIS finalised a model survey on ICT use in households and by individuals (OECD, 2002b). The model survey was revised in 2005 to improve harmonisation with member country ICT use surveys and to reorient the surveys towards current areas of high policy relevance. More information on the development of the model survey, as well as the model itself, can be found in Annex 1d.

184. The model survey is intended to provide guidance for the collection of statistics on:

- Household access to ICT, including broadband access to the Internet and barriers to Internet access.

- Use of ICT by adults (individuals aged 16-74 years) including whether ICT was used during the previous 12 months, how it was used (for instance, how the Internet was accessed), whether security precautions were employed, where ICT was used, and what activities it was used for. The 2005 revision included new and revised material on IT security, e-government, download and purchase of digitised products, mobile Internet access and mobile phone use.

185. Countries are encouraged to use the model as a core part of their survey development in this area of ICT statistics in order to improve the international comparability of information collected and compiled on this topic.

186. Discussion of topics included in the questionnaire can be found in this *Guide* as follows:

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56. This chapter was revised slightly in 2007, therefore references to some country practices may be out of date. A small number of changes were contributed by Eurostat to update its activities in this area of measurement.

57. A note on terminology: the *Guide* uses the terms “model survey” and “model questionnaire”. The latter refers specifically to the questionnaire provided as a model to participating countries. The former refers to the questionnaire plus associated information, such as recommendations on methodology, scope and classificatory variables.

- Trust in the online environment (including IT security) – a special article has been included in Chapter 8. Annex 1d considers the measurement challenges in this area.

- Digitised products – in Chapter 7 and Annex 1d.

- E-government – a special article can be found in Chapter 8.

- Mobile phones – discussed in Annex 1d.

- Use of mobile services for Internet access – discussed in Annex 1d.

E-commerce

187. For individual members of households, e-commerce presents an alternative method of purchasing (and increasingly selling) goods and services for private use.

188. We saw in Chapter 5 that it is the method by which an order is placed or received, rather than the payment or channel of delivery, which determines whether a transaction is an e-commerce transaction. OECD member countries have endorsed narrower (Internet) and broader (other computer-mediated networks) definitions of e-commerce. See Figure 3 in Chapter 5 for guidelines on interpretation of the two e-commerce definitions.

189. The statistical and policy interest for the household sector is in use of the Internet for such transactions, with particular interest in purchasing rather than selling transactions. Surveys of ICT use in households typically collect information on individual purchasing activity via the Internet, with details often including the nature of goods and services purchased, the value of those purchases, the value of online payments and/or barriers to purchasing over the Internet.

190. The major conceptual and collection issues relating to e-commerce are described in Chapter 5. While most are more relevant for businesses, questions relating to the ability of respondents to report purchases according to the definition of e-commerce and the small volume of e-commerce activity have implications for household surveys as well.

191. OECD countries vary in their collection efforts in this area. In particular, because of changes to Eurostat's model household survey,[58] fewer European countries are collecting the value of purchases over the Internet. The 2005 OECD model survey (in Annex 1d) has nominated value of purchases as a non-core question reflecting both the direction of Eurostat and the difficulty respondents have in recalling the value of purchases. In addition to purchasing activity, the model questionnaire asks individuals whether they have sold over the Internet, for example, using auction sites. It also asks about the types of products purchased over the Internet and barriers to Internet purchasing.

The social and economic impacts of ICT use by households and individuals

192. In contrast to the strong interest in impacts of ICT use by businesses, there has been little work done on impacts of use by households and individuals. However, the availability of ICT has obviously

58. Model questionnaire for the Community Survey on ICT Usage in Households and by Individuals, 2006. In addition, the 2007 and 2008 model questionnaires for the Community Survey do not address barriers to purchasing over the Internet. However, an extended module on e-commerce and trust is planned for the 2009 model questionnaire.

changed – and will continue to change – the way people work (for instance, teleworking), how they access commercial and government services, and what they do with their leisure time (for instance, the substitution of the Internet for TV). These changes are having, and will continue to have, impacts on society and the economy.

193. In respect of social impacts of ICT use by households and individuals, the analytical work done has tended to be based on small-scale studies rather than more comprehensive exercises that use the type of official statistics we focus on in this *Guide*. However, it is clear that there are both negative and positive aspects to such use. For instance, on the negative side, consider the question of undesirable content accessible via the Internet and changes in the way people relate to each other (for example, the substitution of e-mail and SMS messages for personal contact). On the positive side, there are many advantages and conveniences offered by ICT in learning, communicating, accessing services and so on.

194. An area that has received significant attention is the question of the digital divide. However, this is not so much an analysis of the impact of ICT use as an analysis of exclusion from its use. It is predicated on the assumption that ICT is, on balance, a positive phenomenon and that those without access to it are relatively disadvantaged. More information on the digital divide and its measurement can be found in Chapter 8.

195. Notwithstanding that most economic analysis of the impacts of ICT has focused on ICT use by firms, the use of ICT by households undoubtedly has impacts on economic performance.

- First, demand for ICT goods and services by households is an important component of overall demand, which has stimulated the growth of the ICT sector, and has helped to foster technological progress in ICT applications. ICT has also stimulated demand for products in sectors that rely heavily on ICT, for example, media and entertainment, leading to growth in those industries as well.

- Second, the wide diffusion of ICT across the economy and to most households may enable a critical mass without which firms may not be able to achieve the full benefits of switching to ICT, *e.g.* in the delivery of their products.

- Third, the diffusion of ICT to households may help in fostering basic abilities for ICT use as well as more sophisticated ICT skills, which can benefit companies that require experienced ICT users.

- Fourth, use of ICT at home may enable companies to achieve greater benefits from teleworking, which could enable companies to rationalise their working environment.

- Finally, increasing access to ICT by households can help reduce socio-economic exclusion, by providing access to information as well as more competitive prices.

196. As these topics have not received as much attention from economists as the economic impacts of ICT use by businesses, empirical literature is somewhat limited.

197. Work in the area of measurement of social impacts of ICT (as applied by, or applicable to, national statistical offices) is summarised in a paper prepared for the 2007 WPIIS meeting (OECD, 2007a).

CHAPTER 7: CONTENT AND MEDIA[59]

Introduction

198. The introduction to this *Guide* states that "we live in a period of unprecedented technological change, both in terms of the extent and speed of change….Many of the underlying transformations are undoubtedly associated with the set of interrelated and, more recently, converging technologies that have come to be known as ICT."

199. In an attempt to describe and understand the magnitude of these changes, considerable effort has been made to measure the supply and use of ICT. However, relatively little is known statistically about the many developments that result from the flow of information, or so-called 'content', which is enabled by ICT.

200. Yet those developments are increasingly significant. For instance, business models are being re-invented, particularly in industries whose output is information in one form or another (for instance, news, music, film, scientific information and business information) and industries whose processes rely heavily on information processing and exchange (financial services and education, for example).

201. A range of industrial, labour, trade, cultural and intellectual property policy issues are emerging as a result of better communications and information exchanges. These policy issues are often embodied in the somewhat vague notions of digital content and digital delivery.

202. The first challenge for the statistical system is to develop the definitions and measurement models necessary to describe the extent of those changes and so inform the relevant policy debates. It is clear that the many issues at stake cannot be addressed with a single measurement model. It is also clear that existing industry, product and demand-based models have limits.

203. This chapter outlines conceptual work done on the topic by the WPIIS and describes current measurement approaches by the WPIIS and ICCP.

204. Because the topic is complex, terminology is an important aid to understanding. A note on terms used is therefore likely to be helpful. For the purposes of this *Guide*, the terms commonly used in discussing the topic have meanings as follows:

- The 'content and media sector' consists of industries that are engaged in the production, publishing and/or the electronic distribution of content products (OECD, 2006b).[60]

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59. Revisions made to this chapter mainly reflect the development of a 'Content and media sector' definition by WPIIS (per OECD, 2006a) and a 'Content and media products' classification (OECD, 2008). Revisions to the Section, *A sectoral study approach to measuring digital content*, were provided by Sacha Wunsch-Vincent of the OECD in 2007.

60. From 2006, the sector was called the 'content and media sector' but references earlier than that are referred to as 'content' in this chapter.

- ‘Content and media products’ are mainly produced by businesses that are classified to the industries that comprise the ‘content and media sector’. However, some content and media products will be produced by businesses outside the sector and by other sectors of the economy, including government, as secondary activities.

- The ‘electronic content sector’ (or ‘digital content sector’) consists of industries that primarily produce ‘electronic content products’ (or ‘digital content products’). For most firms and most industries, electronic content products are still a minor output. This view is reflected in the structure of ISIC Rev. 4, which does not separately identify electronic content activities (industries).

- The terms ‘digitised product’ and ‘digital delivery’ are linked. A digitised product has been defined as a product that can be delivered on line.

205. It is clear from the discussion above that there is an industry view of content and a product view. Analogous to the approach taken with the ICT sector and ICT products, classifications are needed to describe content industries and products. Also as with ICT, such classifications would preferably be based on existing classifications such as the ISIC and the CPC.

The Content and media sector definition

206. In 2006, WPIIS started work on revisions to the ICT sector and ICT product definitions to conform with to the revised ISIC (Rev. 4) and CPC (Ver. 2). At the same time, the Working Party started developing a definition of a ‘content and media’ sector based on the premise that “Content and media industries are engaged in the production, publishing and/or the electronic distribution of content products” (OECD, 2006b).[61] The Working Party agreed that the sector would consist of industries of Division J of ISIC (Information and communication) except for those that are already included in the ICT sector definition.

207. A history of WPIIS deliberations on the ‘content’ sector can be found in Annex 1b – as can the definition of the agreed Content and media sector (released in 2007).

The Content and media product classification

208. Following agreement on a Content and media sector, the development of a product classification became possible. The work was undertaken by the WPIIS Classifications Expert Group and the following guiding principle was used to identify Content and media products (it was adapted from the definition used to determine the Content and media sector):

> Content corresponds to an organised message intended for human beings published in mass communication media and related media activities. The value of such a product to the consumer does not lie in its tangible qualities but in its information, educational, cultural or entertainment content.

61. The development work was undertaken by the WPIIS Classifications Expert Group (established to make recommendations on information economy classifications to the broader membership).

209. The main features of the Content and media product classification, in terms of its relationship with both the sectoral definition and the ICT product classification, can be summarised as follows: (OECD, 2008a)

- All of the products of the Content and media sector are included in the product classification.
- Four products of the ICT sector are included in the Content and media products list. They are the three games software products and *Web search portal content*; and
- Four products that are not products of the Content and media (nor ICT) sector are included in the classification based on majority support from the expert group and consistency arguments (see Annex 1a for details).

210. The list was agreed[62] at the end of 2008 (and slightly revised in January 2009 following further minor changes to the CPC at the end of 2008). There are 74 Content and media products in the list and six broad level categories as shown in Table 3 below. The detailed list can be found in Annex 1a.

Table 3. Broad level categories for Content and media products

Broad level categories	Number of CPC subclasses (products)
Printed and other text-based content on physical media, and related services	18
Motion picture, video, television and radio content, and related services	24
Music content and related services	5
Games software	3
On-line content and related services	12
Other content and related services	12
Total	**74**

Digitised products

211. In 2005, the OECD distinguished digitised products and broadly defined them in an attempt to develop demand-side questions on their use, sale and purchase.

212. According to this definition, digitised products include both:

- Products (such as reports, movies, music and software) which can be delivered over the Internet in digitised form and have a physical analogue (such as a CD or DVD). For such products, the analogy with the physically delivered product is direct (*e.g.* a downloaded movie file and a DVD of that movie, an MP3 file and a CD); and

- Other digitised products where the analogy with a physical product is less direct, for instance, new kinds of Web-based products that are accessed on line. They include online news, information or financial services and online games (where the nature of the game is different from other computer or video games because of the networking capacity of the Internet).

62. Declassified by the WPIIS parent committee, the Committee for Information, Computer and Communications Policy (ICCP).

213. While a variety of services can be digitally delivered and are therefore included above, others may be ordered over the Internet but largely delivered or provided off line. Examples of such transactions include buying insurance through an Internet broker, reserving a hotel room through a hotel chain's Web-based reservation system, booking plane tickets through an airline's Web site and ordering concert tickets from an online seller.

Modifications to the OECD model survey on ICT use by businesses

214. A new question on the nature of products sold over the Internet was added to the 2005 model questionnaire (see Annex 1c, question 12). The question distinguishes:

- Physical products – those ordered on line and delivered off line. They include raw materials, components, stationery, hardware, books and CD-ROMs.

- Digitised products – are **either** delivered over the Internet in digitised form, replacing physical products *e.g.* reports, software (in lieu of paper or CD versions) *or* are new kinds of Web products which are accessed on line and substitute for physical products, *e.g.* online financial and information services; and

- Offline services – are ordered on line but are delivered, or substantially delivered, off line. They include bookings for accommodation, travel and events.

Modifications to the OECD model survey of ICT access and use by households and individuals

215. In order to obtain measures of demand for digitised products, extra categories on Internet activities and products purchased over the Internet were added to the relevant questions in the 2005 model questionnaire. The new Internet activity items include extra categories enabling the identification of digitised products that also exist in physical form (for instance, movies or music). New items included for purchased products distinguish the product in digital and physical form. For instance, computer software is split into computer software that is physically delivered (*e.g.* as a CD) and computer software that is digitally delivered (downloaded from the Internet). A significant advantage of including questions in the model survey is that information on activities and purchases can be broken down by characteristics of the individuals concerned, for instance, by their age, gender and education level.

A sectoral study approach to measuring digital content

216. It is clear that digital content – and digital delivery of content – are increasing in significance, driven by enhanced technological capabilities, a rapid uptake of broadband technologies and improved performance of hardware and software. Digital content and associated applications offer new business opportunities and potentially improved access to knowledge and research. Digital content can also be a major driver of ICT industries such as telecommunications.

217. The OECD's Committee for Information, Computer and Communications Policy (ICCP) has been looking at digital content issues in the emergence of new network-based services since 1996.[63] More recently, their focus has shifted to work on broadband content and digital delivery of goods and services (OECD, 2004b).

63. See OECD (1998) and (1999).

218. At its March 2003 meeting, the ICCP Committee held discussions on interlinked broadband and digital content developments and policy issues. The Committee adopted two tracks for this work, agreeing to work towards a Committee statement on promoting broadband development and to develop a work proposal on digital content. At its October 2003 meeting, it was agreed that the ICCP Committee should undertake more comprehensive analysis on digital content, focusing on growth and value creation, drivers and barriers to growth, and changing market structures and emerging issues.

219. In early 2004, following its preparation in the ICCP Committee, the OECD adopted the *Recommendation of the Council on Broadband Development* (see Box 2 below), setting out ten recommendations for OECD member countries when establishing or reviewing their broadband policies. These policy recommendations recognise the increased policy attention towards broadband content and applications. The ICCP Committee has been asked to monitor the development of broadband in the context of this Recommendation – this process took place during 2007 and 2008.

220. At its April 2004 meeting, the ICCP Committee agreed to the work plan on digital broadband content, with this work being undertaken in the Working Party on the Information Economy (WPIE). The WPIE has completed an initial set of stocktaking studies of the following sectors where digital content is transforming business models: scientific publishing, music, online computer and video games, mobile content services and user-created content. Work is ongoing on film and video, online advertising and news distribution. The studies were designed to further identify analytical, policy and measurement issues, and to prepare the ground for more in-depth analysis of horizontal issues and challenges to broadband content development and applications. A major OECD international conference on the Future Digital Economy: Digital Content Creation, Distribution and Access was held on 30-31 January 2006 in Rome.[64]

221. At the request of the WPIE, a content policy framework was developed in 2006. Business and public policy issues to be addressed are grouped in six areas as outlined in Box 1 below.

Box 1. Digital content policy framework

(i) innovation and technology (*e.g.* enhancing R&D and innovation in content, networks, software and new technologies);

(ii) value chain and business model issues (*e.g.* developing a competitive, non-discriminatory business environment);

(iii) enhancing the infrastructure (*e.g.* technology for digital content delivery, standards and interoperability);

(iv) business and regulatory environments that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights and digital rights management without disadvantaging innovative e-business models;

(v) governments as producers and users of content (*e.g.* commercial re-use and pricing of public sector information); and

(vi) conceptualisation, classification and measurement issues.

Source: OECD "Digital Broadband Content Strategies and Policies", www.oecd.org/dataoecd/54/36/36854975.pdf.

222. In 2006, the WPIE agreed that the existing digital content policy framework could be further developed in key areas of importance for the development, distribution and use of digital content.

64. See www.oecd.org/sti/digitalcontent/conference.

223. In parallel, the OECD is working on increasing access to public sector information (*e.g.* geographical and meteorological data, information held in libraries, archives, museums). The public sector is a large producer of content with major potential for digitisation and new commercial and non-commercial applications. Wider availability and use of public sector information and content can arguably contribute to economic growth and enhanced citizen welfare. A study has been completed on access to public sector content (including the commercial re-use of public sector information). Follow up work includes refinement of the analysis, and potentially the development of international principles and guidelines.

224. For more information on this work, see: www.oecd.org/sti/digitalcontent for the work on digital content and www.oecd.org/FutureInternet for the 2008 Ministerial on 'The Future of the Internet Economy.

Box 2. OECD *Recommendation of the Council on Broadband Development*, 2004

The OECD Council recommends that, in establishing or reviewing their policies to assist the development of broadband markets, promote efficient and innovative supply arrangements and encourage effective use of broadband services, Member countries should implement:

- Effective competition and continued liberalisation in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, non-discriminatory market policies.
- Policies that encourage investment in new technological infrastructure, content and applications in order to ensure wide take-up.
- Technologically neutral policy and regulation among competing and developing technologies to encourage interoperability, innovation and expand choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.
- Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market.
- A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and more generally, strengthened cross-border co-operation between all stakeholders to reach these goals.
- Both supply-based approaches to encourage infrastructure, content, and service provision and demand-based approaches, such as demand aggregation in sparsely populated areas, as a virtuous cycle to promote take-up and effective use of broadband services.
- Policies that promote access on fair terms and at competitive prices to all communities, irrespective of location, in order to realise the full benefits of broadband services.
- Assessment of the market-driven availability and diffusion of broadband services in order to determine whether government initiatives are appropriate and how they should be structured.
- Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models.
- Encouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness.

The Council also instructs the Committee for Information, Computer and Communications Policy to monitor the development of broadband in the context of this Recommendation within three years of its adoption and regularly thereafter.

Source: OECD, *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.

CHAPTER 8: CROSS-CUTTING TOPICS IN INFORMATION SOCIETY MEASUREMENT[65]

Introduction

225. There are a number of areas of policy interest that are relevant to more than one of the framework elements that form the structure of this *Guide*.

226. This chapter has a look at these areas as follows:

- Specific areas of policy interest that have been (or are being) considered by the WPIIS (with articles on e-government, trust in the online environment and the *digital divide).*
- Specific areas of broad policy interest on which the WPIIS has not yet focused (ICT education and skills; ICT occupations; outsourcing of ICT). Statistical work done by other areas of the OECD on these topics is described; and
- The bigger picture: interactions between ICT and the economy, society and the natural environment.

E-government

Introduction

227. This article is based on work undertaken by the WPIIS over several years and compilation work on e-government statistics undertaken by the OECD during 2004 (OECD, 2005c). It primarily considers e-government from the viewpoint of official statistics collections.

228. E-government statistics are also available from other sources such as the UN Division for Public Administration and Development Management. The latter's E-Government Readiness Survey of 2004 (UNPAN, 2004) assessed the public sector e-government initiatives of UN member states using a composite index of e-readiness. The index included a Web measure index that gauges the level of sophistication of a government's online presence by a qualitative assessment of its Web sites. The European Commission uses a similar approach for compiling e-government benchmarking indicators as part of the eEurope 2005 Action Plan.[66] For policy purposes, the e-government indicator of interest is the "number of basic public services fully available online" and data are collected by several means including a survey of relevant government Web sites in each country.

65. Only minimal revisions have been made to this chapter. The status of some of the work described in it is therefore somewhat dated.

66. For more information on the methodology, see Cap Gemini Ernst & Young (2004).

Basic concepts in e-government surveys

229. There are different types of e-government surveys. The best developed statistically are surveys on demand for government electronic services. Eurostat has a set of questions on both their household and business ICT use questionnaires and most European countries that conduct the Eurostat surveys ask them. Some non European OECD member countries also ask such questions in their national surveys. We can also consider demand from the perspective of government (government use of ICT) and the provision of electronic services by government. In terms of international comparability, neither of these areas is well developed.

Measurement challenges for e-government

Collecting e-government information from government organisations

230. Relatively few OECD countries attempt to measure e-government via surveys of government organisations. The difficulties of this approach in respect of comparability have been articulated by OECD member countries (in particular, Denmark and Australia) as follows:

- Definition of the scope of government surveys. For instance, should they include government businesses or semi-government organisations? Should they include small units with no employees (for example, committees or boards that are serviced by larger entities)?

- Definition of government units and their categorisation to the appropriate tier of government. Should a unit include sub-entities or should all (or some) be distinct units?

- Measurement of the intensity of activities such as the offering of electronic services and their categorisation; and

- Heterogeneity of government units and the proportion or counts approach to data on ICT use (whereby data are presented in terms of the proportion or count of entities undertaking a particular activity). This heterogeneity concerns differences in government units (for instance, differences in how ICT functions are organised and changes in organisational structures over time) that make it difficult to make a valid comparison of proportion or counts data across geographic regions, tiers of government and time. It is thought that international comparisons are most affected by unit heterogeneity.

231. The heterogeneity issue is probably the most difficult challenge when data are presented as proportions or counts of units, as they often are in information society measures.

Collecting e-government information from users of government electronic services

232. In recognition of these statistical difficulties, the WPIIS, in collaboration with the OECD e-Government Project, has adopted a demand-side approach to e-government measurement, that is, measuring the use (by businesses and individuals) of electronic services offered by government rather than the supply of those services by government entities. However, it should be noted that a demand-side approach is not without conceptual difficulties.

233. One problem is how to define ‘government’ on questionnaires and other survey instruments such that respondents (generally householders and businesses) have a common understanding of what is meant. The current OECD approach is to follow the System of National Accounts (SNA) (UNSD, 1993) that defines government units as follows “Government units may be described as unique kinds of legal entities

established by political processes that have legislative, judicial or executive authority over other institutional units within a given area. Viewed as institutional units, the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production……". According to the SNA, government units can be "… at the level of the nation, a region or a locality". For more information, see http://unstats.un.org/unsd/sna1993/glossform.asp?getitem=219.

234. Eurostat's approach (for the 2006 questionnaire on household/individual use of ICT) is to use a broad scope, referring to "public services and administration".

235. A related problem arises from differences in the functions of government organisations, however defined, across countries. For instance, in one country, all rail transport might be a function of general government, and in another country it might be a responsibility of public or private sector businesses. Another example concerns outsourcing; government in one country might outsource a client service function, such as employment agency work, to the private sector while another country retains it as a government function. These structural differences will particularly affect international comparability but are also likely to affect comparability over time within a country.

Available statistics

236. Despite the difficulties, some official statistics on e-government are available for OECD countries. They are mainly in the area of use of government services by businesses and individuals. Eurostat has been particularly active in this area, with collection of statistics on business and household use of electronic government services since 2002. Australia and Canada have time series demand-side data for households and Australia has a good time series for business demand. Japan has household data showing the use of computers and mobile phones to obtain information from government using the Internet. The United States collected information on individuals' use of the Internet to access government services in both 2001 and 2003.

237. While some OECD countries (for instance, Denmark and Canada) collect relevant information from the perspective of government organisations (government's own use of ICT and, in several cases, provision of electronic services by government), there is little commonality between the statistics from those countries.

Future efforts by the OECD and member countries

OECD

238. The OECD model surveys of household and business use of ICT have been revised and include more information on the use of government services by individuals and businesses respectively. Relevant questions can be found in Annexes 1c and 1d. They are as follows:

- Model questionnaire on business ICT use, question 17 on business use of the Internet for dealing with government organisations.

- Model questionnaire on ICT access and use by households and individuals, question 19 on individuals' use of the Internet for dealing with government organisations.

239. For the purposes of the model questionnaires, government organisations/public authorities are defined per the SNA93. More information on this definition is provided above in the Section *Collecting e-government information from users of government electronic services*.

Member countries

240. There are also a number of individual OECD country initiatives underway or being planned, including:

- Statistics Canada expects to replace its Household Internet Use Survey by an Individual Internet Use Survey and to significantly expand its collection of e-government related data. The new questionnaire includes additional Internet activities (communication with government organisations and elected officials, e-voting and involvement in online government consultation) and has separate questions on: frequency of use of the Internet to correspond with government organisations to express personal views or concerns; frequency of use of the Internet to access information on government programmes or services; use of the Internet to express opinions relating to government policies, laws, issues, etc.; levels of government dealt with (municipal, provincial, federal); and barriers to using the Internet to search for government information.

- From 2003, the Czech Statistical Office (CSO) conducted an annual public administration survey that collects information on ICT use in public administration. Information collected includes access to, and use of, ICT by public administration, Web site content, and use of the Internet for public procurement. In 2004, the CSO conducted a Web site content survey to better ascertain the type of online services and information available to citizens.

- Denmark, already a frontrunner in measuring e-government, expanded its collection of data from government organisations in 2004 in the following areas: e-learning; e-purchasing (integration with the accounting system and use of digital invoicing); the ICT strategy of the organisation; and use of open source software.

- From 2003, the Hungarian Central Statistical Office enhanced its collection of government organisations (state administration and municipalities) to collect questions on ICT use; IT security; number of online public services with integrated back-office processes; and public procurement processes that are fully carried out on line. The Hungarian survey also includes questions on computers (number, age, value), ICT training and ICT investment.

- For a number of years, Mexico, through its statistical office *Instituto Nacional de Estadistica*, has conducted an annual Federal Public Administration Survey on IT Resources. The survey collects information on ICT human capital, hiring of external services, ICT hardware and software resources, computer applications used and the ICT budget.

- Statistics New Zealand is implementing a four-year plan for ICT statistics collection. It is focusing on the Government's own use of ICT and business and household use of electronic government services. The business and household use questionnaires are currently in development and contain questions about use of government Web sites and services during the reference period.

- Singapore, an observer country in the WPIIS, is beginning to measure public satisfaction with online government services as a means of measuring the effectiveness of e-government in terms of quality of services.

- The Slovak Republic has included a module about ICT on its structural survey of budgetary organisations. The module contains questions on the number of PCs of different types (*e.g.* those connected to the Internet); the number of employees working with PCs; details of ICT current and capital costs; and Web site details (whether the organisation has one, the number of visitors, number of forms on the site etc).

- Eurostat, in its 2006 household ICT use questionnaire included a module of e-government questions covering individuals' actual and potential use of the Internet to deal with government in areas such as income tax declaration, job search services, car registration etc. The response categories match the supply-side European Commission e-government benchmarking indicators referred to above; and

- In addition to these country-specific changes, the expansion of the European Community in 2004 has brought more countries into the scope of the Eurostat surveys. As we have seen, these surveys provide good comparative information on the demand for electronic government services by individuals and businesses.

241. More information on e-government measurement challenges, as well as relevant data, may be found in the OECD publication *E-government for Better Government* (OECD, 2005c).

Trust in the online environment[67]

Introduction

242. A fundamental element in enabling the benefits ICT can bring to the economy and society is the confidence users have in platforms, applications and services. Creating an online environment that builds trust amongst the users of ICT is an increasing priority for industry and governments.

243. At the close of 2004, there were more than 278 million fixed access Internet subscribers in the OECD area – a figure that was up from just over 100 million in 1999. With multiple users of each of these accounts, in homes and businesses, the number of people accessing the Internet was, of course, much greater. By the end of 2004, nearly 43% of these subscribers used broadband platforms to access the Internet, thus enabling connections with higher performance and 'always on' capabilities. This proportion is expected to increase rapidly over the next few years. In addition, the first high speed platforms for cellular wireless access have been introduced and are expected to further increase access to and use of the Internet.

244. As ICT networks develop, the new capabilities create an increasing range of opportunities and challenges. The always-on connectivity enabled by broadband access, for example, increases the need for home and small business users to protect their connections with tools such as firewalls that were once only in the domain of corporate networks. Moreover, the higher performance of broadband means that compromised systems have greater capabilities to harm those of others. One example is the emergence of so called 'botnets'. This phenomenon occurs when a number of compromised machines act in concert, without the knowledge of their owners, to inflict harm on the connections of other users or to retransmit spam. A host of other threats exists and includes: 'phishing', 'pharming', 'spyware', viruses, various forms of 'spoofing' and 'Web page hijacking'. On the other hand, broadband connections enable the ICT industry to provide continuously updated and improved technologies, direct to users, to prevent harm to, or misuse

67. This article is based on a paper presented to the 2005 WPIIS meeting and later declassified, DSTI/ICCP/IIS(2005)1/FINAL.

of, their systems. The automatic updates to preventative technologies such as firewalls and anti-virus software, that always-on connectivity facilitates, are cases in point.

245. OECD governments have agreed on a number of initiatives aimed at building a culture of trust and security. At the international level, examples include OECD guidelines on security and privacy online (OECD, 2002d and 2003d). The private sector has also been active. Numerous initiatives have been put into place from partnerships such as the Anti-Phishing Working Group through to the implementation of tools that aim to build trust directly with users such as privacy statements, trust marks and secure servers.

Official statistics

246. The topic, trust in the online environment, is a broad one and includes: IT security, privacy and trust issues such as consumer protection. Its measurement can also be considered in terms of these three sub-topics.

247. To date, the main approach of official statistical agencies has been to gather data from surveys of households and businesses on use of ICT. In this context, information about trust is often collected, for example, by specific questions on IT security or on perceived 'trust' barriers to Internet use or Internet commerce.

IT security

248. IT security is a challenge both for Internet users and for those measuring ICT use. In official statistics, it is generally considered as a demand-side measurement issue and questions may be included in the household and business ICT use surveys undertaken by many OECD countries. For businesses, the usual measurement approach is to include questions in a survey of business ICT use or a separate IT security enquiry directed at businesses. For households, questions are typically added to a household ICT use survey.

249. Questions on IT security usually deal with respondents' encounters with IT security problems, their origins or consequences, and preventative measures in place. For businesses, financial cost might also be asked about. Additionally, in both household and business surveys, IT security is often included as a response item on questions about barriers to e-commerce and Internet access.

Other trust issues

250. As mentioned above, these issues are less often the subject of official statistics. However, questions on businesses' confidence-building practices have been asked by some countries that conduct Eurostat's *Community Survey on ICT Usage and E-commerce.* Statistics Canada in its *Electronic Commerce and Technology Survey* asks businesses whether their Web site has a privacy policy statement. A number of OECD countries ask about privacy and trust concerns as impediments to e-commerce and Internet access. Household questionnaires may include items on concerns about privacy or about children accessing the Internet.

Trust questions on the OECD model surveys of ICT use

Business model survey

251. The OECD model survey of ICT use by businesses was revised in 2005. Questions have been added on IT security measures that businesses have in place and IT security incidents experienced. In addition, businesses are asked whether their Web site has: a security policy statement, a privacy policy

statement, a security seal or a privacy seal. A barriers/limitations question on selling over the Internet includes items on security, privacy and trust.

252. The relevant questions can be found on the model questionnaire in Annex 1c. They are questions 7, 8, 14 and 16.

Household model survey

253. The OECD model survey of ICT access and use by households was also revised in 2005. New questions have been added on: backing up data, IT security measures in place on a home computer and IT security incidents experienced at home. Barriers questions on household access to the Internet and Internet purchasing by individuals also include items on security and privacy.

254. The relevant questions can be found in the model questionnaire in Annex 1d. They are questions 5, 8, 15, 16 and 23.

The digital divide[68]

Issues, approaches and policy interests

255. Simply defined as the gap between ICT 'haves' and 'have-nots', the notion of the *digital divide* has been a prominent theme of the information society. As ICT began to penetrate our lives and the benefits, actual or potential, associated with its use started to be understood, the undesirability of leaving behind substantial populations surfaced as a major challenge of our times. Numerous initiatives emerged to identify, profile and help address issues of economic marginalisation and social exclusion associated with ICT.

256. The digital divide represents an area of overlap between economic and social issues of the information society. ICT-induced benefits extend everywhere, including to business, governments, health, education and any other area. For example, massive investments on infrastructure for e-commerce and governments on line are taking place; for the benefits of such activities to materialise fully, undoubtedly a critical mass of users is required.

257. The economic and social issues associated with the digital divide hold true both within the context of individual countries and across countries. Indeed, early interest in ICT-related inequalities within countries accelerated when the linkages between ICT and economic development started to become apparent. The idea of 'ICT for development' has been the driving force behind much activity internationally, including the two World Summits on the Information Society in Geneva (2003) and Tunis (2005). Thus, the digital divide matters to the extent that ICT represents both: an historic opportunity for the evolution of our economies and societies; and has the potential to accentuate already existing and sizeable imbalances.

258. As an area of investigation, the digital divide is multi-dimensional and covers a wide range of issues. Some of the approaches have focused on ICT connectivity, with emphasis on infrastructure. Others have been broader in scope, extending to general e-readiness issues, including e-strategies, ICT literacy, skills and training. Indeed, in a 2004 publication (2004b) the OECD states that the digital divide is progressively shifting from an 'access' divide to a more complex 'use' divide.

68. This article draws heavily from "Unveiling the Digital Divide" Sciadas (2002a, b) and "Monitoring the Digital Divide…and Beyond" (Orbicom, 2003).

259. Even though ICT gaps are also manifested among businesses, whether by sector of activity or firm size, most investigations have focused on people, as if to underscore the social dimension of the challenge. Even there, in reality, many issues exist. A proper appreciation of what is involved requires an understanding of the role of at least two important dimensions: individual ICTs, and variable of interest.

260. There are many ICTs and variables and divides can be identified for any permutation of these. For instance, Internet 'haves' and 'have-nots' can be defined in a number of ways including by income, education, gender, age and geographical location, such as metropolitan or rural areas. Each of these results in the delineation of different groupings of people, with different characteristics. While there is overlap between such groupings, as the same individual or household can be present in many, it is nonetheless important to bear in mind the specific group examined and the reasons for such examination. For instance, connecting rural areas at 'reasonable' cost is non-trivial – especially when broadband is concerned; and the use of the Internet by females of a certain age may be significant in the deployment of specific online services. Clearly, even on the basis of these two dimensions alone, analyses of digital divides can be complex.

261. An additional useful dimension concerns the timing of the introduction of individual ICTs. For example, a telephone divide today must be considered in the context of the age of the technology – in its basic form, the twisted copper pair has been around for over a century. This differs from the divide associated with the Internet, which has been around for only a decade or so in its commercial incarnation. Statistics can support quite instructive analyses of this type and separate reality from hyperbole. They capture the actual time-paths needed for certain levels of penetration to be reached among ICTs – and, indeed, compare them to non-ICT products. These have been shown for Canada by Sciadas (2002a, b) and for several countries by the OECD (2004b).

262. Of policy interest has been the ***magnitude*** of the digital divide but, more importantly due to the implied corrective actions, its ***evolution*** – whether it is closing or widening over time – and at what ***speed*** this is happening.

Types of measurement

263. Two main approaches to the digital divide have emerged in the literature: one examines divides internal to a country, and the other involves cross-country comparisons. Measurement and analytical work have been carried out for both, and methodologies and statistical techniques have been developed.

264. Measurement of internal country digital divides started around the mid 1990s. Initially, the focus was on connectivity, and penetration rates of various ICTs were used to highlight the gaps among groups of people, whether by socio-economic, geographic or other characteristic. The first notable quantification came from the *Falling through the Net: A Survey of the 'Have-Nots' in Urban and Rural America* in the USDOC (1995). This was followed by similar work in several other countries. Of interest were the inequalities among groups delineated by variables deemed to be important determinants of access to and use of ICT, such as income and education, as well as groups of specific interest to individual countries, *e.g.* race in the United States. The OECD carried out substantial work of a comparative nature, based on member country statistics (2001c, d; 2002c), as data were developed based largely on the recommendations found in this *Guide*.

265. Measurement of the digital divide across a large number of countries has been a more difficult area since, by definition, the interest was to benchmark countries at various stages of development, with emphasis on the least developed ones. Not surprisingly, data gaps posed a severe limitation, as little existed in terms of comparable indicators world wide beyond the well-known supply-side ITU data.

266. This practical impediment was coupled with the lack of a conceptual approach that would support meaningful analysis. However, measurements are considered indispensable in the formulation of national and international e-strategies for development and general aggregate measures emerged, both quantitative (World Economic Forum, 2002) and qualitative in nature. These focused mostly on issues of competitiveness and e-readiness and were rather peripheral to the digital divide. With the elevated interest in the development of an instrument that would quantify the digital divide across countries, as well as monitor its evolution, a conceptual framework and an operational model were developed by a consortium of organisations, including UN bodies, led by Orbicom (2002, 2003).

Data requirements

267. The data requirements for internal country and cross-country divides are quite different. For cross-country comparisons, typically indicators at the national level suffice – provided that they are available and sufficiently comparable across a very large number of countries. Like other exercises in international benchmarking and comparisons, this requires aggregation across constituent components. Invariably, in addition to the relevance of the underlying framework, the quality of the output measures will depend on the quality of the input data.

268. For internal country divides, many types of very detailed data are needed to adequately examine aspects of the digital divide in which policy makers and other users are interested. These include data on ICT penetration rates by income percentile, geographical location for regional and urban-rural comparisons, data disaggregated by level of education, gender, age, family type and other characteristics of interest. This is so since it is known that in early stages of ICT diffusion, the characteristics of the user population are different from those of the population at large.

269. Comparing countries based on studies of internal country divides is subject to even more caveats, as the boundaries within which meaningful comparisons can be made are not stable. Income percentiles, for example, reflect different absolute income levels (something that becomes more complex if purchasing powers are invoked), urban-rural splits are subject to different population distributions across countries, as are age distributions, and so on.

270. The analyses described above refer to quantification of the magnitude of the digital divide at a given point in time. However, the more important policy consideration has always centred around the evolution of the divide – that is, whether it is widening or closing. Clearly, for this, time-series data are needed, in addition to the detailed breakdowns mentioned.

271. Yet another policy issue is the speed at which the digital divide is evolving. Tackling this question requires even more detailed data. The degree of accuracy of predictions will be best if based on the most detailed level possible, something that requires information on the historical behaviour of individual groups and specific ICTs.

272. The implications for surveys of the type described in Chapter 6 of this *Guide* are that size and stratification of samples are important for producing detailed estimates that would support these analyses. When the policy focus is on access to ICT, the associated analysis can be well supported by data from household surveys, whereas when use of ICT is concerned, surveys of individuals are definitely the vehicle of choice.

Measurement issues

273. Emerging issues, in their early stages, are invariably characterised by a lack of common nomenclature. The digital divide was no exception: definitions, analytical techniques and comparable methodologies developed gradually and are outlined below.

Internal country divides

274. The 'absolute divide' is the gap between the 'haves' and the 'have-nots'. It can be measured by the absolute number of users (versus non-users) or the overall penetration rates (the proportion of users versus non-users). As penetration increases, the absolute divide diminishes.

275. The 'relative divide' is represented by the difference in penetration rates between different groups (for instance, income groups or groups defined by educational attainment) and is the typical measure used to depict the 'magnitude' of internal country divides.

276. Analyses based on differences in penetration rates among groups of people can provide solid evidence of inequalities, particularly in relation to the newest technologies. One of the lessons learnt, however, is that such conclusions cannot be generalised outside the specific groups examined, as they are subject to several qualifications and caveats. Blanket statements regarding the digital divide at large are not substitutes for differences specific to particular ICTs between well-defined groups.

277. Another measure used to quantify the magnitude of the digital divide has been the 'ratio of penetration rates' – whether between high- and low-income or other groups. With reference to the Internet, for instance, this measure is then interpreted as the 'likelihood' of being connected. In the case of perfect equality, the ratio would be 1; the greater the number, the greater the divide. The basic findings are the same as before; the divide is greater for the newer technologies, especially the Internet, whereas it barely registers for saturated technologies such as television and fixed phone – at least among OECD countries.

278. While there is theoretical justification for differences in penetration rates as a divide measure, this is not the case for the ratios – something that becomes particularly obvious when we move to the analysis of the evolution of the divide. There it can lead to contrary conclusions, and therefore confusing policy messages, as is the case with analyses that rely on the rates of growth (see below).

279. Broadly speaking, the 'evolution' of the divide refers to progress between more and less connected groups. The absence of such a divide would require the penetration rates of a certain ICT to be the same regardless of the group of people examined. This should not be expected to happen in early measures of Internet penetration, though – simply because it is not observed anywhere else.

280. Initially, measures of the 'evolution' of the divide were based on the changes in the differences in penetration rates between groups and time periods (USDOC, 1995). Soon, rates of growth by group were included in this type of analysis (Dickinson and Sciadas, 1997), something that was adopted in subsequent work (*Falling through the Net* (USDOC, 1998, 1999, 2000) and its offspring *A Nation Online* (USDOC, 2002); OECD 2001c, d, 2002c and elsewhere). Although growth measures were meant to add to our understanding of trends and allow us to gain some appreciation of the underlying speed of change, they were not intended to be measures of the evolution of the divide. When interpreted as such, they can lead to controversial and confusing conclusions. For instance, while the change in penetration rates over time can indicate a widening divide, the rates of growth could point to the opposite. Sciadas (2002a, b) dealt with the methodological details in this area and worked out the conditions involved in the relationship between the evolution of penetration rates and rates of growth, as well as the interplay between absolute and relative magnitudes of the divide.

281. Sciadas (2002b) shows how trends of Internet penetration by income can reveal the evolution of the digital divide (as indicated by slope changes over time in the relationship between income and penetration rates).

282. Why are rates of growth and ratios of penetration rates inappropriate for analyses of the evolution of the divide? Historically, the diffusion of new products, technological or not, has been gradual, as early adopters are eventually followed by the rest of the population. Moreover, while the speed of adoption among products differs, their penetration generally follows the pattern of an S-curve. This pattern implies accelerating growth in the initial period, which eventually gives way to decelerating growth.

283. Then, for a period, starting from an initial situation involving unequal penetration rates, rates of growth tend to be higher for the low-penetration groups compared to the high-penetration groups. This leads to lower ratios of penetration rates from one period to the next and can cause unnecessary confusion by casting doubt on the direction of the evolution of the digital divide. Mathematically speaking, for the digital divide to begin to close, the rate of growth of the low-penetration group must be higher than the rate of growth of the high-penetration group by at least as many times as the ratio of the penetration rates of the high- to low-penetration groups in the initial period.

284. Other analytical techniques that have been used to study the evolution of the digital divide include numerical or diagrammatic trend analysis and appropriately adapted Lorenz curves. The former tend to be detailed and apply to specific groups of interest, whereas the latter aim at providing an overall direction of the movement – in the average sense. When inconclusive, due to overlapping curves, Gini coefficients are also constructed (Sciadas, 2002a, b; USDOC 2002; OECD 2004b). It must be emphasised that while useful in the detection of overall movements, Lorenz curves and Gini coefficients cannot unveil the true evolution of the gap between specific groups, as the detailed and direct comparisons necessary are camouflaged under the general trend and go undetected.

285. An important subset of the study of the evolution of the digital divide deals with its underlying **speed**. When the direction of the evolution is found, the next policy question is how fast is it evolving? If, say, the divide is closing, the speed at which this is happening has a direct bearing on the potential timeline and dosage of policy responses.

286. Not much empirical work has been done on this, and inferences involving speed have been drawn rather haphazardly. Sciadas (2002a) made an attempt to develop a theory of growth that accounts not only for the overall S-curve diffusion pattern of new ICTs, but also dissected it with the individual behaviour of different income groups. On the basis of differing behaviours between high- and low-income groups, within the overall pattern of diffusion, the accuracy of the predictions can be improved by postulating growth scenarios specific to each group, as well as factoring in as much as possible the individual ICT's diffusion based on its unique characteristics and available statistical history. More work remains to be done in this area.

287. More methodological information on internal country divides may be found in Sciadas (2002b[69]).

The digital divide internationally

288. The enormous interest in the digital divide issue has been accompanied by a realisation of the dearth of measurement. The international community needed a statistical instrument that could systematically quantify the digital divide and monitor its evolution across a great number of countries, with emphasis on developing ones. This would then make possible policy analyses of countries' relative strengths and weaknesses, and in the process, it would assist in the allocation of investments, as well as serve as a performance assessment tool. It was in that context that a conceptual framework, complete with

69. Available on Statistics Canada's Web site: http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE2002007.pdf.

an operational model, was developed by Orbicom (2002).[70] A full-scale empirical application covering up to 192 countries followed, and was presented at WSIS 2003 (Orbicom, 2003).

289. **The conceptual framework:** The framework starts by recognising the dual nature of ICTs, that is, that they are both productive assets and consumables. In that setting, it proceeds to develop the notions of a country's ***infodensity*** and ***info-use.*** Infodensity refers to the country's overall ICT capital and ICT labour stocks, which are directly linked to the country's productive capacity; info-use refers to ICT consumption flows. The aggregation of the two (as indexes) defines the degree of a country's ***infostate***. The terms are defined as follows:

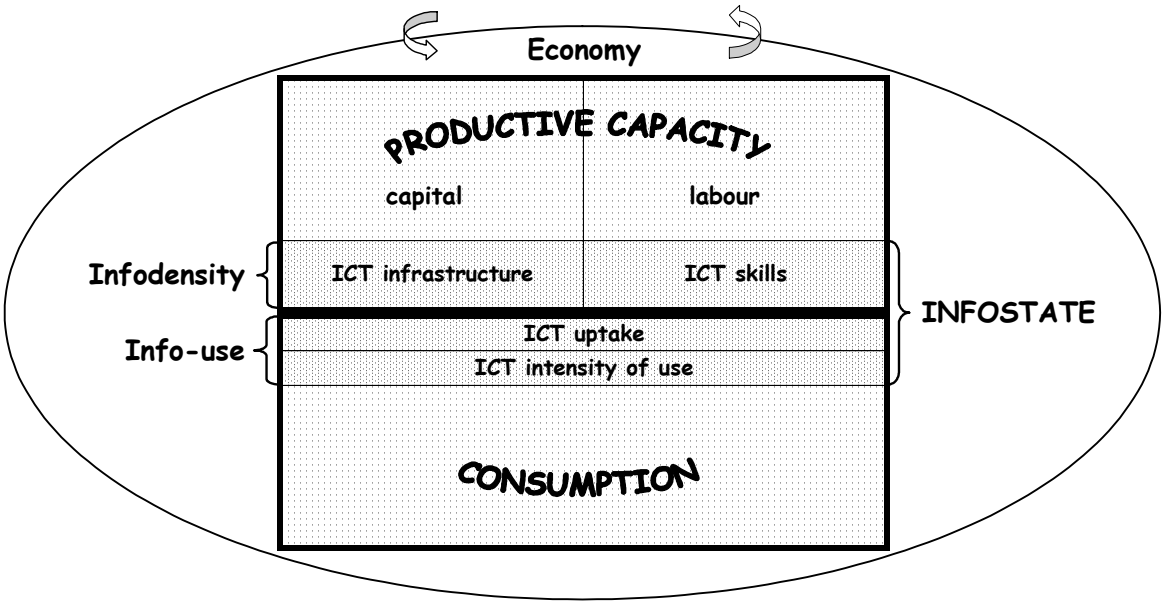
Infodensity = sum of all ICT stocks (capital and labour)

Info-use = consumption flows of ICTs/period

Infostate = aggregation of infodensity and info-use

290. The magnitude of digital divide is then defined as the relative difference in infostates among countries. Figure 4 below provides a schematic of the framework.

Figure 4. A conceptual framework for measuring the digital divide internationally



291. The conceptual framework is further articulated in Orbicom (2003) which also contains comparative country analyses based on the model.

Other cross-cutting areas of policy interest

292. There are a number of areas of information society statistics that are of significant policy interest but have received little or no attention to date from the WPIIS. They include:

70. Orbicom is the International Network of UNESCO Chairs in Communications. It was created by UNESCO and the *Université du Québec à Montréal* in 1994.

- ICT education and skills. Exceptions are relevant classificatory variables and response items in the model surveys of ICT use.[71]

- ICT occupations; and

- Outsourcing, and offshoring more generally (of ICT-related activities and ICT-enabled services).

293. However, other areas of the OECD are doing statistical work in these areas. This work is described briefly below.

OECD work on ICT skills and occupations

294. ICCP has done measurement work on the distribution of ICT skills in the economy, which includes attempts to measure the potential offshoring of jobs (OECD, 2004b; van Welsum and Vickery, 2005a; van Welsum and Vickery, 2005b; van Welsum and Reif, 2005).

295. The first part of the project approximated measures of ICT skills using occupational data. Skills are defined at two levels. The narrow definition is *ICT specialists*, that is, those individuals who have the ability to develop, operate and maintain ICT systems and for whom ICT is the main part of their job. The broad definition includes ICT specialists as well as *basic* and *advanced* ICT users for whom ICT is a tool for their job. *Advanced users* are competent users of advanced, and often sector-specific, software tools. *Basic users* are competent users of generic tools (*e.g.* Word, Excel, Outlook, PowerPoint). In the absence of formal guidance as to ICT content in the various occupational classifications, occupations were chosen on the basis of an assessment of the degree to which workers are expected to use ICT for their own output.

296. Labour Force data on employment by occupation and by industry were then used to calculate the share of ICT-skilled employment in total employment, and by sector. ICT-using sectors are identified by their employment of ICT-skilled personnel. Industries are grouped according to the ICT-skills specialisation of their workforce, or the industry's share of ICT-skilled employment. More information on the project, including the results of data analysis can be found in OECD (2004b) and van Welsum and Vickery (2005a).

297. More recent work by ICCP has considered also potential 'offshoring', recognising that to the extent that sectors outsource work requiring ICT skills, the relationship between the measure of ICT-skilled employment and productivity will be distorted.

298. The same *employment x occupation x industry* data sets are employed to look at selected occupations that use ICT intensively and could potentially be offshored on the basis of 'offshorability' attributes such as:

- Intensive use of ICT.

- Output can be traded or transmitted with the help of ICT.

- Work with a high codifiable information or 'knowledge' content; and

71. The OECD household/individual model survey of ICT use includes level of education as a classificatory variable for ICT use; place of education as a location of Internet use; and use of the Internet by individuals for formal education or training activities. Both the household and business surveys include lack of skills or training as a barrier to Internet use and e-commerce.

- Work that does not necessarily require face-to-face contact.

299. The share in total employment of such occupations is then calculated at the aggregate and the sectoral level. Because classifications are not harmonised across all countries, the trends are more relevant than individual country comparisons. Factors associated with changes in these trends are also analysed. More information on the methodology and results can be found in van Welsum and Vickery (2005b) and van Welsum and Reif (2005).

OECD work on measuring ICT in schools

300. The OECD Directorate for Education, working with member countries, has undertaken work on measuring ICT use by students and teachers at upper secondary schools across a number of OECD countries. The report, released in 2004 (OECD, 2004d), is based on OECD's 2001 *International Survey of Upper Secondary Schools*, which was conducted in Belgium, Denmark, Finland, France, Hungary, Ireland, Italy, Korea, Mexico, the Netherlands, Norway, Portugal, Spain, Sweden and Switzerland. The survey collected information on:

- The accessibility of ICT for students and teachers (availability of computers, the Internet and local networks).
- When ICT applications (standard word-processing and spreadsheet software, the World Wide Web and e-mail) were first introduced to schools.
- The professional development of teachers in ICT and the use of ICT by teachers; and
- The integration of ICT into school curricula.

301. Complementary work was done in 2002 as part of the OECD's 'Schooling for tomorrow' project. This is a case study approach that aims to understand how ICT relates to educational innovation, for instance, instructional reforms that reorient schooling towards processes leading to higher level skills, problem solving and collaborative learning.

302. The OECD's PISA (Programme for International Student Assessment) surveys were conducted in 2000, 2003 and 2006. They are surveys of 15-year-olds in the principal industrialised countries and assess how far students near the end of compulsory education have acquired some of the knowledge and skills that are essential for full participation in society (OECD, 2003e). While the assessments do not currently include computer skills, future plans include an assessment of ICT literacy, possibly in the 2012 survey. The 2000, 2003 and 2006 surveys do include some relevant background information including availability of ICT to students (at home and school) and to teachers, and the use of ICT by students.

OECD work on measuring ICT literacy

303. Results from the 2003 *Adult Literacy and Life Skills Survey* were released in 2005 (Statistics Canada and OECD, 2005). The project was a co-operative effort involving a number of member governments, national statistical offices, research institutions and multi-lateral agencies. The survey follows earlier data collections between 1994 and 1998 and has extended the range of skills measured to include ICT skills. The 2005 release covered the following countries: Bermuda, Canada, Italy, Norway, Switzerland, the United States and the Mexican State of Nuevo Leon. The surveys included a series of self-assessment questions on ICT use, perceptions of experience and degree of comfort with ICT. The 2005 report examined the relationship between ICT use and literacy skills and the determinants of ICT use (such as income, age, gender, educational attainment and occupation).

ICT in a wider context

304. The bigger picture includes – but goes beyond – measurement of aspects of the information society examined in this *Guide*. It includes consideration of cause-and-effect relationships in the information society:

- Factors that influence ICT use and development; and
- Influences that ICT has on society, the economy and the natural environment.

305. Examples of the former include:

- Infrastructure availability.
- Cost of ICT goods and services.
- The ICT policy environment and actions to encourage ICT, for example, to boost the ICT sector, encourage ICT penetration through various means or to enhance competition between suppliers of ICT goods and services.
- Trust that users have in the online environment.
- The education and skills base of the population (specialised and general). Surveys of ICT use by individuals consistently show higher likelihood of use by more educated individuals.
- Labour market supply and costs.
- Innovation and R&D base, entrepreneurship culture and support (private and public).
- A momentum effect driven by penetration of ICT; this includes use of ICT by governments as a means of interacting with users of its services, and a perceived need by individuals and businesses to have ICT in order to 'keep up'.

306. Influences that ICT has on society, the economy and the natural environment are also numerous and include:

- Productivity impacts of ICT investment and use.
- Changes in the structure of economies, for instance, the growth of the ICT and services sectors.
- Changes to employment and the nature of work.
- Impact on globalisation.
- Facilitation of learning (both formal and informal).
- Positive and negative changes in society and social behaviour.
- Positive and negative influences on the natural environment (for instance, reduced reliance on polluting industries but the polluting impact of discarded computer hardware).

307. It is beyond the scope of this *Guide* to examine all these influences on, and resulting from ICT. However, some of the impacts of ICT have been discussed in other chapters as follows:

- The impact of an ICT sector – in Chapter 4.
- ICT and firm performance: productivity impacts – in Chapter 5.
- The impact of ICT on households and individuals – in Chapter 6.

308. Work in the area of measurement of economic and social impacts of ICT (as applied by, or applicable to, national statistical offices) has been summarised in a paper prepared for the 2007 WPIIS meeting (OECD, 2007a).

CHAPTER 9: THE INTERNATIONAL SCENE AND THE ROAD AHEAD[72]

Introduction

309. Measurement of the information society is a relatively new field and much of it is based on concepts, definitions, standards and methods described in this *Guide*. Details of the measurement work done by OECD member countries can be found in Annex 3, while Annex 4 provides details of measurement efforts in a number of non-OECD economies.

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

The international scene

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

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

Context

313. While efforts by member countries were co-ordinated through the OECD and found a common forum in the WPIIS, a number of non-OECD countries started measurement initiatives for the information society in the late 1990s (in some cases, with the support of the OECD through its outreach activities). From the outset, the importance of international comparability was evident and thus regional initiatives were formed, usually with the participation of at least one OECD member country. These initiatives are documented in Annex 4 of this *Guide*.

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

72. This chapter was revised in 2007, with significant contributions from Martin Schaaper of the OECD. Further revisions were applied in 2009 to reflect the work of the Partnership on Measuring ICT for Development.

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

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

317. One of the outcomes from the G8 process was the creation of the Global e-policy Resource Network (see www.epol-net.org), which provides a focal point for global efforts in support of national e-strategies for development.

318. The UN ICT Task Force was created in March 2001 to respond to global concerns regarding the digital divide and to build broad-based partnerships to find ways of spreading the benefits of the digital revolution. Its membership came from the public and private sectors, as well as civil society and the scientific community. One of the activities of the UN ICT Task Force was to form a Working Party on "ICT indicators and MDG Mapping", chaired by Canada, which aimed to map the Millennium Development Goals (MDGs) and its targets to ICT indicators. The group's work focused on two main tracks: ICT indicators development and adoption, and impact measurement and monitoring. A road map for the work of the Task Force was presented at UNCTAD XI (June 2004) (UN ICT Task Force, 2003). The UN ICT Task Force was not set up to be a permanent body and it ceased to exist when its mandate expired at the end of 2005.

319. However, the task of harnessing the potential of ICT for advancing development is not finished. In April 2006, the Global Alliance for ICT and Development (GAID), was approved by The Secretary-General of the UN. "The Alliance responds to the need and demand for an inclusive global forum and platform for cross-sectoral policy dialogue on the use of ICT for enhancing the achievement of internationally agreed development goals, notably reduction of poverty" (see http://www.un-gaid.org).

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

321. By their nature, the Summits provided a forum for the discussion of many aspects of the information society including measurement. The *Plan of Action* stated that: "A realistic international performance evaluation and benchmarking (both qualitative and quantitative) through comparable statistical indicators and research results, should be developed to follow up the implementation of the

objectives, goals and targets in the *Plan of Action*, taking into account different national circumstances" (WSIS, 2003b).

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

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

Direct statistical mobilisation

324. While conferences and other meetings dedicated to the information society have increased over recent years, measurement issues were often subsumed under policy themes and dealt with in a piecemeal fashion. With the exception of the OECD and Eurostat, and the more recent initiatives discussed elsewhere (see Annex 4), there were few international meetings of information society statisticians (OECD/UN/UNDP/World Bank Forum, 2003). However, the need for reliable and comparable statistical information had risen in importance and, indeed, had become a priority, leading to an increased level of attention to measurement issues in recent years.

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

326. The International Telecommunication Union (ITU) organises global telecommunication/ICT indicators meetings every 1.5 to 2 years, bringing together policy makers, regulators and national statistical offices. The purpose of these meetings is to discuss topics related to the identification, definition, collection, processing, dissemination and use of telecommunication/ICT indicators and to enhance collaboration between the different parties involved – at national, regional and international level.

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

would be suitable for all countries, and a decision was made for the creation of a virtual forum that would continue the dialogue (UNCTAD, 2003).

328. Perhaps the most influential meeting aimed at information society statistics on a global scale occurred under WSIS in December 2003. Jointly organised by the UNECE, UNCTAD, ITU, UIS, OECD and Eurostat (UNECE, 2003a, b), the Statistical Workshop on "Monitoring the Information Society: Data, Measurement and Methods" was attended by a great number of countries and representatives from international organisations. It dealt with experiences and needs in monitoring information society statistics and addressed a range of issues, including the role of ICT in economic and social transformation, use of ICT by households and businesses, and the measurement of ICT's social impacts. The necessity of bringing information society measurement into the realm of official statistics was stressed, so that current global gaps could be identified and eventually closed. It was agreed that the first step would be an ICT statistics stock-taking exercise.

329. In addition to conclusions specific to each session, which included the production of this *Guide* by the OECD, the workshop in its deliberations recommended further work towards measuring the information society. In particular, the meeting encouraged countries to collect data in the areas of ICT infrastructure and usage (by individuals and households), barriers to use of ICTs, ICT skills, and purposes of ICT use – while ensuring the disaggregation of these data not only by gender but also by other socio-economic factors such as age, education and income levels, urban/ rural geography, and ethnic background. It further encouraged countries to develop tools to measure the impacts of ICTs, to learn from experiences in other countries and to use conceptual and methodological work developed by those countries and by international organisations.

330. The workshop recommended that data collection in support of indicators for ICT and education should be integrated within systems of official statistics and that education policy makers and administrators should be involved in this process.

331. In concluding, the meeting agreed that the five UN Regional Commissions should, in co-operation with competent regional organisations, commit themselves to organise in 2004, within each region, one ICT-related meeting on the monitoring of information society issues. Both users and producers of official statistics should work together to organise these meetings, intended to provide input for a global summary meeting in early 2005 in order to prepare an action plan for the next WSIS Summit in Tunis. UNCTAD would take the lead in co-ordinating with regional commissions and other regional groups, as well as with the relevant international organisations. The results of the regional meetings would be presented at a statistical side event organised in conjunction with the Tunis Summit (UNECE, 2003b).

Partnership on Measuring ICT for Development

332. In response to the outcome of the WSIS statistical workshop, UNCTAD took on its new task to lead the coordination of international agencies in the area of ICT measurement. Combined with the mandate received by its member states, and in preparation of the UNCTAD XII partnerships on ICT for development, preparatory work to create a new global Partnership on ICT measurement commenced in January 2004. Starting with the three organisations UNCTAD, ITU and OECD (which resulted in the signing of a cooperation agreement on ICT measurement in May 2004), discussions followed with other agencies interested in joining this new global initiative. The main objectives of such a *Partnership* would be to identify a core set of ICT indicators that would be collected by all countries, and harmonised at the international level; and to assist developing countries in building capacity to monitor ICT developments at the national level.

333. The UN Economic Commission for Latin America and the Caribbean (UNECLAC) also followed through on the recommendation of the WSIS event. In collaboration with the Observatory for the Information Society in Latin America and the Caribbean (OSILAC), the UN Statistics Division and other organisations, ECLAC held an inter-agency coordination meeting on information society statistics at the occasion of the occasion of the thirty-fifth session of the UN Statistical Commission, New York, 5 March 2004 and produced a draft questionnaire for stock-taking in its region of responsibility (UNECLAC, 2004a, b). After consultation with the other UN Regional Commissions and the relevant international organisations, the final questionnaire was adopted by four Regional Commissions and UNCTAD (on behalf of UNECE) for stock-taking surveys in their respective regions.

334. As a result of these efforts, on 17 June 2004, the international, multi-stakeholder *Partnership on Measuring ICT for Development* was launched at UNCTAD XI in Sao Paulo, Brazil (UNCTAD, 2004).

335. At the time of its launching, the *Partnership* consisted of the ITU, the OECD, UNCTAD, the UNESCO Institute for Statistics, four UN Regional Commissions (UNECLAC, UNESCWA, UNESCAP and UNECA), the UN ICT Task Force (whose mandate expired at the end of 2005) and the World Bank. Eurostat officially joined the *Partnership* in February 2005, on the occasion of the WSIS Thematic Meeting on Measuring the Information Society. National Statistical offices (NSOs) from advanced countries were invited to contribute to the *Partnership* activities and provide expertise and advice to NSOs from developing economies, and transfer knowledge in areas such as methodologies and survey programmes.

336. The *Partnership* was created to accommodate and further develop various initiatives regarding the availability and measurement of ICT indicators at the regional and international levels. It provides an open framework for co-ordinating ongoing and future activities. The *Partnership* is a joint effort among all stakeholders involved, based on an inclusive approach and the principle of equality among the partners involved. It particularly aims to assist developing economies in their efforts to produce information society statistics by mobilising the resources necessary to build local capacities. Ideally, this will result in an expansion of ICT statistics harmonised internationally, providing a key input to future policy and analytical work on the information society, including the digital divide.

337. The *Partnership* has the following objectives:

- To achieve a common set of core ICT indicators, to be harmonised and agreed upon internationally, which will constitute the basis for a database on ICT statistics.

- To enhance the capacities of national statistical offices in developing economies and build competence to develop statistical compilation programmes on the information society, based on internationally agreed-upon indicators; and

- To develop a global database on ICT indicators and to make it available on the Internet.

338. The first phase of the *Partnership* ran from June 2004 to December 2005. Major events during this period included:

- June 2004: Presentation of a *Partnership* project document (objectives, expected output, proposed activities, partners' main contributions) and launch of the *Partnership* at UNCTAD XI (Sao Paulo, Brazil).

- July/August 2004: Initiation of a global stocktaking exercise through a metadata questionnaire on ICT statistics sent by UNECA, UNECLAC, UNESCAP, UNESCWA and UNCTAD (on behalf

of UNECE) to statistical offices in developing member countries. A parallel exercise for OECD member countries was organised by the OECD, with input from Eurostat.

- October to December 2004: Regional workshops in Western Asia, Africa and Latin America and the Caribbean, to consider the results of the metadata questionnaire and take stock of e-measurement activities in the regions. These workshops identified priority areas for action and made recommendations for a common set of core ICT indicators. Three meetings ultimately took place in this period[73], with inputs also received through other means (such as via e-mail and an Asia-Pacific ICT statisticians meeting held in New Zealand in December 2004). The result was a set of recommendations on core ICT indicators for input into the WSIS thematic meeting held in February 2005.

- February 2005: WSIS thematic meeting on Measuring the Information Society held in Geneva under the umbrella of the *Partnership*, to produce input into the second phase of the WSIS in Tunis (November 2005). The outcomes of the meeting included agreement on a first core list of ICT indicators (*Partnership*, 2005a), with agreement to develop others reflecting the broader information society (in areas such as education, health and government.[74]

- March 2005: Presentation of the core list of ICT indicators and a *Partnership* progress report at the meeting of the UN Statistical Commission (New York).

- Regional meetings in Western Asia and Latin America and the Caribbean[75]; and

- November 2005: Second phase of WSIS in Tunis. A parallel event on Measuring the Information Society was held on 15 November. This global event brought together ICT stakeholders at national, regional and international levels. The objectives of the meeting were:

  – To present the core list of indicators – which were agreed upon in the February meeting – to policy makers, together with an accompanying methodological document (*Partnership*, 2005b).[76]

  – To debate the importance of measuring the information society for ICT policy making and development; and

  – To launch the publication "Measuring ICT: The Global Status of ICT Indicators" (*Partnership*, 2005c). This publication presents the results of the global stocktaking exercise on ICT indicators carried out in 2004.

339. Building on the achievements of the first phase of the *Partnership*, the second phase started in January 2006 and ran until 2008. The outcomes of the General Assembly high-level plenary meeting on the

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73. These meetings were an ESCWA meeting in Beirut, 4-5 October 2004, a joint ECA/ITU meeting in Gaborone, Botswana, 26-29 October 2004, and a joint ECLAC/ICA meeting in Santiago de Chile, 3-4 November 2004.

74. Papers from the meeting are available on UNCTAD's Web site: http://measuring-ict.unctad.org.

75. These meetings were a joint ESCWA/ITU Regional Capacity-building Workshop on Information Society Measurements in June 2005 in Beirut and the Second Regional Workshop on Information Society Measurement in Latin America and the Caribbean in Santo Domingo (Dominican Republic), organised by ECLAC in October 2005.

76. The current (2008) core list of ICT indicators has been included in Annex 5.

MDGs (September 2005) and of WSIS Tunis (November 2005) were incorporated in the planning of the second phase of the *Partnership*.

340. The objectives of the second phase are unchanged, but with a different focus. It includes efforts to:

- Continue to raise awareness among policy makers on the importance of statistical indicators for monitoring ICT policies and carrying out impact analysis.
- Expand the core list of indicators to other areas of interest, such as ICTs in education, government and health.
- Conduct technical workshops at the regional level to exchange national experiences and discuss methodologies, definitions, survey vehicles and data collection efforts.
- Assist statistical agencies in developing economies in their ICT data collection and dissemination efforts, including the development of national databases to store and analyse survey results; and
- Develop a global database of ICT indicators and make it available on the World Wide Web.

341. Four Task Groups were formed to progress these issues: a Task Group on education indicators, a Task Group on government indicators, a capacity building Task Group and a Task Group on database issues. Each Task Group is led by a volunteering organisation, and includes the partner organisations that are involved in the respective activities, as well as any others that wish to participate. Other developments are:

- The *Partnership* submitted a report containing a short overview of its work and the core list of ICT indicators to the 38th session of the UN Statistical Commission (February 2007). The Commission endorsed the *Partnership* core list and encouraged countries to use this core list of indicators in their data collection programmes (UNSC, 2007).
- A Memorandum of Understanding was signed by all *Partnership* members in 2007, with the objective of further strengthening the institutional commitment of the Partners and to provide guidelines to new members wishing to join the *Partnership*.
- A programme on technical assistance and capacity building for developing economies was established and is being carried out.
- The release in 2008 of a publication that brought together available data on the core ICT indicators (*Partnership*, 2008a).
- The core list of ICT indicators was revised in 2008 (*Partnership*, 2008b).
- A list of indicators for ICT in education was proposed by UIS (which leads the Task Group on education indicators) and was added to the core list, on its revision in 2008.

OECD's role in the Partnership

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

- The collection and provision of metadata information for OECD countries as part of the global stocktaking exercise.

- Assistance with the development of a common list of core ICT indicators (for instance, Schaaper, 2003).

- Assistance with methodological work associated with the core indicators through several means, including this *Guide* (for instance, Roberts, 2005a, b).

- Contribution to the development of training material for capacity building, in particular by providing material from this *Guide*; and

- Participation in the development of a global database of ICT indicators, mainly by providing data for OECD countries and for some non-OECD countries.

Future challenges for the OECD

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

  - E-business and e-commerce (see the discussion in Chapter 5).

  - ICT expenditure and investment (see Chapter 5).

  - ICT education and skills, and ICT occupations (see Chapter 8).

  - Outsourcing (see Chapter 8).

  - Trust in the online environment (see Chapter 8).

  - Social and economic impacts of ICT (a discussion can be found in Chapters 4, 5 and 6; see also the paper on this topic prepared for the WPIIS 2007 meeting, DSTI/ICCP/IIS/(2007)1); and

  - Following significant activity during 2006 and 2007 to update ICT sector and product classifications and to introduce new classifications for 'content and media', the challenge remains for member countries and the OECD to compile data using these classifications.

Conclusion

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

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

346. It is frequently argued that the reality of developing economies is different; therefore, adaptations must be introduced to existing statistical recommendations prior to their implementation. The appropriateness of the household unit as a unit of observation is just one example. In the context of developing economies, the argument goes, the notion of a household is not the same considering the housing situation, the more communal attitudes of people and the generally larger family size. It is acknowledged that there will be areas where cultural and structural differences will necessitate adaptation, both for national needs and international relevance. Annex 5 of this *Guide* provides recommendations to developing economies concerning the applicability of the concepts elaborated in this *Guide* and in some cases discusses possible adaptations.

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

348. The creation of the *Partnership on Measuring ICT for Development*, bringing together most of the relevant international organisations as well as some NSOs of developed countries, has been an important step in bringing the methodology developed by the developed world to developing economies. At the same time, this development will also allow developing economies to contribute to the global stock of knowledge and to aid in future developments. The *Partnership* has set itself some ambitious goals, which, if met, will help to close part of the data gap that exists between developed and developing economies.

ANNEX 1A: OECD CLASSIFICATIONS OF INFORMATION ECONOMY PRODUCTS[77]

Introduction

349. The OECD information economy product classifications have been developed in stages, commencing with an ICT goods classification in 2003. In 2006, the first ICT services classification was released and in late 2008, a complete set of information economy products, based on the Central Product Classification Ver. 2 was agreed.[78]

350. The 2008 list includes both *ICT* products and *Content and media* products. Both lists include goods as well as services.

351. As Figure 5 illustrates, the information economy classifications were developed separately – and at different times. The main reasons for this were:

- The lack of appropriate international standard classifications; in particular an ICT services classification only became possible once the CPC Ver. 2 was developed, and

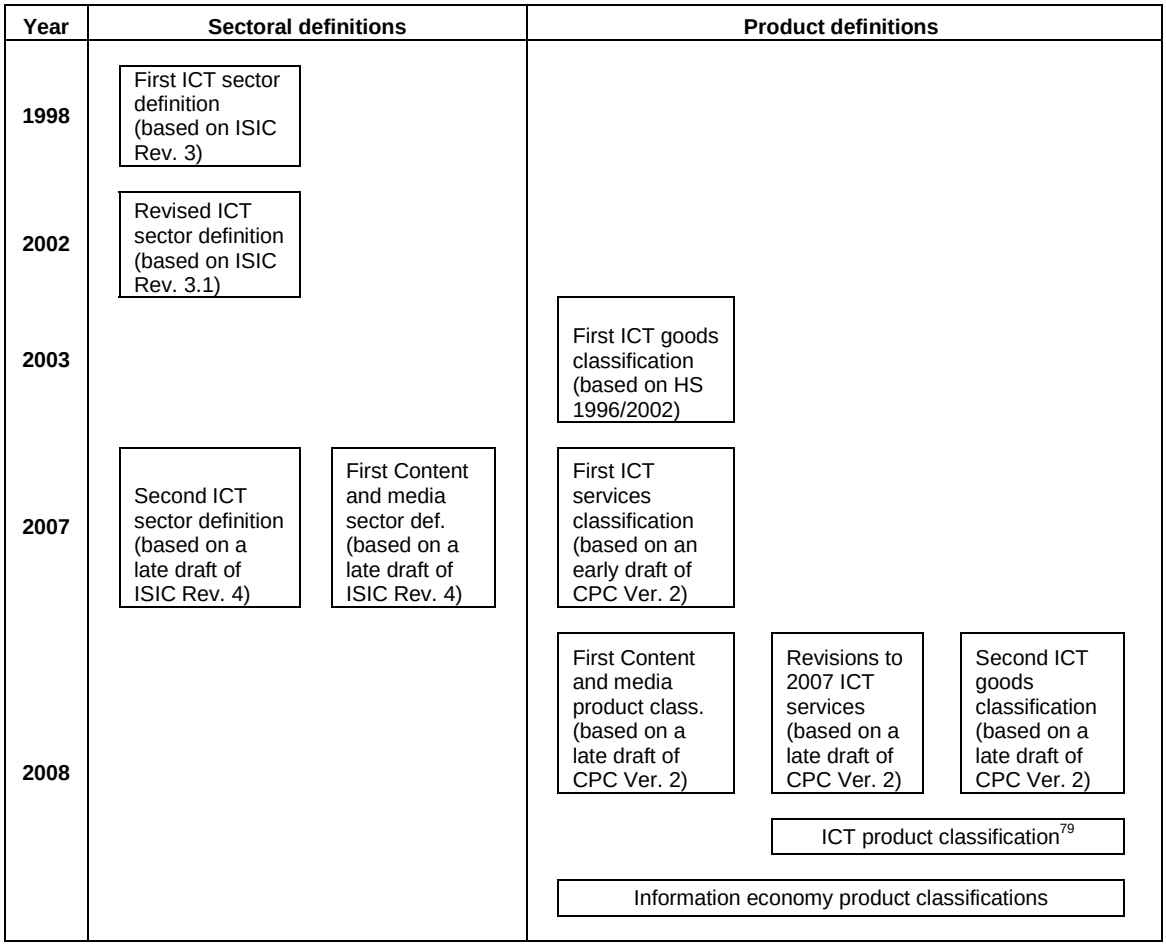
- The lack of an agreed definition of the Content and media sector and associated guiding principles effectively prevented development of a classification of content and media products until 2006; in addition, the underlying product classification, the CPC, was not sufficiently detailed to support the classification until Ver. 2 was developed.

352. Figure 5 provides a diagrammatic representation of the sector and product information economy definitions and classifications produced by WPIIS over time.

77. This annex includes the ICT and Content and media product classifications agreed in 2008 and finalised in early 2009. They are based on the final version of the United Nations Central Product Classification Ver. 2. The work was carried out by an expert group co-ordinated by Sheridan Roberts, a consultant to OECD.

78. It was revised slightly in January 2009 because of a number of small changes made to the underlying classification (the CPC Ver. 2) in late 2008.

Figure 5. OECD information economy sectoral and product definitions



ICT product classifications[80]

ICT goods

353. The main reason to have a classification of ICT goods is to facilitate the construction of internationally comparable indicators on ICT consumption, investment, trade and production. The first OECD classification of ICT goods was finalised in December 2003 (OECD, 2003a).[81] It may be found in the 2005 edition of the *Guide* along with information on its development.

79. A split between ICT goods and services is shown in this diagram for comparative purposes. However, there is no actual split in the ICT product definition.

80. The words 'list' and 'definition' have also been used to describe the information economy product classifications. They are generally equivalent. In this *Guide*, 'definition' in the context of product classifications has been used to describe the guiding principle, rather than the set of categories (which is described as a 'classfiication').

81. It was limited to goods because, the only available international standard at that time, the UN's Central Product Classification (Ver. 1.1), made no mention of core ICT services such as Web hosting and application provisioning.

354. WPIIS work on an ICT goods classification started in 1998. Several papers were written on this topic by Eurostat and discussed over the 1998-2000 period at meetings of the WPIIS. At its meeting in May 2003, the WPIIS discussed a revised list of ICT goods – presented by Canada [OECD Internal Working Document, DSTI/ICCP/IIS(2003)1]. Comments made during and after the meeting were taken into consideration in drafting the final list.[82] The proposal was declassified by ICCP on 15 December 2003 (OECD, 2003a).

355. The guiding principles used to develop the 1998 ICT sector definition (and its revision of 2002) were applied to the 2003 ICT goods classification. This was appropriate given that these principles emphasised the intended use or functionality of products. The guiding principle for the delineation of the ICT sector led to a definition of ICT goods as follows:

> 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.

356. Another guiding principle was to use existing classification systems in order to take advantage of existing data sets and therefore ensure the immediate use of the proposed standard. In this case, the underlying system was the widely used Harmonized System (HS) used for trade statistics.

ICT services

357. Complementing the 2003 ICT goods classification, there was an obvious need for an ICT services classification. In the case of service products, the most obvious international standard is the UN's Central Product Classification (CPC).

358. At the WPIIS meeting of April 2004, Statistics Canada presented a proposal for an ICT services classification based on the North American Product Classification System (NAPCS) (OECD, 2004a). The concept underlying the list of ICT industries was used to develop the list of ICT services. As for ICT goods, this is considered reasonable since the industry concept is based on characteristics of products.

359. The 2004 WPIIS meeting agreed to forward the Canadian proposal to the United Nations Technical Subgroup (of the Expert Group on International Economic and Social Classifications), subject to minor changes, so that it could be taken into account for the 2007 revision of the CPC. Most of the WPIIS proposed changes were adopted and included in a draft of the revised CPC that was circulated for comment in July 2005. The UN Statistical Commission adopted an amended structure at its March 2006 meeting, with the essence of the WPIIS proposal retained – except for software, which appears in different areas of the CPC, depending on its nature and mode of delivery.

360. An ICT services classification based on an early draft version of the CPC Ver. 2 was developed in 2006 and released in 2007. It was subsequently amended in the course of development of a complete ICT products classification (which was based on a later version of the CPC Ver. 2).

A complete set of information economy products

361. The ICT sector definition was revised in 2006 (and released in 2007), when ISIC Rev. 4 became available. A definition of a Content and media sector was developed in conjunction with the ICT sector,

82. The draft list discussed at the May 2003 WPIIS meeting was expressed in terms of the Harmonized System (HS) 1996 classification. The final 2003 list was also expressed in terms of HS 2002. Only a small number of categories were affected by the change.

also based on ISIC Rev. 4. The information economy sectoral definitions can be found in Annex 1b. Agreement on the information economy sectors led the way to development of a set of information economy products.

362. The same expert group that worked on the information economy sectoral definitions developed the product classifications.[83] In respect of the principles used to determine the product lists, the assumption was made that products of the information economy sector[84] should be included, and that products that are not output of the sector should be excluded, unless there is a compelling case for their exclusion/inclusion respectively.

363. Members of the expert group were amenable to taking a majority approach to reach agreement. A product was included where a strong majority view prevailed, irrespective of the corresponding industry. Where the majority was not so clear, other considerations were taken into account.

The ICT product classification[85]

364. The following guiding principle was used to identify ICT products (it is adapted from the agreed guiding principle for the ICT sector):

> ICT products must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display.

365. The main features of the ICT product classification can be summarised as follows (OECD, 2008a):

- One product of the ICT manufacturing industry was excluded from the ICT products list. It is *Connectors for optical fibres, optical fibre bundles or cables* and is linked to the ISIC class 2610 (Manufacture of electronic components and boards). The exclusion followed agreement by the expert group to exclude the related product *Optical fibres and optical fibre bundles; optical fibre cables (except those made up of individually sheathed fibres*) etc.
- Four products that are linked to an ICT and a non-ICT manufacturing industry were excluded with the strong majority support of the expert group, and two products with one link (of several) to an ICT industry were also excluded.
- Two goods that are not products of an ICT industry were included, based on strong majority support and for consistency with other inclusions. They are *Digital cameras* and *Other recording media, including matrices and masters for the production of disks*.
- All of the products of ICT services industries are in either the ICT or the Content and media products list.
- Several ICT services were included in the Content and media products list because the expert group considered that they are more similar to content than ICT. They are the three games software products (38582, 47822 and 84391) of ISIC class 5820 (Software publishing) and the Web portals industry product, *Web search portal content*.

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83. With some changes in membership.

84. A product is taken to be a product of an industry if its CPC Ver. 2 code (subclass) is linked (in the CPC) to the ISIC class representing that industry.

85. The material in this section is taken from OECD (2008).

- A small number of services that are not products of ICT industries were included in the ICT products list. They are: three ICT leasing or rental services, *Business process management services, Engineering services for telecommunications and broadcasting projects* and two ICT installation services.
- The ICT product classification does not have a specific goods/services split (though, for trade statistics purposes, it is clear which products are goods).

366. The specific issues that arose during the expert group's deliberations on the ICT products list and their resolution were as follows:

- ICT manufacturing services (where physical inputs are owned by others). These are shown as products of the relevant ICT manufacturing industries. The question of whether such services are ICT goods or services was debated but the issue was effectively resolved by including the five ICT manufacturing services subclasses in a broad category (Manufacturing services for ICT equipment) within the ICT product definition (that is, not splitting the ICT products list into ICT goods and ICT services).

- *Burglar or fire alarms and similar apparatus*. There was some debate on the inclusion or exclusion of this product. It was ultimately included because it is a product of the ICT sector.

- Exclusion of products with links to both ICT and a non-ICT industries. It was considered that such products should be included or excluded based on their nature rather than a link to an ICT industry. As a consequence, four products that are linked to an ICT and a non-ICT manufacturing industry were excluded, with strong majority support of the expert group. They are electrical capacitors, resistors and their parts. Two products with one link (of several) to an ICT industry have also been excluded. They are: *Parts and accessories for the goods of subclasses 45141, 45142 and 45160 (except covers, carrying cases and the like)* and *Parts for the goods of subclasses 46910, 46921 and 46929; electrical parts n.e.c. of machinery or apparatus* (for both these subclasses, only one of the three cited products is an ICT product).
- Inclusion of products without a link to ICT industries. Several goods were proposed as ICT products even though they are not products of the ICT sector. These products were debated by the expert group and most were ultimately excluded. The excluded products are the electrical apparatus product, 46212, and co-axial and optical fibre cables (46320 and 46360 respectively). Two out-of-industry products were included in the list based on strong majority support. They are *Digital cameras* and *Other recording media, including matrices and masters for the production of disks*.

- ICT installation services. *Installation services of personal computers and peripheral equipment* is a product of the ICT sector but was not included in the original ICT services definition. The expert group agreed to include it in the ICT product definition, along with two other installation services (covering installation of mainframe computers and radio, television and communications equipment) for consistency, even though these are not products of the ICT sector.

- *Maintenance and repair services of computers and peripheral equipment* (87130) was included in the original ICT services definition but the related product *Maintenance and repair services of telecommunication equipment and apparatus* (87153) was not. Both are products of the ICT sector and the expert group agreed that they should both be in the ICT products list. The group was divided on whether to include 87155 *Maintenance and repair services of consumer electronics*, a product of ISIC class 9521 that was excluded from the ICT sector for largely

pragmatic reasons. It was ultimately agreed to exclude it from the product classification given that it is an out-of-industry product and there was not strong support for its inclusion.

- ICT leasing or rental services (subclasses 73123, 73124, 73125 and 73210). There are no corresponding industries in the ICT sector definition. However, 73123 and 73124 were included in the original ICT services classification. The inclusion of 73123 (*Leasing or rental services concerning office machinery and equipment (excl. computers) without operator)* was reviewed by the expert group and excluded because it was considered too broad. However, two other leasing or rental services were included (*Leasing or rental services concerning telecommunications equipment without operator* – 73125, and *Leasing or rental services concerning televisions, radios, video cassette recorders and related equipment and accessories* – 73210).

- The expert group agreed to include *Engineering services for telecommunications and broadcasting projects* (83325) in the ICT product list (it is not a product of the ICT sector, nor included in the original ICT services classification). The group agreed to retain the subclass *Business process management services* (83117), which was in the original ICT services classification but is not a product of the ICT sector.

- There are several wholesale trade services subclasses in the CPC that relate to ICT and Content and media products. None of these is included in the IE product classifications for the following reasons: the value of wholesale trade services will generally be included in the value of goods transactions; and it is likely that, statistically, wholesale trade services are not distinguishable by type. Retail trade services are excluded as well, in this case because retail trade industries are specifically excluded from the sectoral definitions.

367. The ICT product classification has 10 broad categories and 99 products. Table 4 below shows the complete classification as revised in January 2009.

Table 4. ICT products

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Computers and peripheral equipment		
45142	2620	Point-of-sale terminals, ATMs and similar machines
45221	2620	Portable automatic data processing machines weighing not more than 10 kg, such as laptop and notebook computers
45222	2620	Personal digital assistants and similar computers
45230	2620	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

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Computers and peripheral equipment (continued)		
45240	2620	Automatic data processing machines presented in the form of systems
45250	2620	Other automatic data processing machines whether or not containing in the same housing one or two of the following types of units: storage units, input units, output units
45261	2620	Input peripherals (keyboard, joystick, mouse etc.)
45262	2620	Scanners (except combination of printer, scanner, copier and/or fax)
45263	2620	Inkjet printers used with data processing machines
45264	2620	Laser printers used with data processing machines
45265	2620	Other printers used with data processing machines
45266	2620	Units performing two or more of the following functions: printing, scanning, copying, faxing
45269	2620	Other input or output peripheral devices
45271	2620	Fixed media storage units
45272	2620	Removable media storage units
45289	2620	Other units of automatic data processing machines
45290	2620	Parts and accessories of computing machines
47315	2620	Monitors and projectors, principally used in an automatic data processing system
47550	2620	Solid-state non-volatile storage devices
Communication equipment		
46921	2630	Burglar or fire alarms and similar apparatus
47211	2630	Transmission apparatus incorporating reception apparatus
47212	2630	Transmission apparatus not incorporating reception apparatus
47213	2630	Television cameras
47221	2630	Line telephone sets with cordless handsets
47222	2630	Telephones for cellular networks or for other wireless networks
47223	2610, 2630	Other telephone sets and apparatus for transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)
47401	2630	Parts for the goods of subclasses 47221 to 47223
Consumer electronic equipment		
38581	2640	Video game consoles
47214	2640	Video camera recorders
47215	2670	Digital cameras
47311	2640	Radio broadcast receivers (except of a kind used in motor vehicles), whether or not combined with sound recording or reproducing apparatus or a clock
47312	2640	Radio broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles
47313	2640	Television receivers, whether or not combined with radio-broadcast receivers or sound or video recording or reproducing apparatus
47314	2640	Monitors and projectors, not incorporating television reception apparatus and not principally used in an automatic data processing system
47321	2640	Sound recording or reproducing apparatus
47323	2640	Video recording or reproducing apparatus

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Consumer electronic equipment (continued)		
47330	2640	Microphones and stands therefor; loudspeakers; headphones, earphones and combined microphone/speaker sets; audio-frequency electric amplifiers; electric sound amplifier sets
47402	2640	Parts for the goods of subclasses 47321, 47323 and 47330
Miscellaneous ICT components and goods		
45281	2610	Sound, video, network and similar cards for automatic data processing machines
47130	2610	Printed circuits
47140	2610	Thermionic, cold cathode or photo-cathode valves and tubes (including cathode ray tubes)
47150	2610	Diodes, transistors and similar semi-conductor devices; photosensitive semi-conductor devices; light emitting diodes; mounted piezo-electric crystals
47160	2610	Electronic integrated circuits
47173	2610	Parts for the goods of subclasses 47140 to 47160
47403	2630, 2640, 2651	Parts for the goods of subclasses 47211 to 47213, 47311 to 47315 and 48220
47530	2680	Magnetic media, not recorded, except cards with a magnetic stripe
47540	2680	Optical media, not recorded
47590	3290	Other recording media, including matrices and masters for the production of disks
47910	2680	Cards with a magnetic stripe
47920	2610	"Smart cards"
48315	2610, 2670	Liquid crystal devices n.e.c.; lasers, except laser diodes; other optical appliances and instruments n.e.c.
48354	2610, 2670	Parts and accessories for the goods of subclass 48315
Manufacturing services for ICT equipment		
88741	2610	Electronic component and board manufacturing services
88742	2620	Computer and peripheral equipment manufacturing services
88743	2630	Communication equipment manufacturing services
88744	2640	Consumer electronics manufacturing services
88749	2680	Magnetic and optical media manufacturing services
Business and productivity software and licensing services		
47811	5820	Operating systems, packaged
47812	5820	Network software, packaged
47813	5820	Database management software, packaged
47814	5820	Development tools and programming languages software, packaged
47821	5820	General business productivity and home use applications, packaged
47829	5820	Other application software, packaged
73311	5820	Licensing services for the right to use computer software
83143	5820	Software originals
84341	5820	System software downloads
84342	5820	Application software downloads
84392	5820	On-line software

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Information technology consultancy and services		
83117	7020	Business process management services
83131	6202	IT consulting services
83132	6202	IT support services
83141	6201	IT design and development services for applications
83142	6202	IT design and development services for networks and systems
83151	6311	Website hosting services
83152	6311	Application service provisioning
83159	6311	Other hosting and IT infrastructure provisioning services
83161	6202	Network management services
83162	6202	Computer systems management services
Telecommunications services		
84110	6110, 6120	Carrier services
84121	6110	Fixed telephony services – access and use
84122	6110	Fixed telephony services – calling features
84131	6120, 6130	Mobile telecommunications services – access and use
84132	6120, 6130	Mobile telecommunications services – calling features
84140	6110, 6120, 6130, 6190	Private network services
84150	6110, 6120, 6130, 6190	Data transmission services
84190	6110, 6120, 6130, 6190	Other telecommunications services
84210	6110	Internet backbone services
84221	6110, 6120, 6130, 6190	Narrowband Internet access services
84222	6110, 6120, 6130, 6190	Broadband Internet access services
84290	6110, 6120, 6130, 6190	Other Internet telecommunications services
Leasing or rental services for ICT equipment		
73124	7730	Leasing or rental services concerning computers without operator
73125	7730	Leasing or rental services concerning telecommunications equipment without operator
73210	7729	Leasing or rental services concerning televisions, radios, video cassette recorders and related equipment and accessories
Other ICT services		
83325	7110	Engineering services for telecommunications and broadcasting projects
87130	9511	Maintenance and repair services of computers and peripheral equipment
87153	9512	Maintenance and repair services of telecommunication equipment and apparatus
87331	3320	Installation services of mainframe computers
87332	6209	Installation services of personal computers and peripheral equipment
87340	3320	Installation services of radio, television and communications equipment and apparatus

Note: The CPC codes, titles and ISIC links presented above are from the 31 December 2008 version of the Central Product Classification (Ver. 2). In the unlikely case of further changes to the CPC, the final official codes, titles and ISIC links will prevail.

The Content and media product classification[86]

368. The following guiding principle was used to identify Content and media products (adapted from the definition used to determine the Content and media sector):

> Content corresponds to an organised message intended for human beings published in mass communication media and related media activities. The value of such a product to the consumer does not lie in its tangible qualities but in its information, educational, cultural or entertainment content.

369. The main features of the Content and media products classification can be summarised as follows (OECD, 2008a):

- All of the products of the Content and media sector were included in the list.
- Four products of the ICT sector were included in the Content and media products list. They are the three games software products and, the product, *Web search portal content* (see ICT products for details).
- Four products that are not from the Content and media (nor ICT) sector were included in the Content and media products list based on majority support and consistency arguments.

370. The specific issues that arose during the expert group's deliberations on the Content and media products list and their resolution were as follows:

- The inclusion of ICT sector products in the Content and media products list. Four products of the ICT sector were included in the Content and media products list, with the strong agreement of expert group members. The three games software products (38582, 47822 and 84391) are products of ISIC class 5820 (Software publishing). The expert group agreed that such software is more similar to content than ICT. The ICT sector product, *Web search portal content* was included in the Content and media product list as it is considered to be a content, rather than an ICT, product.

- The interpretation of the term "related media activity" in the guiding principle. This covered products such as "sale of advertising space" and "licensing services". Most are products of the Content and media sector and were included in the classification. Three products that are not from the Content and media (nor ICT) sector were included, for consistency. They are: *Full service advertising* and *Purchase or sale of advertising space or time, on commission* (both products of 7310, Advertising), and *Advertising and related photography services*, which is a product of 7420 (Photographic activities).

- Whether some of the products of 5819 *Other publishing activities* complied with the guiding principle, that is whether they are an "… organised message intended for human beings published in mass communication media …". Ultimately, all of these products were included.
- *Leasing or rental services concerning video tapes and disks* (subclass 73220). There is no corresponding industry in the Content and media sector and the group thought that the product is equivalent to a retail service so excluded it from the Content and media products list.

86. The material in this section is taken from OECD (2008).

- Originals. There are several products in the CPC that can be described as "content originals". These constitute the original source of "content" and most have been included. Those excluded were not products of the Content and media sector and were considered marginal by the expert group (the products: *Photographic plates, film, paper, paperboard and textiles, exposed but not developed*, *Photographic plates and film, exposed and developed, other than cinematographic film;* and *Paintings, drawings and pastels; original engravings, prints and lithographs; original sculptures and statuary, in any material*). One original product that is not a product of the Content and media sector has been included – *Original works of authors, composers and other artists except performing artists, painters and sculptors*, a product of ISIC class 9000.

- Wholesale and retail trade services relating to Content and media products were excluded. See the discussion under ICT products above.

371. The Content and media product classification has six broad level categories and 74 products. Table 5 below shows the complete classification as revised in January 2009.

Table 5. Content and media products

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Printed and other text-based content on physical media, and related services		
32210	5811	Educational textbooks, in print
32220	5811	General reference books, in print
32230	5812	Directories, in print
32291	5811	Professional, technical and scholarly books, in print
32292	5811	Children's books, in print
32299	5811	Other books n.e.c., in print
32300	5813	Newspapers and periodicals, daily, in print
32410	5813	General interest newspapers and periodicals, other than daily, in print
32420	5813	Business, professional or academic newspapers and periodicals, other than daily, in print
32490	5813	Other newspapers and periodicals, other than daily, in print
32511	5811	Maps and hydrographic or similar charts (including wall maps, topographical plans and maps for globes), printed, other than in book-form
32530	5819	Printed or illustrated postcards; printed cards bearing personal greetings or messages, with or without envelopes or trimmings
32540	5819	Printed pictures, designs and photographs
32620	5819	Trade advertising material, commercial catalogues and the like
32630	5819	Transfers (decalcomanias) and printed calendars
47691	5811	Audio books on disk, tape or other physical media
47692	5811, 5812, 5813	Text-based disks, tapes or other physical media
83631	5812, 5813	Sale of advertising space in print media (except on commission)
Motion picture, video, television and radio content, and related services		
38950	5911	Motion picture film, exposed and developed, whether or not incorporating sound track or consisting only of sound track
47620	5911	Films and other video content on disks, tape or other physical media
83632	6010, 6020	Sale of TV/radio advertising time (except on commission)
84611	6010	Radio broadcast originals
84612	6020	Television broadcast originals
84621	6010	Radio channel programmes
84622	6020	Television channel programmes
84631	6010, 6020	Broadcasting services
84632	6010, 6020	Home programme distribution services, basic programming package
84633	6010, 6020	Home programme distribution services, discretionary programming package

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Motion picture, video, television and radio content, and related services (continued)		
84634	6010, 6020	Home programme distribution services, pay-per-view
96121	5911, 6020	Motion picture, videotape and television programme production services
96122	5920, 6010	Radio programme production services
96123	5911, 5920	Motion picture, videotape, television and radio programme originals
96131	5912	Audiovisual editing services
96132	5912	Transfers and duplication of masters services
96133	5912	Colour correction and digital restoration services
96134	5912	Visual effects services
96135	5912	Animation services
96136	5912	Captioning, titling and subtitling services
96137	5920	Sound editing and design services
96139	5912	Other post-production services
96140	5913	Motion picture, videotape and television programme distribution services
96150	5914	Motion picture projection services
Music content and related services		
32520	5920	Music, printed or in manuscript
47610	5920	Musical audio disks, tapes or other physical media
96111	5920	Sound recording services
96112	5920	Live recording services
96113	5920	Sound recording originals
Games software		
38582	5820	Software cartridges for video game consoles
47822	5820	Computer game software, packaged
84391	5820	On-line games
On-line content and related services		
73312	5812	Licensing services for the right to use databases
83633	5813, 5819, 6311, 6312	Sale of Internet advertising space (except on commission)
84311	5811	On-line books
84312	5813	On-line newspapers and periodicals
84313	5812	On-line directories and mailing lists
84321	5920	Musical audio downloads
84322	5920	Streamed audio content
84331	5911	Films and other video downloads
84332	5911	Streamed video content
84393	5819	On-line adult content
84394	6312	Web search portal content
84399	5819	Other on-line content n.e.c.

CPC Ver. 2 subclass	ISIC Rev. 4 class	Product description (CPC subclass title)
Other content and related services		
47699	5920	Other non-musical audio disks and tapes
73320	5811, 5813, 5911, 5912, 5920, 9000	Licensing services for the right to use entertainment, literary or artistic originals
83611	7310	Full service advertising
83620	7310	Purchase or sale of advertising space or time, on commission
83639	5811, 5812, 7310	Sale of other advertising space or time (except on commission)
83812	7420	Advertising and related photography services
83940	5812	Original compilations of facts/information
84410	6391	News agency services to newspapers and periodicals
84420	6391	News agency services to audiovisual media
85991	6399	Other information services
89110	5811, 5812, 5813, 5819, 5820, 5920	Publishing, on a fee or contract basis
96330	9000	Original works of authors, composers and other artists except performing artists, painters and sculptors

Note: The CPC codes, titles and ISIC links presented above are from the December 2008 version of the Central Product Classification (Ver. 2). In the unlikely case of further changes to the CPC, the final official codes, titles and ISIC links will prevail.

ANNEX 1B: OECD DEFINITIONS OF THE INFORMATION ECONOMY SECTORS[87]

Introduction

372. This annex is based on summary records of, and papers presented to, the WPIIS and its predecessor, the *Ad hoc* Meeting on Indicators for the Information Society (under the aegis of the ICCP Statistical Panel). The annex firstly provides a brief history of OECD and member country work on the ICT sector definition including: deliberations leading to its agreement, the original (1998), revised (2002) and current (2007) definitions of the sector and some practical notes on data collection. Secondly, it provides a discussion of deliberations on a 'content' sector, leading to agreement on a definition of a Content and media sector in 2007.

373. Importantly, the information economy sector includes the industries in both the ICT and the Content and media sectors.

374. The United Nation Statistics Division (UNSD) agreed to integrate the OECD's information economy sector definitions into the 2007 ISIC as an alternative aggregate. This presented an opportunity to encourage the use of these standards outside the boundaries of the OECD, a goal supported by the Committee for Information, Computer and Communication Policy (ICCP) and in line with the outreach strategy embraced at the World Summits on the Information Society (2003 and 2005).

The ICT sector definition

History

375. While a definition of the ICT sector had been considered by the OECD before 1997, we start this history with the first meeting of the precursor to the WPIIS in 1997. The *Ad hoc* Meeting on Indicators for the Information Society took place in June 1997, with a major agenda item being consideration of a definition for the ICT sector. A paper on the topic was presented by Canada [OECD Internal Working Document, DSTI/ICCP/AH(97)2] who informed the meeting of the definition adopted by Canada, based on the Standard Industrial Classification (SIC). The classification consisted of relevant industry classes in *Manufacturing* and *Services.*

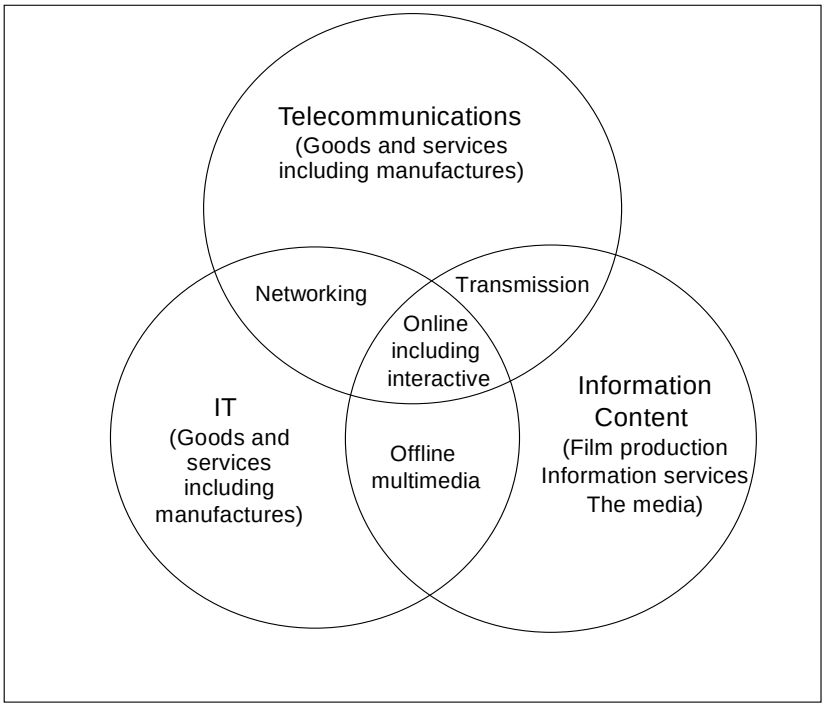
376. The reaction of the meeting was positive, especially in relation to the manufacturing industries in the definition. In relation to services, there was some debate over whether the definition should be expanded to include electronic content producing industries.

377. Measurement of the ICT sector was again a major focus for the 1998 *Ad hoc* Meeting on Indicators for the Information Society. A paper from Australia [OECD Internal Working Document, DSTI/ICCP/AH(98)1] proposed a definition of the ICT sector and explored issues such as specialisation

87. This annex was revised in 2007, with the main changes reflecting the work done during 2006 (and released in 2007) on revising the ICT sector definition and developing a definition of the Content and media sector (see OECD, 2006a). The work was carried out by an expert group co-ordinated by Daniel April of Statistics Canada.

ratio (the proportion of businesses in an industry that have ICT activity), the fact that ICT products will also be produced by enterprises that are not classified to ICT sector industries, and the overlap of the ICT sector with content industries. This was illustrated by the figure reproduced below.

Figure 6. Overlap between the information technology, telecommunications and information content activities of firms (adapted from a Finnish model)



378. In referring to Figure 6, the paper proposed that "Conceptually … the ICT Sector can be viewed as the activities which fall into the union of the Information Technology and Telecommunications activities in the diagram above. It includes therefore the intersections between them and the Information Content activities. However it excludes those Information Content activities which fall outside those intersections; that is, those which have no direct ICT association."

379. The Australian paper proposed a set of information industries that could be included by countries wishing to incorporate content-producing industries. The paper also proposed part industries for inclusion in the ICT sector.

380. Following discussion of this paper plus other contributions from Australia, the Nordic countries and the European Commission's Task Force on Information Society Statistics [OECD Internal Working Document, DSTI/ICCP/AH/RD(98)1], the meeting agreed "to pursue a two-stage approach to developing an industry definition. In the first phase the focus would be on industries and then, in the second phase, a product-based definition would be used to further refine the industry definition at a later date. It was also agreed that to reach agreement a pragmatic, step-by-step approach would need to be adopted where initially an industry definition for ICT would be pursued and then, once achieved, a broader definition of the 'information economy' would be developed that included not only ICT but also content industries." In relation to the inclusion of part classes, it was decided, for pragmatic reasons, that "no parts of classes would be included in the definition." In respect of guiding principles that describe ICT industries, principles proposed by the United Kingdom were discussed and modified [OECD Internal Working Document, DSTI/ICCP/AH/M(98)1/REV1].

381. Agreement was fairly readily reached on inclusion of the following industries:

- 30 Manufacture of office, accounting and computing machinery.
- 32 Manufacture of radio, television and communication equipment and apparatus.
- 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.
- 6420 Telecommunications.
- 7123 Renting of office machinery and equipment (including computers); and
- 72 Computer and related activities.

382. Other industries attracted more debate as follows:

- ISIC 3130 *Manufacture of insulated wire and cable* was questioned because of its inclusion of transmission cable for electric power. However, because of the perceived growing importance of optic fibre cables, it was agreed to include this industry with the understanding that there would have to be a footnote on historical time series alerting users that because of technological change and the advent of optic fibres the nature of this industry had changed significantly over time.
- After a lengthy discussion, it was agreed to exclude ISIC 9213 *Radio and Television Activities*. However, where transmission of radio and television programmes was done as part of the work of a business classified to ISIC 9213, the transmission activities would be included. In those cases, it should be included with a footnote attached to 6420 indicating that the activity of this industry is classified to 9213.
- It was agreed that the definition of the ICT sector would not include content industries but that future work would focus on industries that would be added to an industry definition of ICT to form a definition for the information economy.
- In the case of ISIC 5150 *Wholesale of machinery, equipment and supplies,* ISIC Rev. 3 does not have sufficient subcategories to allow a differentiation between ICT equipment wholesaling and the wholesaling of other equipment (*e.g.* industrial machinery). To avoid this problem, delegates agreed to include 5150 but to report data only for the relevant ICT wholesaling activity by using more detailed national classifications (*e.g.* NACE 5143, 5164 and 5165). The more narrow national classifications used would be noted in a footnote.
- In relation to retailing, because very few retailers exclusively sell ICT products, it was agreed to postpone the inclusion of 5233 *Retail sale of household appliances, articles and equipment* until a goods definition was available.

An agreed definition (1998)

383. With the conclusion of the discussion at the 1998 *Ad hoc* Meeting on Indicators for the Information Society, an industry definition of ICT was established as shown in Box 3 below. The definition was subsequently agreed and declassified by the parent body, the ICCP Committee.

Box 3. Agreed definition of the ICT sector, 1998 (based on ISIC Rev. 3)

The list of industries below was approved by delegates attending the Second *Ad Hoc* Meeting of Indicators for the Information Society under the aegis of the ICCP Statistical Panel.

The definition is a compromise, limited to those industries which facilitate, by electronic means, the processing, transmission and display of information, and it excludes the industries which create the information, the so-called 'content' industries. The definition permits the immediate gathering of statistics for international comparison in an area of considerable policy importance because of deregulation and technological change. The statistics and their comparison will contribute to the work of the next stage of the Panel which is the development of a similar list of content industries and a classification of products which belong to the information and communication technology (ICT) sector.

On the basis of this decision, it was further decided that the definition being proposed would not include any 'parts' of industries but would rather include the entire industry even though in some cases the latter might not be strictly an ICT activity. Exceptions to this general rule, could be considered whenever it was felt, by the majority of countries, that the complete exclusion of an industry would mean the exclusion of a significant number of businesses which are producing ICT goods and services. A set of principles was adopted that would provide a conceptual basis to the selection of industries chosen as 'ICT'.

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 use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process. Components primarily intended for use in such products are also included.

For service industries, the products of a candidate industry must be intended to enable the function of information processing and communication by electronic means.

In the view of the members of the Panel, the 'information economy' consists of the economic activities of those industries that produce content, and of the ICT industries that move and display the content. These economic activities include the use of information and of ICT products by both people and business. The 'information society' includes the social impact of the information economy. These 'working definitions' were seen as a means to promote discussion of the definitions of the constituent parts and of their boundaries. They could not be seen as final until agreement had been reached on the parts. The next steps in building indicators for the information society is agreement on a definition of the content industries which, when added to the ICT definition, will provide a working definition of the information economy. At the same time, the Panel will develop a classification of ICT products which will permit the gathering of statistics on the ICT output of industries not included in the definition.

The proposed definition of ICT includes the following ISIC Rev. 3 industries:

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

Services – goods related

5150	Wholesale of machinery, equipment and supplies[88]
7123	Renting of office machinery and equipment (including computers)

Services – intangible

6420	Telecommunications[89]
7200	Computer and related activities

Source: OECD Internal Working Document, DSTI/ICCP/AH/M(98)1/REV1.

88. Countries were asked to include only those sub-sectors that directly provide ICT wholesaling services.

A revised definition (2002)

384. Review papers were presented to the 2001 and 2002 meetings of the WPIIS. The 2002 paper [OECD Internal Working Document, DSTI/ICCP/IIS(2002)2] was very detailed and built on findings reported in the 2001 paper [OECD Internal Working Document, DSTI/ICCP/IIS(2001)4].

385. The 2002 paper considered country experiences on specialisation ratios for industries in the ICT sector. Industries found to have low ratios were: *Renting of office machinery and equipment (including computers)*, *Manufacture of insulated wire and cable* and *Manufacture of industrial process control equipment*. However, a sensitivity analysis of indicators of the two ICT manufacturing industries showed that the inclusion or the exclusion of those classes from the definition does not make a large difference.

386. The 2002 meeting discussed revisions to the definition but agreed only to a refinement of ICT wholesaling that became possible because of changes in the 2002 revision of ISIC (to Rev. 3.1). The split followed the acceptance of an OECD Secretariat proposal put to the United Nations Technical Subgroup (TSG) of the Expert Group on Economic and Social Classifications and resulted in three classifications replacing the old class 5150. Two of those new classifications defined the wholesaling of ICT products, as follows:

- ISIC 5151 Wholesale of computers, computer peripheral equipment and software.
- ISIC 5152 Wholesale of electronic and telecommunications parts and equipment.

387. Following the changes to wholesale described above, the definition changed as shown below.

Box 4. 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

89. Where countries include telecommunication activities as part of radio and television activities (ISIC 9213), radio and television activities (9213) should be included in this definition.

A complete revision (2006-07)[90]

388. The year 2006 was an opportune time for a review of the ICT sector. Not only were ICT product classifications agreed (goods in 2003 and services in 2006), but the 2007 revision of the ISIC (to Rev. 4) was effectively completed by March 2006, when the structures were approved by the United Nations Statistical Commission (UNSC).

389. The OECD was an active participant in the ISIC revision process and the revised classification incorporated improvements to ICT industry classes.

390. Proposals for the revision of the ICT sector definition (and for a new 'content and media' sector definition) were presented to the May 2006 meeting of the WPIIS [DSTI/ICCP/IIS(2006)2]. While the Working Party was not in a position to finalise the proposals, it agreed on a process to fast track an outcome. Delegates were given a month to send in their suggestions and a group of volunteer experts was given the mandate to resolve any outstanding issues and finalise proposals.

391. The expert group was chaired by Daniel April (Canada), vice chair of WPIIS. The members were: Marc Aufrant (France), Yves Froidevaux (Switzerland), Troels Burchall Henningsen (Denmark), Jeong-Eon Kim (South Korea), Martin Mana (OECD), Ron McKenzie (New Zealand), John Burns Murphy (United States), Lea Parjo (Finland), Sheridan Roberts and Sid De (Australia). In its deliberations, the group considered comments received from WPIIS delegates and Eurostat following the May 2006 meeting. Eurostat submitted its conclusion based on deliberations of its Working Group on ICT sector statistics and on a wide consultation of European countries. In total, 28 member countries provided input.

392. There was no immediate consensus on the list of industries that define the ICT sector. The delegations that replied directly to the OECD supported a narrower list of industries, but the proposed scope varied from one delegation to the next. The majority of European countries preferred a broader definition, but again the scope varied somewhat by country.

393. The debate concerned the suitability of the conceptual basis for the definition, the so-called guiding principles, and the interpretation of these principles.

394. In the case of goods producing industries, the most basic questions were:

- Should the scope of the definition be limited to industries producing products intended to fulfil the functions of information processing and communication *or* should the definition include industries producing products that use electronic processing to detect, measure, record or control a physical process?

- If a choice was made for the broader approach, how could the scope of the definition be justified given that more and more products incorporate technologies that use electronic processing?

395. In the case of services producing industries, the debate concerned the interpretation of the guideline more than the guideline itself. The existing guideline reads "The products of a candidate industry must be intended to enable the function of information processing and communication by electronic means." The determination of what constitutes an "enabling" service or technology represented the main challenge.

90. Much of the material in this section is taken from OECD (2006a).

396. In addition to conceptual issues, participants in the consultation process raised a number of pragmatic concerns including time series continuity, the clarity of messages to users, and the availability and confidentiality of relevant statistics.

397. WPIIS delegates, Eurostat and the UNSD all agreed to accept the conclusions of the expert group. Members of the expert group settled on an approach to choose among a number of options that emerged during the consultation phase.

ICT manufacturing industries

398. The starting point for the expert group's discussion was the proposal presented to the 2006 WPIIS meeting and comments that followed. There was broad support for the inclusion of the following industries of ISIC Rev. 4:

Group	Class	Title
261	2610	Manufacture of electronic components[91]
262	2620	Manufacture of computers and peripheral equipment
263	2630	Manufacture of communication equipment
264	2640	Manufacture of consumer electronics
268	2680	Manufacture of magnetic and optical media

……and the exclusion of the following industry:

266	2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment

399. The most fundamental issue discussed was that of industry 2651 – Manufacture of measuring, testing, navigating and control equipment (see the discussion above). Similar industries[92] were included in the 2002 definition because they produce goods that "use electronic processing to detect, measure and/or record physical phenomena or to control a physical process".

400. The debate centred on how to rationalise the inclusion of this industry while excluding others that also use electronic processing to perform some detection, recording or process control. A prevailing argument was that it would become increasingly difficult to distinguish industries that do so in a significant way from those that do so in an incidental way, given that ICTs are embedded into a growing number of products produced by a variety of industries.

401. The contrary view was that the exclusion of industry 2651 represented a significant departure from the existing definition, one that could be difficult to explain to users and that would change the message given by statistical indicators.

402. The expert group was ultimately swayed by the first argument and chose to exclude this industry from the definition. By doing so, it changed the guiding principle agreed to in 1998. The revised guiding principle excludes the second element and is:

91. In a later version of ISIC Rev. 4, the title changed to *Manufacture of electronic components and boards.*

92. ISIC 3312 – Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment and 3313 – Manufacture of industrial process control equipment.

For manufacturing industries, the products of a candidate industry must primarily be intended to fulfil the function of information processing and communication by electronic means including transmission and display.

403. In taking its decision, the expert group noted that ISIC Rev. 4 significantly restructured some of the industries of ISIC Rev. 3.1 (3312 and 3313 in particular) that are included in the ICT sector definition. The restructuring would make it very difficult to produce consistent time series when ISIC Rev. 4 is implemented. In that context, the argument for maintaining time series continuity is not as strong as it may appear. The group also noted that the narrower definition will lead to a clearer message, and therefore more useful analysis.

404. There was also a debate concerning the inclusion of ISIC 2731 – Manufacture of fibre optic cable. Those in favour of including this industry in the definition claimed that fibre optic cables are an integral part of telecommunication networks. Others argued that while cables do transport information in electronic format, they are passive components that do not fulfil any electronic processing of information. This functionality is made possible by network equipment. Furthermore, some participants expressed concern about the availability of statistics for this industry, and others about the existence of such an industry.

405. The case was presented that if a choice was made to include manufacturers of fibre optic cable in the ICT sector, it should also include manufacturers of other electronic and electric wires and cables (ISIC 2732) for two reasons: these products perform the same or a similar function and the producers of cable often produce more than one type.

406. The expert group accepted the arguments to exclude ISIC 2731 from the ICT sector definition.

ICT repair industries

407. The proposal submitted for discussion to the 2006 meeting included the following industries:

Group	Class	Title
951	9511	Repair of computers and peripheral equipment
	9512	Repair of communication equipment
952	9521	Repair of consumer electronics
331	3313	Repair of electronic and optical equipment

408. There was broad support for the inclusion of relevant repair activities in the ICT sector. Repair is seen as an activity that enables the function of information processing and communication by electronic means. However, many expressed concerns about the availability of statistics for these industries, especially those subsumed within industry groups (3-digit categories). For that reason, there was more reluctance for the inclusion of ISIC 9521 – Repair of consumer electronics (one of several industries within industry group 952 – Repair of personal and household goods). There was also little support for the inclusion of ISIC 3313 – Repair of electronic and optical equipment, especially given that optical equipment manufacturing is excluded from ICT manufacturing industries.

409. The options that emerged for the expert group to consider were:

- Option 1 – Industries 9511 and 9512.
- Option 2 – Industries outlined in option 1 plus 9521.

410. Although the repair of consumer electronics should logically be included in an ICT repair aggregate (consumer electronics manufacturing is included), the expert group noted the concern of many countries regarding data availability and chose Option 1, which excluded that industry from the ICT sector.

ICT trade industries

411. The proposal submitted to the 2006 meeting included the following industries:

Group	Class	Title
465	4651	Wholesale of computers, computer peripheral equipment and software
	4652	Wholesale of electronic and telecommunications equipment and parts
	4659	Wholesale of other machinery and equipment
474	4741	Retail sale of computers, peripheral units, software and telecomm. equipment in special stores
	4742	Retail sale of audio and video equipment in specialized stores

412. There was broad support for the inclusion of relevant wholesale industries in the definition. The rationale for including ICT wholesale in the current definition is that organisations manufacturing ICTs in some OECD countries are often distributors of ICTs in other countries. The argument was that a business such as IBM should be included in the ICT sector in all countries, irrespective of the relative importance of its various ICT related activities (manufacturing, software development, IT infrastructure service or IT distribution services). This argument explains the continued support for the inclusion of wholesale activities. There was, however, little support for the inclusion of class 4659, which was seen as too broadly defined to be a useful component of the definition.

413. There is no similar argument for ICT retail industries, nor the same level of support for the inclusion of retail activities in the ICT sector. Those who argue for inclusion generally do so for the purpose of consistency. Those against inclusion tend to argue that specialty stores' low share of the total ICT retail market means that statistics are incomplete and therefore somewhat misleading.

414. The options that emerged for the expert group to consider were:

- Option 1 – Industries 4651 and 4652
- Option 2 – Industries outlined in option 1 plus 4741
- Option 3 – Industries outlined in option 2 plus 4742

415. The expert group accepted the arguments to exclude specialty retail activities from the ICT sector definition and chose the first option.

ICT services industries

416. The proposal submitted to the 2006 meeting included the following industries:

Group	Class	Title
582	5820	Software publishing
601	6010	Radio broadcasting
602	6021	Television broadcasting
	6022	Cable, satellite and other subscription programming
611	6110	Wired telecommunications activities
612	6120	Wireless telecommunications activities
613	6130	Satellite telecommunications activities
619	6190	Other telecommunications activities
620[93]	6201	Computer programming activities
	6202	Information technology consultancy activities and computer facilities management activities
	6209	Other information technology service activities
631	6311	Data processing, hosting and related activities
	6312	Web portals

417. The inclusion of telecommunications (Division 61), computer programming activities (industry group 620) and information service activities (industry group 631) was not questioned. It was accepted that the products of those industries are intended to enable the function of information processing and communication by electronic means.

418. The discussion focused on software publishing and broadcasting industries, in particular whether these industries should be classified to the ICT services grouping or to a proposed Content and media sector.

419. On different occasions during the ISIC and CPC revision consultation processes, WPIIS and some national delegations made the point that software publishing (ISIC 5820) comprises at least two distinct components – the publishing of productivity software and the publishing of multimedia software. Ideally the publishing of multimedia software would be classified to the Content and media sector. This type of software is designed to inform, educate or entertain. It has more in common with other types of 'content' products such as newspapers, television programmes, films or musical recordings. Productivity software on the other hand is designed to facilitate information processing and seems more appropriately classified with technology-centric services such as telecommunications or hosting services.

420. However, at this point in time, the option to make that distinction is not available because ISIC recognises only one software publishing industry that produces both types of software. Given this constraint, the expert group recommended the inclusion of this industry in ICT services.

421. The discussion on broadcasting was essentially about its defining characteristic. Broadcasting results from a set of activities including the development of channels and programming (scheduling, commissioning and production) and the transmission of those programs. Those activities are sometimes vertically integrated. The transmission aspect of broadcasting clearly enables the processing and communication of information, like other activities classified in the ICT services grouping. The

93. Some titles in this group changed in a later draft of ISIC Rev. 4.

development and programming aspects of broadcasting are of a very different nature and have more in common with those of other content industries such as publishing or film production.

422. The expert group and the majority of delegations were of the opinion that the development of channels and programming is the defining characteristic of establishments classified in ISIC Division 60, Programming and broadcasting activities. This Division was therefore assigned to the Content and media sector.

423. The changing nature of broadcasting, in particular the transmission aspect of broadcasting, and the potential impact of these changes on industry classification was also discussed. The case of IPTV[94] in particular was brought up. The incidental classification of IPTV in ICT services is coherent with the principle of the proposed classification since it is essentially a transmission activity. The same observation applies to mobile TV, another new mode of broadcasting.

424. However new modes of broadcasting are at an early stage of development. The clear distinction seen today between the transmission activity and the content development activity may well blur in the future, and establishments classified in other industries could join the IPTV market. If and when these changes materialise, it will be important for statisticians to develop the tools (including classifications) to track the phenomenon.

425. Box 5 below shows the revised ICT sector definition.

94. IPTV is a system whereby a digital television signal is delivered using the Internet protocol. It can take various forms and can be delivered over different types of networks, but it is most commonly commercially supplied over closed network architectures (DSL or VDSL television by telecom operators and digital television by cable operators). Those establishments are typically classified in ISIC Division 61 – Telecommunications. They do not usually engage in the development of channels and programming, only in the transmission of channels and programming developed by others.

Box 5. The 2006-07 OECD ICT sector definition (based on ISIC Rev. 4)[95]

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
- 6110 Wired telecommunications activities
- 6120 Wireless telecommunications activities
- 6130 Satellite telecommunications activities
- 6190 Other telecommunications activities
- 6201 Computer programming activities
- 6202 Computer consultancy and computer facilities management activities
- 6209 Other information technology and computer service activities
- 6311 Data processing, hosting and related activities
- 6312 Web portals
- 9511 Repair of computers and peripheral equipment
- 9512 Repair of communication equipment

Variables for collection of ICT sector statistics

426. The specification of information to be collected about the ICT sector and the consequent definition of variables was not a consideration of the WPIIS. However, it has arisen as a practical matter as data on the subject have been compiled by the OECD.

427. In its early data collection work on the ICT sector, the OECD collected information on, and defined, the following variables: Capital expenditure, Employment, Number of enterprises, Production, Research and development, Value added, Wages and salaries, Business sector value added and Business sector employment. For those interested, the definitions are available from the OECD publication *Measuring the ICT Sector* (OECD, 2000).

428. More recently, OECD is accepting definitions of those variables that are compatible with countries' National Accounts tables.

95. From OECD (2006a). The codes and titles were checked against the final (November 2008) version of ISIC Rev. 4.

429. As part of a change to its approach to collection of ICT sector data, OECD is reviewing the definition of the total business sector. As the ICT sector is an activity-based definition, a total business sector defined by activities may be preferable as a denominator, rather than a total business sector defined on an institutional basis.

Potential collection difficulties for the ICT sector

430. Some participating countries have encountered the following problems in applying the 2002 OECD ICT sector definition:

- For countries that do not use ISIC Rev. 3.1 (or NACE Rev. 1) to classify economic units, there may be some correspondence issues that need to be addressed.

- For confidentiality reasons, some countries may be unable to report data for telecommunications services. Aggregation into total ICT services (which is the level at which OECD generally tabulates ICT sector data) will often solve this problem.

431. The first dot point above is less likely to be a problem with the 2007 (ISIC Rev. 4) version of the definition because the definition is narrower and more focused on ICT activities. The second dot point is likely to still apply (though with an increase in the size of the telecommunications industry in most countries, may reduce in significance).

Implementation of the revised definition

432. Implementation of the 2006-07 ICT sector definition is not feasible until a majority of OECD countries are using ISIC Rev. 4 in their national statistical systems. Until then, the 2002 version will continue to be used as a basis of data collection.

The Content and media sector definition

History

433. The WPIIS started working on a definition of 'content' industries in 1998. A brief history of this work is presented here.[96]

- **1997 meeting** – The need for a definition of the Content sector is highlighted. At its first meeting, the ICCP Statistical Panel (later WPIIS) discussed the development of an activity-based ICT sector definition. Several delegates at that meeting expressed a desire to see the definition expanded to include content-producing industries.

- **1998 meeting** – A step-by-step approach is adopted. It was agreed that to "reach agreement a pragmatic, step-by-step approach would need to be adopted where initially an industry definition for ICT would be pursued and then, once achieved, a broader definition of the 'information economy' would be developed that included not only ICT but also content industries" [OECD Internal Working Document, DSTI/ICCP/AH/M(98)1/REV1]. Having this in mind, it was agreed to exclude the content related ISIC 2230 (Reproduction of Recorded Media) and 9213 (Radio and Television Services) from the proposed definition of the ICT sector (except where transmission

96. The notes in this section are adapted from the 2004 Secretariat paper, OECD Internal Working Document, DSTI/ICCP/IIS/(2004)7, which used WPIIS summary records from 1998 to 2003, and the summary record of the 2004 WPIIS meeting. Additional material was added in respect of events occurring after 2004.

of radio and television programs was done as part of the work of a business classified to ISIC 9213).

- **1999 meeting** – A 'broad' definition of the content sector. At the 1999 WPIIS meeting, Canada and France presented a proposal for an activity-based definition of the Content sector "Defining the Content Sector: a Discussion Paper" [OECD Internal Working Document, DSTI/ICCP/IIS(99)1]. This proposal was based on the new concept of a 'communication product', defined as the combination of medium and content. The term 'communication' was preferred to the term 'information' because the latter refers to a particular type of content. It was also suggested that, in order to define the content sector, it is important to distinguish the 'creator' and 'promoter' of the communication product; the promoter being the taker of the risk for marketing the communication product. Delegates felt that the proposed industry definition of the Content sector was too broad and would lead to inappropriate statistical information being compiled. There was considerable discussion on the principles guiding a definition of content activities as outlined in the OECD Internal Working Document, DSTI/ICCP/IIS(99)1, particularly whether an activity could be included in the definition if it only had the capacity to produce communication products, without necessarily being involved in their production. The consensus among delegates was that more work in the elaboration of these basic principles was needed. Delegates also made the point that content goods and services could be produced by many industries but generally only as a small part of their total activities.

- **2000 meeting** – From 'content sector' to 'electronic content sector and electronic communication products'. At the 2000 WPIIS meeting, the Secretariat presented a paper that argued for defining "the electronic content sector and electronic communication products" [OECD Internal Working Document, DSTI/ICCP/IIS(2000)1] and then discussed how these might best be measured. Some delegates were concerned that the electronic content sector as defined would not really answer the questions being asked by their users. Some questioned whether an electronic content sector existed at all. Finally other delegates thought that a better approach might be to treat the electronic content sector, not as a separate sector but as merely one component of an overall content sector. It was argued that this would lead to a much more useful set of outputs including measurement of the transition to an electronic information society. France, on the other hand, was in favour of adopting the approach outlined in the paper [OECD Internal Working Document, DSTI/ICCP/IIS/M(2000)1].

- **2001 meeting** – A 'narrow' definition of a content sector and the need to look at products that can be delivered electronically. Following the 2000 discussion, a new French-Canadian discussion paper, "The Content Sector: Outline and Features" was presented to the 2001 meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2001)5]. 'Content' was defined as:

  - An organised message intended for human beings.
  - Resulting from an organised production activity.
  - Combined with, or carried by, a medium.
  - Whose diffusion is not restricted to a list of privileged recipients.
  - Whose diffusion requires a communication medium, *i.e.* a mass diffusion medium; and
  - Also requires the intervention of a publisher, that is, of a publishing business.

These criteria had led the authors to identify a set of industries whose principal activity would be the publishing of content products. Some member countries were not enthusiastic about limiting the process to what were termed 'publishing industries' and the proposal was put that the issue be broadened to all products that could be delivered electronically. The argument was that economic consequences of electronic delivery were of considerable policy importance. Several delegates expressed interest in enlarging the set of industries to education, health services and other industries where ICT is having a profound impact on the way the product is delivered. The United States proposed an alternative approach of focusing on electronic delivery of content and services by particular sectors [OECD Internal Working Document, DSTI/ICCP/IIS/RD(2001)13]. It was also argued that the user requirements for data on the supply side should not be disconnected with the ones guiding measurement on the demand side. In the latter area, an interest in the issues of banking, education and access to government services on line had clearly emerged.

- **2002 meeting –** The topic of 'content' was not on the agenda. However, during the 2002 meeting under the agenda item "Measuring activities and products in the information economy", France tabled a room document [OECD Internal Working Document, DSTI/ICCP/IIS/RD(2002)10] where an attempt was made to delimit the Information economy. This paper defined the information economy as the sum of the ICT sector and the content sector and proposals for criteria for these sectors and related products were introduced.

- **2004 meeting** – The Secretariat produced a paper in the context of examining user needs and measurement challenges more generally [OECD Internal Working Document, DSTI/ICCP/IIS/(2004)7]. The paper summarised past WPIIS efforts in the area of content and presented some options for future work. There were two reasons cited in the paper for re-engaging in the discussion. The first related to the need to strengthen the link between WPIIS work and policy needs for measurement. The second related to the potential opportunity offered by the 2007 revisions of the CPC and ISIC. Importantly, the paper extended the debate to digitised products. The outcome of the meeting was that the OECD would initiate an exploratory collection of the supply of some information/digital products and refine questions on digital products contained in the ICT use surveys.[97]

- **2006 meeting –** A proposal for a 'content and media' sector definition based on the draft ISIC Rev. 4 was put to the 2006 WPIIS meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2006)2]. With the more widespread inclusion of an 'information' sector or similar in industrial classifications (including ISIC Rev. 4), it was considered likely that agreement on a definition of the sector could be reached. The development of a content and media sector definition occurred during 2006.

- **2007** – The Content and media sector definition was released (OECD, 2006b).

An agreed definition (2006-07)[98]

434. The interest in the 'content sector' originated in the belief that the rapid transformation and diffusion of information and communication technologies would have a significant impact on industries that create and distribute content (*e.g.* text, audio, video), particularly those that create and distribute

97. Only the second of these tasks was completed.

98. Much of the material in this section is taken from OECD (2006a).

content to a wide audience. The structural changes seen since then in the distribution of news, music and video are good examples of those impacts.

435. In 2002, the North American Industry Classification System (NAICS) introduced an information sector within its structure. That represented a significant departure from the tradition in that it brought together industries that were previously seen as belonging to different sectors of the economy: publishing, motion picture and sound recording, broadcasting and telecommunications, information services and data processing. The common thread between those industries is that they all include organisations primarily engaged in the creation and dissemination (except by wholesale or retail methods) of information and cultural products, or in providing the means to process and disseminate those products.

436. While the initial version of the North American Industry Classification System used to be the only classification to recognise an information sector, it is now an integral part of the latest ISIC and NACE as well as national classifications (*e.g.* the Japanese classification and, the Australian-New Zealand classification).[99] Thus, there is a growing recognition of the close tie between industries that create and disseminate mass market information and cultural products in their various forms (content industries) and the industries that provide the means to disseminate those products (ICT industries).

437. A proposal was submitted to the 2006 WPIIS meeting for discussion [OECD Internal Working Document, DSTI/ICCP/IIS(2006)2]. It included the following ISIC Rev. 4 industries:

Group	Class	Title
181		**Printing and service activities related to printing**
	1811	Printing
	1812	Service activities related to printing
182	**1820**	**Reproduction of recorded media**
581		**Publishing of books, periodicals and other publishing activities**
	5811	Book publishing
	5812	Publishing of directories and mailing lists
	5813	Publishing of newspapers, journals and periodicals
	5819	Other publishing activities
582	**5820**	**Software publishing**
		Content retail trade
	4761	Retail sale of books, newspapers and stationary
	4762	Retail sale of music and video recordings
		Content renting
	7722	Renting of video tapes and disks
591		**Motion picture, video and television programme activities**
	5911	Motion picture, video and television programme production activities
	5912	Motion picture, video and television programme post-production activities
	5913	Motion picture, video and television programme distribution activities
	5914	Motion picture projection activities
592	**5920**	**Sound recording and music publishing activities**

438. Though this particular proposal was not retained, there was near unanimous support for the adoption of a content and media sector definition. In particular, there was broad support for a definition

99. Although the sector is not identical from one classification to the other, the underlying principles are very similar.

that includes all industries of Division J of ISIC (Information and communication) except those that are already included in the ICT sector definition.

439. There was some debate over the placement of multimedia software publishing and broadcasting activities, with the former eventually included in the ICT sector (because ISIC does not recognise a separate multimedia software industry) and the latter in the Content and media sector. Details can be found in the discussion on the ICT sector definition above.

440. The resulting agreed definition of the Content and media sector is shown in Box 6 below. The guiding principle is as follows:

> The production (goods and services) of a candidate industry must primarily be intended to inform, educate and/or entertain humans through mass communication media. These industries are engaged in the production, publishing and/or the distribution of content (information, cultural and entertainment products), where content corresponds to an organised message intended for human beings.[100]

Box 6. The 2006-07 OECD Content and media sector definition (based on ISIC Rev. 4)[101]

Publishing of books, periodicals and other publishing activities

- 5811 Book publishing
- 5812 Publishing of directories and mailing lists
- 5813 Publishing of newspapers, journals and periodicals
- 5819 Other publishing activities

Motion picture, video and television programme activities

- 5911 Motion picture, video and television programme production activities
- 5912 Motion picture, video and television programme post-production activities
- 5913 Motion picture, video and television programme distribution activities
- 5914 Motion picture projection activities

Sound recording and music publishing activities

- 5920 Sound recording and music publishing activities

Programming and broadcasting activities

- 6010 Radio broadcasting
- 6020 Television programming and broadcasting activities

Other information service activities

- 6391 News agency activities
- 6399 Other information service activities n.e.c.

100. The guiding principle in this form was developed after the finalisation of the sector definition and was communicated by Daniel April to the UNSD to be included in an annex to ISIC Rev. 4.

101. From OECD (2006a). The codes and titles were checked against the final (November 2008) version of ISIC Rev. 4.

Implementation of the definition of the Content and media sector

441. Like the revised ICT sector, implementation of the definition is not feasible until a majority of OECD countries are using ISIC Rev. 4 in their national statistical systems.

ANNEX 1C: OECD MODEL SURVEY OF ICT USE BY BUSINESSES[102]

Introduction

442. This annex is based on a number of papers presented to the WPIIS and records of discussion at WPIIS meetings. The main sources are the 2001 paper presented to ICCP that proposed declassification of the model survey [OECD Internal Working Document, DSTI/ICCP/IIS(2001)1/REV1] and papers leading up to the finalisation of the revision of the model survey in 2005 [OECD Internal Working Documents, DSTI/ICCP/IIS(2004)4, DSTI/ICCP/IIS(2005)2 and DSTI/ICCP/IIS(2005)2/REV1].

443. It should be noted that OECD has benefited from the work of Eurostat, the statistical office of the European communities, and those member countries that have been prominent in this area of measurement. Many have provided invaluable assistance to the lead country (Denmark) in developing the 2001 model survey and to the OECD Secretariat in revising the model in 2005.

History of the model survey's development

444. The WPIIS started work in this area in 1999, with a stocktake of country measurement practices prepared by Sweden and presented to the April 1999 meeting [OECD Internal Working Document, DSTI/ICCP/IIS/RD(99)2]. The surveys of Statistics Denmark and Statistics Finland in 1998-1999 resulted in a draft proposal for a model survey being presented at the Voorburg Group on Services Statistics meeting in Christchurch (October 1999). With input from the Voorburg Group, a revised model survey was developed and tested in 1999-2000 by Statistics Denmark, Statistics Finland, Statistics Norway and Statistics Sweden.

445. A model questionnaire on the use of ICT products by the business enterprise sector was first presented to the WPIIS by Denmark in 2000 and was based on work done by the statistical offices of the Nordic countries[103] that were the first countries to establish a project for a common set of guidelines for measuring ICT use in enterprises.[104] The results from these surveys, together with experiences from similar surveys carried out by the Australian Bureau of Statistics, Statistics Canada and the Department of Trade and Industry (DTI) in United Kingdom, combined with the discussions at the WPIIS meeting in April 2000 [OECD Internal Working Document, DSTI/ICCP/IIS(2000)6], formed the input to the revision of the model questionnaire that was discussed at the Voorburg Group meeting in Madrid (September 2000). New lessons were drawn from the 2000-2001 survey in the Nordic countries, the Eurostat pilot survey launched in the same period and the 2000 surveys of Statistics Canada and the Australian Bureau of Statistics.

446. Another round of discussion at the April 2001 WPIIS meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2001)1] and subsequent written comments led to a final proposal that was

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102. This annex was revised slightly in 2007. Most of the changes were contributed by Eurostat and were updates of its activities in this area of measurement.

103. Denmark, Finland, Iceland, Norway and Sweden.

104. Nordic Council of Ministers: *Guidelines for Measuring use of Information and Communication Technology (ICT) in Enterprises – a first step towards harmonised Nordic Surveys*, Copenhagen 1998.

presented to WPIIS' Parent Committee ICCP for declassification (approval) in October 2001 [OECD Internal Working Document, DSTI/ICCP/IIS(2001)1/REV1].

447. A number of aspects of the measurement of ICT use and e-commerce by business were discussed at WPIIS and expert Group meetings after the model survey was approved in 2001. The content of the model questionnaire was always intended to be dynamic, with the 2001 proposal stating that "As technology and policy priorities evolve, the model questionnaire will need to be reviewed and adapted over time."

448. Additionally, the 2001 proposal outlined outstanding methodological issues needing to be addressed "…..to ensure the comparability of the statistics obtained via the proposed model questionnaire." Those issues included weighting of data according to common principles, harmonisation of the concept of income used when measuring the monetary value of electronic transactions and the collection unit used in each country. This paper attempts to address those outstanding issues.

449. The 2002 WPIIS meeting discussed a number of enhancements to the model survey and established two expert groups to consider measurement issues for e-business and the finance sector. The 2003 meeting considered reports from the two groups and agreed to continue work on e-business as a priority area. After some discussion, delegates agreed not to pursue work on the finance sector but instead to monitor Eurostat's efforts in this area.

450. An OECD workshop on the measurement of e-business was held in December 2003 and involved statisticians, analysts, policy makers and businesses. A subsequent expert Group meeting was held in April 2004 and the topic was followed up at the 2004 WPIIS meeting.

451. The 2004 WPIIS meeting considered a Secretariat proposal for a revision of the model survey that was intended to ensure that it reflected current policy needs and was reasonably aligned with country survey practices. The proposal suggested including survey methodology and scope in the new model and suggested new topics such as IT security and e-business [OECD Internal Working Document, DSTI/ICCP/IIS(2004)4].

452. A detailed proposal, developed by the Secretariat in consultation with interested member countries, was presented to the 2005 meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2005)2] and subsequently revised based on comments made at, and following, the meeting.

453. The revised model was finalised in late 2005 and distributed as DSTI/ICCP/IIS(2005)2/FINAL (OECD, 2005d).

Development of the revised model of 2005

454. In order to prioritise material to be included in the revised model survey, content was examined from both an output and an input perspective. Regarding output, reference was made to the OECD list of core e-commerce indicators, agreed at the 2000 WPIIS meeting[105], and data that OECD has been able to collect from member countries. A core list of ICT indicators currently proposed for use by non-OECD

105. Detailed in OECD Internal Working Document, DSTI/ICCP/IE/IIS(2000)3/REV1.

member countries (per the WSIS[106] meetings) was also consulted in order to ensure as many options as possible for future benchmarking across a greater number of countries.

455. Regarding input, survey material from a number of member countries was examined, including the Eurostat questionnaire for 2006.[107] Details of other surveys consulted may be found in the 2004 WPIIS paper [OECD Internal Working Document, DSTI/ICCP/IIS(2004)4].

456. New questions were considered based on known policy needs and, as far as possible, the experiences of member countries in asking those questions in their surveys. Ultimately, because of the nature of the revisions, some questions were included in the model that are relatively untested by member countries. Parts of the questionnaire are therefore considered somewhat experimental (for more information, see the section below on non-core questions and the footnotes to the questionnaire).

457. An important criterion applied at each stage, was to try to minimise the number and complexity of the questions. This is in recognition of the high cost of collecting these data in terms of expense and respondent load.

458. Comments were sought on the 2004 and 2005 proposals from all WPIIS delegates. A number of countries and organisations responded[108] and their comments were incorporated into the model as far as possible.

459. In addition, some question testing work by Statistics Canada was completed during this period and the results taken into consideration for the revised model questionnaire.[109] The Statistics Canada test included questions on IT security, interaction with government and deployment of e-business processes in the areas of marketing and customer relations, sales, purchases, logistics, and financial and human resource management.

460. The model survey consists of a number of elements that are described further below. They include: survey methodology; scope and coverage; classificatory variables; particular statistical issues associated with business ICT access and use measurement; comparison with Eurostat's model survey; and a model questionnaire (including definitions of terms and metadata notes). [110]

Survey methodology

Introduction

461. The 2001 model did not contain specific methodological recommendations and pointed out the need to do further work in this area. Particular areas cited were weighting methodology and collection

106. World Summit on the Information Society meetings. OECD contributed to a list of core ICT indicators that could be used by countries following final agreement. The core indicators were agreed to by a WSIS meeting held in Geneva in February 2005.

107. Model questionnaire for the Community Survey on ICT Usage and e-Commerce in Enterprises, 2006.

108. See OECD Internal Working Document, DSTI/ICCP/IIS(2005)2, for details of responses to the 2004 proposal and to a revised questionnaire sent out to interested countries and organisations in December 2004.

109. The testing consisted of 26 cognitive interviews with a selection of respondents from the 2004 Statistics Canada *Survey of Electronic Commerce and Technology*. The work was undertaken with the support of WPIIS and one of its aims was to provide input to the work on revising the OECD model survey.

110. This material is taken from the final model survey paper of 2005 (OECD, 2005d).

units. Other methodological issues have since been raised in expert Group and Eurostat Task Force meetings, including: sample design and size, validation rules, outlier treatment and non-response treatment. Additional areas falling under the general umbrella of 'survey methodology' include: data collection methods and survey vehicles, population frame (or list), whether collections should be mandatory, data processing (editing, imputation, and estimation), survey frequency, reference period and date.

462. The model survey does not attempt to cover all these areas, for two reasons:

- Feedback from delegates indicated that methodological recommendations should be kept broad because member countries generally have established procedures for conducting business ICT use surveys.

- The publication in late 2005, and thereafter annually, of a methodological manual for Eurostat's *Community Survey on ICT Usage and E-commerce in Enterprises*. This manual details recommendations for countries that undertake the Community Survey and deals in detail with methodological issues such as sample design, validation rules, non-response treatment, weighting and so on.

Minimising sampling and non-sampling error

463. In general, countries should note that differences in survey methodologies can lead to inconsistencies in output. All countries should therefore aim to reduce sampling and non-sampling error ('bias') as much as possible by:

- Using a population frame that accurately reflects the target population (therefore which is up-to-date and representative).

- Using well-designed samples that are of sufficient size to produce reliable data (that is having low standard errors for the aggregates suggested in this paper).

- Careful design and testing of questions, definitions and question sequences.

- Reducing unit and item non-response rates as far as possible (by, for example, using well designed questionnaires and following up outstanding responses); and

- Minimising errors arising from data entry, editing and other data processing (by appropriate staff training and documentation).

Survey vehicles

464. There is a variety of survey vehicles that could be used to collect data on business ICT use. Most OECD countries conduct dedicated surveys on ICT use, but countries that do not have such a vehicle could add questions to an existing economy-wide survey or to separate industry surveys (where they can collectively cover the industry scope required for ICT use data).

Collection techniques

465. Most OECD countries use mail-out/mail-back surveys for collecting data on business use of ICT. However, the information could also be collected by means of personal interview (face-to-face or telephone) or other methods such as drop-off/call-back (or post back). Electronic data capture may be

viable for some respondents, though with one or two exceptions, OECD countries are not yet using this technology.

Statistical unit

466. The following discussion refers to the unit about which data are collected. This may be different from the unit that reports the data (the 'reporting unit'). The OECD and Eurostat both specify the 'enterprise' as the statistical unit and this is the unit used by most OECD countries. Choice of unit is important as it influences the results obtained. As output from ICT use surveys is mainly proportions data, comparability between countries is more likely to be attained where the unit chosen is the same. As an example, if country A uses the establishment as a unit and country B uses the enterprise, then it is likely that country B will report higher proportions, especially of more sophisticated uses, such as buying and selling over the Internet, or use of an intranet. Another example is that units of a lower order (for instance, establishments) within a larger entity may do more external e-commerce (within the entity) than higher order units such as enterprises.

467. Unfortunately, there is no single definition of an enterprise that is used by all countries. The two main definitions are those of the ISIC (Rev. 3.1)[111] and the European Union.[112] While they have common characteristics that enterprises exercise a certain degree of autonomy in decision making, the EU concept is narrower and it is suggested that this concept be used where possible.

468. It is important not to confuse the enterprise unit with the 'legal unit' entity. While legal units are independent in a legal sense, they may not necessarily constitute independent economic entities with decision-making autonomy for their productive activities.

469. Like most other business surveys conducted by national statistical offices, those measuring business ICT use are national surveys of businesses operating in the country. They therefore include enterprises located in the country but which are part of a multinational group (note that only the domestic part of the multinational should be included).

Survey frequency and reference period/date

470. There is perhaps a greater requirement than for household surveys for the frequency of business surveys to be sensitive to the evolution of ICT and its use. It is probably unrealistic to expect countries to conduct surveys more frequently than annually. For some countries, even an annual collection will not be feasible, in which case it is important that those countries try to align their collection years as far as possible. As much of the information collected is point-in-time data, it would be preferable to also have alignment of reference dates across participating countries.

111. ISIC is the International Standard Industrial Classification of all Economic Activities. According to 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."

112. Defined by the European Commission as: "……the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit."

Weighting methodologies

471. The subject of weighting of survey estimates was noted as an outstanding issue in the first model survey paper (OECD, 2001b) and has been raised at expert Group meetings as an area to be further explored. In particular, debate has centred on the merits of employment-weighted estimation. In an attempt to clarify the technicalities of weighting methodologies, the main methods employed by member countries are briefly described below.

Number-raised weighting (or estimation)

472. This involves applying a unit weight to each selected business unit according to the total number of units in its stratum. For instance, if there are 100 businesses in a selected unit's stratum and 20 are selected, the selected unit's weight is 5 (that is, 100 divided by 20) which means that the unit represents five businesses in the population (itself plus four others). Algebraically, the weight is depicted by N_h/n_h, where N_h is the total number of units in stratum h and n_h is the number of sampled units in stratum h.

473. The technique is applicable to both qualitative (for our purposes, usually 'yes/no') and numerical variables (those whose elements are numbers such as a percentage or an absolute value). In the case of numerical variables whose value is a percentage (for instance, the percentage of income earned through selling over the Internet), the value is first converted to an absolute value (for this example, the percentage is converted to a fraction (that is, divided by 100) then multiplied by the unit's total income to yield the value of income earned through selling over the Internet). The absolute value is then treated like any other value.

474. The population estimate is derived by first weighting up unit values in stratum h (that is, multiplying each of them by the stratum weight, N_h/n_h) and then adding all the weighted unit values in the stratum. This is done for each stratum and then stratum totals are aggregated to calculate the population estimate.

Ratio estimation

475. This technique uses a benchmark (or auxiliary) variable, such as employment or income in addition to the variable of interest. The benchmark variable should be highly correlated with the variable of interest and needs to be known for all units in the population. The ratio estimate is calculated, for each stratum, by weighting each unit's value by a factor equal to the sum of values of the benchmark variable for all units in the stratum divided by the sum of values of the benchmark variable for all selected (sample) units in the stratum. This technique would be suitable for a numerical variable, for instance, estimating e-commerce sales value using total turnover as the benchmark variable.

476. As before, weighted values of units in stratum h are aggregated across the stratum and stratum totals are added to calculate the population estimate.

Economically-weighted estimation

477. Employment weighting is an example of this type of estimation. In general, it is an estimation technique that gives more weight to larger units. It is typically used for qualitative variables and produces output of the type: businesses with a Web site account for (or represent) x% of total employment.

478. The estimates are calculated for each unit in stratum h, by multiplying the unit's value (0 or 1 for a 'yes/no' variable) by its stratum weight (N_h/n_h) and by the value of the auxiliary variable (usually employment or turnover). The resulting values are aggregated across the stratum and then stratum totals are added.

Country practice

479. Most OECD countries appear to use number-raised weighting for qualitative variables and either number-raised or ratio estimation for numerical variables. Both of these estimation techniques are designed to give population estimates of the type 'proportion of businesses using the Internet' or 'value of income derived from Internet sales'. Theoretically, the techniques should yield fairly similar results.[113]

480. In addition, some countries present output derived by economically weighted estimation. Estimates resulting from this technique provide valuable **but quite different** information from the other two types of estimation. It is suggested that countries that use economically weighted estimation should make it quite clear to users what such an estimate means. For instance, the difference between a number-raised and economically-weighted estimate relating to whether businesses have Web sites can be significant (in Canada, in 2004, 37% of businesses had a Web site, but they accounted for 85% of total business revenue for Canada).

Scope and coverage

Introduction

481. In practice, survey scope varies between countries, with notable differences in both industry and size scope. The scope of business surveys is commonly defined by type of organisation, industry (activity), size and geography. The scope of the 2001 OECD model survey was not specified but it was described as an economy-wide survey of business enterprises. However, some guidance on scope was offered for the 2005 revision of the model. It derives from the practical experience of OECD in data collection from member countries and from Eurostat in its specifications for its model survey. Details are outlined below.

Type of organisation

482. Whilst not specified in the 2001 OECD model, this will usually be businesses from the private and public sectors[114] that are operating in the country conducting the survey. General government organisations[115] are excluded. Most OECD countries also exclude non-employers.

Industry (activity) scope

483. It is important for comparability purposes to have a reasonably consistent industry scope, as some industries are less ICT intensive than others. Most OECD member countries collect business ICT use data from businesses in the following industries: Manufacturing (ISIC D), Construction (ISIC F), Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (ISIC G), Hotels

113. Analyses done by Statistics Finland and Statistics Netherlands on the impact of different weighting methodologies have found that ratio estimation by turnover resulted in a higher figure for e-commerce value than number raised estimation. However, the difference is not thought to be statistically significant.

114. These are financial and non-financial corporations following the concepts of the SNA 1993. Such corporations are "institutional units which are principally engaged in the production of market goods and non-financial services" and include corporations "subject to control by Governments".

115. According to the SNA 1993 "The general government sector consists of the totality of institutional units which, in addition to fulfilling their political responsibilities and their role of economic regulation, produce principally non-market services (possibly goods) for individual or collective consumption and redistribute income and wealth."

and restaurants (ISIC H), Transport, storage and communications (ISIC I) and Real estate, renting and business activities (ISIC K).[116]

484. Eurostat specifies a scope of NACE[117] sections D, F, G, H (55.1 and 55.2 only),[118] I, K and O (92.1 and 92.2 only).[119] Industries that Eurostat states as optional are: E, 55.3-55.5, 92.3-92.7 and 93.

485. In respect of Financial intermediation (ISIC J),[120] Eurostat includes NACE classes 65.12, 65.22, 66.01 and 66.03.

486. Based on industries included in member country surveys, the following minimum scope is feasible for most countries: ISIC sections D, F, G, H, I and K. In addition, Section J has been included in scope but as a non-core sector. ISIC Division 92 (recreational, cultural and sporting activities) has also been added as a non-core sector because of interest in this area. This leads us to an industry scope as follows:

- Manufacturing (ISIC D).
- Construction (ISIC F).
- Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (ISIC G).
- Hotels and restaurants (ISIC H).
- Transport, storage and communications (ISIC I).
- Financial intermediation (ISIC J) (non-core).
- Real estate, renting and business activities (ISIC K); and
- Recreational, cultural and sporting activities (ISIC Division 92) (non-core).

Size scope

487. Most OECD countries specify that in-scope businesses are employers and they define size scope in terms of number of employees. Eurostat specifies a size cut-off of 10 or more employees. For comparability, OECD does likewise when collecting data even though there is a range of cut-offs used among OECD (including European) countries, with at least two member countries including enterprises with a single employee. It is suggested that the size scope recommendation for the model survey be 10+

116. All ISIC references in this annex are to ISIC Rev. 3.1.

117. NACE is the Statistical Classification of Economic Activities in the European Community, Rev. 1.1 (2002). All NACE references in this annex are to NACE Rev. 1.1.

118. In respect of Section H, Hotels and restaurants, about half the countries which do the Eurostat survey collect data for the remaining NACE categories 55.3 to 55.5 (restaurants, bars etc).

119. Not all countries that do the Eurostat survey collect data for all classes of Section O (Other community, social and personal service activities). For collection purposes, divisions 92 and 93 are most relevant.

120. Eurostat developed a specific module of the enterprise survey for a pilot study of this sector in 2004. In 2005, the Eurostat model questionnaire was revised but limited to general ICT variables. For 2006, the model questionnaire was improved and included questions on e-commerce.

employees consistent with Eurostat. However, it is recognised that there are important policy issues pertaining to businesses that are smaller than this. Countries are therefore encouraged to extend the scope to include smaller businesses where they have a policy need and resources permit.[121]

Geographic scope

488. The 2001 OECD model did not specify a geographic scope, while Eurostat specifies that the whole country is in scope. It is presumed that this scope applies generally to member countries so it has been explicitly adopted for the OECD model. The geographic scope therefore encompasses businesses operating anywhere in the reporting country.

Coverage

489. Coverage refers to departures from scope and describes the situation where in-scope businesses are not liable to selection in the survey. There are various reasons this could occur and they include inaccessibility of part of the population in a physical sense or undercoverage arising from an incomplete population frame. Where undercoverage exists, it is useful if countries advise of any significant impact on survey estimates.

Classificatory variables

490. The 2001 and revised OECD model questionnaires recommend collection of information on business industry and size (number of employees). While different industry classifications are used by countries, in practice, the results are reasonably concordable at the broad level at which the OECD publishes them.

491. Some classificatory data may be collected as part of the survey in cases where the information is not available from other sources (such as the population frame or another survey). Three questions have been included for this purpose in Section C of the model questionnaire. A minimal set of classification variables and categories based on practices of OECD countries is suggested below. This is consistent both with advice offered by Eurostat for collection of business use of ICT data and the scope recommendations presented above.

492. Countries may use extra classificatory variables and/or additional categories. In particular, countries where a rural/urban divide exists may wish to add a geographic classification, though none has been specified for the OECD model. In practice, classifying units to regions within a country can be difficult as multi-unit businesses do not usually split their operations evenly between regions. For instance, head office operations will tend to be in major cities, but represent national activities.

493. The following classificatory variables are recommended for the model survey.

Industry (activity)

494. A broad industry output classification consistent with the suggested industry scope is: Manufacturing (ISIC D); Construction (ISIC F); Wholesale trade (ISIC 51); Retail trade (ISIC 52); Hotels and restaurants (ISIC H); Transport, storage and communications (ISIC I); Financial intermediation (ISIC

121. Countries should note that the broader the scope, the larger the sample size generally required to obtain adequate aggregate estimates. Extending the scope to employing businesses with fewer than 10 employees might increase the sample size by a factor of two or more.

J) (non-core); Real estate, renting and business activities (ISIC K); and Recreational, cultural and sporting activities (ISIC Division 92) (non-core).

Size (number of employees)

495. The recommended size categories align with those of Eurostat and OECD data collection categories. They are as follows:

- 10-49 employees.
- 50-249 employees; and
- 250 employees or more.

496. Countries are encouraged to further disaggregate the top category when producing output. Use of some ICTs (in particular relating to e-business) are likely to be more prevalent in very large businesses.

Particular statistical issues associated with business ICT use measurement

497. Arguably, the main areas of difficulty in ICT use measurement are e-business and e-commerce. These are discussed in some detail in Chapter 5 so are not covered in this annex. The measurement of e-government is also challenging – see the article in Chapter 8. Other measurement issues are discussed below.

Trust in the online environment

498. A number of questions (and parts of questions) in the model questionnaire deal with the important topic of trust in the online environment. The questions concern IT security (questions 7 and 8), privacy and security features of a business' Web site (question 16) and security and privacy as barriers or limitations to selling over the Internet (question 14).

499. Feedback from WPIIS delegates both confirmed the importance of this topic and the survey difficulties it presented. In general, the questions are relatively technical, which can present problems, especially for small businesses.

500. At the 2005 meeting, WPIIS comments were sought on the feasibility of relatively untested response categories on IT security measures in place: anti-spyware software, regular back up of data critical to your business operations, and employee training programmes in IT security. The question was changed slightly as a result of feedback. There were suggestions from delegates that the category on anti-spyware could be technically difficult. The definition has been changed slightly to indicate that such software might be integrated into other packages. The anti-spyware and data backup categories remain non-core until they are better tested in member country surveys. As a result of comment, an item was added to the question on Spam filters (which are relevant for security given that Spam can contain malware and cause denial-of-service). The concept of a Spam filter was understood by respondents in question testing by Statistics Canada[109] and is successfully used by Statistics Denmark in its business ICT use questionnaire.

501. Delegates were also asked for their views on the statistical feasibility of the following types of questions, and to offer any experience in testing or asking such questions.

- Whether the business has conducted a risk assessment on the security of its computer system and, if so, what type of assessment that was (for instance, internal, by an external party, by a certifying organisation/authority etc).

- Whether businesses that use anti-virus software download virus definitions and, if so, whether automatically, daily, weekly, etc; and

- Whether the business applies patches to, or updates, software that is critical to the security of its computer systems, and if so, whether automatically, daily, weekly etc.

502. Feedback suggested that there are problems asking about updating of software and virus definitions, partly because these processes can happen automatically and therefore the person completing the questionnaire would not necessarily be aware of them. On the topic of risk assessment, question testing by Statistics Canada[109] found that the term was not uniformly interpreted and attracted a high 'yes' response. As a result, no questions on these topics have been added to the model.

503. There were other issues raised by member countries, the main one being that questions about security incidents encountered are problematic. There is significant anecdotal evidence that businesses will either not answer such questions or will understate the extent of any problems. Reflecting this concern, the question on IT security incidents (question 8) was reduced to attacks by viruses etc. and made non-core. More information on the measurement of 'trust' can be found in Chapter 8.

Digitised products

504. The Internet sales distribution question (part of question 12) includes a percentage breakdown of Internet sales by product type. Of particular interest are 'digitised products', those products that are able to be digitally delivered via the Internet. They are challenging statistically as they are difficult to describe in a way which is technically correct yet understandable to respondents. However, the United Kingdom has found that respondents seem to be able to provide the information in question 12 using a very similar definition to that in the question. More information on the measurement of digitised products can be found in Chapter 7.

E-government

505. Issues associated with measurement of e-government (question 19) are described in Chapter 8.

Comparison with Eurostat's model survey

506. European Union countries comprise about two-thirds of OECD countries. Additionally, some OECD countries that are not EU members use the Eurostat model survey. It is therefore important to try to align the OECD and Eurostat model questionnaires (and associated standards) as far as possible, while taking into account the interests of the OECD countries that do not carry out Eurostat's model survey. The revised model questionnaire is reasonably consistent with Eurostat's 2006 Enterprise questionnaire – where they overlap. However, Eurostat asks questions about several topics that are not on the OECD model questionnaire and *vice versa*, in particular, in the area of e-business. Other differences include instances where the questionnaires differ because response categories are split in one questionnaire and not in the other. The OECD model tends to have more response categories in equivalent questions.

507. In respect of scope and classificatory variables, the revised OECD and Eurostat models are very similar.

About the model questionnaire

508. The revised model questionnaire, including definitions of terms and associated metadata notes, is shown below.

Logic of the revised model questionnaire

509. The questionnaire logic incorporates the following main assumptions:

- If a business **does not have a computer**, it is assumed that it could still use the Internet.

- Businesses that **do not use any networks** (internal or external) are filtered out of the questionnaire very early; and

- Businesses **without the Internet** (but with another network) are filtered out of most of the questionnaire and are not asked questions about IT security or questions about use of the Internet for business processes. This logic means that businesses without the Internet but on whose behalf orders are placed or received over the Internet are excluded from relevant questions. The general view of WPIIS delegates was that this exclusion would not cause a problem.

Core and non-core questions (and response categories)

510. Questions and response categories denoted 'non-core' are considered to be **either** difficult to collect **or** relatively untested (and therefore experimental to some degree). The term 'non-core' is **not** used to indicate a lower priority. In the model questionnaire, a *non-core* question or response category is indicated by **NC** beside it.

Adaptation of the model questionnaire

511. It is not expected that the structure, question wording or definitions which comprise the model questionnaire would be used unchanged (or literally translated) in national surveys. However, it is important for comparability purposes that:

- Where questions are used, their meanings are preserved; and

- The logic is preserved to the extent that the same (or very similar) populations of businesses are asked each question. For instance, non-computer users should be asked whether they used the Internet.[122]

122. Even though the incidence of Internet access by devices other than computers is currently low, it may increase with improvements in mobile phone technology (such as 3G).

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>? ***Including:*** *via Web sites, specialised Internet marketplaces, extranets, EDI over the Internet, Internet-enabled mobile phones but* ***excluding*** *orders submitted via conventional e-mail* ***Including:*** *orders received on behalf of other organisations and orders received by other organisations on behalf of your business* ☐ **No** ☐ **Yes**	**Go to 14**	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** **Go to 22** ☐ **Yes**		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** **Go to 25** ☐ **Yes**		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 1D: OECD MODEL SURVEY OF ICT ACCESS AND USE BY HOUSEHOLDS AND INDIVIDUALS[123]

Introduction

512. This annex is based on a number of papers presented to the WPIIS and records of discussion at WPIIS meetings. The main sources are the paper presented to ICCP that proposed the first model survey for declassification [OECD Internal Working Document, DSTI/ICCP/IIS(2002)1/REV1]; the (slightly) revised version of that paper (OECD, 2002b), and papers leading up to the finalisation of the revision of the model survey in 2005 [OECD Internal Working Documents, DSTI/ICCP/IIS(2004)3 and DSTI/ICCP/IIS(2005)3].

513. As with the business questionnaire, OECD has benefited from the work of Eurostat, the statistical office of the European communities, and a number of member countries that have been prominent in this area of measurement. Many provided invaluable assistance to the lead country (Australia) in developing the 2002 model survey and to the OECD Secretariat in revising the model in 2005.

History of the model survey's development

514. At the April 2000 and 2001 meetings of the WPIIS, Australia presented a model survey for ICT use by households and individuals [OECD Internal Working Documents, DSTI/ICCP/IIS(2000)7 and DSTI/ICCP/IIS(2001)2]. Discussion at the WPIIS, Voorburg Group and Eurostat meetings and subsequent correspondence indicated a diversity of views on the content of such a model survey. The 2002 WPIIS meeting discussed major outstanding issues [OECD Internal Working Document, DSTI/ICCP/IIS(2002)1] and reached broad consensus. Another round of discussion following that meeting and subsequent written comments led to a final proposal that was presented to WPIIS' Parent Committee ICCP for declassification (approval) in October 2002 [OECD Internal Working Document, DSTI/ICCP/IIS(2002)1/REV1]. Slight modifications were made the following year [OECD Internal Working Document, DSTI/ICCP/IIS(2002)1/REV2].

515. The 2002 proposal suggested that additional components of the questionnaire be added over time as technologies, usage practices and policy interests change. In discussing the proposal, the 2002 meeting agreed to review the inclusion of several items at the first review of the model survey. In particular:

- Additional modules on use of mobile phones and e-mails. Whilst seeing value in the suggested modules, the WPIIS agreed that consideration should be deferred until the first review of the approved model survey.

- Children's use of ICT. The WPIIS agreed to leave children's use of ICT out of the current proposal. It might be considered in the future, possibly in different types of survey vehicles, *e.g.* school surveys. It was pointed out that countries that wish to collect data in respect of children's

123. This annex was revised only slightly in 2007, therefore references to some country practices are somewhat out of date.

use of ICT are not constrained by the age limit of 16 recommended by the model survey. In order to achieve international comparability, those countries are asked to also produce output in respect of people aged 16 years and over.

- Internet purchases by location of supplier (international versus domestic transactions). Based on suggestions that the question posed difficulty for respondents, it was agreed to defer consideration of this question until the first review of the model survey.

516. The 2003 meeting considered these issues and agreed only that more development work should be undertaken on refining a set of mobile phone and e-mail questions for discussion in 2004. The meeting also agreed that more work should be done on expanding the existing items covering household interaction with government by electronic means.

517. To accommodate these changes, the 2003 meeting agreed that the questionnaire should be reviewed to remove lower priority questions (or reduce them to non-core status).

518. In response to the outcome of the 2003 meeting, a Secretariat proposal outlining a number of areas for revision was presented to the 2004 meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2004)3]. The proposal suggested a thorough review of the model survey to ensure that it continued to reflect current policy needs and priorities and was aligned, as far as possible, with country survey practices.

519. A detailed proposal, developed by the Secretariat in consultation with interested member countries, was presented to the 2005 meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2005)3] and subsequently revised based on comments made at, and following, the meeting.

520. The revised model was finalised in late 2005 and distributed as DSTI/ICCP/IIS(2005)3/FINAL (OECD, 2005e).

Development of the revised model of 2005

521. In order to prioritise material to be included in the revised model survey, content was examined from both an output and an input perspective. Regarding output, reference was made to the OECD list of core e-commerce indicators, agreed at the 2000 WPIIS meeting,[124] and data that OECD has been able to collect from member countries. A core list of ICT indicators proposed for use by non-OECD member countries (per the WSIS[125] meetings) was also consulted in order to ensure as many options as possible for future benchmarking across a greater number of countries.

522. Regarding input, survey material from a number of member countries was examined, including the Eurostat questionnaire for 2006. Details of other surveys consulted may be found in the 2004 WPIIS paper [OECD Internal Working Document, DSTI/ICCP/IIS(2004)3]. Where a majority of country surveys had not incorporated an existing (2002) model survey question, then it was generally removed or revised.

523. New topics were considered based on known policy needs and experiences of member countries with questions about those topics. An important criterion applied at each stage was to try to minimise the

124. Detailed in OECD Internal Working Document, DSTI/ICCP/IE/IIS(2000)3/REV1.

125. World Summit on the Information Society meetings. OECD contributed to a list of core ICT indicators which could be used by countries following final agreement. The core indicators were agreed to by a WSIS meeting held in Geneva in February 2005.

number and complexity of the questions. This is in recognition of the high cost of collecting these data in terms of expense and respondent load.

524. Comment was sought on the 2004 proposal from all WPIIS delegates following the meeting. A number of countries and organisations responded.[126] In January 2005, a revised questionnaire was sent out to countries and organisations that had responded earlier. Feedback from this round of consultation[126] was incorporated and a detailed proposal was presented to the 2005 WPIIS meeting.[127]

525. The 2005 model survey consists of a number of elements that are described further below. They include: survey methodology; scope and coverage; classificatory variables; particular statistical issues associated with household and individual ICT access and use measurement; comparison with Eurostat's model survey;[128] and a model questionnaire (including definitions of terms and metadata notes).[129]

Survey methodology

Introduction

526. Neither the 2005 nor the 2002 model surveys offered detailed advice on how to conduct or process household surveys. The aim is to convey the methodological points and conceptual issues that are most relevant to the collection of household and individual ICT access and use information.

527. Additionally, for most countries, there are established procedures in place for household surveys that collect ICT access and use data. Therefore no recommendations are made on the following aspects of collection methodology:

- For use of a particular type of sample frame, sampling methodology or sample size; these will vary according to country practices and the availability of information (for instance, administrative information on individuals).

- Whether collections should be mandatory or voluntary – both types of collections are used among OECD member countries; however, where collections are voluntary, non-response will tend to be higher and therefore the recommendations below regarding survey bias will be more relevant.

- How to process collected information, including editing, imputation and benchmarking of data; and

- A particular type of survey vehicle. There is a variety of survey vehicles used by member countries to collect data on household and individual ICT access and use. Most countries use existing household surveys (such as, labour force surveys or general purpose household surveys). At least two OECD countries use separate collections for household ICT access and individual ICT use data.

126. See OECD Internal Working Document, DSTI/ICCP/IIS(2005)3 for details.

127. Comments were received at and/or following the meeting from the following countries and organisations: Australia, Canada, the Czech Republic, Eurostat, Finland, France, Germany, Hungary, Japan, Korea, Mexico, Portugal and Sweden. Their comments have been incorporated into the model as far as possible.

128. Model questionnaire for the Community Survey on ICT Usage in Households and by Individuals, 2006.

129. This material is taken from the final model survey paper of 2005 (OECD, 2005e).

Minimising sampling and non-sampling error

528. In general, countries should note that differences in survey methodologies can lead to inconsistencies in output. All countries should therefore aim to reduce sampling and non-sampling error ('bias') as much as possible by:

- Using well designed samples that are of sufficient size to produce reliable data (that is having low standard errors for the aggregates suggested in this paper).
- Careful design and testing of questions and question sequences.
- Intensive training and checking of interviewers, where they are used.
- Reducing the non-response rate as far as possible; and
- Minimising data entry, editing and other processing errors.

Collection techniques

529. Most member countries use personal interview techniques for collecting data on household and individual access and use of ICT. Personal interview can be by face-to-face or by telephone and, for either method, interviewers may be assisted by computers (using, for instance, CAPI or CATI applications respectively). Face-to-face interviewing may be better for some situations in that it potentially allows the interviewer to check the type of Internet connection or other technical details.

530. Telephone interviews should generally be avoided where it is not possible to include mobile phone only or unlisted subscribers.

531. It is also suggested that postal surveys generally not be used because they offer less opportunity for interaction with the respondent (for instance, to clarify technical issues) and because response rates are likely to be lower, thus leading to higher sampling error and possible non-response bias. However, it is acknowledged that postal surveys offer advantages such as cost and a simpler method of presenting list-based questions (of which there are several in the model questionnaire). They are likely to be most reliable when used in conjunction with other questionnaire-based approaches such as a drop-off/call-back (or post back) approach that may enable some interaction and improve the response rate.

Statistical units, selection and weighting

532. Both households and individuals are recommended as statistical units. Information should ideally be sought from a randomly selected adult[130] who responds in respect of the household (Section A of the model questionnaire) and in respect of him/herself (Section B). Alternatively, more than one household member could provide individual information in Section B. Households, and individuals within households, should be selected in an unbiased manner.

533. Because the sample of households and individuals selected is unlikely to be perfectly representative of the whole population, it is important to weight responses according to an independent estimated distribution of the population.

130. Some-one aged between 16 and 74 years.

Survey frequency and reference period/date

534. It is probably unrealistic to expect participating countries to conduct surveys more frequently than annually. For some participating countries, an annual collection will not be feasible, in which case it is important that those countries align their collection years as far as possible.

535. As some of the information collected is point-in-time data, it would be preferable to also have alignment of reference dates across participating countries. However, the dependence of many countries on existing survey vehicles probably makes this an unrealistic expectation.

Scope and coverage

Individuals

536. The scope of individuals would normally be limited by age. The 2002 OECD model survey recommended that all individuals aged 16 years or over be included in the scope of the survey. However, many European countries have an age range of 16-74 years and therefore exclude individuals aged outside this range. In the 2005 revision, the lower age of 16 years was retained but an upper age limit of 74 years was introduced, giving a common individual age scope of 16-74 years.[131] This is consistent with Eurostat's recommendations and OECD data collection practices. Of course, individual countries can choose to collect data from individuals aged outside the 16-74 years range and are encouraged to do so (of particular policy interest for many countries is the use of ICT by those aged 75 and over).

537. Other scope or coverage limitations on individuals are likely to be relatively minor and could include things like limiting the survey to those living in private dwellings (therefore excluding individuals in institutions such as prisons and nursing homes and special dwellings such as hotels); excluding full-time members of the armed forces; and excluding non-residents and some foreign residents. Such limitations are likely to have a fairly small impact on estimates so no recommendations are made here.

Households

538. It is recommended that household scope be consistent with that for individuals, therefore households where all members are outside the age scope, will themselves be out of scope. This is a change from the 2002 model where all households were in scope. However, many countries are constrained by use of existing survey vehicles and are not able to follow that guidance. A number of European countries, for instance, exclude households consisting only of members over 74 (or, less likely, under 16).

539. Many countries will also restrict household survey scope or coverage to those in private dwellings. For some countries, there could be other reasons for a more limited scope (or coverage) of the national survey. They include exclusion or undercoverage of particular households, for example those in remote or inaccessible areas.

540. For both households and individuals, it is important that countries advise of significant impact on survey estimates resulting from deviations from scope, or areas of poor coverage.

131. Of practical note, there are few OECD countries which would be *unable* to comply with a scope of 16-74 but few which would be able to provide data for those aged outside this range.

Classificatory variables

541. The 2002 OECD model survey recommended inclusion of minimal information on a number of household and individual characteristics. A similar set of classificatory variables is included in the 2005 model survey, though many countries will decide to use extra variables and/or additional categories. Data for these variables will usually be collected as part of the survey (though note that questions have not been included in the model questionnaire). Of possible interest to those countries where a rural/urban divide exists is a geographical classification. However, such a variable is problematic from an international comparability viewpoint and has not been included in the model.

Household characteristics

542. The 2002 OECD model had a *household size* (number of members) variable and a small *household composition* classification that identified several different household types (*e.g.* couple, one parent family, lone person). The *composition* variable in the 2002 model survey did not have an equivalent in the Eurostat model. Eurostat's current approach is to collect information on the total number of household members as well as the number of children under 16 in the household. The Eurostat approach enables tabulation of households by size and type (those with and without children under 16). For simplicity and improved comparability, it was adopted in the 2005 model, leading to household variables as follows:

- Household type (two-way classification: households with/without children under 16); and
- Household size (number of members including those outside the age scope).

543. The variable, *household income*, is differently defined in the 2002 OECD and Eurostat model questionnaires. The 2002 OECD model specified annual gross household income from all sources, while Eurostat defines the variable as average net monthly household income. Household income is not collected on all countries' household ICT access and use surveys and for this reason is an optional variable on the Eurostat model. Nevertheless, it is regarded as an important classificatory variable because of the strong correlation between household income and access to ICT. Regarding the conceptual basis of the *household income* variable, a quartile approach has been adopted by Eurostat from 2006. This approach entails either collecting income in ranges corresponding to quartiles (based on other survey data) or collecting income data in other ways and converting it to quartiles for output purposes.

544. Given that countries that collect household income as a classificatory variable use a variety of bases (monthly, annual, gross, net etc), the quartile approach allows better comparability. The revised OECD model therefore does not make any recommendation on the conceptual basis of household income but asks countries that collect it to either collect or output household income on a quartile basis for the purposes of classifying household ICT data.

Individual characteristics

545. Age is a strong determinant of ICT use so a common age cut-off is important. Consistent with the age scope, an age range of 16-74 is recommended. It is also recommended that the following sub-ranges be used as output categories of the age variable: *16 to 24; 25 to 34; 35 to 44; 45 to 54; 55 to 64* and *65 to 74.* These are the ranges used by OECD and Eurostat for their model surveys but they differ from the 2002 OECD model that had coarser categories.

546. The 2002 model included a variable, *highest education level received*, with four categories: primary, secondary, post-secondary (not tertiary) and tertiary. For consistency with Eurostat, the

classification has been reduced, giving a three-way classification as follows: *No formal education, primary or lower secondary* (ISCED 0,1,2); *Upper secondary and post-secondary non-tertiary* (ISCED 3,4) and *Tertiary* (ISCED 5,6).[132]

547. In respect of employment status, for consistency with Eurostat, the first two categories in the 2002 model (full-time employee and part-time employee) have been combined giving the following four-way classification: *paid employee; self-employed;*[133] *unemployed* and *not in the labour force*.[134,135]

548. The other two individual characteristics in the 2002 model were *Gender* and *Occupation.* They are retained in the revised model. In respect of *Occupation*, countries are asked to use ISCO88 major groups where possible (as in the 2002 model).

549. In terms of output, many countries may wish to cross-classify some of these variables. This can produce information that is very useful for analytical purposes. However, it should be noted that cross-classified output is often more detailed and therefore usually requires higher sample sizes to support reliable estimates.

Particular statistical issues associated with household/individual ICT access and use measurement

Households versus individuals as statistical units

550. A key issue concerns the appropriate statistical unit for measurement. In general, the household unit is used to elicit information about facilities in place in the household (for example, whether there is a computer or Internet access). The individual unit is used to provide information on use of these facilities (both in and away from the home) and, most importantly, the intensity of that use (for instance, frequency and range of activities undertaken). Debate continues among OECD countries on the preferable unit, though at this stage most use both.

Recall period

551. Amongst OECD countries, this has been a much-debated issue, though mainly in the context of the value of Internet purchases by individuals.

552. The 2002 OECD model questionnaire used a 12 month recall period for all questions except for the value of Internet purchases. The 2006, 2007 and 2008 Eurostat model questionnaires ask questions in respect of both 12 months and three months (for instance, individual use of a computer and the Internet, and whether the individual has purchased products over the Internet) but asks others (*e.g.* location and frequency of use, and activities undertaken) in respect of the last three months.

553. The 2005 OECD model retained a 12 months recall period for individual use questions but includes new filter questions probing the time period when activities occurred (use of a computer, the

132. For more information on ISCED (1997), see: http://www.uis.unesco.org/ev.php?ID=3813_201&ID2=DO_TOPIC.

133. Self employed includes: employers; own account workers; contributing family workers; and members of producers' co-operatives.

134. Note that Eurostat splits students from others not in the Labour Force. As students may be included in the Labour Force (in some countries at least), this split has not been proposed for the OECD model.

135. Categories are based on ILO definitions. For more information, see: http://www.ilo.org/public/english/bureau/stat/class/icse.htm.

Internet and purchasing). This allows tabulation of those aggregates for both three and 12 months time periods. An additional point regarding recall period, is that for EU and probably most other OECD countries, in respect of main aggregates, it makes little practical difference whether a three or 12 month period is used (as very few individuals are infrequent users). The most obvious exception to this is the value of Internet purchases (see discussion below).

554. The advantages of a 12 month recall period include avoidance of seasonal effects and better capture of less frequent activities such as selling on line, dealing with government organisations or searching for health information.

555. In respect of the value of Internet purchases, countries should select a recall period for Internet purchases that would enable calculation of 12 months value. For instance, countries that collect monthly information should collect information in respect of the last month; countries collecting quarterly data, in respect of the last quarter etc. Whichever method is chosen, it should be able to deliver a reasonably unbiased estimate of the value of Internet purchases in respect of the 12 month reference period.

Trust in the online environment

556. Several questions (and parts of questions) in the model questionnaire deal with the topic of trust in the online environment. The questions concern the issue of IT security (questions 8, 15 and 16) and privacy, security or trust as barriers (questions 5 and 23).

557. WPIIS comments were sought on the feasibility of the new questions 15 and 16, and on including several other trust topics as follows:

- Whether households/individuals who use anti-virus software download virus definitions and, if so, whether this is done automatically, daily, weekly, etc.

- Whether households/individuals who use the Internet apply patches or software updates that are critical to the security of their computer, and if so, whether this is done automatically, daily, weekly etc.

- Whether individuals regularly back up their important files, *e.g.* documents, spreadsheets, e-mails, digital photos; and

- Which sources individuals use to find information about IT security issues (*e.g.* newspapers, TV, vendor Web sites, government Web sites, etc).

558. General feedback from Eurostat and others is that it is problematic asking individuals about IT security in terms of: the incidents they have encountered, what action they take to protect themselves and whether the computer they use at home is protected. Feedback on the inclusion of the new topics outlined above was couched in similar terms, that is, respondents are unlikely to be able to respond to such technical questions. The only exception appears to be whether individuals regularly back up important files. This is a question successfully asked by Finland and a new non-core question (question 8) on this topic has consequently been included on the model questionnaire.

559. While the general feedback on IT security questions was sceptical, they are of such policy importance that they have been retained as non-core questions. One change made as a result of feedback is to limit questions 8 (on data backup) and 15 (on incidents experienced) to home use only as this is the environment about which users are likely to know most and over which they have most control (for

instance, they may have no role in backing up material at work, nor knowledge about attacks on the computer they use at school).

560. More information on this topic can be found in Chapter 8.

Internet access using mobile services

561. The questionnaire includes a question (question 11) on individual mobile access to the Internet. The question focuses on mobile services unlike a similar question on the Eurostat 2006 questionnaire that asks about devices used for mobile access. The OECD approach is thought to be better aligned with policy interests in this area and is slightly simpler. The question is non-core because it is both untested and possibly technically complex for some respondents.

Digitised products

562. The Internet activities and purchasing items questions (19 and 21 respectively) contain several new categories designed to probe individuals' interest in new types of products that the Internet has made possible. These so-called 'digitised products' are those that are able to be digitally delivered via the Internet. They are challenging statistically as they are difficult to describe in a way that is technically correct yet understandable to respondents.

The value of Internet purchases

563. The 2002 question on the value of Internet purchases has been included in the revised questionnaire with few changes (question 22). However, it is a conceptually complex question and has been made non-core because of difficulty respondents have answering it accurately. Importantly, Eurostat has dropped this question from its model questionnaire (from 2005).

Mobile phones

564. In OECD countries, information on mobile phones has conventionally been collected in respect of the household (therefore whether the household, through one or more of its members, has access to a mobile phone). However, there is increasing recognition that it is more important to examine individual use of mobile phones, especially since they are typically owned and/or used by an individual rather than a group of people. The model questionnaire includes two questions (24 and 25) on individual mobile phone use. It should be noted that the questions are relatively untested in OECD countries and therefore might change as experience increases. They have been denoted non-core for this reason.

E-government

565. Issues associated with measurement of e-government (question 19) are described in Chapter 8.

Comparison with Eurostat's model survey

566. European Union countries comprise about two thirds of OECD countries. Additionally, some OECD countries that are not EU members use the Eurostat model. It is therefore important to try to align the two model questionnaires (and associated standards) as far as possible, while taking into account the interests of the OECD countries that do not carry out Eurostat's model survey. The revised model questionnaire is reasonably consistent with Eurostat's 2006 Household questionnaire – where they overlap. However, Eurostat asks questions about a number of topics that are not on the OECD model questionnaire and (to a lesser extent) *vice versa*. Other differences include instances where the questionnaires differ

because response categories are split in one questionnaire and not in the other. Such differences may be able to be dealt with at the output stage.

567. For differences in the recall periods used, see *Recall period* above.

568. In respect of scope and classificatory variables, there were a number of differences between the 2002 OECD and Eurostat models most of which have now been removed, leaving the 2005 OECD and 2006 Eurostat models very similar.

About the model questionnaire

Core and non-core questions

569. Questions denoted 'non-core' are considered to be **either** relatively untested and therefore somewhat experimental, or difficult to collect. The term 'non-core' is **not** used to indicate a lower priority. In the model questionnaire, a *non-core* question is indicated by **NC** under the question number.

Format of the model questionnaire

570. The OECD model questionnaire is not an operational questionnaire that can be used directly in countries' household surveys. This is because countries conduct household ICT access and use surveys in different ways, each requiring their own types of survey instruments. For instance, a questionnaire that is self-enumerated will look quite different from one designed for a telephone survey, which in turn will differ from a questionnaire that is used for face-to-face interviewing. Because the model questionnaire is not an operational questionnaire, it does not show:

- Questions that establish the values of classificatory variables (household and individual characteristics).
- Filter questions that have no ICT data content (*e.g.* whether the respondent is an employee).
- Interview instructions (though it does indicate question populations and logic); and
- How questions are asked (this will vary depending on the collection methodology used, for instance, personal interviewers might use prompt cards for a number of the 'list' questions whereas telephone interviewers might use a running prompt *i.e.* ask each response item as a yes/no question).

Adaptation of the model questionnaire

571. It is not expected that the structure, question wording or definitions that comprise the model questionnaire would be used unchanged (or literally translated) in national surveys. However, it is important for comparability purposes that:

- Where questions are used, their meanings are preserved; and
- The logic is preserved to the extent that the same (or very similar) populations of households or individuals are asked each question.

OECD model questionnaire for ICT access and use by households and individuals (2005)

Section A: Household access to information and communication technology		Logic[1]	Definitions and notes
1	**Does any member of this household/do you[2] have access to a computer at home regardless of whether it is used?[3]** *Population: all in-scope households*	☐ **No** ☐ **Yes**	A computer includes: a desktop, portable or handheld computer (*e.g.* a personal digital assistant). A computer does not include other equipment with some embedded computing functions, such as cell phones, VCRs or TV sets.
2	**Does any member of this household/do you[2] have access to the Internet at home regardless of whether it is used?[4]** *Population: all in-scope households*	☐ **No** **Go to 5** ☐ **Yes**	The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files. Internet access may be via a computer, Internet-enabled mobile phone or TV, games machine etc.
3	**On which devices do members of this household access the Internet at home?[5]** *Population: in-scope households with access to the Internet at home* Multiple responses allowed		The Internet is as defined in Question 2.
	Through a computer[6] ☐		A desktop, portable or handheld computer.
	Through an Internet-enabled mobile phone ☐		For instance WAP (Wireless Application Protocol), GPRS (General Packet Radio Service), i-mode or UMTS (Universal Mobile Telecommunications System).
	Through a games machine with Internet connection ☐		Also known as a games console.
	Through an Internet-enabled television set ☐		For instance, digital TV or TV with a set-top box.
	Using any other means (please specify)…….…….. ☐		
	Do not know ☐		

Section A: Household access to information and communication technology	Logic	Definitions and notes
4 What types of Internet access services are used for Internet access at home?[7] *Population: in-scope households with access to the Internet at home* Multiple responses allowed		
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.
DSL (ADSL, SDSL, VDSL etc)[8] ☐		Digital subscriber line; it is a high-bandwidth, local loop technology carrying data at high speeds over traditional (copper) telephone lines.
Cable modem[8] ☐		A modem which uses cable TV lines for connecting to the Internet.
Other narrowband[9] ☐		Including most mobile phone access (*e.g.* WAP, GPRS, i-mode) and other forms of access with an advertised download speed of less than 256 kbps (kilobits per second).
Other broadband[8,9] ☐		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.
Do not know ☐		
	Go to 6	

Section A: Household access to information and communication technology	*Logic*	*Definitions and notes*
5 What are ALL the reasons for members of this household not having access to the Internet at home?[10] *Population: in-scope households without access to the Internet at home (whether or not they have a computer)*		Note that not having a computer is not a valid response.
Multiple responses allowed		
Not interested ☐		
Costs are too high ☐		Includes equipment and access costs.
Lack of confidence, knowledge or skills ☐		
Concern that content is harmful ☐		For instance, concern that children will access inappropriate sites.
Have access to Internet elsewhere ☐		For example, household members are able to use the Internet at work.
Security concerns, for example, concerns about viruses ☐		
Privacy concerns, for example, concerns about abuse of personal information ☐		
Other (please specify)…… ☐		

Section B: Individual (adult) use of information and communication technology		Logic	Definitions and notes
6	**When did you most recently use a computer?**[11] *Population: all in-scope individuals*		From any location. A computer is defined in Question 1.
	Within the last three months ☐		
	Between three months and a year ago[12] ☐		
	More than a year ago ☐	**Go to 9**	
	Never used a computer ☐	**Go to 9**	
7	**In the last 12 months, did you use a computer at home?** ☐ **No**	**Go to 9**	
	Population: all in-scope individuals who used a computer in the last 12 months[13]		
NC[14]	☐ **Yes**		
8	**When using a computer at home in the last 12 months, how frequently did you back up files (such as documents, spreadsheets or digital photographs) which you created and kept on the computer?**[15]		For example, by putting them onto a CD, memory stick or external hard drive, or storing them on Web sites (such as those offering online storage for photographs or other files). Includes files created elsewhere (for instance, on a handheld computer or digital camera) and transferred to a computer used at home.
NC	*Population: all in-scope individuals who used a computer at home in the last 12 months*		
	Always or almost always ☐		That is, all or most files created by the individual are backed up – either individually or via a periodic backup of new (or all) files.
	Sometimes ☐		
	Never or hardly ever ☐		
	Not applicable – I have not created files which I kept on a computer used at home ☐		

Section B: Individual (adult) use of information and communication technology		Logic	Definitions and notes
9	**When did you most recently use the Internet?**[11] *Population: all in-scope individuals*		From any location and access device. The Internet is defined in Question 2.
	Within the last three months ☐		
	Between three months and a year ago[12] ☐	**Go to 11**	
	More than a year ago ☐	**Go to 24**	
	Never used the Internet ☐	**Go to 24**	
10	**How often did you typically use the Internet during the last 12 months?**[16] *Population: all in-scope individuals who used the Internet within the last 12 months*		From any location.
	At least once a day ☐		If using the Internet from work, this category refers to at least once each working day.
	At least once a week but not every day ☐		
	At least once a month but not every week ☐		
	Less than once a month ☐		

Section B: Individual (adult) use of information and communication technology	Logic	Definitions and notes
11 In the last 12 months, did you connect to the Internet using any of the following methods of mobile access?[17] **NC** *Population: all in-scope individuals who used the Internet in the last 12 months* Multiple responses allowed		
Via a WAP, GPRS or i-mode mobile cellular network ☐		Connection is typically via an Internet enabled mobile phone or another device such as a laptop computer or handheld device. WAP is Wireless Application Protocol, GPRS is General Packet Radio Service.
Via a UMTS (3G) mobile cellular network ☐		Connection is via an Internet enabled mobile phone or another device such as a laptop computer or handheld device. UMTS is a 3G mobile technology that will deliver information at speeds up to 2Mbits/sec.
Via a wireless connection, such as a 'hotspot', WiFi or Wimax, away from home ☐		Characterised by its local nature. Coverage would generally not be continuous across a very wide area such as a country. Connection is typically by a laptop computer or handheld device such as a PDA or smartphone. Excludes use of a wireless network at home.
12 In the last 12 months, did you use the Internet at home? *Population: all in-scope individuals who used the Internet in the last 12 months[13]*	☐ **No** **Go to 17** ☐ **Yes**	Via fixed or mobile access. Fixed access is defined in Question 17 and mobile access in Question 11.
13 How often did you typically use the Internet at home during the last 12 months?[16] *Population: all in-scope individuals who used the Internet at home in the last 12 months*		
At least once a day ☐		
At least once a week but not every day ☐		
At least once a month but not every week ☐		
Less than once a month ☐		

Section B: Individual (adult) use of information and communication technology			Logic	Definitions and notes
14	**Did you use a computer to access the Internet at home in the last 12 months?[18]**	☐ **No**	**Go to 17**	
NC	*Population: all in-scope individuals who used the Internet at home and who used a computer at home in the last 12 months*	☐ **Yes**		
15	**When using a computer to access the Internet at home in the last 12 months, have you experienced 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?[19]**			Excluding attacks which were successfully prevented by security measures in place. 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.
NC	*Population: all in-scope individuals who used a computer to access the Internet at home in the last 12 months*	**No** ☐	**Yes** ☐	**Don't know** ☐
16	**Was the computer you (mainly) used to access the Internet at home protected by:[20]**			
NC	*Population: all in-scope individuals who used a computer to access the Internet at home in the last 12 months*	**No**	**Yes**	**Don't know**
	Virus checking or protection software?	☐	☐	☐ Software which detects and responds to malicious programs such as viruses, Trojan horses and worms.
	A firewall?	☐	☐	☐ Software or hardware that controls access into and out of a network or a computer.
	Anti-spyware software?	☐	☐	☐ Software which detects and removes spyware from a computer system (spyware is tracking software which gathers information without the user's knowledge).
17	**Did you use the Internet at places other than home in the last 12 months using a fixed access device?[21]**	☐ **No**	**Go to 19**	A fixed access device is associated with the place where the Internet was used, for instance, a computer at work or at school. It includes a portable computer which is usually located in a particular place (for instance, work). It excludes devices such as portable computers or mobile phones used in conjunction with mobile access services as defined in Question 11.
	Population: all in-scope individuals who used the Internet in the last 12 months	☐ **Yes**		

Section B: Individual (adult) use of information and communication technology	*Logic*	*Definitions and notes*
18 At which of these other places did you use the Internet in the last 12 months?[22] *Population: all in-scope individuals who used the Internet at places other than home, using a fixed access device, in the last 12 months* Multiple responses allowed		
Work (other than home) ☐		
Place of education ☐		
At another person's home ☐		For instance, home of a friend, neighbour or relative.
Community Internet access facility[23] ☐		Includes access at community facilities such as public libraries, publicly provided Internet kiosks or government agencies; access is typically free or low cost.
Commercial Internet access facility[23] ☐		Includes access at Internet or cyber cafés, hotels or airports; even though the venue is commercial, the cost is not necessarily at full market price.
Other places (please specify)…… ☐		
19 For which of the following activities did you use the Internet for private purposes in the last 12 months?[24] *Population: all in-scope individuals who used the Internet in the last 12 months* Multiple responses allowed		For private use from any location (private means not as part of one's current job).
Getting information		
About goods or services ☐		
About job opportunities ☐		
Related to health or health services ☐		Covers injury, disease, nutrition and improving health generally.

Section B: Individual (adult) use of information and communication technology		*Logic*	*Definitions and notes*
19	**For which of the following activities did you use the Internet for private purposes in the last 12 months? (continued)**		For private use from any location (private means not as part of one's current job).
	Getting information (continued)		
	From government organisations (*e.g.* from Web sites or via e-mail)[25]	☐	
	Other information or general Web browsing	☐	
	Communicating		
	Sending or receiving e-mails	☐	
	Telephoning over the Internet	☐	
	Other communication (*e.g.* chat rooms/sites, message boards, instant messaging, Web logs)	☐	Web logs are also known as 'blogs'.
	Selling goods or services (*e.g.* through auction sites)[26]	☐	
	Internet banking	☐	
	Applying for jobs	☐	
	Formal education or training activities	☐	For instance, related to school or university courses, formal online courses.
	Dealing with government organisations[25]		Government organisations are defined by the SNA93 and include government organisations at local, regional and national level.
	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 tax forms, claims, applications for permits etc.
	Making online payments	☐	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.

Section B: Individual (adult) use of information and communication technology		*Logic*	*Definitions and notes*
19	**For which of the following activities did you use the Internet for private purposes in the last 12 months? (continued)**		For private use from any location (private means not as part of one's current job).
	Leisure activities		
	Downloading or listening to online music ☐		Includes file sharing and streaming from subscription services. Excludes listening to Web radio.
	Playing or downloading computer or video games ☐		Includes file sharing games and playing games on line.
	Downloading or watching movies, short films or images ☐		Includes file sharing. Excludes watching Web television but includes watching downloaded TV programmes.
	Listening to Web radio or watching Web television ☐		Includes podcasts of radio programmes.
	Reading or downloading electronic books, newspapers or magazines ☐		Includes accessing Web news sites.
	Downloading software, patches or upgrades ☐		Includes downloading computer software, software patches (*e.g.* for operating systems) and upgrades; excludes software for computer and video games.
20	**When did you most recently buy or order goods or services for private use over the Internet?**[11]		From any location; it refers to purchase orders placed via the Internet whether or not payment was made on line. Orders which were cancelled or not completed are excluded.
	Population: all in-scope individuals who used the Internet in the last 12 months		
	Within the last three months ☐		
	Between three months and a year ago ☐		
	More than a year ago ☐	**Go to 23**	
	Never bought or ordered goods or services over the Internet ☐	**Go to 23**	

Section B: Individual (adult) use of information and communication technology	Logic	Definitions and notes
21 What types of goods or services did you buy or order over the Internet for private use in the last 12 months?[27] *Population: all in-scope individuals who bought or ordered goods or services for private use over the Internet in the last 12 months* Multiple responses allowed		
Books, magazines or newspapers which are digitally delivered ☐		Downloaded from the Internet.
Books, magazines or newspapers which are physically delivered ☐		Generally delivered by post or delivery service.
Clothing, footwear, sporting goods or accessories ☐		
Computer equipment or parts (including peripheral equipment) ☐		Computer equipment includes packages where some software (such as an operating system) is included.
Computer or video games which are digitally delivered ☐		Downloaded from the Internet or played on line.
Computer or video games which are physically delivered ☐		For example, as CDs.
Computer software (including patches and upgrades but excluding computer games) which is digitally delivered ☐		Downloaded from the Internet.
Computer software (including patches and upgrades but excluding computer games) which is physically delivered ☐		For example, as CDs.
Financial products (including shares and insurance) ☐		The interest is in the purchase of the service rather than the investment value of the product. Include only where there is a service cost such as brokerage or commission.
Food, groceries, alcohol or tobacco ☐		
Information technology and telecommunications services (excluding software) ☐		Includes subscription to, or renewal of, ICT services such as: Internet access, pay TV, phone services; includes purchase of credit for Internet access or mobile phone use.
Movies, short films or images which are digitally delivered ☐		Downloaded from the Internet *e.g.* as AVI, MOV, MPEG files.
Movies, short films or images which are physically delivered ☐		For example, as DVDs.

Section B: Individual (adult) use of information and communication technology		*Logic*	*Definitions and notes*
21	**What types of goods or services did you buy or order over the Internet for private use in the last 12 months? (continued)**		
	Music products which are digitally delivered ☐		Downloaded from the Internet *e.g.* as MP3, WMA files or streamed from subscription services.
	Music products which are physically delivered ☐		For example, as CDs.
	Photographic, telecommunications or optical equipment ☐		Includes photographic equipment and accessories; telecommunications equipment such as fixed, cordless, mobile phones or fax machines; optical equipment such as binoculars.
	Tickets or bookings for entertainment events (sports, theatre, concerts etc) ☐		Excludes travel products.
	Travel products (tickets, accommodation, vehicle hire etc) ☐		
	Other[28] (please specify……) ☐		
22	**What was the TOTAL value of goods and services you bought or ordered for private use over the Internet in the last <period>?[29]** ☐		In national currency units. Includes the value of orders placed via the Internet whether or not payment was made on line. It excludes the value of orders which were cancelled or not completed and the value of capital items such as investment products, shares and loans. It includes financial services charges such as Internet brokers' fees or Internet banking charges.
NC	*Population: all in-scope individuals who bought or ordered goods or services for private use over the Internet in the last 12 months*	**Go to 24**	

Section B: Individual (adult) use of information and communication technology			Logic	Definitions and notes
23	**What were ALL the reasons for not buying or ordering goods or services for private use over the Internet in the last 12 months?**[30] *Population: all in-scope individuals who used the Internet in the last 12 months, but who did <u>not</u> buy or order goods or services for private use over the Internet during that period* Multiple responses allowed			
	Not interested	☐		
	Prefer to shop in person or deal personally with a service provider	☐		
	Security concerns, for example, worried about giving debit or credit card details over the Internet	☐		
	Privacy concerns, for example, worried about giving personal details over the Internet	☐		
	Trust concerns, for example, worried about warranties, receiving goods or services, or returning goods	☐		
	Lack of confidence, knowledge or skills	☐		
	Speed of connection is too slow	☐		
	Other (please specify)……..……	☐		
24	**Did you have <u>personal use</u> of a mobile phone during some or all of the last 12 months?**[15]	☐ **No**	**Go to end**	The phone need not be owned or paid for by the person but should be reasonably available through work or family etc. Excludes occasional use, for instance, borrowing a mobile phone to make a call.
NC	*Population: all in-scope individuals*	☐ **Yes**		

Section B: Individual (adult) use of information and communication technology	Logic	Definitions and notes
25 **For which of the following activities did you use a mobile phone in the last 12 months?**[15]		
NC *Population: all in-scope individuals with personal use of a mobile phone during some or all of the last 12 months*		
Multiple responses allowed		
Accessing the Internet, for example, browse WAP pages or use i-mode services ☐		
Sending or receiving SMS (short text messages) ☐		
Sending or receiving photographs ☐		
Downloading music, ringtones, games or video ☐		Free or charged.
Paying for goods or services ☐		Where the payment appears in the phone bill (or is deducted from phone credit).

Notes to the questions

1 Where there is no ‘Go to’ direction, the respondent is asked the next question.

2 The term ‘do you’ is included to cover single person households. It does not refer to individual activities.

3 This question refers to access rather than use. The equipment should be in working order or expected to be returned to working order soon.

4 This question refers to access rather than use. The connection should be functional (that is, any equipment or software needed should be in working order) or expected to be returned to working order soon. Note that access is not assumed to be only via a computer. It may also be by mobile phone, games machine etc. Therefore this question is asked even if there is a ‘No’ response to Question 1.

5 Possible country variations are: 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.

6 Three types of computers (desktop, portable and handheld) are combined into one category based on information from EC countries that the incidence of use of portable and handheld computers to access the Internet from home is very low. Where statistically feasible, countries may split the category.

7 The main aim of this question is to enable estimation of the proportion of households with broadband access. Possible country variations are: remove categories where items are not feasible, add or split categories according to technologies available and country data requirements (though note comments about bias above). Note also the comments against the categories ‘Other narrowband’ and ‘Other broadband’.

8 Based on Finnish household data for 2004, the broadband categories have not been split by speed (unlike the same question on the revised OECD business model questionnaire). Finland reported a very high ‘don't know’ response for such questions.

9 This 'Other' item would not appear on questionnaires – countries should add appropriate category/ies based on services available.

10 Changes have been made to categories to improve consistency with Eurostat and items have been ordered based on Eurostat data for 2004. Possible country variations are to add or split categories according to country data requirements though note comments about bias above. 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 the least burdensome presentation and is suitable for telephone interviewing. Where countries use a different method of collecting 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 and so on. Note that responses to barriers questions tend to be fairly stable over time therefore they may be rotated in and out of an annual collection.

11 New filter question. This formulation is consistent with Eurostat's model and would provide somewhat more information than a simple Yes/No filter question. However, countries could use a Yes/No filter question if they preferred (for countries with a low incidence of infrequent (3-12 months) use, the advantages of using the split question are much less).

12 Based on Eurostat data, the incidence of this item is likely to be low for most countries (average for EU: 3% of respondents in 2004 for computer use and 2% for Internet use).

13 As it is possible that households could have had computer access /Internet access at some time in the previous 12 months, but not at the time of the survey, the population for questions 7 and 12 (respectively) has not been restricted to those who had such access at home.

14 NC denotes a non-core question, that is, a question which is either relatively untested and therefore somewhat experimental, or may be difficult to collect.

15 New question nominated as non-core because relatively untested.

16 Note that countries are able to add additional frequency categories if they wish to obtain finer level information. The question refers to typical or usual use, therefore less frequent use because of absence (*e.g.* on holiday) is not taken into account.

17 The purpose of this question is to explore the use of mobile Internet access. It has been nominated as non-core because it has not been tested in this form and its categories may be technically complex for many respondents (though the sub-population for whom the question is relevant is likely to be relatively advanced, technically).

18 New filter question for the following two questions on security of the home computer. Like those questions, it has been nominated as non-core.

19 This is a new question and is nominated as non-core because such questions may be quite technical for many respondents.

20 This is a new question and is nominated as non-core because of evidence that many respondents are unaware of security precautions in place. Consistent with that hypothesis, Finnish data indicates that countries can expect quite high 'don't know' rates on this question. However, the incidence of 'don't know' responses may be useful information as an indication of awareness.

21 This is based on question 13 in the previous (2002) model questionnaire. The purpose of the question is to explore the use of the Internet from particular locations where the access device (typically a computer) is associated with the location.

22 Possible country variations are: add or split categories according to country data requirements, though note comments about bias above.

23 This category would not appear on country questionnaires. Each country should tailor the response categories for the facilities available in their country.

24 There are alternative ways of asking activities questions. For instance, each could be rated according to its frequency of use. The model questionnaire uses a simplified method of presentation which asks respondents to respond in respect of all activities. It is presumed that reasonably comparable output can be compiled by those countries taking a different approach. Possible country variations are: add or split categories according to country data requirements, though note comments about bias above. Note that the categories are not strictly mutually exclusive (*e.g.* getting information about goods or services may overlap with getting information from government organisations). The response categories of Australia, Canada, Japan, Korea, the United Kingdom, the United States and Eurostat were checked for the revision of this question. 2004 data from Eurostat were used to remove some categories with very low responses (*e.g.* gambling and other financial services such as share purchasing).

25 Government organisations/public authorities are defined per the SNA93. They include government organisations at local, regional and national level. According to SNA93 "the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." For more information, see http://unstats.un.org/unsd/sna1993/glossform.asp?getitem=219.

26 The item ‘purchasing over the Internet’ has been removed following a Eurostat change for 2006. The logic for the removal is that there is a separate question on Internet purchasing and analysis of Eurostat data has shown that the results from the two questions differ.

27 An option is to have a separate section for digitally delivered products (following the practices of Eurostat and Japan). Other possible country variations are: remove categories where items are not available (or are illegal); add or split categories according to products available and country data requirements (though note comments about bias above). Classifications of Canada, Japan, Eurostat, Finland, Korea, the United Kingdom and Australia have been used in revising this question. In addition, the CPC 1.1 mail-order/Internet purchases categories were considered as were those of a major Internet purchasing Web site. Note that categories are arranged in alphabetical order.

28 Following feedback that there were too many categories, the following items were removed (in some cases, country data indicate a low level of purchases; in other cases, the items were removed because they are not generally included on equivalent country questions): *Gambling, lotteries or betting services; Gifts n.e.c. (e.g. flowers, gift baskets, gift certificates); Household furniture, appliances or equipment (white goods, audio-visual equipment; excluding computer equipment and parts); Motor vehicles, accessories or parts; Musical instruments or sheet music; Real estate; Toiletry or health items (pharmaceuticals, other medical products, perfume, cosmetics etc); Toys, hobby items or collectibles (stamps, coins, autographs, figurines, models, craft items, art etc); Watches or jewellery.* If any of these categories are important, countries may wish to add them back.

29 The issue of bias arising from recall error is especially relevant for this question. OECD suggests that countries select a recall period for Internet purchases which allows calculation of 12 months' value (for instance, countries which collect monthly information should collect expenditure in respect of the last month). This information could also be collected in a household expenditure (or budget) survey rather than a use of ICT collection. Whichever method is chosen, it should deliver a reasonably unbiased estimate of total domestic Internet expenditure for the 12 month reference period. Note that this question should be asked in national currency and can be asked as a single value or as a set of ranges. If the latter, then the top category should be open (and ask for an exact value), and preferably apply to a small proportion of respondents. It is suggested that use of ranges may reduce recall bias (and probably also question non-response). Note that Eurostat dropped this question from 2005. Because it can be a difficult question to collect, it has been nominated as non-core.

30 It is possible to ask barriers questions in a variety of ways – see footnote 10 for more information. Possible country variations are: add or split categories according to country data requirements. In revising this question, response categories have been compared with those of Eurostat, Australia, Japan and the United Kingdom. Note that responses to barriers questions tend to be fairly stable over time therefore they may be rotated in and out of an annual collection.

ANNEX 1E: OECD DEFINITIONS OF INTERNET AND E-COMMERCE TRANSACTIONS[136]

572. Because of the high policy interest in e-commerce and the mandate received by OECD Ministers in Ottawa in 1998 to "compile definitions of e-commerce that are policy relevant and statistically feasible", the WPIIS has devoted a great deal of attention to the measurement of e-commerce. In particular, the WPIIS worked on the development of a framework for user needs and priorities, definitions, and statistical measurement of core e-commerce indicators.

573. In April 2000, OECD member countries endorsed two definitions of electronic transactions (electronic orders), based on narrower and broader definitions of the communications infrastructure. According to the OECD definitions, the method by which the order is placed or received, not the payment or the channel of delivery, determines whether the transaction is an Internet transaction (conducted over the Internet) or a broader electronic transaction (conducted over any computer-mediated network).

574. In 2001, the OECD developed guidelines for interpreting the definitions of e-commerce and encouraged countries to take such guidelines into account when developing their questionnaires.

575. Figure 7 below shows the current OECD definitions of e-commerce transactions and operational guidelines.

576. It should be noted that a number of issues associated with e-commerce remain open and continue to be discussed by the WPIIS. These are described in Chapter 5.

136. This annex has not been revised but the content is still current.

Figure 7. The OECD definitions of e-commerce transactions and interpretation guidelines[137]

E-commerce transactions	OECD definitions	Guidelines for the Interpretation of the Definitions (WPIIS proposal April 2001)
BROAD definition	An **electronic transaction** is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, 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.	**Include**: orders received or placed on any online application used in automated transactions such as Internet applications, EDI, Minitel or interactive telephone systems.
NARROW definition	An **Internet transaction** is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, 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.	**Include**: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, Minitel over the Internet, or over any other Web enabled application regardless of how the Web is accessed (e.g. through a mobile or a TV set, etc.) **Exclude**: orders received or placed by telephone, facsimile, or conventional e-mail.

137. This figure comes from the Summary Record of the 2001 meeting [OECD Internal Working Document, DSTI/ICCP/IIS(2001)M].

ANNEX 2: OUTPUT[138]

577. This annex provides an overview of dissemination of information society statistics by the OECD.[139] Additionally, it explores the presentation issue regarding populations to use when constructing proportions (for example, of people using a computer or purchasing over the Internet).

Publication of information society statistics

578. In parallel with development of standards for measuring the information society, the OECD has been publishing comparable statistics based on those standards. Many, but not all of those statistics, have been based on standards developed by the WPIIS. Others have included ICT infrastructure, ICT skills and ICT patent statistics. The following paragraphs briefly describe the more important OECD published outputs on the information society. More detail, including Web links to publications and data, is included for recent versions of regular publications.[140]

Information Technology Outlook 2000

579. *Information Technology Outlook* 2000 included some official statistics on ICT diffusion (PCs and the Internet) amongst households. It also included some ICT sector data, though not using the WPIIS-developed definition of the ICT sector.

Measuring the ICT sector 2000

580. This publication was the first OECD release of ICT statistics based on WPIIS standards. It presented ICT sector statistics collected from OECD member countries.

Science, Technology and Industry Scoreboard 2001

581. The 2001 edition of the OECD's *STI Scoreboard* contained a more extensive range of ICT statistics based on WPIIS standards. It included statistics on the diffusion of Internet technologies in businesses and households, e-commerce and the ICT sector. Other ICT statistics included those on investment in, and expenditure on, ICT; occupations and skills in the information economy; infrastructure for the information economy; the price of Internet access and use; and trade in ICT goods.

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138. This annex was revised in 2009 to include the main OECD information society statistics publications released up to the end of 2008.

139. Details of information society statistics output from individual member countries can be found in Annex 3. Eurostat has a 'home page' for its information society databases, see: http://epp.eurostat.ec.europa.eu/pls/portal/url/page/PGP_DS_INFO_SOC/PGE_DS_INFO_SOC.

140. The regular OECD publications containing information society statistics are *Communications Outlook*, *Information Technology Outlook* and *Science, Technology and Industry Scoreboard*. They are usually published biennially, with each series starting in the early to mid 1990s.

Communications Outlook 2001

582. The 2001 OECD *Communications Outlook* provided an extensive range of indicators for different types of communications networks and compared performance indicators such as revenue, investment, employment and prices for service throughout the OECD area.

Measuring the Information Economy 2002

583. This ICT data release remains the most comprehensive OECD release on ICT statistics. It included a very large range of ICT statistics, many based on WPIIS standards. The text and data are available for free downloading from the OECD Web site. See: http://www.oecd.org/document/5/0,2340,en_2649_34449_2765701_1_1_1_1,00.html.

Science, Technology and Industry Scoreboard 2003

584. The 2003 release included a section on the information economy. The content was similar in scope to the previous edition but more detail was presented on topics such as e-commerce.

Communications Outlook 2003

585. As for 2001, the 2003 edition of *Communications Outlook* provided an extensive range of indicators for communications networks and performance comparisons.

Information Technology Outlook 2004

586. The 2004 edition of *Information Technology Outlook* presented a large range of IT statistics, including, for the first time, ICT trade data based on the 2003 ICT goods classification. Other official ICT statistics in the release included those on ICT use by businesses – with a focus on e-commerce and e-business; use of ICT by households and individuals; ICT occupation and skills data based on labour force statistics; and trade in ICT services based on international trade in services statistics.

Communications Outlook 2005

587. *Communications Outlook 2005* presented comparable data on the performance of the communication sector (telecommunications, Internet and broadcasting) and related policy frameworks in OECD countries.

Science, Technology and Industry Scoreboard 2005

588. This release contained slightly more ICT statistics than the 2003 version, in particular, it included time-series data from Eurostat, Australia, Canada, Japan and the United States on the value of e-commerce.

Information Technology Outlook 2006

589. The 2006 edition of *Information Technology Outlook* built on the 2004 edition and, like it, presented a large range of IT statistics. Highlights included: developments in India and China, ICT skills, digital content and the participative Web.

Communications Outlook 2007

590. *Communications Outlook 2007* presented the most recent comparable data on communication sector performance and related policy frameworks in OECD countries. For the first time, the 2007 edition

includes analysis of the communication sector in the non-OECD countries, Brazil, Russia, India, China and South Africa. More information can be found at www.oecd.org/sti/telecom/outlook.

Science, Technology and Industry Scoreboard 2007

591. This release contained several new sections covering topical issues of interest to member countries. Like previous editions, the *Scoreboard* was made available electronically, with text and data able to be downloaded free of charge from the OECD Web site. See: www.oecd.org/sti/scoreboard.

Information Technology Outlook 2008

592. The 2008 edition of *Information Technology Outlook* was released at the end of 2008. It analysed recent developments in the IT goods and services industries and presented an outlook for continued long-term growth constrained by the uncertain macroeconomic environment in OECD countries. The 2008 edition can be browsed on line for free or purchased from the OECD Online Bookshop. For details, see www.oecd.org/sti/ito.

Key ICT Indicators

593. At the end of 2004, OECD introduced *Key ICT Indicators*, an online compilation of selected ICT indicators. Data are updated continually and can be found here: http://www.oecd.org/document/23/0,2340,en_2649_34225_33987543_1_1_1_1,00.html.

The presentation of information society statistics

594. A number of issues relating to collection and compilation of information society statistics are included in relevant chapters and Annex 1 of this *Guide*. However, there is one presentation issue that often leads to confusion so is worthy of mention here. It is the choice of denominator when presenting ICT use statistics.

595. Most indicators arising from ICT use surveys are presented as proportions data. They include: proportions of the whole population of units (businesses, households or individuals) or of sub-populations, such as particular industries, household type or age groups. In addition, countries often present data as a proportion of units that, for example, use the Internet or (for businesses) have a Web site. This mix of denominators can be very confusing to users, so it is important to be quite clear which denominator is used to calculate a particular indicator, especially when data are being compared across countries.

596. It is suggested that, for international comparability purposes, the simplest approach is for countries generally to provide collection agencies (such as OECD) with proportions that use the **overall population** as the denominator rather than the **active population** (the latter being the number of units that use the Internet or have a Web site, etc). Note that, for presentation purposes, it is possible to calculate indicators with the **active population** as the denominator using other output. For example, the proportion of business Internet users that have broadband access is equal to the proportion of businesses with broadband access divided by the proportion of businesses that use the Internet.

597. It should be noted that the 'overall population approach' does not work well for barriers, limitations and benefits data where the relevant denominator is the population of units that are, for barriers, **not** using the technology in question and, for limitations and benefits, **are** using the technology in question.

598. A useful alternative to the above is to provide the numbers relevant to the proportions sought.

ANNEX 3: MEMBER COUNTRIES' ICT STATISTICS COLLECTION WORK[141]

599. This annex consists of a brief overview and a Web link to the OECD ICT statistics metadata 'homepage'.[142] The entries found there constitute a significant repository of information about ICT statistical work undertaken by official statisticians of OECD countries. The aims of Annex 3 are to:

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

600. Features of country entries in this annex are:

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

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

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141. Metadata entries were updated for most member countries during 2007. Minor revisions were made to the text on this page.

142. http://www.oecd.org/sti/ictmetadata.

ANNEX 4: NON-MEMBER ECONOMIES[143]

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

1. ICT measurement activities of a large number of non-OECD economies.
2. ICT measurement activities of regional networks. In the last ten years, some regional networks have been formed in order to develop and collect regional ICT indicators.
3. Finally, many international organisations have an interest in measuring ICT. The third section of this annex will provide information on the ICT measurement activities of such organisations.

ICT measurement in non-OECD economies

603. One of the first activities of the *Partnership on Measuring ICT for Development* was to carry out a global stocktaking exercise on ICT statistics. The objectives of this exercise were: to take an inventory of existing and planned ICT indicators, questionnaires and methods of collecting statistics; to collect information that could lead to standardised definitions and a set of commonly accepted ICT core indicators; and to identify best practices and needs of NSOs in order to prepare technical assistance and knowledge exchange. The questionnaire was divided into four sections: *i.* general questions on ICT statistics; *ii.* ICT statistics in household surveys; *iii.* ICT statistics in business surveys; and *iv.* ICT statistics in others sectors such as industry and trade, education or government.

604. The questionnaire was sent by UNECA,[144] UNECLAC,[145] UNESCAP[146] and UNESCWA[147] to national statistical offices of their member countries, but excluding OECD countries. UNCTAD[148] sent the questionnaire to UNECE[149] member countries not covered by the OECD or Eurostat.

605. This section will present highlights from the metadata survey[150] from a regional point of view, based on the inputs provided by the UN Regional Commissions and UNCTAD.[151] A publication

143. This annex was revised in 2007 by Martin Schaaper, OECD, with contributions from a number of contacts from the organisations mentioned. The sections on measurement activities are now somewhat out-of-date.

144. United Nations Economic Commission for Africa.

145. United Nations Regional Commission for Latin America and the Caribbean.

146. United Nations Economic and Social Commission for Asia and the Pacific.

147. United Nations Economic and Social Commission for Western Asia.

148. United Nations Conference on Trade and Development.

149. United Nations Economic Commission for Europe.

150. The information in this section reflects the situation in 2003-2004, and may have changed since.

151. The designations employed and the presentation of the material in this section do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where the designation “country or area” appears, it covers countries, territories, cities or areas.

(Partnership on Measuring ICT for Development, 2005c) with a more detailed analysis can be consulted on line at: http://measuring-ict.unctad.org.

Africa

606. Nineteen out of 52 African countries replied to the questionnaire sent by UNECA. The responding countries were: Morocco, Tunisia, Benin, Gambia, Niger, Senegal, Sierra Leone, Central African Republic, Democratic Republic of Congo, Gabon, Lesotho, Zambia, Zimbabwe, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda and Tanzania.

Indicators on access and use of ICT by households/individuals

607. All countries, except for one, that responded collect (some of the) indicators on access and use of ICT by household/individuals. The following indicators are collected by African countries.

Table 6. African countries collecting ICT household/individual indicators

	Benin	Congo	Ethiopia	Gabon	Gambia	Kenya	Lesotho	Madagascar	Mauritius	Morocco	Niger	Central African Republic	Rwanda	Senegal	Sierra Leone	Tanzania	Tunisia	Zambia	Zimbabwe
Presence of electricity	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of radio	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of fixed line telephone	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
Presence of mobile phone	✓					✓		✓	✓	✓		✓	✓	✓		✓		✓	✓
Presence of TV (terrestrial/cable/satellite)	✓		✓	✓	✓	✓			✓	✓	✓	✓		✓		✓	✓	✓	✓
Presence of a computer (PC, Mac, laptop)	✓					✓		✓	✓				✓	✓		✓	✓	✓	✓
Presence of Internet access						✓		✓	✓	✓			✓						
Methods of access/bandwidth for Internet access						✓		✓		✓			✓						
Location of the most frequent use of Internet						✓			✓	✓			✓						
Frequency of Internet use						✓		✓	✓	✓			✓						
Purposes of PC use						✓		✓	✓		✓		✓						
Purposes of Internet use						✓			✓		✓		✓						
Services/activities the Internet is used for						✓		✓	✓				✓						
Languages of visited Internet sites													✓						
Type of goods/services purchased over the Internet													✓						
Value of goods/services purchased over the Internet									✓										
Barriers to PC use								✓	✓		✓								
Barriers to Internet use								✓	✓		✓								
Barriers to purchase over the Internet																			
Geographic location where Internet goods are purchased																			

Indicators on access and use of ICT by businesses

608. Ten countries that responded collect (some of the) ICT business indicators. The following indicators are collected by African countries.

Table 7. African countries collecting ICT business indicators

	Benin	Congo	Lesotho	Madagascar	Mauritius	Morocco	Rwanda	Senegal	Sierra Leone	Tanzania	Tunisia	Zimbabwe
Presence of fixed line telephone	✓	✓		✓	✓	✓	✓	✓		✓		✓
Presence of mobile devices				✓		✓	✓	✓		✓		
Presence of computer (PC, Mac, laptop)	✓			✓	✓	✓	✓			✓		✓
Number of computers (PC, Mac, laptop)	✓			✓	✓	✓	✓			✓		✓
Presence of Internet access	✓				✓	✓	✓	✓		✓		✓
Methods of access/bandwidth used for Internet	✓				✓	✓	✓			✓		✓
Presence of local network	✓				✓		✓			✓		✓
Presence of Web site	✓			✓	✓	✓	✓			✓	✓	✓
Recent ICT investments	✓				✓		✓			✓	✓	✓
% of employees using a PC in their normal work routine	✓				✓	✓						✓
% of employees using a PC connected to the Internet in normal work routine	✓											✓
Concrete services/activities the Internet is used for	✓									✓		✓
Value of Internet purchases					✓	✓				✓	✓	
Value of Internet sales				✓		✓				✓	✓	
Customer groups/destination of Internet sales						✓				✓		
Training/formation in ICT use for employees	✓				✓	✓				✓		✓
Barriers to PC use	✓			✓			✓			✓		✓
Barriers to Internet use	✓						✓			✓		✓
Barriers to e-commerce							✓			✓		
Geographic location where Internet goods are sold										✓		

Asia and the Pacific

609. This analysis refers to findings of the meta-information survey on ICT statistics for the Asia-Pacific membership of UNESCAP. However, because of agreements with OECD and UNCTAD some countries are excluded. Five UNESCAP members (Australia, Japan, New Zealand, Korea and Turkey) are also members of the OECD, therefore UNESCAP and OECD agreed that these five countries would be surveyed by OECD. Furthermore, UNESCAP and UNCTAD agreed on a division of work that assigned to UNCTAD the task of carrying out the metadata survey on nine UNESCAP Central Asian members (Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkmenistan, and Uzbekistan) that are also members of the United Nations Economic Commission for Europe (UNECE). In conclusion, UNESCAP sent the metadata survey questionnaire to 44 countries or areas in the Asia and the Pacific region, of which 18 replied.

Table 8. Countries and areas surveyed by UNESCAP in Asia and the Pacific

Country or area	Replied	Country or area	Replied
Afghanistan		(Federated States of) Micronesia	✓
American Samoa		Mongolia	✓
Bangladesh		Myanmar	
Bhutan		Nauru	
Brunei Darussalam		Nepal	
Cambodia	✓	New Caledonia	✓
China		Niue	✓
Cook Islands		Northern Mariana Islands	
Democratic People's Republic of Korea		Pakistan	✓
Fiji		Palau	
French Polynesia		Papua New Guinea	
Guam		Philippines	✓
Hong Kong, China	✓	Samoa	
India	✓	Singapore	✓
Indonesia	✓	Solomon Islands	
Iran (Islamic Republic of)	✓	Sri Lanka	✓
Kiribati		Thailand	✓
Lao People's Democratic Republic		Timor-Leste	
Macao, China	✓	Tonga	
Malaysia	✓	Tuvalu	
Maldives	✓	Vanuatu	✓
Marshall Islands		Vietnam	

Indicators on access and use of ICT by households/individuals

610. The most important element of the household/individuals section of the questionnaire was about the indicators that were currently collected by countries. The following table shows the availability by country or area.

Table 9. Asian and Pacific countries collecting ICT household/individual indicators

	Cambodia	Hong Kong, China	India	Indonesia	Iran	Macao, China	Malaysia	Maldives	Micronesia	Mongolia	New Caledonia	Niue	Pakistan	Philippines	Singapore	Sri Lanka	Thailand	Vanuatu
Presence of electricity	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of radio	✓		✓	✓			✓		✓	✓		✓	✓	✓		✓	✓	✓
Presence of fixed line telephone	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Presence of mobile phone	✓		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Presence of TV (terrestrial/cable/satellite)	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
Presence of a computer (PC, Mac, laptop)	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
Presence of Internet access		✓				✓	✓	✓	✓		✓	✓	✓		✓	✓		✓
Methods of access/bandwidth for Internet access		✓							✓			✓	✓		✓	✓		
Location of the most frequent use of Internet		✓							✓				✓		✓	✓	✓	
Frequency of Internet use		✓							✓				✓		✓	✓	✓	

	Cambodia	Hong Kong, China	India	Indonesia	Iran	Macao, China	Malaysia	Maldives	Micronesia	Mongolia	New Caledonia	Niue	Pakistan	Philippines	Singapore	Sri Lanka	Thailand	Vanuatu
Purposes of PC use		✓							✓						✓	✓	✓	
Purposes of Internet use		✓							✓			✓			✓	✓	✓	
Services/activities the Internet is used for		✓										✓			✓		✓	
Languages of visited Internet sites															✓			
Type of goods/services purchased over the Internet		✓													✓		✓	
Value of goods/services purchased over the Internet		✓													✓		✓	
Barriers to PC use		✓																
Barriers to Internet use		✓											✓		✓			
Barriers to purchase over the Internet		✓													✓			
Geographic location where Internet goods are purchased															✓			

Indicators on access and use of ICT by businesses

611. The following table shows the availability of ICT indicators for the business sector.

Table 10. Asian and Pacific countries collecting ICT business indicators

	Hong Kong, China	India	Indonesia	Macao, China	Maldives	Mongolia	New Caledonia	Pakistan	Philippines	Singapore	Thailand	Vanuatu
Presence of fixed line telephone		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of mobile devices	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
Presence of computer (PC, Mac, laptop)	✓	✓		✓			✓		✓	✓	✓	
Number of computers (PC, Mac, laptop)	✓	✓		✓					✓	✓	✓	
Presence of Internet access	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Methods of access/bandwidth used for Internet	✓		✓	✓				✓	✓	✓		
Presence of local network			✓	✓					✓	✓		
Presence of Web site	✓		✓	✓					✓		✓	
Recent ICT investments	✓		✓	✓					✓	✓		
% of employees using a PC in their normal work routine				✓					✓	✓	✓	
% of employees using a PC connected to the Internet in normal work routine									✓	✓	✓	
Concrete services/activities the Internet is used for	✓			✓					✓	✓	✓	
Value of Internet purchases									✓			
Value of Internet sales	✓											
Customer groups/destination of Internet sales	✓											
Training/formation in ICT use for employees									✓			
Barriers to PC use	✓			✓				✓	✓		✓	

	Hong Kong, China	India	Indonesia	Macao, China	Maldives	Mongolia	New Caledonia	Pakistan	Philippines	Singapore	Thailand	Vanuatu
Barriers to Internet use	✓								✓	✓	✓	
Barriers to e-commerce	✓										✓	
Geographic location where Internet goods are sold										✓		

Central Asia and Central and Eastern Europe

612. UNCTAD collaborated with UNECE in this survey and sent the questionnaire to 24 countries in Central Asia and Central and Eastern Europe. The questionnaire was sent to those UNECE member countries that are not members of OECD (with the exception of Turkey, which is included in this summary) or covered by Eurostat surveys. Nineteen countries returned the questionnaire.

Table 11. Countries in Central Asia and Central and Eastern Europe surveyed by UNCTAD

Countries	Responded	Countries	Responded
Albania	✓	Liechtenstein	✓
Andorra	✓	Macedonia FYR	✓
Armenia	✓	Moldova	✓
Azerbaijan	✓	Monaco	
Belarus	✓	Romania	✓
Bosnia and Herzegovina	✓	Russian Federation	✓
Bulgaria	✓	Serbia and Montenegro	
Croatia	✓	Tajikistan	
Georgia	✓	Turkey	✓
Israel	✓	Turkmenistan	
Kazakhstan	✓	Ukraine	✓
Kyrgyzstan	✓	Uzbekistan	

Indicators on access and use of ICT by households/individuals

613. Andorra and Bulgaria are the countries that collect the highest number of ICT household indicators, respectively 16 and 18 out of 20 indicators. The most common indicators collected by NSOs are the 'basic access to ICT' indicators (presence of electricity, radio, fixed telephone, mobile phone, TV and computer), which are collected on average by 15 countries (out of 19). The collection of indicators concerning type of ICT use is less frequent, and at least 11 NSOs do not have any plans to measure these indicators in the near future. However, Kazakhstan and Armenia plan to collect the indicators on Internet use and barriers to use in the next years, and Bosnia and Herzegovina, Georgia and Romania plan to do so in the next three years. 'Language of sites' is the only indicator that is not collected by any NSO.

Table 12. Central Asian and Central and Eastern European countries collecting ICT household/individual indicators

	Albania	Andorra	Armenia	Azerbaijan	Belarus	Bosnia & Herzegovina	Bulgaria	Croatia	Georgia	Israel	Kazakhstan	Kyrgyzstan	Liechtenstein	Macedonia	Moldova	Romania	Russian Federation	Turkey	Ukraine
Presence of electricity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	
Presence of radio		✓			✓	✓	✓	✓	✓		✓	✓			✓	✓	✓		✓
Presence of fixed line telephone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	
Presence of mobile phone	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓		✓	✓	
Presence of TV (terrestrial/cable/satellite)	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓
Presence of a computer (PC, Mac, laptop)	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓				✓	✓	✓	✓
Presence of Internet access	✓	✓					✓	✓		✓						✓		✓	
Methods of access/bandwidth for Internet access		✓					✓									✓		✓	
Location of the most frequent use of Internet		✓					✓											✓	
Frequency of Internet use	✓	✓					✓											✓	
Purposes of PC use		✓					✓			✓						✓			
Purposes of Internet use		✓					✓			✓						✓		✓	
Services/activities the Internet is used for		✓					✓			✓								✓	
Languages of visited Internet sites																			
Type of goods/services purchased over the Internet							✓			✓								✓	
Value of goods/services purchased over the Internet							✓			✓								✓	
Barriers to PC use		✓					✓												
Barriers to Internet use		✓																	
Barriers to purchase over the Internet		✓					✓											✓	
Geographic location where Internet goods are purchased							✓												

Indicators on access and use of ICT by businesses

614. Among the 19 countries that responded to the questionnaire, 12 NSOs collect at least one ICT indicator through their business sector surveys. The remaining seven NSOs either plan to collect ICT indicators in the next three years (Bosnia and Herzegovina, Georgia) or do not collect any ICT business indicator (Israel, Turkey) or have not responded to this section (Croatia, Liechtenstein and Macedonia FYR). The latter are not likely to collect any indicators in the near future.

615. Romania and the Russian Federation are the countries that collect the highest number of indicators (17 out of 20). Bosnia and Herzegovina and Georgia plan to start the collection of ICT indicators in business surveys in the next three years. Andorra and Kazakhstan plan to develop the collection of the indicators about ‘e-commerce’ and ‘barriers to ICT’ in the next year or in the next three years.

616. The most common business sector ICT indicators are the ‘basic access to ICT’ ones: presence of fixed telephone and mobile devices, the presence and number of computers and the presence of Internet access (indicators 1-5). The indicators about ‘Internet activities and e-commerce’ (indicators 12-15) and about ‘barriers to ICT use’ (indicators 17-19) are collected less. Only Bulgaria, Romania and the Russian Federation collect at least one of these indicators.

Table 13. Central Asian and Central and Eastern European countries collecting ICT business indicators

	Albania	Andorra	Armenia	Azerbaijan	Belarus	Bosnia & Herzegovina	Bulgaria	Georgia	Israel	Kazakhstan	Kyrgyzstan	Moldova	Romania	Russian Federation	Turkey	Ukraine
Presence of fixed line telephone	✓	✓	✓	✓	✓					✓	✓	✓		✓		✓
Presence of mobile devices	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓		✓
Presence of computer (PC, Mac, laptop)							✓				✓	✓	✓	✓		✓
Number of computers (PC, Mac, laptop)							✓				✓	✓	✓	✓		✓
Presence of Internet access		✓	✓	✓	✓		✓			✓	✓	✓	✓	✓		✓
Methods of access/bandwidth used for Internet		✓					✓				✓	✓	✓			✓
Presence of local network							✓				✓	✓	✓			✓
Presence of Web site		✓					✓				✓		✓	✓		
Recent ICT investments										✓	✓	✓	✓	✓		✓
% of employees using a PC in their normal work routine		✓					✓				✓	✓	✓	✓		✓
% of employees using a PC connected to the Internet in normal work routine		✓					✓				✓		✓	✓		
Concrete services/activities the Internet is used for							✓				✓		✓	✓		
Value of Internet purchases							✓						✓	✓		
Value of Internet sales							✓						✓	✓		
Customer groups/destination of Internet sales							✓						✓			
Training/formation in ICT use for employees														✓		
Barriers to PC use													✓	✓		
Barriers to Internet use							✓						✓	✓		
Barriers to e-commerce							✓							✓		
Geographic location where Internet goods are sold							✓						✓	✓		

Latin America and the Caribbean

617. The metadata questionnaire was sent electronically to the directors and ICT statistics areas of the National Statistics Offices. Thirty-six questionnaires were sent in total, of which 20 countries responded: 10 from South America, three from Central America and seven countries from the Caribbean. Mexico, an OECD country, was included in the survey, and the results for Mexico will be included here.

Table 14. Latin American and Caribbean countries that responded to the questionnaire

South America	Central America	Caribbean
Argentina	Costa Rica	Barbados
Bolivia	El Salvador	Belize
Brazil	Mexico	Jamaica
Chile		Dominican Republic
Colombia		Saint Kitts and Nevis
Ecuador		St. Vincent and the Grenadines
Paraguay		Trinidad and Tobago
Peru		
Uruguay		
Venezuela		

Indicators on access and use of ICT by households/individuals

618. The majority of the countries have made efforts to include basic questions about ICT use by households/individuals into their questionnaires. Fourteen countries reported using household/living conditions surveys to ask some ICT questions, 12 countries used a population census and two countries had done specific ICT surveys.

Table 15. Latin American and Caribbean countries collecting ICT household/individual indicators

	Argentina	Barbados	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Ecuador	El Salvador	Jamaica	Mexico	Paraguay	Peru	Dominican Republic	Saint Kitts and Nevis	St. Vincent and the Grenadines	Trinidad and Tobago	Uruguay	Venezuela
Presence of electricity		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of radio		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
Presence of fixed line telephone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of mobile phone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Presence of TV (terrestrial/cable/satellite)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of a computer (PC, Mac, laptop)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Presence of Internet access	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Methods of access/bandwidth for Internet access		✓	✓			✓		✓				✓						✓		
Location of the most frequent use of Internet		✓	✓			✓	✓	✓				✓		✓				✓		
Frequency of Internet use		✓	✓			✓	✓	✓				✓						✓		
Purposes of PC use		✓				✓	✓					✓						✓		
Purposes of Internet use		✓				✓	✓	✓				✓						✓		
Services/activities the Internet is used for		✓				✓	✓					✓						✓		
Languages of visited Internet sites																				
Type of goods/services purchased over the Internet		✓					✓					✓						✓		

	Argentina	Barbados	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Ecuador	El Salvador	Jamaica	Mexico	Paraguay	Peru	Dominican Republic	Saint Kitts and Nevis	St. Vincent and the Grenadines	Trinidad and Tobago	Uruguay	Venezuela
Value of goods/services purchased over the Internet		✓										✓						✓		
Barriers to PC use		✓										✓								
Barriers to Internet use		✓										✓						✓		
Barriers to purchase over the Internet		✓																✓		
Geographic location where Internet goods are purchased		✓										✓								

Indicators on access and use of ICT by businesses

619. Concerning survey vehicles for business indicators, countries have included ICT modules in their business surveys, mainly in the commerce and services surveys (five countries) and in the manufacturing surveys (four countries). Additionally there are three countries that have included ICT questions in their surveys of technological innovation in companies.

620. Regarding the questions included in ICT surveys for businesses, there is a diversity in the topics covered, types of surveys and their frequency. There is a group of questions about access, such as the presence of fixed and mobile phones, computers, Internet, local area networks and Web sites, which are incorporated in some surveys or which have been used in thematic ICT surveys. Additionally, questions about sales over the Internet are becoming more common (25% of the countries).

Table 16. Latin American and Caribbean countries collecting ICT business indicators

	Argentina	Barbados	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Ecuador	El Salvador	Jamaica	Mexico	Paraguay	Peru	Dominican Republic	Saint Kitts and Nevis	St. Vincent and the Grenadines	Trinidad and Tobago	Uruguay	Venezuela
Presence of fixed line telephone			✓	✓		✓	✓	✓		✓			✓					✓		
Presence of mobile devices	✓		✓	✓		✓	✓	✓					✓						✓	
Presence of computer (PC, Mac, laptop)		✓	✓			✓	✓	✓				✓						✓		
Number of computers (PC, Mac, laptop)						✓	✓											✓		
Presence of Internet access	✓	✓	✓		✓	✓	✓	✓				✓	✓					✓	✓	
Methods of access/bandwidth used for Internet		✓				✓	✓											✓		
Presence of local network	✓					✓	✓					✓						✓		

	Argentina	Barbados	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Ecuador	El Salvador	Jamaica	Mexico	Paraguay	Peru	Dominican Republic	Saint Kitts and Nevis	St. Vincent and the Grenadines	Trinidad and Tobago	Uruguay	Venezuela
Presence of Web site	✓	✓		✓	✓	✓	✓					✓						✓	✓	
Recent ICT investments												✓						✓		
% of employees using PC in normal work routine							✓											✓		
% of employees using a PC connected to the Internet in normal work routine							✓											✓		
Concrete services/activities Internet is used for	✓				✓		✓											✓		
Value of Internet purchases						✓	✓											✓		
Value of Internet sales	✓				✓	✓	✓											✓		
Customer groups/destination of Internet sales						✓												✓		
Training/formation in ICT use for employees		✓					✓					✓						✓		
Barriers to PC use																		✓		
Barriers to Internet use																		✓		
Barriers to e-commerce		✓																✓		
Geographic location Internet goods are sold																				

Western Asia

621. Ten of the 13 UNESCWA member countries responded to the questionnaire as follows: Egypt, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria and Yemen.

Indicators on access and use of ICT by households/individuals

622. Nine of the ten responding countries collect at least some of the indicators on access and use of ICT by household/individuals. The following indicators are collected by Western Asian countries.

Table 17. Western Asian countries collecting ICT household/individual indicators

	Egypt	Jordan	Kuwait	Lebanon	Oman	Palestine	Qatar	Saudi Arabia	Syria	Yemen
Presence of electricity	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Presence of radio	✓	✓	✓	✓	✓	✓	✓		✓	
Presence of fixed line telephone	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Presence of mobile phone	✓	✓		✓	✓	✓	✓		✓	
Presence of TV (terrestrial/cable/satellite)	✓	✓		✓	✓	✓	✓	✓	✓	
Presence of a computer (PC, Mac, laptop)	✓	✓		✓	✓	✓	✓	✓	✓	
Presence of Internet access	✓	✓			✓	✓	✓	✓		
Methods of access/bandwidth for Internet access						✓				

	Egypt	Jordan	Kuwait	Lebanon	Oman	Palestine	Qatar	Saudi Arabia	Syria	Yemen
Location of the most frequent use of Internet										
Frequency of Internet use		✓				✓				
Purposes of PC use		✓		✓		✓				
Purposes of Internet use		✓	✓	✓		✓				
Services/activities the Internet is used for				✓		✓				
Languages of visited Internet sites										
Type of goods/services purchased over the Internet										
Value of goods/services purchased over the Internet										
Barriers to PC use						✓				
Barriers to Internet use						✓				
Barriers to purchase over the Internet										
Geographic location where Internet goods are purchased										

Indicators on access and use of ICT by businesses

623. The following table shows the business indicators that are collected by the responding countries.

Table 18. Western Asian countries collecting ICT business indicators

	Egypt	Jordan	Kuwait	Lebanon	Oman	Palestine	Qatar	Saudi Arabia	Syria	Yemen
Presence of fixed line telephone	✓		✓		✓		✓			
Presence of mobile devices	✓									
Presence of computer (PC, Mac, laptop)	✓				✓					
Number of computers (PC, Mac, laptop)	✓									
Presence of Internet access	✓									
Methods of access/bandwidth used for Internet										
Presence of local network										
Presence of Web site										
Recent ICT investments										
% of employees using a PC in their normal work routine										
% of employees using a PC connected to the Internet in normal work routine										
Concrete services/activities the Internet is used for					✓					
Value of Internet purchases										
Value of Internet sales										
Customer groups/destination of Internet sales										
Training/formation in ICT use for employees										
Barriers to PC use										
Barriers to Internet use										

	Egypt	Jordan	Kuwait	Lebanon	Oman	Palestine	Qatar	Saudi Arabia	Syria	Yemen
Barriers to e-commerce										
Geographic location where Internet goods are sold										

Activities of regional ICT measurement networks

624. Over the last five to ten years, a number of regional networks have been established in different parts of the world. Regional collaboration networks are a very effective way for countries to exchange information on indicator development, while ensuring international comparability at the same time. By using existing methodology, developed by other international networks – such as the OECD or Eurostat – international comparability can be enhanced even more. Moreover, by avoiding unnecessary duplication, valuable time can be saved.

625. Collaboration with these networks has become one of the main strands of OECD's outreach activities. Through participation in these networks, WPIIS methodologies have been diffused to a large number of non-OECD economies. By now, in the various identified networks (including the OECD itself) more than 50 countries in the world use the methodologies developed by the WPIIS to some extent, while WPIIS work has been presented to many more countries.

626. The following information will be presented for the networks identified:

- Name of the network.
- Lead country/organisation.
- Participating countries.
- Objectives.
- Short history; and
- Results, links and contacts.

Name	**Asia Pacific ICT Technical Meeting** (formerly known as the Asia Pacific Technical Meeting on IT&T Statistics)
Lead country/organisation	-
Participating countries	Australia; China; Hong Kong, China; Japan; South Korea; New Zealand; the Philippines and Singapore.
Objectives	With the increasing maturity of ICT statistics collection in the Asia Pacific region, technical conferences and other forms of information exchange will become increasingly important. The main objective is to ensure comparable frameworks and understanding in ICT statistics among Asia Pacific countries. It provides an opportunity for agencies to share their experiences in building comparable data collection and dissemination knowledge on ICT statistics.
Short history	In May 2001 the first meeting was held in Brisbane, Australia. The second round in the series was hosted by Hong Kong, China, in October 2002. The third meeting was held in Wellington, New Zealand, in November/December 2004. Currently, the group is inactive.
Results, links and contacts	• Documents from the three meetings can be found at http://www.unescap.org/stat/ict/. • In addition, documents from the second meeting are available at: http://www.info.gov.hk/censtatd/itt/conference.htm. • And documents from the third meeting at: http://www.stats.govt.nz/about-us/events/2004-asia-pacific-ict-meeting.htm.

Name	e-ASEAN Measurement Framework
Lead country/organisation	• Thailand/Electronic Commerce Resource Center, National Electronic and Computer Technology Center. • Thailand/Department of Business Economics, Ministry of Commerce. • Singapore/Infocomm Development Authority of Singapore.
Participating countries	ASEAN countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam.
Objectives	The main objective is to develop a set of recommendations for positioning the ten ASEAN countries in the digital economy, to cover indicators for the digital economy and to improve the practice of regularly measuring the progress of the region towards the goals of e-ASEAN. Specific objectives of the second meeting were to consider and establish a core list of ICT indicators and their definitions; to share information and experience among countries on model surveys and data collection methodology, as part of capacity building effort; and to take stock of ICT/e-commerce surveys in each ASEAN country.
Short history	A first meeting was held in September 2002 in Bangkok, Thailand. A second meeting was held in November 2003 in Yangon, Myanmar. Due to a restructuring of the e-ASEAN working group, the activities of the e-ASEAN measurement working group have been transferred to the Telsom working group, which falls under the e-Society and ICT Capacity Building (ESICB) working Group. Leading organisations for this issue remain NECTEC/Thailand and IDA/Singapore.
Results, links and contacts	• First meeting: http://www.ecommerce.or.th/project/asean-measurement/.

Name	eEurope Action Plans 2002 & 2005
Lead country/organisation	European Commission.
Participating countries	EU Member States and EFTA countries.
Objectives	The eEurope Action Plans followed the European Council meeting in Lisbon in 2000 to target Internet connectivity (2002) and to support economic growth and social cohesion through the take up of online services and e-business based on a broadband infrastructure (2005). Both plans included a list of benchmarking indicators agreed by Member States to: • Aid policy development by providing a record of progress. • Allow a comparison with countries outside the EU. • Evaluate the net overall impact of eEurope and the information society; and • Show the current levels of activity in key areas. eEurope 2005 benchmarking is based on a list of 40 key indicators that were endorsed by Member States in 2003 (Council Resolution of 18 February 2003).
Short history	In December 1999, the eEurope initiative was launched by the European Commission to bring the benefits of the information society to all Europeans. In June 2000, the eEurope 2002 Action Plan called eEurope 2005, running from 2003 to 2005. That action plan builds on eEurope 2002 and maintains eEurope as the symbol of European Union policy to develop the information society. A revised eEurope 2010 initiative is expected at the end of 2005.
Results, links and contacts	• The results of eEurope 2002 have been analysed in the eEurope benchmarking report: http://europa.eu.int/information_society/.../benchmarkin_en.pdf. • The eEurope 2005 benchmarking report was released in December 2005: http://europa.eu.int/...Final%20Benchmarking%20Report.pdf. • eEurope 2005 benchmarking indicators: http://europa.eu.int/eur-lex/en/archive/2003/c_04820030228en.html.

Name	**eEurope 2003 Action Plan**
Lead country/organisation	European Commission.
Participating countries	Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, Slovenia and Turkey.
Objectives	*e*Europe+ mirrored the priority objectives and targets of *e*Europe but provided for actions which tackle the specific situation of the Candidate Countries before joining the European Union. To enable comparison of data for monitoring and benchmarking between *e*Europe and *e*Europe+, the Candidate Countries agreed to use the same indicators which were selected and agreed by the EU.
Short history	At the European Ministerial Conference held in Warsaw on 11-12 May 2000, Central and Eastern European Countries recognised the strategic goal set by the EU-15 in Lisbon and agreed to embrace the challenge set by the EU-15 with *e*Europe and decided to launch an '*e*Europe-like Action Plan' *by and for* the Candidate Countries as a complement to the EU political commitments. After publication of the final report in February 2004, the exercise was finalised and most of the Candidate Countries of the time are now EU Member States and integrated in the EU and EU-statistics. For the current candidate countries, Bulgaria, Romania, Turkey and Croatia, support will be offered for carrying out the standard ICT use surveys on a voluntary basis.
Results, links and contacts	General information: http://europa.eu.int/information_society/... A first progress report was presented in June 2002. The final progress report was presented in February 2004: http://europa.eu.int/.../eeuropeplus_progress_report.pdf.

Name	**Northern *e*Dimension Action Plan (NeDAP)**
Lead country/organisation	European Commission
Participating countries	Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, the Russian Federation, Sweden and the European Commission.
Objectives	The aim of the project is to identify a set of indicators to be used across all countries and to harmonise methods and concepts, based on the methodology developed by international organisations, such as Eurostat and the OECD.
Short history	The Northern *e*Dimension Action Plan (NeDAP) serves as a tool for enhancing the development of ICT in the Northern region. The initiative for the NeDAP is based on the EU's Northern Dimension and the decision of the Council of Baltic Sea States (CBSS), from 26 January 2001, to develop NeDAP in partnership with the European Commission. The NeDAP initiative builds upon the *e*Europe and *e*Europe+ action plans and national and regional e-Initiatives. Statistics Denmark is chairing action line 6 that is responsible for the publication on e-Indicators. Data have been collected from all countries in the Baltic region. The first publication was released in 2003 and the second publication in 2005.
Results, links and contacts	• http://www.riso.ee/en/nordic/ned05v01AL6.htm. • Final publication 2003: http://www.ssb.no/ikt/rapp_ict_baltic/rapp_ictbaltic.pdf. • Final publication 2005: http://www.dst.dk/upload/baltic2005.pdf.

Name	**RICYT (*Red Iberoamericana de Indicadores de Ciencia y Tecnología*, the Ibero-American Network on Science and Technology Indicators)**
Lead country/organisation	RICYT.
Participating countries	Latin American and Caribbean countries, the United States, Canada, Spain and Portugal.
Objectives	To critically review the methodologies designed and used by the most important statistical institutions in the world, and specifically those used in Ibero-America, in order to evaluate the relevance and feasibility of their application by RICYT countries. The eventual aim is to measure the knowledge society – a broader concept than the information society and covering more than ICT indicators.
Short history	• 2001 – Seminar on Information Society and Scientific Cultural Promotion, Lisbon, Portugal. Participants analysed the current situation of the Latin American and Caribbean area and made policy recommendations for countries in the region. • 2003 – Second Workshop on Information Society Indicators, Lisbon, Portugal. The main objectives of this Workshop were promoting discussion on information society indicators in the Ibero American context; reaching consensus on basic indicators for measuring the information society, and setting common criteria for Ibero America; incorporating RICYT in the global discussion on IS measurement; and generating a proper environment for linkages among experts and favouring the exchange of IS-measuring related knowledge. • 2005 – Third Ibero American Seminal on Information Society Indicators, Lisbon, Portugal, with the motto "Information Society Indicators: benchmarking and good practices". The Seminar aimed at making advances in the elaboration of the *Lisbon Manual – Guide for the interpretation of available statistical data and the elaboration of indicators referred to the transition of Ibero-America toward the Information Society*. The *Manual* is intended to become an orienting document for indicators production, focused on the 'Information Society Indicators Matrix'. In order to produce the Manual, information about the most important existing institutions, indicators and methodologies in the IS area will be collected/surveyed. This survey will allow for an analysis of variables and indicators potentialities and limitations, as well as the main technical and institutional obstacles that need to be overcome in order to improve the measurements. • 2006-2007 – Organisation of the Fourth Ibero-American Workshop on Information Society Indicators, Lisbon, Portugal, 2007. This time, the principal aim of the Workshop is to present the results of the 2006-2007 efforts in order to up-date and improve the *Lisbon Manual.* • 2007 – *Lisbon Manual* Revision. In order to improve and update the *Manual*, RICYT will co-ordinate several country specific studies about IS issues: e-government, ICT incorporation in the private sector, the ICT sector and the digital divide.
Results, links and contacts	• Participation in IS projects: o Monitoring the Digital Divide… and beyond (ORBICOM-UNESCO); 2004-2005. o Collaboration with IS Commission (RECYT MERCOSUR); 2004. o Observatory for Connectivity in the Americas (OSILAC) – ECLAC/ICA/IDRC/OECD; 2003-2005. o IS and Technological Innovation Indicators (COLCIENCIAS/OCYT/OAS); 2002-2004. o Observatory in Action of Social Impacts of ICTs in Latin America and the Caribbean (OLISTICA) – IDRC/MISTICA/FUNREDES; 2001-2003. o Observatory in Action of Social Impacts of ICTs in Latin America and the Caribbean (OLISTICA) – IDRC/MISTICA/FUNREDES; 2001-2003. o Knowledge networks in productive chains: generation, circulation and knowledge appropriation and creation of competitive advantages in the Argentinean productive chains. Components: a) Analysis and measurement of e-government in two specific regions; b) Analysis and measurement of ICT incorporation in firms. IDRC/FLACSO/UNGS/RICYT); 2007-2008. • www.ricyt.org, ricyt@ricyt.edu.ar, glugones@ricyt.edu.ar.

Activities of other international organisations in the field of ICT indicators

627. A number of international organisations other than the OECD are interested in ICT indicators and carry out relevant data collections. In 2004, these organisations formed the *Partnership on Measuring ICT for Development* (see Chapter 9 for more information). In this section, an overview is given of the measurement work carried out by members of the *Partnership*.

628. For each organisation, where available, the following information is provided:

- Name of the organisation.
- Description of mandate/mission.
- Relevant department/division.
- Contact person/Web address.
- Data collection details (including future plans).
- Country coverage.
- Publications; and
- Collaboration with other international organisations.

629. The following organisations are covered:

- European Commission – DG Eurostat.
- International Telecommunication Union (ITU).
- Organisation for Economic Co-operation and Development (OECD).
- UNESCO Institute for Statistics (UIS).
- United Nations Conference on Trade and Development (UNCTAD).
- UN ICT Task Force.[152]
- United Nations Economic Commission for Africa (UNECA).
- United Nation Economic Commission for Latin America and the Caribbean (UNECLAC).
- United Nations Economic and Social Commission for Western Asia (UNESCWA).
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP); and
- The World Bank.

152. The UN ICT Task Force was a member of the *Partnership*, until its mandate expired at the end of 2005.

Name of organisation	European Commission – DG Eurostat
Description of mandate/mission	Eurostat's mission is to provide the European Union with a high-quality statistical information service.
Relevant department/division	Eurostat Directorate F, Unit F6-Information society and tourism statistics.
Contact person/Web address	http://epp.eurostat.ec.europa.eu/.
Data collection details (including future plans)	Eurostat has collected statistics on enterprises and the information society since 2001 and on individuals/households and the information society since 2002, based on an agreement with Member States until 2005; from 2006 onwards based on Regulation (EC) No. 808/2004 of the European Parliament and of the Council, OJL 143/49, 30.04.2004: http://europa.eu.int/eur-lex/pri/en/oj/dat/2004/l_143/l_14320040430en00490055.pdf. Annual implementing measures allow adjustment of the data collections to user needs. The national statistical offices of member states are collecting these data by using agreed Eurostat model questionnaires, which guarantee highly comparable data sets for the EU-25 countries. Results can be downloaded free of charge from the Eurostat database: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_30298591... For meta data, model questionnaires and a methodological manual the following link can be used: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=2353,47212666....
Country coverage	EU-25 Member States, candidate countries and other EEA countries.
Publications	Various publications and *Statistics in Focus*.
Collaboration with other international organisations	Collaboration with the OECD in developing methodology and collecting data and metadata from common member countries.

Name of organisation	International Telecommunication Union (ITU)
Description of mandate/mission	The International Telecommunication Union is an intergovernmental organisation where the public and private sectors co-operate for the development of telecommunications and harmonisation of national telecommunication policies. The ITU consists of 191 Member States and some 609 sector members representing public and private companies and organisations with an interest in telecommunications. The ITU's mission is *i*. to promote the development and efficient operation of telecommunication facilities and the extension of the benefits of new information and communication technologies to people everywhere; *ii.* to promote and offer technical assistance to developing economies in the field of information technologies and telecommunications including the mobilisation of the human and financial resources needed; and *iii*. to promote, at the international level, the adoption of a broader approach to the issues of telecommunications in the global information economy and society. In addition, a broad goal is also to bring governments and the private sector together to work towards advancing the development of communications technology. The activities of the three Sectors of the Union – Radiocommunication (ITU-R), Telecommunication Standardization (ITU-T), and Telecommunication Development (ITU-D) – cover all aspects of telecommunication, including ensuring an efficient and on-time production of high quality standards (Recommendations) covering all fields of telecommunications, allocation of bands of the radiofrequency spectrum, allotment of radio frequencies and the registration of radio frequency, facilitating connectivity and access, fostering policy, regulatory and network readiness, expanding human capacity through training programmes and formulating financing strategies in developing economies.
Relevant department/division	Telecommunication Development Bureau (BDT).
Contact person/Web address	http://www.itu.int/ict.
Data collection details (including future plans)	Collection, compilation and dissemination of over 100 telecommunication/ICT statistics. The ITU is also the lead agency responsible for defining and monitoring ICT indicators for the UN Millennium Development Goals project.
Country coverage	Global coverage.
Publications	Yearbook of Statistics, World Telecommunication Development Report, World Telecommunication Indicators (WTI) database, Regional Telecommunication Indicator publications.

Name of organisation	Organisation for Economic Co-operation and Development (OECD)
Description of mandate/mission	The OECD groups 30 member countries sharing a commitment to democratic government and the market economy. With active relationships with some 70 other countries, NGOs and civil society, it has a global reach. Best known for its publications and its statistics, its work covers economic and social issues from macroeconomics, to trade, education, development and science and innovation. The Directorate for Science, Technology and Industry (DSTI) manages databases of internationally comparable statistics in the areas of science, technology and industry. These statistics and indicators underpin policy-related analytical work, particularly with respect to links between technology, competitiveness and globalisation. DSTI plays a leading role in the development of international statistical standards in the STI area.
Relevant department/division	Economic Analysis and Statistics Division of the Directorate for Science, Technology and Industry.
Contact person/Web address	www.oecd.org/sti/measuring-infoeconomy. sti.contact@oecd.org.
Data collection details (including future plans)	Since 2000, data for the ICT sector have been collected. These data are progressively becoming available from existing sources (such as structural business statistics and the STAN database), reducing the need for a separate data collection. Data on ICT use by households/individuals and by businesses have been collected since 2001. Every two years, a full data collection is done for the *Scoreboard* publication, while more minor updates are done for the *IT Outlook* publication. In addition, 15 key ICT indicators, drawn from various publications and databases produced by the OECD's Directorate for Science Technology and Industry (DSTI), are updated annually on a rolling basis, and disseminated at www.oecd.org/sti/ICTindicators.
Country coverage	OECD member countries.
Publications	• OECD Science, Technology and Industry Scoreboard (www.oecd.org/sti/scoreboard). • Measuring the Information Economy 2002.
Collaboration with other international organisations	Collaboration with Eurostat in developing methodology and collecting data and metadata from common member countries.

Name of organisation	UNESCO Institute for Statistics (UIS)
Description of mandate/mission	UIS aims to gather a wide range of quality statistical information to help Member States analyse the efficiency and effectiveness of their programmes and to inform their policy decisions; and to interpret and report on the global situation with regard to education, science and technology, culture and communication.
Relevant department/division	The UIS Culture and Communication Programme.
Contact person/Web address	Simon Ellis; http://www.uis.unesco.org.
Data collection details (including future plans)	Current UIS data collections include surveys of national press and broadcasting (radio and television) including online media. UIS also began collecting data on ICT use in education including ICT trained teachers in 2007. The data will be used in global monitoring of the WSIS Plan of Action, and *Education For All*.
Country coverage	Global coverage.

Name of organisation	United Nations Conference on Trade and Development (UNCTAD)
Description of mandate/mission	UNCTAD is the focal point within the United Nations for the integrated treatment of trade and development and related issues in the areas of investment, finance, technology, enterprise development and sustainable development. Established in 1964, UNCTAD promotes the development-friendly integration of developing economies into the world economy.
Relevant department/division	The UNCTAD ICT and E-Business Branch (ICTEB) carries out policy-oriented analytical work on the use of ICT and its impact on trade and development, economic growth and enterprise competitiveness.
Contact person/Web address	• http://r0.unctad.org/ecommerce/. • http://measuring-ict.unctad.org/.

Name of organisation	United Nations Conference on Trade and Development (UNCTAD)
Data collection details (including future plans)	UNCTAD's work on ICT-related statistics is focused on the measurement of the access to and use of ICT in enterprises, the ICT sector and trade in ICT goods and services. UNCTAD carries out an annual survey on ICT use in enterprises. The survey collects the set of core indicators recommended by the *Partnership on Measuring ICT for Development*, as well as metadata information. The objective of the survey is to provide internationally comparable data on ICT in enterprises as an input to the UNCTAD database on ICT use in enterprises, based on internationally agreed upon indicators. The statistics are published in the UNCTAD annual *Information Economy Report* and on the UNCTAD Web site.
Country coverage	All UN member countries (data for OECD member countries are provided by the OECD and Eurostat).
Publications	• Information Economy Report (formerly called E-Commerce and Development Report). • UNCTAD Handbook of Statistics.

Name of organisation	UN ICT Task Force
Description of mandate/mission	In March 2001, the United Nations Economic and Social Council requested the Secretary-General to establish an Information and Communication Technologies (ICT) Task Force. This initiative was intended to lend a truly global dimension to the multitude of efforts to bridge the global digital divide, foster digital opportunity and thus firmly put ICT at the service of development for all. The UN ICT Task Forces ceased to exist at the end of 2005, when its mandate expired.
Relevant department/division	Working Party on ICT Indicators and MDG Mapping.
Contact person/Web address	• http://www.unicttaskforce.org/index.html. • http://www.unicttaskforce.org/perl/showdoc.pl?area=mdgm.
Data collection details (including future plans)	To develop a comprehensive conceptual framework and a matrix of indicators and benchmarks that would present a quantifiable assessment of the role that ICT plays in the overall development agenda and the achievement of the MDGs. To this purpose, the ICT Task Force established a Working Party on Indicators and MDG Mapping, with the following tasks: • Elaborate a conceptual framework linking ICT to MDG. • Define specific indicators, targets and milestones for ICT4D relevant to MDG. • Match proposed targets with ICT MDG targets and monitor progress. • Clarify the operational roles and responsibilities of international agencies collecting and compiling statistical data on ICT4D. • Integrate, in concert with the above agencies, key statistical indicators into an ICT benchmarking report for the WSIS in 2005.

Name of organisation	United Nations Economic Commission for Africa (UNECA)
Description of mandate/mission	Established in 1958, ECA is one of five regional commissions under the administrative direction of United Nations (UN) headquarters. As the regional arm of the UN in Africa, it is mandated to support the economic and social development of its 53 member States, foster regional integration, and promote international co-operation for Africa's development.
Relevant department/division	ICT, Science and Technology Division (ISTD); African Centre for Statistics.
Contact person/Web address	• http://www.uneca.org/eca_programmes/it_for_development/index.html. • http://www.uneca.org/aisi/.

Name of organisation	United Nations Economic Commission for Africa (UNECA)
Data collection details (including future plans)	Through the African Information Society Initiative (AISI), ECA in co-operation with the International Development Research Centre (IDRC) of Canada, the European Union (EU) and the Norwegian Agency for Development Co-operation (NORAD) launched in 2000 the SCAN ICT project (http://www.uneca.org/aisi/scanict.htm), aimed at measuring the penetration and impact of the information society in key sectors of African economies. Scan-ICT Phase 2 is implemented with National Statistics Offices (NSOs) in the framework of the AISI and the Partnership on Measuring ICT for Development with financial support from the Government of Finland. ECA is planning capacity building activities at the country level to support NSOs in collecting Information Society indicators. At the sub-regional level ECA will, in collaboration with the Regional Economic Communities (RECs), organise capacity building workshops on harmonisation of methodologies for collecting and processing ICT indicators.
Country coverage	All African countries.
Publications	• Baseline Scan-ICT studies were carried out in six African countries, namely Ethiopia, Ghana, Mozambique, Morocco, Senegal and Uganda, see http://www.uneca.org/aisi/docs/ScanICT.pdf. • ECA/IDRC document: "ICT penetration and use in selected African countries: A synthesis". Available on CD-ROM. • SCAN-ICT Phase 2 methodology. • SCAN-ICT Reports in Cameroon, Gambia, Ghana, Mauritius and Rwanda. • The Academic Research Network (ARN) on measuring the African Information Society has developed impact Indicators.

Name of organisation	UN Economic Commission for Latin America and the Caribbean (UNECLAC)
Description of mandate/mission	ECLAC, which is headquartered in Santiago, Chile, is one of the five regional commissions of the United Nations. It was founded for the purposes of contributing to the economic development of Latin America, co-ordinating actions directed towards this end, and reinforcing economic relationships among the countries and with the other nations of the world. The promotion of the region's social development was later included among its primary objectives, as well as the same objectives for the Caribbean region.
Relevant department/division	Division of Production, Productivity and Management (DPPM).
Contact person/Web address	• http://www.eclac.org/socinfo/. • http://www.eclac.org/socinfo/osilac. • ddpe@eclac.org. • osilac@eclac.org.
Data collection details (including future plans)	UN ECLAC is the acting secretariat of the Statistical Conference of the Americas. Through its information society observatory OSILAC (*Observatorio para la Sociedad de la Información en América Latina y el Caribe*), a joint activity with the Institute for Connectivity in the Americas (ICA/IDRC), ECLAC assists its member countries with methodological work, data harmonisation and centralisation and capacity building and technical co-operation in ICT statistics.
Country coverage	Latin America and Caribbean countries.
Publications	• Benchmarking the Plan of Action of the World Summit on the Information Society (WSIS) in Latin America and the Caribbean (version 3.0). • Toward an Information Society measurement instrument for Latin America and the Caribbean: getting started with Census, household and business surveys. • Benchmarking the Plan of Action of the World Summit on the Information Society (WSIS) in Latin America and the Caribbean. • Where do Latin America and the Caribbean Stand in Relation to the eLAC 2007 Plan of Action? • Evaluation of e-Readiness Indices in Latin America and the Caribbean.

Name of organisation	UN Economic Commission for Latin America and the Caribbean (UNECLAC)
Collaboration with other international organisations	• ECLAC is one of the partners in the Partnership on Measuring ICT for Development; ECLAC, together with UNCTAD and ITU, is part of the Steering Committee of the *Partnership*. • ICA (Institute for Connectivity in the Americas) - IDRC (International Development Research Centre). • Regulatel (*Foro Latinoamericano de Entes Reguladores de Telecomunicaciones*). • *@LIS* program of the European Commission. • UNDP. • AHCIET (Asociación Hispanoamericana de Centros de Investigación y Empresas de Telecomunicaciones). • Fundación Telefonica. • More than 20 other regional organisations through multistakeholder alliances for the Regional Action Plan eLAC2007 (http://www.eclac.org/SocInfo/eLAC).

Name of organisation	UN Economic and Social Commission for Western Asia (UNESCWA)
Description of mandate/mission	ESCWA promotes economic, social and technological development through regional and subregional co-operation and integration and serves as the main general economic and social development forum within the United Nations system for the ESCWA region.
Relevant department/division	Information and Communication Technology Division (ICTD).
Contact person/Web address	http://www.escwa.org.lb/divisions/main.asp?division=ictd
Data collection details (including future plans)	• ICTD has been producing periodical profiles of ICT and the information society for each of its 13 member countries and for Western Asia as a whole. It has also developed an ICT indicators database and integrated it within the ESCWA Statistical Information System (ESIS). The latter system provides comparative analysis at the regional and global levels for the benefit of member countries and international organisations. ICTD is pursuing the development and maintenance of a portal for information and communication technology partnerships and networks. This Web-based platform would combine ICT indicators and national and regional profiles to better measure the information society at the national, regional and global levels. • In order to promote data collection for ICT policy making, ICTD has carried out several activities that target the development of ICT thematic applications.
Country coverage	Western Asian countries.
Publications	• Regional Profile of the Information Society in Western Asia, 2003, 2005. The 2007 Update is in preparation. • Information Society Profiles for Western Asia, 2003, 2005. The 2007 update is in preparation. • Information Society Indicators. • Tentative Plan of Action for Western Asia: Building the Regional Information Society.
Collaboration with other international organisations	• ESCWA collaborates with regional and Arab organisations including the League of Arab States, the UNDP-ICT for Development in the Arab Region (ICTDAR), UNESCO Institute for Statistics, Arab Institute for Training and Research in Statistics, UNDESA – KMB (Knowledge Management Branch) and Global Knowledge Partnership (GKP). • ESCWA also collaborates with international organisations. These collaborations have resulted in several fruitful initiatives, one of which is the ESCWA initiative on Technology, Employment, and Poverty Alleviation (TEPA), formulated in cooperation with the International Labour Organization (ILO). This initiative is designed to explore and pilot concepts and modalities aimed at harnessing new technologies for employment creation and poverty reduction in the Arab countries. • ESCWA is also one of the partners in the Partnership on Measuring ICT for Development.

Name of organisation	UN Economic and Social Commission for Asia and the Pacific (UNESCAP)
Description of mandate/mission	To promote economic and social development through regional and subregional co-operation and integration.
Relevant department/division	The concept of information society crosses all three main themes of UNESCAP, 'Reducing Poverty', 'Managing Globalisation', and 'Tackling Emerging Social Issues'; in order to respond efficiently to the challenge of measuring ICT and the information society in the region, several actors within UNESCAP have decided to join their efforts and develop appropriate synergies among themselves and with the regional arms of other partners involved.
Contact person/Web address	• http://www.unescap.org/stat/ict/index.asp. • http://www.unescap.org/icstd/index.asp.
Data collection details (including future plans)	UNESCAP supports its members and associate members in the ICT field by providing technical assistance through capacity-building workshops, meetings and advisory services in the formulation of ICT policies and promotion of ICT applications. On the measurement side, ESCAP intends to pursue activities along the lines envisaged by the Partnership on Measuring ICT for Development, in particular for future capacity building initiatives in the field of measuring ICT and the information society. Data collection on ICT and, in particular, the Information Society is being done on a voluntary basis.
Country coverage	Countries in Asia and the Pacific.
Publications	
Collaboration with other international organisations	UNESCAP is working towards partnering with other national, regional and international organisations and institutions, which are active in the Asia-Pacific region and have shown interest in the field of ICT for development. In this context, UNESCAP jointly organised with ITU and UNCTAD the *Regional Workshop on Information Society Measurements in Asia-Pacific* in July 2006 in Bangkok, Thailand.

Name of organisation	The World Bank
Description of mandate/mission	The World Bank Group's mission is to fight poverty and improve the living standards of people in the developing world. It is an international development Bank which provides loans, policy advice, technical assistance and knowledge sharing services to low and middle income countries to reduce poverty. The Bank promotes growth to create jobs and to empower poor people to take advantage of these opportunities.
Relevant department/division	Global ICT Department and Development Economics Data Group.
Contact person/Web address	David Cieslikowski (dcieslikowski@worldbank.org).
Data collection details (including future plans)	• To create a database that will consolidate core ICT indicators from other international organisations and various household and business surveys conducted by the World Bank. The database, with customised basic reporting and analysis tool, will provide one-stop access to an array of up-to-date ICT indicators from the World Bank's data exchange partners and private firms for use in analytical research, MDG monitoring and World Bank ICT project evaluation. • To work with selected countries through World Bank projects on capacity building in collecting and monitoring ICT statistics.
Country coverage	
Publications	• 'ICT at-a-glance' tables providing country-specific key ICT data (about 30 indicators) for 144 countries. • A toolkit on monitoring and evaluation (M&E) of national e-strategies to suggest a framework to enable the means by which indicators and M&E best practices are integrated into e-strategy formulation and ICT implementation planning. • A World Information and Communications for Development report: The 2006 edition (Global Trends and Policies), includes World Bank analytical work on investment trends, principles and practical solutions to extending ICT services, the role of ICT in doing business, trends in national e-strategies, approaches to tracking ICT globally, and ICT at-a-glance tables.
Collaboration with other international organisations	The World Bank is one of the partners in the Partnership on Measuring ICT for Development.

ANNEX 5: MEASUREMENT ISSUES FOR DEVELOPING ECONOMIES[153]

Introduction

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

631. Readers should also note the efforts of the Partnership on Measuring ICT for Development in establishing an agreed set of core ICT indicators including definitions, model questions and methodological recommendations (2005b, 2008b). The *Partnership*'s main objective in undertaking this work is to enable the production of internationally comparable data on various aspects of ICT. An important goal of the *Partnership* is to help countries (and particularly those in the developing world) to develop ICT surveys or add suitable questions to existing collections. In March 2007, the UN Statistical Commission endorsed the core list of ICT indicators and encouraged countries to use it in their data collection programmes (UNSC, 2007; Partnership on Measuring ICT for Development, 2007). The core list was revised in 2008 and is shown at the end of this annex. More information about the *Partnership* can be found in Chapter 9.

632. It is important to note at the outset that measurement of the information society should be an integral part of a country's statistical system, with many concepts, classifications and methodologies being common to other areas of statistical enquiry. For instance, surveys of ICT use are not very different from other statistical surveys in terms of frames, sample selection, statistical units, questionnaire design, collection methodology or data processing. In fact, ICT use surveys can often be integrated with other surveys, thus reducing the costs of data collection. General references to statistical survey methodology can be found in the Bibliography (for example, United Nations (2005), PARIS 21 (2009) and the International Household Survey Network (2009)).

633. It is beyond the scope of this annex to explore all the initiatives of non-OECD countries in collecting ICT statistics. Instead, it will highlight areas where developing economies might diverge from OECD guidelines because of difficulties in measurement or because of the unique way in which the information society has evolved or taken shape within a particular country. The purpose of the annex is to expand the range of countries to which the *Guide* can be applied, by providing suggestions that take into account the different circumstances of statistically less advanced countries. It has been prepared with the least developed economies particularly in mind.[154] Countries in more advanced stages of development are

153. This annex was originally prepared by the UNESCO Institute for Statistics (UIS) in 2005 in consultation with a number of individual experts and organisations. It was revised in 2007 and organisations contributing to the revision were OECD, UIS, UNCTAD and the ITU. It was further revised in 2009 to reflect the revision of the core ICT indicators by the Partnership on Measuring ICT for Development.

154. 'Developing economy' in this annex does not refer to a homogeneous set of countries and the authors do not assume that developing countries cannot collect the data suggested by the *Guide*. Some measurement issues discussed here may not always be relevant, especially for least developed countries (LDCs), but could become relevant in the near future with the ever-expanding growth of ICT.

likely to move towards direct use of the standards set by OECD and therefore some of the issues discussed – and problems identified – here will be of less concern to them.

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

Measuring the information society in developing economies

635. Information on availability, access and use of ICT is being collected by a range of national, regional and international organisations. For instance, all of the ICT infrastructure and access core indicators proposed by the Partnership on Measuring ICT for Development are already being collected by the ITU. ITU data are collected primarily through annual questionnaires addressed to countries, usually the regulatory telecommunication/ICT authority or the Ministry in charge of telecommunication/ICT.

636. In spite of the leading place that the Internet and computers occupy in discussions of public policy, ICT in the context of developing economies could include a wide range of other 'older' technologies (such as radio and television) as well. For example, in some Latin American countries, penetration of television and radio has exceeded 95% (ITU, 2007b), but there are other economies where penetration is still low. Measures, such as those established by the *Partnership* on the number of television and radio sets per 100 inhabitants, would help address the information needs in this area.[155]

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

- Countries may have different priorities for data collection. They may not be able to afford dedicated surveys on ICT. Instead, they may be able to include questions in existing surveys, some of which include background information (*e.g.* demographic and socio-economic data in social surveys).

- National Statistical Offices and other agencies with a role in the collection of official statistics have a strong part to play in co-ordination as well as standard setting and data collection.[156] It is essential that metadata systems are incorporated into such developments in order to capture information essential to informed use of national data.

- A methodology that is appropriate to the circumstances should be used. It should be needs-driven and relate to local cultural determinants, with variables that can be captured accurately and adequately. It might evolve from a first-time collection of essential core indicators to a more sophisticated collection of elaborate disaggregated indicators.

- Caution should be exercised that international comparisons take into account the different circumstances of countries and their economic and social situation. Analyses and best practice

155. It should be noted that older technologies such as radio or television have undergone tremendous change in how they disseminate information by converging with digital and wireless technologies.

156. Co-ordination with other agencies is paramount and this requires that the statistical system of a country (including the National Statistical Office, other agencies having statistics as their main core business and the statistical units of ministries and government agencies) be able to share a common set of definitions (of ICT for example), be aware of each others' data collection activities and needs, how they are each serving the common purpose of good national policy making on the information society, and what data gaps exist.

examples[157] can help countries to learn from others' experiences in data collection.[158] Ideally, countries will adopt recommendations of the *Partnership* (2005b, 2008b) for standardised metadata associated with ICT measurement (for instance, on scope and classifications).

ICT products

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

639. The OECD started revising its ICT goods classification in 2006 and finalised an ICT products classification in 2008 (see Chapter 2 for details). The full list of categories included in the ICT product classification can be found in Annex 1a of this Guide.

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

ICT infrastructure

641. ICT infrastructure is a crucial resource for an information society. As newer technologies emerge, they create the challenge of establishing infrastructure able to meet demand. For this reason, measurement of infrastructure may precede measurement of products or usage.[159]

642. Many developing economies suffer from a lack of the basic infrastructure needed to build a solid ICT base, such as electricity, buildings and roads. ITU data show that in many developing economies, the majority of main telephone lines are concentrated in urban areas.[160] Further work is required to describe the changing technology gap between urban and rural areas in developing economies, especially with regard to availability of fixed and mobile infrastructure facilities and the Internet.

643. In some non OECD countries, providing access to information through public access points is an important element of the national ICT strategy. As defined by the ITU, a public Internet access centre (PIAC) is a site where Internet access is made available to the public, on a full- or part-time basis. PIACs may include digital community centres, Internet cafés, libraries, schools and other establishments offering Internet access to the public. All such centres should have at least one publicly available computer for Internet access. The role of PIACs differs between countries and regions but given low penetration levels of ICTs in households in most developing economies, public access is an important means of raising ICT access levels. Data on crucial aspects of ICT infrastructure will not be complete unless use of such institutions is included in surveys and preferably extended to include use by socially excluded and marginalised groups.

644. The percentage of localities (villages, towns and cities) with public Internet access centres is one of the core ICT indicators proposed by the *Partnership* (2005b, 2008b) and currently being collected by the

157. For examples, see ITU's case studies on Hong Kong, China and Australia, at: http://www.itu.int/ITU-D/ict/cs/.

158. See also Annex 3 of this *Guide*. It provides metadata on ICT statistics produced by OECD countries.

159. Note that the ITU, through its *World Telecommunication Indicators Database*, collects a range of ICT infrastructure data.

160. See ITU's World Telecommunication Indicators Database, at: http://www.itu.int/ITU-D/ict/publications/world/world.html.

ITU. For a given country, it is computed by dividing the number of localities with at least one PIAC by the total number of the country's localities and multiplying by 100. The *Partnership*'s core indicators also include one on individual Internet use by location that has community Internet access facility as a response category.

645. International bandwidth is a critical infrastructure component and is of importance to many developing economies. However, bandwidth linking developing nations and the developed world is scarce and expensive.[161] There is also a critical lack of connectivity between developing nations (particularly in Africa), meaning that inter-regional communications must often be routed over long and expensive inter-continental routes. However, the capability for local traffic exchange is increasing and, in October 2005, Ghana became the 14th African country with an Internet Exchange Point.[162] Bandwidth data collected by the ITU show that developing economies still have considerably less bandwidth than developed countries.

646. While not all developing economies have deployed broadband technologies, more and more countries are starting to use high speed Internet access, particularly in the business sector. Broadband access is an important indicator that is collected by the ITU. Note that there is an indicator on broadband subscribers in the *Partnership*'s core ICT infrastructure indicators.

647. When newer technologies, such as mobile phones, are introduced to a local market, it is important to consider the 'leap-frogging' effect of such technology. "If technological leap-frogging is to be successful, it must be feasible to bypass stages of capability building or investment that the industrialised countries have had to pass through in the process of economic development" (Mansell, 2001). For example, the number of mobile phone subscribers exceeds the number of fixed lines in the majority of developing economies,[163] and some countries are reconsidering their policies for landline provision. Reflecting this trend, one of the core ICT infrastructure indicators proposed by the *Partnership* (2005b, 2008b) is *Mobile cellular telephone subscribers per 100 inhabitants*, an indicator that is tracked by the ITU. Another trend for developing economies is to leap straight to wireless technology for Internet access. In Thailand, for instance, the main telephone companies report adding substantial numbers of subscribers in rural villages in the last 3-4 years using local wireless loops (Yoon, 2003). The situation is similar in India and Bangladesh. Though such technologies may not be the preferred option in all situations, they offer the advantage of avoiding the necessity of laying landlines in rugged or inhospitable terrain.

ICT supply

648. In the OECD conceptual framework, 'ICT supply' refers to the ICT sector, whose component industries are defined as follows: "The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" (OECD, 2006b). OECD revised the definition in 2006 in order to be consistent with the revised ISIC Rev. 4 (UNSD, 2008a). An outcome of the revision was that the ICT sector definition was more restricted than the original concept (which dated from 1998). See Chapter 4 and Annex 1b for more information.

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161. For example, "in Ghana, a monthly half circuit 2mbps (E1) bandwidth cost between four thousand and six thousand US dollars over satellite while the same bandwidth costs twelve thousand dollars over the SAT3 undersea cable which lands in Accra. The cost of the Internet is 25 times as expensive in Africa as it is in Europe; this is the case in the capital cities but, to the exception of these cities, bandwidth remains 100 to 400 times more expensive in rural and semi-urban sub-Saharan Africa than in Europe" (Osiakwan, 2004).

162. "Ghana Launches Internet Exchange", *News in Ghana*, 20 October 2005.

163. ITU, World Telecommunication Indicators Database, 2005, see: http://www.itu.int/ITU-D/ict/publications/world/world.html.

649. It may be useful for country surveys to consider whether the market in new technologies is led by imports or by local manufacturing businesses. One would normally assume that initial penetration takes place through imports; however, growth in local supplies might price out imported goods over time. During 2005, announcements by major suppliers to supply specially manufactured phones and computers to developing economies[164] suggest that there may be rapid changes in markets. These changes would ideally be captured statistically, for instance, by measuring the supply of such devices and their use by different groups.

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

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

ICT demand by businesses

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

653. Therefore, not only do a lower proportion of businesses in most developing economies use ICT, but those that do are most likely to use simpler ICTs. Business surveys on the use of ICT in non-OECD countries might therefore prefer to focus on the relatively simple core indicators identified by the *Partnership*. See also the comments in Chapter 5 on the statistical challenges of measuring e-commerce. Some of these (for instance, the challenge of reliably measuring a rare event) will be particularly applicable to many developing economies.

654. Some indicators on barriers to ICT use that are not on the *Partnership's* core list might also be useful for individual countries. They include barriers relating to skills, finance, language, availability of content, quality and cost of infrastructure, and critical mass of users.

655. While countries may establish a priority for measurement of trends in business use of ICT, such work may be hampered by problems in the statistical system. The potential for work on businesses can be severely limited by the absence of reliable business registers in some countries. In others, the capacity to carry out large-scale surveys is lacking. Such capacity may need to be built according to individual country requirements. If a comprehensive business register is not available for a country, then establishing one

164. For instance, in 2005, IBM agreed to create a reduced function PC for the Indian market (Financial Times, May 2005); there is also an agreement between Nokia and a consortium of GSM service operators to produce a considerably cheaper mobile phone for emerging markets (The Economist, July 2005).

might be the first priority of statistical agencies. Volatile business demographics and a large informal sector are major issues hindering the development of business registers in many developing economies. Transparent metadata should be provided to indicate the sampling base for any business survey – especially where the sample frame has been limited by lack of complete or up-to-date information.

ICT demand by households and individuals

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

657. While the set of household and individual classificatory variables recommended by the *Partnership* (2005b, 2008b) represents a useful minimal set, it does not cover all these characteristics. Surveys of ICT penetration and use in developing economies may therefore need to consider a wider range of social factors and issues than proposed in that document (and normally collected by OECD countries in their household surveys of ICT use). If such factors are not considered, there is a risk of incorrectly identifying reasons for low levels of ICT access and use in developing economies.

658. In the majority of developing economies, household and individual access to PCs, modems, a telephone line and the Internet remains very low. Community access potentially plays an important role in helping to overcome this divide – which separates the ICT-rich countries from the ICT-poor as well as population groups within a country. Several countries are taking steps to address this gap by increasing the number of PIACs. Due to the varying nature of such centres, attempts are being made, especially by the ITU, to define such facilities and collect information about them (see discussion under *ICT infrastructure*).

659. Radio and television are still the leading electronic means of information distribution in many developing economies, particularly in rural and remote areas. 'New' technologies, such as computers and Internet access, may only exist in urban areas. Such limitations in access mean that developing economies might prefer to frame surveys according to those limits. However, for reasons of international comparability, information collected from such surveys should be adjusted so that it represents the population of the entire country.

660. International household surveys have seen increasing co-ordination in the last five years (in particular through the International Household Survey Network established by the World Bank in 2004[165]) and there is increasing use of censuses and surveys in developing economies. Nevertheless, such surveys remain expensive. It is likely that with scarce resources, developing economies would not be able to run a dedicated ICT household survey more frequently than every few years. Such timing may not be frequent enough to capture the rapid pace of change that can ensue as a new technology enters a national market. It is thus almost certain that the majority of developing economies will want to add questions on ICT to existing multi-purpose, labour force or general household surveys.

661. Such household surveys are characterised by competing interests and pressures to reduce interview time to a minimum. Countries would thus need to determine a small core set of key questions. Such core questions are unlikely to be the same as those chosen for OECD countries, but it is important that the small group of questions that are chosen are closely aligned with international guidelines to allow international comparisons and benchmarking. The core indicators on access to, and use of, ICT by households and individuals that have been presented by the *Partnership* (2005b, 2008b) are likely to be a useful starting point. Given the comments above on the importance of barriers to ICT use, a question on

165. See Bibliography.

household barriers (such as question 5 in the OECD model survey shown in Annex 1d) and/or individual barriers could be added to the core suite of questions for developing economies.

Content

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

663. Countries that want to use software in other national languages may have to translate the material and adapt it, as China has already been doing on a huge scale. However, this will increase costs, especially for countries with several languages, or several scripts. For example, Thailand has 75 spoken languages, China has 202, and India has 15 official and 1683 spoken languages.[166]

664. Work by researchers on the statistics of language use on the Internet has shown how the inherent technical bias of ICT in favour of Latin scripts and European languages hinders the collection of accurate data on numbers of Web sites and pages by countries (Paolillo *et al.*, 2005).

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

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

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

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

166. See: Ethnologue, http://www.ethnologue.com.

Other issues

The 'digital divide'

669. A considerable proportion of the population in developing economies lives in rural areas while ITU data show that the majority of main telephone lines in many developing economies are concentrated in urban areas. In other words, the social and economic divide is now also 'digital'. ITU's recently published ICT Opportunity Index has tracked the digital divide by measuring the relative difference in 'ICT Opportunity' levels amongst economies and over time. The index is calculated from 10 indicators and has been built as a composite merger of four subindices: **Network index:** fixed telephone lines per 100 inhabitants, mobile cellular subscribers per 100 inhabitants, and international Internet bandwidth (kbps per inhabitant); **Skills index:** adult literacy rate, and gross school enrolment rates; **Uptake index:** computers per 100 inhabitants, Internet users per 100 inhabitants and proportion of households with a TV; and **Intensity index:** total broadband Internet subscribers per 100 inhabitants, international outgoing telephone traffic (minutes) per capita (ITU, 2007c).

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

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

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

E-government

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

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

675. In developed countries, new technologies can be introduced directly to the individual consumer. In developing economies, new technologies may be introduced through community services such as public access points or community telecentres. Developing economies may therefore have to rely on government or other donors to introduce networked services and infrastructure rather than waiting for the market or private industry to do so. It may thus be useful to collect e-government indicators such as the availability of

Web sites and electronic services. However, note the comments in Chapter 8 on the challenges of collecting statistical information from the public sector. Such challenges are likely to apply to both OECD and developing economies.

676. However, there are a number of barriers that hinder a country's measurement of e-government and these apply to both developing and other countries – see Chapter 8 for a general discussion of the statistical challenges associated with e-government measurement.

Education and training

677. Some studies (for example, the SITES studies[167]) have shown that ICT plays a role in improving the quality of formal education in school classrooms and in encouraging further supplemental learning by students at their homes. Data on availability of ICT in formal education, its costs and benefits, use, equity of access and impact in terms of educational outcomes are very useful in the context of planning formal education programmes.

678. It is often understood that the main reason for using ICT in the classroom is to better prepare the current generation of students for a workplace where ICT, particularly computers, the Internet and related technologies, is becoming much widely used. Computer literacy – the ability to use ICT effectively and efficiently – thus gives a competitive edge in an increasingly globalised job market, and tests of ICT skills, such as the International Computer Driving Licence,[168] are becoming more common.

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

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

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

682. ICT training (in formal education, non-formal education and private industry-led vocational training) for developing economies should not be seen as an ancillary service, but as a vital part of ICT

167. The SITES project (Second Information Technology in Education Study) includes a set of case studies on innovative practices involving ICT (174 studies involving 28 countries in Europe, North America, Asia Pacific, Africa, and South America). An analysis of the cases studies found that "technology is supporting significant changes in classroom teaching and learning. They paint a very different picture than the traditional classroom where the teacher lectures in front of the classroom and students take notes or do worksheets. They show important similarities in how technology is being used in many countries around the world." (IEA, 2003).

168. See: https://www.acs.org.au/icdl/.

infrastructure that must be in place as a precursor to market penetration, especially where governments are trying to encourage market growth.

683. The *Partnership* core indicators of 2008 include a set of core 'ICT in education' indicators developed by UIS.

The gender dimension

684. In many developing economies, the number of women producers and traders is increasing as a result of micro-credit initiatives. Women's dual role (in direct production and in caring for the family) typically implies reduced physical business mobility and overcoming social barriers to information access.[169] ICT provides an opportunity both to give women wider access to information and services as well as allowing them to develop their own business skills. In India, there are a number of projects underway, including the Smile project (Savitri Marketing Institution for Ladies Empowerment), a voluntary organisation in Pune. According to Agarwal (2004), this project has "increased literacy level of underprivileged women through the usage of ICT. Internet has also helped them market their various products like soft toys, candles, bags, utility items, etc. Through Internet, there is greater awareness and exposure and market reach for the products." More examples from India can be found in Agarwal (2004).

685. Note that classificatory variables recommended for the core individual ICT use indicators established by the *Partnership* (2005b, 2008b) include education level and gender. Core indicators on aspects of individual use of ICT should therefore be classifiable by gender to provide more information on the gender dimension. It is also recommended that developing economies aim to collect gender data relating to ICT barriers (where information on the latter is collected).

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

Health information and services

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

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

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

Partnership on Measuring ICT for Development – core ICT indicators (2008)[170]

Core indicators on ICT infrastructure and access

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

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

HH1	Proportion of households with a radio
HH2	Proportion of households with a TV
HH3	Proportion of households with a telephone • Fixed telephone only • Mobile cellular telephone only • Both a fixed and a mobile cellular telephone
HH4	Proportion of households with a computer
HH5	Proportion of individuals who used a computer (from any location) in the last 12 months
HH6	Proportion of households with Internet access at home
HH7	Proportion of individuals who used the Internet (from any location) in the last 12 months
HH8	Location of individual use of the Internet in the last 12 months • Home • Work • Place of education • Another person's home • Community Internet access facility (specific denomination depends on national practices) • Commercial Internet access facility (specific denomination depends on national practices) • Any place via a mobile cellular phone • Any place via *other* mobile access devices
HH9	Internet activities undertaken by individuals in the last 12 months (from any location) • Getting information about goods or services • Getting information related to health or health services • Getting information from general government organisations • Interacting with general government organizations • Sending or receiving email • Telephoning over the Internet/VoIP • Posting information or instant messaging • Purchasing or ordering goods or services • Internet banking • Education or learning activities • Playing or downloading videogames or computer games • Downloading movies, images, music; watching TV or video; or listening to radio or music • Downloading software • Reading or downloading online newspapers or magazines, electronic books
HH10	Proportion of individuals with use of a mobile cellular telephone

170. As revised in 2008 (Partnership on Measuring ICT for Development, 2008b).

HH11	Proportion of households with access to the Internet by type of access • Narrowband • Fixed broadband • Mobile broadband
HH12	Frequency of individual use of the Internet in the last 12 months (from any location) • at least once a day • at least once a week but not every day • less than once a week
Reference indicator	
HHR1	Proportion of households with electricity

Core indicators on use of ICT by businesses

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

Core indicators on the ICT sector and trade in ICT goods

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

Core indicators on ICT in education

ED1	Proportion of schools with a radio used for educational purposes (by ISCED level 1 to 3)
ED2	Proportion of schools with a TV used for educational purposes (by ISCED level 1 to 3)
ED3	Proportion of schools with a telephone communication facility (by ISCED level 1 to 3)
ED4	Student-to-computer ratio (by ISCED level 1 to 3)
ED5	Proportion of schools with Internet access, by type (by ISCED level 1 to 3) • Fixed narrowband • Fixed broadband • Both fixed narrowband and broadband
ED6	Proportion of students who have access to the Internet at school (by ISCED level 1 to 3)
ED7	Proportion of students enrolled by gender at the tertiary level in ICT-related fields (for ISCED levels 5 and 6)
ED8	Proportion of ICT-qualified teachers in primary and secondary schools
Reference indicator	
EDR1	Proportion of schools with electricity (by ISCED level 1 to 3)[171]

Classifications for core ICT indicators

689. Classificatory variables are used to describe the indicators for business and household/individual ICT use and classifications are used for the core indicators on the ICT sector and trade. The classifications are described in *Partnership* (2008b). They are:

- Business characteristics (Industry and Employment size);
- Household characteristics (Household composition and Household size);
- Individual characteristics (Age, Gender, Highest education level received, Employment status, Occupation);
- ICT sector (Industry classification); and
- Trade (ICT goods classification).

Methodological information associated with the core ICT indicators

690. Methodological notes on the *Partnership*'s core indicators can be found in *Partnership* (2008b). The notes include information on measurement concepts, definitions, statistical units, scope and coverage.

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

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