

Chapter 5

ICT Demand by Businesses

This chapter describes the OECD model survey of ICT use by businesses and discusses the 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.

Introduction

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.

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.

This chapter was revised in 2010. Revisions made in 2010 mainly reflect changes to definition of e-commerce.

OECD model survey of ICT use by businesses¹

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, 2001).

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 5.A1. Of note, the 2005 OECD model survey of ICT use by businesses does not take into account the 2010 revision of the OECD statistical definition of e-commerce. At its 2010 meeting, WPIIS agreed to update the model survey of ICT use by businesses for the 2011 meeting.

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.

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) – the statistical challenges are discussed in Annex 5.A1.
- E-business – in this chapter.
- Digitised products – in Chapter 7 and Annex 5.A1.
- E-government – the statistical challenges are discussed in Annex 5.A1.

E-commerce

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.

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 5.A1 incorporates definitions and instructions consistent with those recommendations.

In 2001, 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 or 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. The 2001 OECD definitions of e-commerce are shown in Table 5.1 below. In 2009, the definition of e-commerce was revised.

In April 2009, OECD member countries endorsed their latest definition of e-commerce. The OECD revised the guidelines for interpreting the definition of e-commerce and encouraged countries to take such guidelines into account when developing their questionnaires. Table 5.2 below shows the current OECD definition of e-commerce transactions and operational guidelines.

At its 2008 meeting, WPIIS agreed to revise the e-commerce definition for the 2009 meeting.

The revised e-commerce definition was approved by WPIIS in April 2009, and declassified by the Committee for Information, Computer and Communications Policy (ICCP) in October 2009.

The 2009 definition of e-commerce unifies the broad and narrow definitions into a single one.² The definition and guideline is shown in Table 5.2 below.

Table 5.1. **The 2001 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 (<i>e.g.</i> through a mobile or a TV set, etc.) Exclude: Orders received or placed by telephone, facsimile, or conventional e-mail.

Table 5.2. **The 2009 definition of e-commerce**

OECD definition of e-commerce	Guidelines for the Interpretation
An e-commerce transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations.	Include: orders made in web pages, extranet or EDI. The type is defined by the method of making the order. Exclude: orders made by telephone calls, facsimile, or manually typed e-mail.

The rationale for a new definition can be summarised as follows:

- It is difficult to produce good e-commerce estimates based on a network distinction because respondents find it difficult to make such a distinction; the convergence of technologies makes it increasingly more challenging.
- Many users find it more relevant to understand how e-commerce is being done rather than over which networks it is being done.
- The two-tiered definition of e-commerce has resulted in less international harmonisation.

The new definition attempts to respect a few basic principles:

- It should be **coherent, simple and pragmatic**; in that spirit, the definition does not attempt to cover all methods of doing electronic transactions, but rather concentrates on those that are known and definable and that are the most important at this point in time.
- It should be limited to clearly **defined concepts** so as to avoid incoherent interpretation by respondents to the extent possible.
- It should acknowledge that as technologies and policies evolve, **new forms of e-commerce** that are not defined and included here might become of interest and will need to be considered **in the future**.

It is hoped that the new definition and measurement framework will contribute to improving the quality and comparability of e-commerce estimates over time and among countries.

In addition to moving from a two-definition system to a single-definition system, the 2009 definition includes terminology changes intended to simplify and clarify the concepts.

- The expression “electronic transaction” is replaced by “**e-commerce transaction**”.
- The expression “computer-mediated networks” is replaced by “**computer networks**” to avoid unnecessary complication of terminology.
- The definition now includes the statement “**by methods specifically designed for the purpose of receiving or placing orders**”. This is done in order to make it clear that not all activities over networks are targeted, only those specifically intended for selling. This implies the presence of an e-sales system. Excluded are orders by manually typed e-mail, telephone calls or facsimile.
- The expression “ordered over those networks” is replaced by “**ordered by those methods**”.
- The expression “may be conducted on or offline” is replaced by “**does not have to be conducted online**”.

A number of changes also apply to the interpretation guidelines:

- Reference is made to the **web (or extranet) and EDI only**. The Minitel and interactive telephone systems examples are no longer mentioned.
- The type of e-commerce transaction is defined by the method of making the order. This approach should mitigate the interpretation problems where both types, EDI and web, are used in the process. An example is a situation where an order is made by the customer through a web-application but the information is transmitted to the seller as an EDI-message. However, in this case, the type of selling application is web-based – EDI is the business application to transmit information about the sale.
- Exclusions that previously appeared in the narrow definition implementation guidelines have been integrated into the new definition, albeit using different wording. The exclusion for orders placed by telephone now reads “**orders made by telephone calls**” in order not to exclude web sales done by mobile phones using an Internet-browser. The exclusion for orders by conventional e-mail now reads “**manually typed e-mail**”.
- The guidelines refer to **orders made** only (not purchases), since ordering is the key element of the definition.

The framework for measurement

The framework for measurement is proposed as an implementation tool. It goes beyond the conceptual definition by specifying the types of e-commerce of interest, the so-called “functional split”.

The functional split is now generally regarded as the best approach to deal with the measurement of e-commerce. It was adopted as a general approach in the European Union in 2008 and is consequently used in many OECD countries.

Table 5.3. **The framework for measurement**

Type	Definition of the type of e-commerce
Web e-commerce	Orders made at an online store (webshop) or via web forms on the Internet or extranet regardless of how the web is accessed (computer, laptop, mobile phone, etc.)
EDI e-commerce	Orders initiated with EDI. EDI (electronic data interchange) is an e-business tool for exchanging different kinds of business messages. EDI is here used as a generic term for sending or receiving business information in an agreed format which allows its automatic processing (e.g. EDIFACT, XML, etc.) and without the individual message being manually typed. "EDI e-commerce" is limited to EDI messages placing an order.

The proposed functional categories are "web e-commerce" and "EDI e-commerce". These are the main e-commerce activities at this time and are found to be clear concepts for enterprises. They are also well defined.

The expert group acknowledged that additional types of e-commerce might become important to measure in the future. The proposed framework allows for the future identification of additional functional categories as the need arise while keeping existing ones intact.

Other functional types

The expert group recommended that countries planning to implement the functional split approach described above, consider the possibility of adding a residual category,³ if it is seen as relevant in the national context. This would allow for the identification of emerging functions important enough to warrant separate measurement. It is recognised that open-ended residual categories require resources to code and classify responses in a coherent manner, but it is one of the best methods to develop surveys based on evidence.

The 2001 e-commerce definition mentions interactive telephone systems, but they generally have not been included in the measurement of e-commerce. As mentioned earlier, the expert group recommended its exclusion in order to keep the definition simple and to concentrate on the most important, well defined and recognized activities.

Mobile e-commerce (M-commerce) is included in the proposed definition to the extent that it is done via web pages, which probably is a growing phenomenon. Other kinds of m-commerce – e.g. SMS and mobile cash payment solutions are not included at present.

There is clearly interest in the measurement of m-commerce, but no agreed definition and no obvious measurement method. The expert group **was** not convinced it is possible to integrate m-commerce within the existing e-commerce measurement system in a coherent manner, or that the inclusion of m-commerce within the e-commerce definition is the best solution to the measurement of m-commerce. If there is an interest, the development of specific concepts and tools would be necessary in order to properly measure the m-commerce phenomenon. Other business use of mobile tools beyond m-commerce would also deserve closer investigation.

Future work

The measurement of e-commerce has many methodological challenges that **have not been discussed**. The adoption of different methodologies by member countries to deal with the collection of data and the production of estimates can seriously affect the comparability of results. The treatment of outliers or of e-commerce by multinational enterprises, the imputation of e-commerce values and third party issues are but a few examples of methodological issues that have a material impact on estimates.

E-business

Measurement of e-business is of particular interest to policy makers because of the potential productivity impacts of ICT use on business functions.⁴ 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

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.

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 and outbound); and inventory control.

An expert meeting on measuring e-business was hosted by the OECD in December 2003. 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.

Conceptual model for measuring e-business

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

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 5.A1). For instance, customer relation functions have been included in a question on website 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).

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).

Regarding other e-business questions, there are specific questions on use of the Internet in business processes in Question 16 (website 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]).

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.⁵

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

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 Canada⁶ 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).

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 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.

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

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).

Measuring Capital – OECD Manual 2009 (OECD, 2009) provides a comprehensive and up-to-date guide to the approaches toward capital measurement. 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.

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 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 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 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.

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. 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.

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

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

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.

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, 2005). 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.

Several studies have also been undertaken at the industry level (Pilat *et al.*, 2002; O'Mahony and van Ark *et al.*, 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, 2003). Moreover, the European Union lags behind the United States in this sector (O'Mahony and van Ark, 2003).

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, 2003).

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, 2004; 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

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*).

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.

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

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.

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.

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.

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

Subjective measurement of impacts

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.

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 5.A1). Response categories for the question include: reduced transaction time, increased quality of customer service and lower business costs.

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 website, 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.

Notes

1. Denmark, Finland, Iceland, Norway and Sweden.
2. 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.
3. 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.
4. Model questionnaire for the Community Survey on ICT Usage and e-Commerce in Enterprises, 2006.
5. 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.
6. This material is taken from the final model survey paper of 2005 (OECD, 2005).
7. 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.”
8. 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.”
9. 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.
10. 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”.
11. 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”.
12. All ISIC references in this annex are to ISIC Rev. 3.1.
13. 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.
14. 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.).
15. 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.

16. 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.
17. 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.
18. 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).

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ANNEX 5.A1

*OECD Model Survey of ICT Use by Businesses***Introduction**

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.

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.

Of note, the 2005 OECD model survey of ICT use by businesses does not take into account the 2010 revision of the OECD statistical definition of e-commerce. At its 2010 meeting, WPIIS agreed to update the model survey of ICT use by businesses for the 2011 meeting.

History of the model survey's development

The WPIIS started work in this area in 1999, with a stocktaking of country measurement practices prepared by Sweden and presented to the April 1999 meeting. 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.

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 countries¹ that were the first countries to establish a project for a common set of guidelines for measuring ICT use in enterprises.² 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, 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.

Another round of discussion at the April 2001 WPIIS meeting and subsequent written comments led to a final proposal that was presented to WPIIS' Parent Committee ICCP for declassification (approval) in October 2001.

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".

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.

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.

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.

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.

A detailed proposal, developed by the Secretariat in consultation with interested member countries, was presented to the 2005 meeting and subsequently revised based on comments made at, and following, the meeting.

The revised model was finalised in late 2005 and distributed as DSTI/ICCP/IIS(2005)2/FINAL (OECD, 2005a).

Development of the revised model of 2005

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, 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 member countries (per the WSIS³ meetings) was also consulted in order to ensure as many options as possible for future benchmarking across a greater number of countries.

Regarding input, survey material from a number of member countries was examined, including the Eurostat questionnaire for 2006.⁴

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 that are relatively untested by member countries were included in the model. 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).

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.

Comments were sought on the 2004 and 2005 proposals from all WPIIS delegates. A number of countries and organisations responded and their comments were incorporated into the model as far as possible.

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.⁵ 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.

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).⁶

Survey methodology

Introduction

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 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.

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 (Eurostat, 2010a).

Minimising sampling and non-sampling error

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

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

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

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.

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)⁷ and the European Union.⁸ 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.

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.

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

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.

Weighting methodologies

The subject of weighting of survey estimates was noted as an outstanding issue in the first model survey paper (OECD, 2001) 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)

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 .

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.

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

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.

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

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 website account for (or represent) $\times\%$ of total employment.

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

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.⁹

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 websites can be significant (in Canada, in 2004, 37% of businesses had a website, but they accounted for 85% of total business revenue for Canada).

Scope and coverage

Introduction

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

Whilst not specified in the 2001 OECD model, this will usually be businesses from the private and public sectors¹⁰ that are operating in the country conducting the survey. General government organisations¹¹ are excluded. Most OECD countries also exclude non-employers.

Industry (activity) scope

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 and restaurants (ISIC H), Transport, storage and communications (ISIC I) and Real estate, renting and business activities (ISIC K).¹²

Eurostat specifies a scope of NACE¹³ Sections D, F, G, H (55.1 and 55.2 only),¹⁴ I, K and O (92.1 and 92.2 only).¹⁵ Industries that Eurostat states as optional are: E, 55.3-55.5, 92.3-92.7 and 93.

In respect of Financial intermediation (ISIC J),¹⁶ Eurostat includes NACE classes 65.12, 65.22, 66.01 and 66.03.

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

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+ 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.¹⁷

Geographic scope

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

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

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.

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.

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.

The following classificatory variables are recommended for the model survey.

Industry (activity)

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 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)

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.

Countries are encouraged to further disaggregate the top category when producing output. Use of some ICTs (in particular relating to e-business) is likely to be more prevalent in very large businesses.

Particular statistical issues associated with business ICT use measurement

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 this annex. Other measurement issues are discussed below.

Trust in the online environment

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.

At the close of 2009, there were more than 313 million fixed Internet subscriptions in the OECD area – a figure that was up from just over 260 million in 2005. 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 2009, nearly 91% 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.

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 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.

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.

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.

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, 2002, 2003 and 2005b). 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.

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' website (Question 16) and security and privacy as barriers or limitations to selling over the Internet (Question 14).

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.

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 Canada⁵ and is successfully used by Statistics Denmark in its business ICT use questionnaire.

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.

- 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.

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 Canada⁵ 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.

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.

Digitised products

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

There are several issues associated with measurement of e-government (Question 19). 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.

In recognition of the statistical difficulties of the supply-side approach – collecting e-government information from government organisations – , 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.

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>.

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

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.

Comparison with Eurostat's model survey

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 (Eurostat, 2010b). 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.

In respect of scope and classificatory variables, the revised OECD and Eurostat models are very similar.

About the model questionnaire

The revised model questionnaire, including definitions of terms and associated metadata notes, is shown below.

Logic of the revised model questionnaire

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)

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

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.¹⁸

Table 5.A1.1. 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 <input type="checkbox"/> Yes <input type="checkbox"/>	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 <input type="checkbox"/> Yes <input type="checkbox"/>	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 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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. 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. A network connecting computers and associated devices within a localised area such as a single building, department or site; it may be wireless. A network that connects computers and associated devices within a wide geographic area, such as a region or country.
4.	Did your business use the Internet during <period>?	No <input type="checkbox"/> Yes <input type="checkbox"/>	The Internet is defined in Question 2. Use of the Internet may be on your business premises or elsewhere.
5.	What proportion of persons employed in your business routinely used the Internet at work during <period>? ³	<input type="text"/> %	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.

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section A: General information about your business' use of ICT		Logic ¹	Definitions and notes
6. How did your business connect to the internet during <period>?⁴			
Analog modem (dial-up via standard phone line)	<input type="checkbox"/>	Tick all which apply	This question refers to the business as the subscriber rather than individual employees.
ISDN (Integrated Services Digital Network)	<input type="checkbox"/>		An analog modem converts a digital signal into analog for transmission by traditional (copper) telephone lines. It also converts analog transmissions back to digital.
Other narrowband ⁵	<input type="checkbox"/>		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.)	<input type="checkbox"/>		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).
Cable modem	<input type="checkbox"/>		Digital subscriber line; it is a high-bandwidth, local loop technology carrying data at high speeds over traditional (copper) telephone lines.
Other broadband ⁵	<input type="checkbox"/>		A modem which uses cable TV lines for connection to the Internet.
	<input type="checkbox"/>		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.
7. Did your business have any of the following IT security measures in place at <reference date>?			
Virus checking or protection software which is regularly updated	<input type="checkbox"/>	Tick all which apply	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	<input type="checkbox"/>		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	<input type="checkbox"/>		Software or hardware that controls access into and out of a network or computer.
Spam filter	<input type="checkbox"/>		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)	<input type="checkbox"/>		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	<input type="checkbox"/>		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)	<input type="checkbox"/>		
Intrusion detection system	<input type="checkbox"/>		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	<input type="checkbox"/>		

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section A: General information about your business' use of ICT		Logic ¹	Definitions and notes
Offsite data backup		<input type="checkbox"/>	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		<input type="checkbox"/>	
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>? <i>Excluding:</i> attacks which were successfully prevented by security measures in place.		No <input type="checkbox"/> Yes <input type="checkbox"/>	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 ¹	Definitions and notes
<i>Purchasing and selling goods or services via the Internet</i>			
9. Did your business place orders (make purchases) for goods or services via the Internet during <period>? <i>Including:</i> via websites, specialised Internet marketplaces, extranets. EDI over the Internet, Internet-enabled mobile phones but excluding orders submitted via conventional e-mail		No <input type="checkbox"/> Yes <input type="checkbox"/>	An order is a <i>commitment</i> 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. <i>Purchases</i> 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>? <i>Including:</i> via websites, specialised Internet marketplaces, extranets. EDI over the Internet, Internet-enabled mobile phones but excluding orders submitted via conventional e-mail <i>Including:</i> orders received on behalf of other organisations and orders received by other organisations on behalf of your business		No <input type="checkbox"/> Yes <input type="checkbox"/>	An order is a <i>commitment</i> to purchase goods or services <i>from</i> 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? <i>Note:</i> 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. <i>Note:</i> Careful estimates are acceptable.		% <input type="text"/>	The Internet and Internet orders are defined in Question 10.

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations		Logic ¹	Definitions and notes
12. Please provide percentage breakdowns of the value of those Internet orders (sales), by:⁹			
<i>Note:</i> Careful estimates are acceptable.			
Types of products your business sold			
Physical products (ordered on line and delivered off line)	<input type="text"/>	%	Via the Internet For instance, raw materials, components, stationery, equipment, hardware, books.
Digitised products (downloaded or accessed on line)	<input type="text"/>	%	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	<input type="text"/>	%	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 an online ordering facility on your website	<input type="text"/>	%	Via the Internet For instance, a shopping cart facility. Excludes conventional e-mail linked from a website.
Through another website (e.g. specialised Internet marketplace or an agent's site)	<input type="text"/>	%	
Via EDI over the Internet	<input type="text"/>	%	For example XML/EDI. EDI is defined in Question 2.
Via other Internet technologies (please specify)	<input type="text"/>	%	
	= 100	%	
Types of customers your business sold to			
Other businesses	<input type="text"/>	%	Via the Internet Including related businesses.
Individual consumers	<input type="text"/>	%	
Government and other non-business organisations	<input type="text"/>	%	Including non-profit organisations.
	= 100	%	

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations	Logic ¹	Definitions and notes
The location of customers your business sold to		Via the Internet
Customers within your country	<input type="text"/> %	
Customers outside your country	<input type="text"/> %	
	= 100	
13. Which of the following benefits, if any, did your business realise through Internet selling during <period>?¹⁰		
Reduced transaction time	<input type="checkbox"/>	Internet selling (that is receiving orders for goods or services over the Internet) is defined in Question 10.
Increased quality of customer service	<input type="checkbox"/>	
Lower business costs	<input type="checkbox"/>	Including transaction and other costs.
Increased sales volume and/or number of customers	<input type="checkbox"/>	
Keeping pace with competitors	<input type="checkbox"/>	
Able to better target customers individually	<input type="checkbox"/>	
Other (please specify).....	<input type="checkbox"/>	
No benefits realised	<input type="checkbox"/>	
14. Which of the following factors, if any, limited or prevented Internet selling by your business during <period>?¹¹		
Products of your business are not well suited to sale via the Internet	<input type="checkbox"/>	Internet selling (that is receiving orders for goods or services over the Internet) is defined in Question 10.
Security concerns	<input type="checkbox"/>	Includes concerns the business has and the perceived concerns of customers (e.g. on providing credit card details over the Internet).

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations	Logic ¹	Definitions and notes
Privacy concerns	<input type="checkbox"/>	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	<input type="checkbox"/>	
Customers' or suppliers' computer systems are incompatible with yours ¹² NC	<input type="checkbox"/>	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	<input type="checkbox"/>	
Uncertainty concerning legal/regulatory framework for selling over the Internet	<input type="checkbox"/>	
Cost of development and/or maintenance is too high	<input type="checkbox"/>	
Lack of skilled employees to develop, maintain or use the technology required	<input type="checkbox"/>	
No limitations to selling over the Internet ¹³	<input type="checkbox"/>	
Not relevant – as selling over the Internet is currently under development or planned for the near future ¹⁴	<input type="checkbox"/>	
Other (please specify).....	<input type="checkbox"/>	
<i>Use of the Internet for other business processes within your business</i>		
15. Did your business have a website at <reference date>?	No	Go to 17 Includes the business' website/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.
<i>Including</i> : website, 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	<input type="checkbox"/>	
	Yes	
	<input type="checkbox"/>	
16. As at <reference date> did your business' website have any of the following features?¹⁵		
	Tick all which apply	
Product catalogues or price lists	<input type="checkbox"/>	
Customised web page or information provided for repeat clients	<input type="checkbox"/>	

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations	Logic ¹	Definitions and notes
Facility for collecting customer information on line	<input type="checkbox"/>	
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	<input type="checkbox"/>	Ranges from a simple order form which is completed on line to a <i>shopping cart</i> system. May involve an intermediary, for example, a transaction processor. Products include goods and services.
Facility for online payment	<input type="checkbox"/>	
Provision of online after sales support	<input type="checkbox"/>	For example, online queries, customer feedback, customer services organised on line, FAQ facility.
Order tracking available on line	<input type="checkbox"/>	
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.
17. Did your business use the Internet for dealing with government organisations during <period>?⁶	<input type="checkbox"/>	Government organisations are defined by the SMA93 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 websites or via e-mail)	<input type="checkbox"/>	
For downloading or requesting government forms	<input type="checkbox"/>	Includes downloading from websites or e-mailing requests for forms; includes taxation forms, claims, applications for permits, etc.
Completing forms on line or sending completed forms	<input type="checkbox"/>	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	<input type="checkbox"/>	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 website.

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations	Logic ¹	Definitions and notes
Other dealings with government (please specify).....	<input type="checkbox"/>	
Did not use the Internet for dealing with government organisations	<input type="checkbox"/>	
18. Did your business use the Internet in any of the following areas of your business during <period>?¹⁷ <i>Including</i> : the WWW, extranets, intranets, EDI over the Internet but excluding conventional e-mail	NC	
	Tick all which apply	
Finance	<input type="checkbox"/>	Includes invoicing and making payments via the Internet, online banking.
Internal or external recruitment	<input type="checkbox"/>	For instance, including details of vacant positions on an intranet or website.
Staff training	<input type="checkbox"/>	Includes e-learning applications available on an intranet or from the WWW.
Sharing or distribution of information within your business	<input type="checkbox"/>	Includes via an intranet or knowledge management software.
Sharing or distribution of information with other organisations	<input type="checkbox"/>	For instance, collaboration with business partners.
Did not use the Internet for any of the above business activities	<input type="checkbox"/>	
<i>Purchasing and selling goods or services via computer networks other than the Internet</i>		
19. Did your business place orders (make purchases) for goods or services via computer networks other than the Internet during <period>? <i>For instance</i> : non-Internet based EDI, automated telephone systems	No <input type="checkbox"/> Yes <input type="checkbox"/>	An order is a <i>commitment</i> 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. <i>Purchases</i> 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>? <i>For instance</i> : non-Internet based EDI, automated telephone systems <i>Including</i> : orders received on behalf of other organisations and orders received by other organisations on behalf of your business	No <input type="checkbox"/> Yes <input type="checkbox"/>	An order is a <i>commitment</i> to purchase goods or services <i>from</i> 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.

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations		Logic ¹	Definitions and notes
21.	What proportion of your business' total turnover during <period> (excluding value added taxes) did those orders (sales) represent? ⁸	<input type="text"/>	% Orders are defined in Question 20.
<i>Note:</i> 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.			
<i>Note: Careful estimates are acceptable.</i>			
<i>Integration of your business' processes</i> ¹⁸			
22.	Did your business place or receive orders for goods or services via any computer networks during <period>? ¹⁹	No <input type="checkbox"/> Yes <input type="checkbox"/>	Go to 25 An order is defined in Questions 9, 10, 19 and 20.
<i>Including:</i> the Internet and other computer networks (e.g. non-Internet based EDI) but excluding orders submitted via conventional e-mail			
23.	Did your systems for placing orders via computer networks link automatically 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	<input type="checkbox"/>	
	Your purchasing partners' computer system/s	<input type="checkbox"/>	
	Your business' computer system/s	<input type="checkbox"/>	
	For ordering or inventory control	<input type="checkbox"/>	
	For accounting functions	<input type="checkbox"/>	For instance, paying suppliers.
	For production or service operations	<input type="checkbox"/>	
	Other internal or external computer system/s (please specify).....	<input type="checkbox"/>	
	Your system/s for placing orders via computer networks were not linked automatically to any of the above	<input type="checkbox"/>	

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section B: How your business uses ICT in its operations	Logic ¹	Definitions and notes
<p>24. Did your business' computer systems for receiving orders via computer networks link automatically with any of the following internal or external systems as at <date>?²⁰</p>		
<p>Your customers' computer system/s</p> <p><input type="checkbox"/></p>	<p>Tick all which apply</p>	<p>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.</p> <p>For instance, invoicing customers. Including electronic delivery.</p>
<p>Your suppliers' computer system/s</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>Your business' computer system/s</p> <p>For ordering or inventory control</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>For accounting functions</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>For delivery of products</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>For production or service operations</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>For marketing or customer relations management</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>Other internal or external computer system/s (please specify).....</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>Your system/s for receiving orders via computer networks were not linked automatically to any of the above</p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p>	
<p>25. Main activity of the business Please describe</p>		
<p>26. Number of employed persons at <date>²¹</p> <p style="text-align: right;"><input type="text"/></p>		
<p>27. Total turnover during <period> <i>In national currency, excluding value added taxes</i></p> <p style="text-align: right;"><input type="text"/></p>		

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section C: Other information about your business

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.

Table 5.A1.1. OECD model questionnaire for ICT use by businesses (2005) (cont.)

Section C: Other information about your business

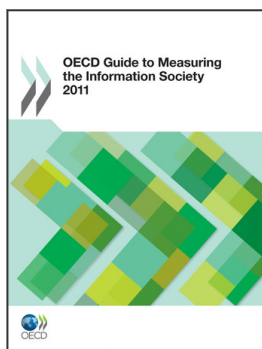
13. This would be a valid response for businesses which are already selling over the Internet.
14. This would be a valid response for businesses which are not currently selling over the Internet but are planning to do so.
15. This question offers the potential to cross-classify categories and produce useful information on e-business and trust functions on a business' website. 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.

Notes

1. Denmark, Finland, Iceland, Norway and Sweden.
2. 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.
3. 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.
4. Model questionnaire for the Community Survey on ICT Usage and e-Commerce in Enterprises, 2006.
5. 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.
6. This material is taken from the final model survey paper of 2005 (OECD, 2005).
7. 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.”
8. 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.”
9. 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.
10. 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”.
11. 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”.
12. All ISIC references in this annex are to ISIC Rev. 3.1.
13. 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.
14. 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.).
15. 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.
16. 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.
17. 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.
18. 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).

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