# The OECD Model Survey on ICT Usage by Businesses

## 2nd Revision

Working Party on Measurement and Analysis of the Digital Economy

2015

# FOREWORD

This report presents the second revision of the OECD Model Survey on the Use of Information and Communication Technologies (ICT) by Businesses.

The Model Survey was released in 2002 and then revised for the first time in 2005 [DSTI/ICCP/IIS(2005)2/FINAL].

The report was prepared by the OECD Secretariat in consultation with delegates from the OECD Working Party on Indicators for the Information Society (WPIIS) and declassified by the Information, Computer and Communication Policy Committee (ICCP) on 13 December 2013.

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## TABLE OF CONTENTS

# THE OECD MODEL SURVEY ON ICT USAGE BY BUSINESSES: 2ND REVISION

## Background to the revision process

1. This paper presents the second revision of the OECD model survey on the use of Information and Communication Technologies (ICTs) by businesses. This model survey (MS) and its counterpart covering ICT access and use by households and individuals were first issued in 2001 and 2002 respectively[1] by the Working Party for Indicators on the Information Society (WPIIS), of which the Working Party on Measurement and Analysis of the Digital Economy (MADE) is the follower, setting an international standard for the production of indicators on the Information Society. Both surveys were subsequently revised only once, in 2005.[2]

2. Since that review, the depth and breadth of ICT use by businesses in OECD countries have increased dramatically. The use of computers has become a necessity in all sectors of the economy, and enterprises increasingly interact via the Internet. More recently, the evolution of ICT applications has created new business opportunities as well as policy challenges, for instance regarding the collection, protection and use of personal data. Progress in measurement has also been substantive, with improvements in data collection practices and wide extensions in the scope of surveying likely to continue in coming years, for instance including the Internet as a source of data, or inserting ICTs in the broader framework of advanced technologies' adoption, business strategies, innovation activity.

3. In view of the above, at its 2010 meeting the WPIIS decided to revise both model surveys on ICT use to ensure that they reflect evolving policy needs and priorities and to align them with current practices. The revision would also take into account changes in definitions – such as that of e-commerce, approved by WPIIS in 2009 – as well as updates in international classifications.[3] To this end, two expert groups were set up with a mandate to report progress to the Working Party. At its December 2012 meeting, the WPIIS discussed preliminary drafts (Room documents no. 1 and 2) and agreed that the two model surveys should follow a common framework. The secretariat drafted a proposal that was discussed by WPIIS at its December 2013 meeting (DSTI/ICCP/IIS(2013)2) and recommended for declassification to the OECD Committee for Information, Communications and Computer Policy (ICCP, now Committee on Digital Economy Policy, CDEP). This final version of the document includes the comments received during the declassification process.

4. The WPIIS-MADE also agreed the two model surveys should henceforth be subject to a regular revision process on annual basis. The scope of revisions would vary: in some instances it may be where a new thematic module is discussed or new definitions are introduced. The main purpose of the annual

1. See DSTI/ICCP/IIS(2001)1/REV1 and DSTI/ICCP/IIS(2002)1/REV2.

2. The revised model surveys were published as DSTI/ICCP/IIS(2005)2/FINAL for businesses, and DSTI/ICCP/IIS(2005)3/FINAL for households and individuals.

3. For the updated definitions of e-commerce and ICT industries, products and occupations, as well as for the past editions of the model surveys, see the *OECD Guide to Measuring the Information Society 2011* (http://browse.oecdbookshop.org/oecd/pdfs/free/9311021e.pdf).

process is to ensure that the two model surveys are consistently aligned with policy priorities as reflected in OECD discussions. Moreover, reviews on a rolling basis would allow MADE to be more forward looking and proactive in the development of international standards.

**Main elements of this revision**

5. The present document takes into account policy priorities expressed by the OECD Committee for Information, Communications and Computer Policy (ICCP - CDEP) and sister Working Parties,[4] as well as in depth comments on indicators based on survey experience by Eurostat and the European Commission (DG CONNECT). Other colleagues in national statistical institutes and specialised agencies also provided comments. All contributions in the development of the revision have been greatly appreciated.[5]

***Purpose***

6. Overall, the OECD model surveys are meant to improve international comparability by encouraging the use of standardised indicators. As such, the purpose of this revision is to better align the MS on business use of ICT with the evolution of the internet economy and progress in metrics in general, taking into account emerging policy needs. To achieve these objectives, the current revision marks a significant change in terms of approach and scope of the survey.

***Approach***

7. The proposed survey approach is based on a two-tier structure consisting of core and supplementary indicators within 12 thematic modules.[6] Core indicators represent statistical information deemed essential to understand the foundations of the internet economy, i.e. broadband adoption, computer use, selling online, etc.; supplementary indicators are meant to provide more in depth information on these phenomena, and to capture advanced aspects that may be occurring in some OECD member countries, i.e. data analytics services, RFID, software-as-a-service, etc.

8. This dual approach ensures that a common set of prioritised information is complemented with advanced measures of ICT sophistication. For member countries, it means maintaining a pulse on existing policy issues with a degree of adaptability as the internet economy and policy needs change. This flexibility also provides strategic value to the WPIIS and its work plan moving forward.

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4. See, *inter alia*, envisaged work on metrics in DSTI/ICCP(2013)7, or DSTI/ICCP/REG(2012)12/REV1.

5. Special acknowledgements should go to: Aarno Airaksinen (Statistics Finland and member of the WPIIS Bureau), who has been leading the WPIIS expert group on businesses and developed with Gregor Zupan (Slovenian National Statistical Institute) and Justin Bayard (Industry Canada and WPIIS Bureau) an earlier draft, including the two-tier approach in the presentation of indicators, which provided a useful background, and a number of detailed comments to this document. All other WPIIS Bureau members, i.e. Luis Magalhães (Chair, Lisbon Technical University – Portugal), Hans-Olof Hagen (Statistics Sweden) and Martin Mana (Czech Institute of Statistics) provided extensive guidance throughout the process. Albrecht Wirthmann, Kostantinos Giannakouris and Michail Skaliotis from Eurostat offered several insights and shared their experience with the European model survey, to which this document is also indebted for the wording of many indicators. Stefano Abruzzini (DG CONNECT) was of great help in discussing future trends and gave fruitful comments on indicators. Valuable comments and feed backs were also provided by Mark Uhrbach (Statistics Canada), Diane Braskic, Andrew Puljic and Neil Griffin (Australian Bureau of Statistics), as well as by other WPIIS colleagues.

6. The modular approach is common in survey practice and was the approach taken in the first edition of the MS The 2005 revision, instead, adopted a questionnaire “look and feel”, but it also introduced a few (3) complementary items, corresponding to experimental (not yet tested) indicators.

9. More concretely, the current revision includes 5 core and 7 supplementary modules on business use of ICTs, covering a broader range of topics than the previous revision.[7] The indicators draw from member countries' current ICT surveys and best practices including the European model surveys, adopted by the large majority of OECD countries, and surveys and modules developed in Canada, Korea, the United States and, jointly, by Australia and New Zealand.

***Scope***

10. There have been a number of changes in scope since the last revision process, including the development of experimental (not yet tested) indicators capturing policy aspects of security and privacy, data analytics, and E-Government; new indicators on ICT;[8] and new modules on ICT expenditure and acquisitions and on *other (emerging) uses of ICT technologies* (i.e. RFID, cloud computing, data analytics and ICT green policies).[9] Table 1 illustrates some of the changes that are proposed between the 2005 and 2013 revisions.

11. The WP MADE (and, formerly, WPIIS) also considers extending the approach and scope of the model surveys through a regular revision process and calendar, with the objective of coordinating data development across the OECD on specific, non-core items. In this process, *complementary* indicators, many of which are based on extensive cognitive testing, will provide a credible statistical reference for countries seeking to collect information for certain priority areas. As proposed by the Working Party's Bureau, the benefits of this approach could be maximised by joint efforts on data collection (especially on emerging topics), with the coordination of complementary modules based on strategic priorities in particular calendar years.

12. Finally, a periodic assessment of *core* indicators through the revision process will reinforce data harmonisation amongst OECD member and non-member countries.[10]

7. Excluding background information which might or not be collected via this survey, indicators are now 73 (sometimes multiple), against 24 in the previous release, 40 to 45 in Eurostat model surveys 2013 to 2015 (corresponding to 74 questions in the 2013 survey), and about 65 in Korea's (2010 to 2012). The revision proposed for the twin survey on ICT usage by households and individuals (DSTI/ICCP/IIS(2013)1) also increases the number of indicators with respect to the previous release, from 25 to 50, many of which based on lists of items.

8. Some of these include ICT expenditure and acquisition, open source software, social media, and the demand for ICT-skilled professionals

9. It is interesting to note that the monitoring of use of RFID and Cloud computing were already envisaged as 'for future work' in the 2005 revision.

10. The WPIIS is directly engaged in the *Partnership on Measuring ICT for Development*, with UN agencies and other international Organisations. Countries approaching the collection of ICT usage statistics can find useful guidance in the second edition of the *Manual for the Production of Statistics on the Information Economy* published in 2009 by the UNESCO in the framework of the Partnership (see http://unctad.org/en/docs/sdteecb20072rev1_en.pdf ).

**Table 1. The 2013 revision at a glance**

| | Modular structure and contents of the 2013 revision | No. of Indicators (2013 – 2005)[11] | | Novelties in the 2013 vs. the 2005 revision |
|---|---|---|---|---|
| CORE MODULES | **A. Connectivity:** Basic access to and use of computers, the Internet and broadband, as well as qualitative aspects related to firm structure. Complementary indicators address emerging issues of remote access and barriers to optimal connectivity. | 7 | 6 | Updated lists. Introduced speed tiers, remote access & connectivity issues |
| | **B. Website:** Enterprise's presence on the Internet and how the website is integrated in its business functions. Website e-commerce capabilities are considered as core, but other characteristics of website management are also monitored. | 4 | 3 | Website management & strategies to direct traffic to website |
| | **C. Information management (and sharing) tools:** business' use of Intranet & Extranet, EDI, ERP, CRM, E-invoicing, and how these tools are integrated into its different business functions. | 14 | 2 | Several new elements (ERP, e-Invoicing) and much broader scope |
| | **D. Electronic commerce:** purchasing and/or selling on line, relevance of e-commerce in business according to the transaction channel, the type of customers and their geographical location. | 8 | 8 | Improvements in indicators shaping and updated definitions of e-commerce |
| | **E. Security and Privacy** (policies and incidents): looks at the implementation of specific policies of risk prevention in these domains, at the occurrence and relevance of incidents and at incident response policies. | 8 | 2 | Privacy, incident relevance and response policy. Overall improvements in scope |
| COMPLEMENTARY MODULES | **F. E-Government:** Use of ICT tools to interact with public authorities, ways and types of interaction and perceived limitations. | 3 | 1 | Lists for e-administrative procedures and hindrances |
| | **G. Other uses of ICTs**: Diffusion (and features) of RFID, Cloud computing, Data analytics and ICT savings policies among enterprises, and perceived benefits and obstacles. | 11 | - | **New topics** (RFID, cloud computing, data analytics, ICT green policies) |
| | **H. ICT Skills:** Demand for and employment of ICT skilled workers, including unsatisfied needs and perceived motivations for employing ICT professionals. | 8 | - | **New topic** |
| | **I. ICT Expenditure and Acquisition:** Resources devoted to ICTs by type of tools (e.g. software vs. hardware) and how these assets are acquired. | 4 | - | **New topic** |
| | **J. Open source software:** Diffusion of *free* versus proprietary software solutions, and characteristics of the former. | 1 | - | **New topic** |
| | **K. Use of social media:** Enterprises' presence on social media, and targets & strategies deployed. | 3 | - | **New topic** |
| | **L. Effects of ICT adoption:** Perceived benefits and impacts of Broadband, E-commerce and ERP/CRM, and barriers to adoption. | 2 | 2 | Broader array of applications and up-to-date list of items |
| **Background information:** details auxiliary variables on enterprises' characteristics (sector of activity, turnover, employment, etc.), if not collected elsewhere or if a check with existing sources is deemed necessary. | | 6 | 3 | Information on business' purchases and belonging to a group |
| | Total numbers of indicators: | **79** | **27** | |

11. Please note that the numeric comparison is purely indicative: for the sake of simplicity, here and in Tables 2 and 3 below, different modalities or lists of items related to the same dimension are counted as one indicator.

## Complementary tools and the work ahead

13. This revision entails major changes of the OECD model survey on ICT usage by businesses, including substantial amendments to its architecture and a large broadening in scope. However, several of the indicators proposed are bound to rapidly become obsolete, while other measurement opportunities and needs will be emerging.

14. For instance, in the near future it might become irrelevant to track broadband and/or mobile connectivity as separate items, or to collect information on simple ICT use, while topics such as Machine-to–Machine (M2M) communication, mobile apps in service markets, or the digitisation of value chains might require greater attention. As discussed in the WPIIS meetings of December 2012 and 2013, the Internet and other sources of data collection can also contribute to enlarge the array of available indicators beyond the scope of this model survey.[12]

15. In view of the above, and considering the complexity of the current revision process, the WPIIS agreed that lighter updates to its model surveys would be performed on a rolling basis, following a simplified procedure. Hence, the current revision was conceived as an evolving platform that can provide a reference for countries and, possibly, be reinforced by metadata information. In particular, following the enhanced data and metadata collection also agreed at the 2012 meeting,[13] a repository of existing surveys is being set up, which might also be queried for specific indicators and for comparisons of countries' experiences.

16. Finally, an outline of key statistical issues and developments in surveying is also proposed in Annex 1 to this document. Aspects addressed include the extension of surveying to smaller businesses, attention to groups of enterprises as the relevant decision unit, the joint occurrence of ICT adoption and other strategic behaviours (e.g. innovation, a broader automation, etc.) and to the analysis of the determinants and impacts of ICT usage on business performance. Future work by the WPIIS might also usefully address these issues.

## Proposed coverage of the model survey of ICT use in business

17. This section provides an outline of core and complementary indicators. The complete list of indicators in each module is provided in Annex 2, together with relevant information and definitions: please note that **in Annex 2 proposed core indicators are highlighted in grey**.

### *Core versus non-core indicators*

18. Core indicators are proposed based on policy relevance and statistical feasibility. The number of proposed core indicators is kept at bear minimum to maximise the likelihood of obtaining a set of key, internationally comparable indicators. These address key topics in the domains of connectivity, web presence and e-commerce, the use of tools for automated information management and sharing, IT security and privacy policies. Other domains such as e-governement or emerging areas in ICTs do not include any core indicator, while complementary indicators are present in both core and non-core modules.

12. A feasibility study on the use of the Internet as a source of data (IaD) is currently being undertaken by Eurostat on some indicators related to website characteristics, information sharing and e-commerce.

13. See DSTI/ICCP/IIS(2012)7

**Table 2. Proposed core indicators by module**

**Connectivity**

1. Persons employed regularly using a computer at work (as a % of persons employed – p.e.)
2. Enterprises with (fixed/mobile) broadband (as a % of total enterprises)
3. Connection speed *(OECD tiers)* (distribution)
4. Persons employed with access to the Internet (% of p.e.)
5. Persons employed provided with Internet enabled portable devices (% of p.e.)

**Website**

6. Enterprises having a website (% of enterprises)
7. Enterprises with a website allowing for online ordering (% of enterprises – total & w/website)

**Information management tools**

8. Enterprises using ERP, CRM (plus EDI and RFID) software (% of total – by technology/application)
9. Enterprises sharing electronically supply management information with suppliers/customers (% of total, by type of partner)

**E-commerce**

10. Enterprises conducting e-sales (as a % of enterprises)
11. E-sales value by platform (EDI, web) and customer (B2X) (% of total turnover of enterprises, including by platform and customer)
12. Enterprises conducting e-purchases (as a % of enterprises)
13. E-purchases value by platform (EDI, web) (% of total purchases of enterprises, including by platform)

**Security and privacy**

14. Security breaches/incidents encountered (% of enterprises by occurrence)
15. Formal policy to manage ICT privacy risks (% of enterprises)

**Table 3. Proposed complementary indicators by module**

**Connectivity**

1. Remote access to the enterprise resources *(% of enterprises providing access)*
2. Barriers to the use of mobile networks for accessing the Internet *(% relevance of items listed)*

**Website**

(x) (possible extension to core 2) Website characteristics (*% of enterprises- website allowing selected functions*)

3. Use of selected channels to direct traffic to enterprise website *(% of enterprises, by strategy)*
4. Reasons for not having a website *(% relevance of items listed)*

**Information Management Tools**

5. Intranet *(% of all enterprises)*
6. Extranet *(% of all enterprises)*
7. Automated share of information on orders received, across different business functions *(% of enterprises, by type of function integrated)*
8. Sending or receiving EDI-type messages suitable for automated processing for selected purposes *(% of enterprises, by type of action and message)*
9. Barriers to sending or receiving EDI-type messages *(% relevance of items)*
10. Use of CRM software to manage and analyse information about customers *(% of enterprises)*
11. Share of Supply Chain Management (SCM)-related information with suppliers *(% of enterprises, by type of information)*
12. Share of SCM-related information with customers *(% of enterprises, by type of information)*
13. Methods used to exchange SCM-related information *(% of enterprises by method)*
14. Barriers to the use of information management tools *(% relevance of items)*
15. E-invoices sent *(% of total invoices and enterprises)*
16. E-invoices received *(% of enterprises)*

**E-commerce**

17. Web-sales % breakdown by customer (B2X) and geographic area *(national vs. other)*
18. Means of payment (online vs. offline) accepted for web-sales *(% of enterprises by mean)*
19. Barriers to web-sales *(% relevance of items among enterprises)*
20. EDI sales % breakdown by geographic area *(national vs. other)*

**Security and privacy**

21. Formal policy to manage ICT security risks (*% of enterprises*)
22. Risks addressed by the ICT security policy (*% of enterprises by occurrence*)
23. Security facilities or procedures in place *(% of enterprises by type of facility/procedure)*
24. Collection/storage of personal information on end-customers for analytical purposes *(% of enterprises)*
25. Ways to obtain or collect personal information on end-customers *(% relevance of each method)*
26. Methods of protecting digital personal information *(% relevance of each method)*

**E-government**

27. Use of the Internet to interact with public authorities *(% of enterprises, by type of interaction)*
28. Use of the Internet to manage selected administrative procedures *(% of enterprises, by procedure)*
29. Barriers to electronic interaction with public authorities *(% relevance of each barrier)*

**Table 3 continued – Proposed complementary indicators by module**

| |
|---|
| **Other uses of Information Technologies** |
| 30. Use of RFID technology for selected purposes: *(% of enterprises, by purpose)* |
| 31. Adoption of selected ICT based saving policies *(% of enterprises, by policy)* |
| 32. Purchase of selected cloud computing services *(% of enterprises, by service)* |
| 33. Access to cloud computing services via shared or dedicated servers *(% of enterprises, by type)* |
| 34. Benefits realised from using cloud computing services *(% relevance of each item)* |
| 35. Barriers to the use of cloud computing services *(% relevance of each item)* |
| 36. Use of data analytics, in-house or purchased *(% of enterprises, by way of use)* |
| 37. Expenditure on data analytics *(value, % of total variable costs)* |
| 38. Reasons for using data analytics *(% relevance of each motivation)* |
| 39. Impacts of data analytics on selected performance aspects *(% relevance of each aspect)* |
| 40. Barriers to the use of data analytics *(% relevance of item)* |
| **ICT Skills** |
| 41. Employment of ICT specialists *(% of enterprises employing specialists)* |
| 42. Employment of ICT specialists *(% on persons employed)* |
| 43. ICT training of persons employed *(% of enterprises, by type of training offered)* |
| 44. Recruitment of ICT specialists *(% of enterprises offering positions)* |
| 45. Difficulties in hiring ICT specialists *(% of enterprises experiencing difficulties)* |
| 46. Difficulties in hiring ICT specialists *(% relevance of reasons for hard to fill vacancies)* |
| 47. ICT functions performed in-house or by external providers *(external dependence by function)* |
| 48. Use of foreign suppliers for ICT related functions *(% of enterprises using external suppliers)* |
| **ICT expenditure and acquisition** |
| 49. Purchase of ICT hardware, software or services *(% of enterprises, by type of expenditure)* |
| 50. Expenditures on hardware, software or services *(values and % relevance of expenditure by type)* |
| 51. Channels used to acquire ICT goods and services *(% relevance of each channel)* |
| 52. Purchase of selected ICT services *(% of enterprises and expenditure on each type of service)* |
| **Open Source Software (OSS)** |
| 53. Use of third party open source software *(% relevance of each type of application)* |
| **Use of social media** |
| 54. Use of selected social media: social networks, blogs, file sharing, wikis *(% relevance of each tool)* |
| 55. Use of social media for selected activities *(% relevance of each activity)* |
| 56. Presence of a formal policy for using social media *(% of enterprises)* |
| **Perceived impacts of ICT adoption – open indicators** |
| 57. Benefits from selected ICTs not included in thematic modules *(% relevance of each impact)* |
| 58. Changes in selected aspects of business organisation from ICT adoption *(% relevance of each aspect)* |

19. In core modules, complementary indicators provide additional information on topics already covered by core indicators. In the other modules they include both 'key' and more detailed indicators on a specific theme. Following recommendations in DSTI/ICCP(2013)7, complementary indicators are also proposed and included in most modules to portray perceived benefits as well as barriers to the adoption of ICT technologies, and two open indicators providing a frame to this respect are proposed, as last module of the model survey.

20. The majority of complementary modules addresses already established topics which, however, are unevenly surveyed among OECD countries (the EU guaranteeing the most regular coverage). The proposal by the WPIIS Bureau is that a coordinated rotation system of modules be put in place to allow for a harmonised coverage of these themes across the OECD, in terms of both indicators and timing.

21. Some proposed indicators (and modules) have been tested in few or no OECD countries yet. The modules on ICT expenditure and acquisition, the one on the use of data analytics, as well as a set of indicators in the modules on security and privacy are to be considered as "experimental", and deserve closer attention.

***Experimental indicators***

22. In particular, the proposed module on *ICT expenditure and acquisition* includes indicators on economic resources devoted to of ICT equipment and software and on the ways these are acquired.[14] Previous survey experience includes a module administered in Canada, a questionnaire piloted in seven EU countries (in some of them as a standalone surveys, in others as a module) and an additional module in the US Annual Capital Expenditures Survey (ACES), which also includes non-capitalised purchases, in a similar fashion to the module proposed here, following the taxonomy used in current literature on intangible assets.[15]

23. Given the high policy relevance of information on these topics (both stand-alone and in association with usage and skills variables), the inclusion of this module is aimed at promoting further testing.

24. The module on *Data analytics* addresses a theme almost unexplored in business surveying,[16] also because the number of respondents likely to be engaged in this activity is likely too small to justify extensive data collection and to produce reliable statistics.

25. Information in this area is nonetheless considered as having increasing policy relevance, and the module is a candidate for initial piloting with large companies in final consumers' markets (e.g. retail trade, insurance and banking).

26. Also, some of the complementary indicators included in the module on *ICT security and privacy* are not yet tested. In particular, indicators on security – based on the rich set of questions already used in

14. Partial information on ICT investment is collected in many countries via other sources: these include structural business surveys targeting economic accounts or administrative (balance sheets) data for enterprises. At the macro level, instead, expenditure is usually estimated either by surveys (on consumers, or with telecom operators for communications) or, outside official statistics, based on expert assessment of market trends (e.g. for IT).

15. The Canadian survey includes only binary questions, to get information on the *diffusion* of given acquisitions of ICT hardware and software. The EU pilot tested expenditure variables with mixed results: issues included risks of under-reporting for current expenditures (which, unlike investment, lack systematic administrative tracking), difficulties to evaluate own-account software costs based on labour input, and a (too) high variability in the composition of purchases between investment and other expenditures among respondents. No similar issues are reported for the case of the United States.

16. A notable exception is represented by a pilot survey undertaken in Japan by the Ministry of Internal Affairs and Communications (MIC – not yet published), which focuses on specific outcomes of extensive use of digital information. Elsewhere, testing is limited to a more general question on purchasing of data processing services by Statistics and Industry Canada. Outside official statistics, a more thorough survey was recently undertaken on 500 medium and large companies in the United Kingdom by the NESTA Foundation

Eurostat surveys – are complemented with corresponding indicators on the qualitative assessment of security incidents. Indicators on privacy, instead, develop on the Canadian experience, adding the presence of a formal policy.

27. The development of this module, including the new indicators proposed, responds to the growing economic and societal relevance of the issues addressed and policy demand for metrics, put forward by the ICCP Working Party on Internet Security and Privacy (WPISP).

28. Minor innovations with respect to established practice were also introduced in the Module on e-Government, e.g. introducing the use of intermediaries as a possible item for surveying.

***Other features***

29. The 2005 revision of the Model Survey provided a questionnaire. This revision presents only indicators, to avoid quick obsolescence and lengthy debates on the wording of questions. However, it is worth recalling that information on the most relevant aspects in surveying (e.g. industry and size coverage, statistical units, breakdowns, etc.) is provided in Annex 1, with reference to current practices and developments, while the full list of indicators in Annex 2 also provides details on how indicators can be obtained, as well as on items which might be monitored. Finally, examples of wording of questions can be taken from existing survey practice and shall be made available in the upcoming metadata repository.

## ANNEX 1. STATISTICAL ISSUES AND DEVELOPMENTS IN SURVEYING

30. This Annex addresses some key aspects of survey methodology, providing an outline of most advanced practices and emerging issues. The aim is not to provide detailed methodological guidelines, are easily accessible elsewhere,[17] but rather to recall elements related to size thresholds, industry coverage, survey units or breakdowns to be envisaged in designing the survey strategy which are deemed useful for the harmonisation process moving forward, to increase the robustness of current and new indicators and modules, as well as for the potential inclusion of analytical work within the aims of surveying. The WPIIS in the future might also provide guidelines on some of these issues.

### The operational definition of businesses: statistical units

31. Throughout the OECD the common practice is to refer to the enterprise as the main object of the survey. According to the guidelines for the application of ISIC Rev. 4, an enterprise consists of *an institutional unit in its capacity as a producer of goods and services (...). An enterprise is an economic transactor with autonomy in respect of financial and investment decision-making, as well as authority and responsibility for allocating resources for the production of goods and services. It may be engaged in one or more productive activities*.[18]

32. The above definition, focusing on the autonomy in decision making, excludes pure *legal units* and establishments (currently surveyed only in Korea and in Mexico within the census). However it provides limited guidance with respect to those enterprises which are part of an enterprise group. In this case, although overall decision-making may stay autonomous, decisions with respect to ICT usage are keen to reflect the fact that the enterprise belongs to a broader entity, which brings to the forefront different and often more sophisticated needs regarding ICT usage.

33. There is not a unique or best way to address the issue of enterprise groups. The practice of surveying does not consider them as a specific aggregate in sampling or in the computation of results (e.g. by size of the enterprise). However, this element might be usefully taken into account in the interpretation of results. In Europe, for instance, a special *EuroGroups Register* (EGR) is in the process of

17. For an overview of all relevant topics (e.g. ways to minimize errors, treatment of non-response, etc.), see the *Methodological manual for statistics on the Information Society* published by Eurostat, whose latest edition (updates are published making specific reference to that year's surveys) can be accessed at https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp, while key topics are addressed also in the original edition, available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BG-06-004/EN/KS-BG-06-004-EN.PDF. Detailed guidelines for countries approaching ICT measurement in business can be found in the UNCTAD *Manual for the Production of Statistics on the Information Economy*. For all definitions related to ICTs, please refer to the latest (2011) edition of the *OECD Guide to Measuring the Information Society* (www.oecd.org/sti/measuring-infoeconomy/guide).

18. Available at the URL: http://unstats.un.org/unsd/publication/seriesM/seriesm_4rev4e.pdf (paragraph 77). Unlike in ISIC Rev. 3.1, this definition is in line with that of the European Commission.

being created to serve structural business statistics,[19] and this might impact also on the production of some indicators included in the survey on ICT usage by business.

**The field of observation: Industry (activity), size and geographical scope and coverage**

34. With respect to the economic activities targeted by the ICT usage survey, international practice tends to exclude agriculture (notable exceptions are Australia, Chile and New Zealand) and, in some cases, construction and personal services, on grounds of relevance. Always excluded are the economic activities of households and the whole of the public administration, for which are better suited other types of survey.

35. Surveying in the European Statistical System (ESS) also excludes (in the past, monitored via a specific survey) enterprises in the financial sector and in the past excluded *network industries* (e.g. Electricity, Telecommunications), on grounds of their generalised uptake of some technologies. The same approach is followed in most other OECD countries.

36. With respect to size, the established practice is to refer to employment. The scope of observation, though, is not uniform. Countries in the European Statistical System collect information for enterprises with 10 or more persons employed. A significantly higher threshold (100+) is adopted only by Japan. In Australia, Korea and New Zealand, instead, all enterprises are included in the reference population, and the same was done in the Chilean survey of 2006.

37. Micro-enterprises historically were not included into the European regulation, due to cost and relevance considerations, as the increase in sample would correspond to a much smaller increase in coverage of the economy, and smaller business were less likely to use ICTs.

38. The growing accessibility of technologies and increased policy consideration are changing this practice. Several countries now collect data on micro-enterprises as well, at least for some indicators: Belgium fixed the lower threshold at 5 persons employed, while Germany, Portugal, the Slovak Republic and Spain consider all enterprises with at least one person employed and France recently undertook a special survey on micro enterprises (due early 2014).

39. A possible cost-effective strategy to include smaller units in surveys consists in adopting short-form and multi-yearly modules. This approach would be more effective within a co-ordinated effort, to be promoted by the WPIIS.

40. With respect to the geographical scope, the established practice in all OECD countries is to include businesses operating anywhere in the country.[20]

**Grouping businesses to produce statistics: classificatory variables**

41. The key classificatory variables, used to define the scope of the survey, its stratification and the presentation of indicators consist of the industry (main economic activity) of businesses and their size:

19. The *EuroGroup* (see http://egr.istat.it/) should allow the profiling of enterprises, which might in turn lead to the definition of different (group level) statistical units in surveys. The EGR is part of an envisaged broader architecture, to create a *European system of interoperable statistical business registers* (ESBR: see http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.42/2013/Eurostat_-_ESBRs_AL.pdf).

20. Countries having limitations in running a full scale ICT survey are recommended to avoid reducing its geographical scope (e.g. to main urban areas only), and to prefer instead limitations in industry detailed breakdowns and, if necessary, breadth of indicators covered.

- Industry (activity) stratification should aim at producing reliable statistics at the ISIC Rev.4 Section (one letter) level, or the equivalent level in regional classification systems. Many countries provide breakdowns for manufacturing and the most relevant service activities, and a few aggregations (e.g. D-E).[21]
- Size: employment is the standard characteristic used to group enterprises by size: stratification is based on the number of persons employed, in general using the following thresholds: (0 to 9, micro), 10 to 49 (small), 50 to 249 (medium), 250 and over (large).

42. Turnover is also sometimes used to fix the minimum threshold to be included in the survey population (e.g. in Canada), while in the European Union it is a complementary variable for the definition of SMEs. Additional elements might include regional and rural vs. urban breakdowns.

**Data collection techniques**

43. Different data collection techniques often coexist. They span from postal survey to (computer assisted telephone or personal) interviews to, increasingly, remote data entry via the NSI (or specialised service supplier's) website.[22] Some experiences are also being made on the Internet as a data source, including a pilot study by Eurostat, which will eventually lead to the production of some of the indicators currently collected by means of the ICT usage surveys.

44. It is important to stress that the way of collecting the information (besides the pros and cons of each method) is not neutral with respect to the way the questionnaire should be shaped. In case of direct interview the simpler, "tick all that apply" approach fits the purpose. When the respondent is not assisted, instead, a "YES/NO" presentation is recommended, to reduce the incidence of false negatives.

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21. For instance, within manufacturing (ISIC Rev. 4 Section C) the current European regulation envisages the following aggregates of Divisions (in brackets, the translation into National Accounts double-letter nomenclature):
    - 10 to 18 (CA to CC): Food-beverages-tobacco, textile-apparel-leather, wood-paper-printing
    - 19 to 22 (CD to CG22): Coke-refining, chemical-pharmaceutical, rubber-plastics
    - 23 to 25 (CG23 to CH): non-metallic minerals, basic and fabricated metal products except machinery
    - 26 to 33 (CI to CM): Computers, electrical products and equipment, other machinery and equipment, transport equipment, other manufacturing including furniture, repair and installation of equipment.

    The other aggregations envisaged for publication include the following:
    - 35 to 39 (D and E): Electricity-Gas-Water and Sewage management
    - 41 to 43 (F): Construction
    - 45 to 47 (G): Wholesale and retail trade, repair of motor vehicles
    - 49 to 53 (H): Transport and storage
    - 55 (I55) Accommodation and, as a separate item, 56 (I56) Food and beverage service activities
    - 58 to 63 (Section J): Information Industries, encompassing IT, CT and Media and content activities
    - 68 (L68): Real estate activities
    - 69 to 74 (L69 to M74): Professional, Scientific and technical activities (except veterinary)
    - 77 to 82 (Section N excluding 79): Administrative and support service activities
    - 79 (N79): Travel agencies and related activities
    - 95.1 (S951): Repair of computer and communication equipment

    Since 2011, a further aggregate of some activities in section K (Financial intermediation) is also envisaged as an optional reporting unit, including classes 6419, 6492, 651X, 652X, 6612 and 6619.
22. Mainstreamed in most OECD countries, this is now the main or sole technique in Denmark, Finland, France, Italy, the Netherlands, Poland, Spain and Sweden.

45. When the questionnaire is administered electronically, this is sometimes supplemented by "binding" features (the respondent cannot proceed until it has ticked YES or NO to all questions) to avoid missing answers. The trade-off is represented by the need to tick all items in sometimes long lists, which might in turn result in partial only or inaccurate compilation. A good compromise (adopted by Finland) is to inform respondents of missing answers with a visual alert.

**Survey frequency and reference period/date**

46. Most OECD countries (e.g. all those abiding to the regulation of the European Statistical System) undertake the survey on annual basis, while a few do it on multi-annual or occasional basis, or collect essential data (e.g. e-commerce in the United States) by means of other surveys.

47. A possible development for countries willing to increase the number of comparable indicators they produce consists in administering a 'short-form' of ICT questionnaire on yearly basis, and undertaking more in depth surveys according to an agreed calendar.

**Types of indicators and their computation: auxiliary variables and weighting**

48. In tabulations, statistics are typically computed as percentage values. The reference units (denominators) are enterprises, persons employed and turnover.

49. To this respect, indicators can be divided into (a) binary and qualitative, or (b) quantitative, depending on the typology of underlying statistics.

50. For binary and qualitative indicators, the denominator of the ratio is typically the number of enterprises, overall or within a given stratum (e.g. % of enterprises performing a given activity). Quantitative indicators also use employment (e.g. % share of persons employed using the internet) or turnover (e.g. importance of e-commerce, measured as a % share of turnover).

51. These aspects are reflected in weighting procedures, which might be simple (just the number of enterprises based on the same survey), involve a double weighting (e.g. enterprises and employment) and/or also require achieving consistency with the primary sources of auxiliary variables outside the survey itself.[23]

**Survey vehicles and sampling strategy**

52. Nearly all OECD countries undertake a specific survey on ICT usage. Australia and New Zealand include it as a module within their broader surveys on businesses, as do the United States with respect to e-commerce variables and expenditure on ICTs.[24]

53. A dedicated survey has the advantage of increasing the number of indicators that can be collected. Multi-purpose surveys, instead, allow for the collection of information on other characteristics of

23. For an overview of necessary weighting methodologies, refer to Eurostat *Methodological manual for statistics on the Information Society* (see note The aim is not to provide detailed methodological guidelines, are easily accessible elsewhere,17).

24. Other examples of multiple surveying include the one-off broad multi-survey exercise undertaken in Italy within the latest Census of Businesses (2011), where a set of questions on ICT usage, R&D and innovative activity was administered to a sample of more than 200 thousand businesses representing the vast majority of the economy. A similar approach, including only a few basic questions on ICT usage, was followed in the Mexican Economic Census of 2009.

the enterprise, jointly to ICT usage. This can be achieved also by linking micro data from different surveys (or imputing them, for instance via statistical matching).

54. For record linkage to be effective, however, a positive coordination of sample design across surveys should be adopted, while negative sampling coordination across surveys (i.e. any company selected for one survey would be excluded from other surveys) and over time (i.e. the same company would not be selected again for a certain number of years) has been extensively used in Europe and elsewhere to reduce the statistical burden on respondents.[25]

55. Understanding how ICT usage is interrelated with other characteristics of the firm and, notably, innovation activity and economic performance, has become increasingly relevant. Micro-level analyses on ICT and business performance started in the late 1990s using investment variables, and in the early 2000s, under the auspices of WPIIS, using the first survey data available. The OECD and Eurostat have been promoting a number of more recent experiences. These include the OECD based project on *ICT enabled innovation*, the ICTNET network, and the Eurostat funded projects ESSLIMIT and its follow up ESSLait.[26]

56. Possible strategies to mitigate the conflict between statistical burden on respondents and analytical objectives include the framing of rotating panels (where a portion of the enterprises in the sample are surveyed a few years in a row), which can be done together with positive co-ordination among surveys (where the same enterprise is likely to be surveyed also in a *contiguous* survey: this is currently being implemented in some EU countries).

57. The adoption of multi-purpose surveys currently done in Australia and New Zealand for ICT and innovation represents an alternative strategy. This can be implemented with an alternation in the breadth of the questions addressing one or the other characteristic of the enterprise (a 'long form' questionnaire on a theme and a 'short-form' one on the other).

58. Developments in statistical imputation techniques are also a promising way to increase the availability of information. In Europe, a project for systematising the integration of all Structural Business Statistics has just been launched, and future scenarios might encompass all of the above.

25. Together with differential probability of inclusion depending on size (i.e. smaller firms would be hit with lower probability), and limitations to the size of the questionnaire.

26. For a review of earlier experiences and the first WPIIS work in the field, see Pilat (2002) "OECD work on ICT and business performance - the role of data linking", available at: http://www.insee.fr/en/insee-statistique-publique/colloques/voorburg/pdf/ISS10.pdf and the more general work by Wyckoff and Pilat (2003) on "The impacts of ICT on economic performance - an international comparison at three levels of analysis" available at http://kahin.people.si.umich.edu/hawk/htdocs/wyckoffpaper.doc. Results of the WPIIS based project on *ICT enabled innovation* are presented by Spiezia (2011) "Are ICT Users More Innovative? An Analysis of ICT-Enabled Innovation in OECD Firms", in the OECD Journal: Economic studies (http://dx.doi.org/10.1787/eco_studies-2011-5kg2d2hkn6vg). The final report of the ICTNET project is available at https://community.oecd.org/docs/DOC-52489. For the final reports of the Eurostat based projects, see: http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/methodology.

# ANNEX 2. INDICATORS ON ICT USAGE BY BUSINESSES[27]

## CORE MODULES

### Module A: Connectivity

#### *Computer use*

**Definitions**

**Information and Communication Technologies (ICT)** consist of the hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services.

**Computers** include personal computers, portable computers, tablets, other portable devices. They do not include smart phones or any other device, although with embedded computing abilities, when not used for computing (e.g. MP3 and other media players, game consoles, electronic dictionaries, GPS navigation devices, e-book readers etc.)

**Persons employed** is the total number of persons who work in the observation unit (inclusive of working proprietors, partners working regularly in the unit and unpaid family workers), as well as persons who work outside the unit but belong to it and are paid by it (e.g. sales representatives, delivery personnel, repair and maintenance teams). It excludes manpower supplied by other enterprises, persons carrying out repair and maintenance work in the enquiry unit on behalf of other enterprises, as well as those on compulsory military service.

| | | |
|---|---|---|
| **A1.** | **Persons employed regularly using a computer in their work** (as a % of persons employed in the enterprise) | This indicator portrays the intensity of computer usage in enterprises. Data can be collected as number or % of persons employed. The item can be used as a general filter question in surveying: if none in the enterprises uses a computer then only background data will be collected. |

#### *Broadband access*

**Definitions**

- **Broadband** subscriptions have an advertised download speed greater than 256 Kbit/s.
- **Wired (fixed) broadband connections** include xDSL, cable modem, optical fibre (e.g. FTTx), leased lines, Ethernet, PLC, BPL;
- **Fixed wireless connections** include public-WIFI, satellite and terrestrial fixed wireless such as fixed WiMAX, LMDS and MMDS;
- **(Terrestrial wireless) Mobile broadband connections** include technologies such as 3G/LTE/4G, UMTS, CDMA2000, and any other future technology, including both standard and dedicated data subscriptions: these are typically used with portable devices (laptops, tablets, smartphones)

| | | |
|---|---|---|
| **A2.** | **Enterprises with broadband by type (fixed/mobile)** (as a % of total enterprises) | Wired and fixed wireless connections should be kept separated from mobile broadband connectivity.<br>Most countries have by now discontinued collecting information on narrowband connectivity, but this might still be appropriate for countries with a less developed telecommunication infrastructure. |

[27] **Core indicators are highlighted in grey.** As detailed in the main text, it is worth recalling that this Annex presents a collection of indicators, based on best practices and meant to offer a broad coverage of areas of policy interest and possible target variables, not a questionnaire: (a) The selection is intentionally very wide: not all the indicators are intended to be administered in one go; (b) Efforts were made to offer guidelines on definitions and routing to producers, not text to be proposed to final users: agencies approaching the implementation of a questionnaire are invited to consider current practices, as wording and sequencing of questions in surveys impact on responses; (c) Indicators were selected based on their policy relevance and on current practice: some are known to be problematic in terms of robustness and require particular caution in survey implementation (e.g. when relying on subjective assessments, such as "reasons for not doing something", or when the respondent is not in charge of some decisions and might not be aware of them or even understand the question); (d) It should be kept in mind that the informative value of some indicators might be hampered under specific circumstances (e.g. presence of concurrent technologies, obligation to perform given procedures online); (e) some indicators and whole modules might be appropriate only in given contexts, e.g. for countries more (or less) advanced in the uptake of ICTs in businesses, or for large (or small) enterprises only, and (f) some indicators still have an experimental nature.

| | | |
|---|---|---|
| **A3.** | **Connection speed (distribution)** | Maximum contracted download speed of the enterprise fastest fixed connection: a) 2 Mbit/s, b) up to 10 Mbit/s, c) up to 30 Mbit/s, d) up to 100 Mbit/s, e) up to 1 Gbit/s, f) at least 1 Gbit/s. |

### *Internet use*

| | | |
|---|---|---|
| **A4.** | **Persons employed using computers with Internet access**(% of persons employed) | If nil, MODULE ends here. |
| **A5.** | **Persons employed provided with Internet enabled portable devices**<br>(% of persons employed) | Includes persons employed endowed with a portable device provided by the enterprise (notebooks, mobile phones, etc.) suitable for connectivity on mobile telephone networks.<br>If nil, MODULE ends here. |
| **A6.** | **Remote access to the enterprise ICT facilities**<br>(% of enterprises providing access, by facility) | a) company's e-mail accounts, b) documents in servers, c) applications |
| **A7.** | **Barriers to the use of mobile broadband telephone networks for accessing the Internet:**<br>(% relevance of barriers) | Applies to respondents who declared not to use mobile wireless connections.<br>Barriers may include problems with connectivity to networks (not accessible, low-speed), high subscription and integration costs, security issues. |

## Module B: Website

| | | |
|---|---|---|
| **B1.** | **Enterprises having a website**<br>(as a % of all enterprises) | This indicator can be used as filter question in survey implementation |
| **B2.** | **Website characteristics**<br>(% of enterprises with a website allowing for online ordering) | Website allowing for online ordering or reservation or booking (e.g. shopping cart). |
| **B2 (bis)** | **Website characteristics**<br>Can be an extension to B2: (% of enterprises with website allowing for other specified functionalities) | Other possible core functionalities include:<br>a) Description of products (goods or services) or price lists,<br>b) Possibility to customise or design online the products,<br>c) Tracking or status of orders placed,<br>d) Mobile version of the website,<br>e) Personalised content for regular/repeated visitors,<br>f) Links to the enterprise's social media profiles,<br>g) A privacy policy statement,<br>h) Seal or safety certificate,<br>Advertisement of open positions or online job application. |
| **B3.** | **Use of selected channels to direct traffic to enterprise website** (% of enterprises) | Items may include: advertisement on (a) other websites, (b) search engines, (c) other media (including TV and printed media), or (d) presence on social media |
| **B4.** | **Reasons for not having a website** | This indicator might be relevant for countries where website diffusion is not yet generalised. The following items are usually considered: (a) No need; (b) high set up and maintenance costs, (c) lack of internal technical expertise. |

## Module C: Information Management Tools

### *Intranet and Extranet*

**Definitions**

**Intranet** is an internal company communication network that uses Internet protocol

**Extranet** is a network that uses Internet protocol to securely share enterprise's information with business partners. It can take the form of an extension to the enterprise Intranet or of a private part of its website.

| | | |
|---|---|---|
| **C1.** | **Intranet** (% of all enterprises) | |
| **C2.** | **Extranet** (% of all enterprises) | |

### *EDI, ERP, CRM and RFID*

**Definitions**

**Electronic Data Interchange (EDI)** refers to the electronic transmission of data suitable for automated processing between enterprises or organisations:

- Sending and/or receiving of messages (e.g. payment transactions, tax declarations, orders, etc.) in an agreed or standard format suitable for automated processing, e.g. EDI, EDIFACT, XML , xCBL, cXML, ebXML, ODETTE, TRADACOMS;
- Without the individual message being typed manually.

**Enterprise Resource Planning (ERP)** is a software package used to manage resources by sharing information among different functional areas (e.g. accounting, planning, production, marketing, etc.). ERP software can use EDI technology and be clubbed with or embed ***Customer relationship management*** **functionalities (CRM)**.

**Radio Frequency Identification (RFID)** is a technology allowing for contactless transmission of information via radio waves. Data are contained in 'RFID tags' (transponders) applied or incorporated into products or objects, which can also be integrated with sensors. RFID can be used for a wide range of purposes, including personal identification or access control, logistics, retail trade and process monitoring in manufacturing.

| | | |
|---|---|---|
| **C3.** | **Enterprises using ERP, CRM, EDI, RFID**[28]<br>(% of all enterprises, by technology/application) | Under this heading are grouped very diverse items, each corresponding to a stand-alone indicator. |

### *Sharing information electronically: Supply Chain Management (SCM) and internal integration of information*

**Definitions**

**Sharing information electronically** on Supply Chain Management (SCM) refers to exchanging information with suppliers and/or customers about the availability, production, development or distribution of goods or services. This information may be exchanged via websites, networks or other means of electronic data transfer, but it excludes manually typed e-mail messages.

| | | |
|---|---|---|
| **C4.** | **Sharing electronically SCM information with suppliers and customers**<br>(% of all enterprises, by type of partner) | This is a double indicator: underlying data ought to be collected asking separately for suppliers and customers. **See note 28** |

[28] EDI and RFID are listed here along with other major information management tools. However, taking into account the nature and diffusion of these technologies, monitoring might usefully be limited, e.g. to EDI sales (included in the E-commerce module) or to RFID use for given purposes, for some segments only (e.g. large firms), and/or be surveyed with longer intervals, e.g. every second or third year. A similar (rotation) strategy might be adopted for SCM. For this last indicator, some countries reported that the concept of exchange of information on *supply chain management* is interpreted in a different fashion between industries, and that interpretation might pose difficulties in some service activities.

| | | |
|---|---|---|
| **C5.** | **Automated share of information on orders received across different business functions**<br>(% of all enterprises) | This indicator refers to software integration, and the item might be usefully treated with reference to the use of an ERP software package and its functionalities.<br>Business functions may include management of inventory levels, accounting, production or services management, distribution management, etc.[29] |
| **C6.** | **Sending or receiving EDI-type messages suitable for automated processing for selected purposes**<br>(% of all enterprises) | Sending and receiving orders, e-invoices, product information, transport documents, paying instructions, data to public authorities |
| **C7.** | **Barriers to sending or receiving EDI-type messages**<br>(% of all enterprises) | Reasons may include: lack of in-house expertise for implementation; low or uncertain expected returns; lack of appropriate software; difficulty in agreeing common standards with business partners; uncertainty of the legal status of the messages exchanged. |
| **C8.** | **Using CRM software to manage (collect, store, make available) and analyse information about customers**<br>(% of all enterprises) | Items may include (a) the collection, storing and availability of information about customers to various business functions, as well as (b) the analysis of information about customers for marketing purposes (e.g. setting prices, sales promotion, choosing distribution channels, etc.) |
| **C9.** | **Sharing of SCM-related information with suppliers**<br>(% of all enterprises, possibly by type of information) | For both indicators, items considered may include: (a) Demand forecasts, (b) Inventory levels, (c) Production plans, and (d) Progress of deliveries (i.e. distribution of raw materials or finished products).<br>Note: sharing considered is by electronic means only |
| **C10.** | **Sharing of SCM-related information with customers**<br>(% of all enterprises) | |
| **C11.** | **Methods used to exchange SCM-related information** (% of all enterprises, by method) | Methods include (a) websites or web portals, and (b) electronic transmission allowing automatic processing methods (e.g. EDI-type systems, XML, EDIFACT, etc.) |
| **C12.** | **Barriers to the use ERP, CRM, RFID**<br>(% relevance of barriers, by tool) | Examples of barriers include: lack of relevance, lack of in-house expertise; employees' resistance to changes in work-practices; low or uncertain expected returns; lack of appropriate software; high costs, unavailability of reliable support services<br>In scope population: enterprises which do not use IM tools. |

## ***Electronic invoicing***

**Definitions**

There are invoices in paper form and electronic form. **Invoices in electronic form** are of two types:

- E-invoices in a **standard structure suitable for automated processing** (e.g. EDI, UBL, XML). E-invoices are exchanged either directly or *via* service operators or *via* an electronic banking system
- Invoices in electronic form **not suitable for automated processing** (e.g. e-mails, e-mail attachment as pdf, images in TIFF, JPEG or other format).

| | | |
|---|---|---|
| **C13.** | **Types of invoices sent by the enterprise**<br>(% of all invoices; % of all enterprises) | Types include (a) e-invoices in a standard structure suitable for automatic processing (e.g. EDI, UBL, XML, etc.), and (b) electronic invoices not suitable for automatic processing (e.g. emails, normal PDF documents) and paper form invoices |
| **C14.** | **E-invoices received by the enterprise**<br>(% of all enterprises) | E-invoices in a standard structure suitable for automatic processing (e.g. EDI, UBL, XML, etc.). |

[29] Particular care is recommended when collecting information on this indicator, as survey experience showed that answering is often difficult for respondents, which might not be aware of all functions being implemented.

## Module D: Electronic Commerce

**Definitions**

An **electronic commerce (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 payment and the ultimate delivery of the goods or services do not have to be conducted online.

- An e-commerce transaction can take place between enterprises, households, individuals, governments, and other public or private organisations. Enterprises' e-commerce sales *(E-sales)* with reference to customers the acronyms B2B *(Business to Business),* B2C *(– to Consumers), or B2G (– to Government).*
- To be included are orders made over the web, extranet or electronic data interchange (EDI). The type is defined by the method of placing the order. To be excluded are orders made by telephone calls, facsimile or manually typed e-mail.
- EDI transactions take place in an agreed or standard format which allows their automated processing (e.g. EDIFACT, UBL, XML) without the individual messages being typed manually.
- Web transactions are made *via* an online store (web shop), web forms on a website or extranet. Manually typed e-mails are to be excluded.

| | | |
|---|---|---|
| **D1.** | **Enterprises conducting e-commerce sales, by platform** (as a % of all enterprises) | Platforms include (a) EDI and (b) web; figures for the two should be collected separately. |
| **D2.** | **E-sales value by platform and type of customer** (as % of total turnover) | Platforms include (a) EDI and (b) web. Customers include end consumers and other enterprises and government: these two latter categories might need being joined, where separate data are unavailable. As survey practice showed that respondents find it difficult to report their total e-sales (e-purchases), these figures might be better obtained by summing up components. Also, values can be collected in absolute terms. |
| **D3.** | **Web-sales breakdown by type of customer and geographic area**<br>(% of web-sales) | Customers: (see above, D2)<br>Geographic area: own country; foreign countries. Value data ought to exclude value added taxes.<br>Information on value could prove difficult to collect or be unreliable; an alternative indicator might consider the number of enterprises with web-sales abroad (% of total, % of enterprises with web-sales) |
| **D4.** | **Means of payment accepted web-sales**<br>(% of all enterprises, by means of payment) | (a) **Online:** payments integrated in the ordering transaction (e.g. credit, debit card, direct debit authorisation, *via* third party accounts); (b) **Offline**: the payment process is not included in the order transaction (e.g. cash on delivery, bank transfer, cheque payment and other non-online payment) |
| **D5.** | **Barriers to web-sales**<br>(% relevance among enterprises) | Barriers may include the following: (a) products unsuited for web-sales, (b) logistics, (c) payments, (d) security, (e) legal issues, and (f) low expected returns. |
| **D6.** | **EDI-sales breakdown by geographic area**<br>(% of enterprises and % of EDI sales) | Own country, foreign countries. Whereas information on values would prove difficult to collect or unreliable, an alternative indicator might consider the number of enterprises with EDI abroad (% of total, % of enterprises with web-sales) |
| **D7.** | **Enterprises conducting e-purchases**<br>(as a % of all enterprises) | **Warning**: this indicator and D8 are considered relevant and included in the *core* group. However, they might prove to be problematic to survey, as purchase decisions are often decentralised within the enterprise. Respondents' confusion between sales and purchases has also been observed. |
| **D8.** | **E-purchase value by platform**<br>(as a % of total purchases) | Platforms include EDI and web. Values can be collected in absolute terms (excluding VAT) and/or by bands and asking for components separately (**see comments to D2 and D7**). |

## Module E: Security and Privacy

**Definitions**

**Management** represent measures, controls and procedures applied on ICT systems to ensure integrity, authenticity, availability and confidentiality of data and systems.

**Privacy risks** refer to any danger that personal information stored by the enterprise be used for illegal purposes, or any other purpose not explicitly agreed by the interested party.

**External attacks:** can be determined by injection of malicious software or unauthorised access, pharming (redirection of traffic to a fraudulent website)

| | | |
|---|---|---|
| **E1.** | **Formal policy to manage ICT security risks** (% of all enterprises) | This indicator is a twin to the indicator on privacy, and aims at acknowledging the diffusion of formal guidelines to address risks among enterprises |
| **E2.** | **Risks addressed by the ICT security policy of the enterprise** (% of enterprises, by occurrence) | Risks include ICT failures and external attacks/security breaches. |
| **E3** | **ICT Incidents (security breaches) encountered by the enterprise** (% of enterprises, by occurrence) | Incidents encountered include loss or disclosure of data or service unavailability, graded according to their seriousness* |

**(*) Incidents self-evaluation guidelines (scale):**

**Minor**: Addressed with routine intervention, which had no relevant impact in terms of time/information/money loss.

**Serious**: Demanded specific countermeasures (e.g. restoring back-up copies of disk information; in-depth analysis; service denial attack) and thus resulted in some costs in terms of time, information or money.

**Critical:** An event that implied serious consequences, such as massive loss of information, disclosure of confidential data, system breakdowns and, in general, significant negative consequences in terms of productivity, money or reputation.

| | | |
|---|---|---|
| **E4.** | **Security facilities or procedures in place** (% of all enterprises) | A taxonomy of facilities/procedures may include:<br>– Identification and authentication (Strong password, Hardware tokens (e.g. smart cards), Biometric methods),<br>– Intrusion detection systems (e.g. antivirus, antispyware, firewall, etc.),<br>– Spam filter / Web filter,<br>– Offsite data backup,<br>– Staff awareness on their obligations on ICT security related issues (by training, information, contractual obligation),<br>– Other aspects related to security policy management (Security manager, specific resources, regular review and audit plans)<br>In-scope population: All enterprises |
| **E5.** | **Collection or storage of personal information on end customers for analytical purposes** (% of all enterprises) | Collection or storage of sensitive personal information in order to analyse socio-demographic characteristics and purchasing behaviour. |
| **E6.** | **Methods of obtaining or collecting personal information on end customers** (% of enterprises using each method) | Methods may include: (a) Social media (e.g. Facebook, Twitter), (b) third party (e.g. Marketing firm), (c) directly from customers and loyalty or reward programmes. |
| **E7.** | **Formal policy to manage ICT privacy risks** (% of all enterprises) | This indicator might be included as a specific item under E2 |
| **E8.** | **Methods of protecting digital personal information** (% of enterprises collecting information) | Methods may include: (a) Storing data offline, (b) control to limit access (e.g. security clearances, sharing agreements), (c) encryption of data and (d) protection by third party.<br>In-scope population: Enterprises collecting digital personal information under E5. |

# COMPLEMENTARY MODULES

## Module F: E-Government

**Definitions**

**Public authorities** refer to both public services and administration activities such as tax, customs, business registration, social security, public health, environment or commune administrations.

Public authorities can be at local, regional or national/federal level.

| | | |
|---|---|---|
| **F1.** | **Use of the Internet to interact with public authorities** (% of all enterprises, by type of interaction) | Interactions may include: (a) obtaining information or documents (e.g. tax declaration) from public authorities' websites, (b) returning filled in forms electronically (e.g. for customs, value added tax declaration), (c) treating an administrative procedure completely electronically (e.g. declaration, registration, authorisation request)<br>**Note:** Interaction may occur via a third party (e.g. accounting company); this ought to be taken into account in surveying.<br>**Warning:** this and following indicators might be problematic and/or getting obsolete: when respondents are IT managers, they might be unaware of procedures in place; also, in some countries procedures are being compulsorily digitised. |
| **F2.** | **Use of the Internet to manage administrative procedures** (% of all enterprises, by type of procedure) | Declaration of social contributions for the persons employed, corporate tax, value added taxes and customs/excise. |
| **F3.** | **Barriers to interact electronically with public authorities** (% relevance of each barrier) | Barriers may include the following: concerns of security, complexity, ineffectiveness, lack of information on the availability of electronic procedures. |

## Module G: Other uses of Information Technologies

This module refers to technologies that at present are used by relatively few enterprises (data analytics, and to a lesser extent Radio Frequency Identification - RFID), or whose linkages with economic outcomes are less straightforward (green ICT policies) or are not obvious to assess, and in coming years are likely to spread in a seamless fashion (cloud computing).

In view of the above, this module is considered as "non-core". In addition, its sections will need to be revised in the future, with the possible inclusion or exclusion/displacement of some technologies and uses.

### *Use of Radio-frequency identification (RFID) technologies*[30]

| | | |
|---|---|---|
| **G1.** | **Use of RFID technologies for selected purposes** (% of enterprises by purpose) | Aspects monitored may include:<br>(a) Personal identification or access control;<br>(b) Production and delivery process (control of production, supply chain/inventory tracking, service or asset management);<br>(c) Product identification (theft control, counterfeiting etc.);<br>(d) Payment applications (highway tolls, ticketing, etc.) |

[30] See definition in Module C.

### *ICT energy and materials saving policies*

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|---|---|---|
| **G2.** | **Adoption of selected ICT based saving policies** (% of enterprises, by policy) | Aspects considered might include policies designed to (a) to reduce paper usage (b) to reduce ICT equipment energy consumption (e.g. automated power-down of devices, multi-function peripherals, virtual servers, etc.), (d) to substitute travel with telephone, web or video conferencing, (d) to introduce dedicated IT applications to reduce energy consumption of business processes. |

### *Use of cloud computing*

**Definition**

**Cloud computing** refers to ICT services that are used over the Internet to access software, computing power, storage capacity etc., where the service:

a. Is delivered from **servers** of service providers;

b. Can be easily **scaled** up or down (e.g. number of users or change of storage capacity);

c. Can be used **on-demand by the user,** at least after the initial set up (without human interaction with the service provider);

d. Is **paid** for, either per user, by capacity used, or they are pre-paid.

Cloud computing may include as well connections via Virtual Private Networks (VPN)

| | | |
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| **G3.** | **Purchase of selected cloud computing services** (% of enterprises, by service) | Main cloud computing services include: (a) E-mail, (b) Office software, (d) Finance or accounting software, (e) Customer relationship management (CRM) software, (c) Hosting of databases, (d) storage of files, and (f) computing power to run own software |
| **G4.** | **Access to cloud computing services via shared or dedicated servers** (% relevance of each way of access) | |
| **G5.** | **Benefits from using cloud computing services** (% relevance of each item considered) | Items considered might include: (a) reduction of ICT related costs, (b) flexibility in up- or down-scaling services, (c) simplicity of (easy and quick) deployment of cloud-based solutions, (d) Increased productivity.<br>Self-assessment might be performed based on a qualitative scale (e.g. high/some/limited/no benefit)<br>Free of charge services might be excluded from evaluation, or considered separately. |
| **G6.** | **Factors preventing or limiting the use of cloud computing services**<br>(% relevance of each item) | Items considered might include: (a) Risk of a security breach; (b) Problems accessing data or software; (c) Difficulties in unsubscribing or changing service provider (including concerns with data portability); (d) Uncertainty about the location of the data; (e) Uncertainty about applicable law, jurisdiction, dispute resolution mechanism; (f) High cost of buying cloud computing services, or (g) Insufficient knowledge of cloud computing |

### *Use of data analytics*[31]

**Definitions**

**Data analytics** here is intended as the treatment (analysis, modelling) of large sets of data concerning, for instance, the behaviour of customers (including potential ones), to gain information supporting decisions (e.g. targeting products and marketing, and/or allocation of resources). Data and data analysis can be collected and/or performed by the enterprise itself or purchasing databases and/or services from external providers. The definition excludes the purchase of online advertising, where ads are addressed to potential customers based on data analytics techniques, but where data analytics is not the main purpose of the transaction.

**Expenditure** hereunder covers all types of expenditure made by the enterprise for data analytics purposes, including e.g. personnel costs, databases, third-party services, etc. (VAT should always be excluded).

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| **G7.** | **Use of data analytics, in-house or purchased**<br>(% of enterprises, by way of use) | In survey implementation, this indicator might be translated into a filter question, or joined to G8. |
| **G8** | **Expenditure on data analytics**<br>(value, % of total variable costs) | Data might be collected in currency or percentage values, and should include personnel costs. |
| **G9.** | **Reasons for using data analytics**<br>(% relevance of each motivation) | Items considered might include: (a) Identification of potential customers; (b) Increasing customers' spending (targeting offers and discounts, etc.); (c) Tailoring products to customers' needs; (d) Gaining effectiveness in internal production and/or organisation (e.g. identify bottlenecks, best practices, etc.) |
| **G10.** | **Impact of data analytics on selected performance aspects** (% relevance of each aspect) | Aspects considered might include: (a) Cost savings; (b) Sales growth (including due to product improvements and more effective marketing); (c) enhancements in business organisation<br>Self-assessment might be performed as "yes/no" or based on a qualitative scale (e.g. high/some/limited/no benefit) |
| **G11.** | **Factors limiting or preventing the use of data analytics**<br>(% relevance of each item) | Aspects considered might include: (a) of no use in business (b) limited expected returns vs. costs, (c) lack of skills, (d) legal (e.g. privacy) issues and risks. |

## Module H: Ict Skills

**Definitions**

**ICT specialists** are employees for whom ICT is the main job. For example, to develop, operate or maintain ICT systems or applications.

**ICT related functions** encompass a wide variety of activities within the enterprise. ICTs are not the main job but a tool.

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|---|---|---|
| **H1.** | **Employment of ICT specialists**<br>(% of enterprises) | In survey implementation, this indicator might be translated into a binary filter question or joined to H2 |
| **H2.** | **ICT specialists**<br>(% of persons employed) | Data might be collected as number of persons employed or percentage |
| **H3.** | **ICT training provided to persons employed**<br>(% of enterprises, by type of training offered) | It is useful to distinguish specialists' training from other ICT related training |

[31] As detailed in the main text, this module portrays still experimental indicators. These are not suited for general surveying as only a small number of enterprises (mostly large ones, and in specific sectors) are potential users of data analytics applications.

| | | |
|---|---|---|
| **H4.** | **Recruitment of ICT specialists**<br>(% of enterprises which offered positions) | Filled and non-filled vacancies should be distinguished (% of enterprises *recruiting* and searching but *not recruiting*) |
| **H5.** | **Difficulties in recruitment of ICT specialists**<br>(% of enterprises experiencing difficulties) | In survey implementation this indicator might be translated into a binary question or joined to H6. |
| **H6.** | **Difficulties in recruitment of ICT specialists**<br>(% relevance of each reason) | Reasons for hard to fill vacancies might include lack of ICT skills by applicants: (a) technical, (b) managerial (e.g. ICT project, ICT contract or ICT security managers), or (c) related to ICT business integration, as well as (d) salary requests too high |
| **H7.** | **ICT functions performed in-house or by external specialists**<br>(% of enterprises relying mainly on internal or external resources, by function) | Functions considered might include:<br>– Maintenance of ICT infrastructure (servers, computers, printers, networks, etc.)<br>– Service and support for software<br>– Development of e-business systems (e.g. ERP, CRM. databases)<br>– Maintenance of e-business systems<br>– Development of web solutions (e.g. websites, e-commerce)<br>– Maintenance of web solutions<br>– Security and data protection (e.g. testing and software)<br>– Development of ICT architecture (i.e. planning and organising of IT assets, their interoperability, etc.) |
| **H8.** | **Use of foreign suppliers for ICT functions**<br>(% of enterprises) | The use of foreign suppliers might regard any function requiring ICT specialists.<br>The indicator might further distinguish external suppliers from foreign affiliates of the enterprise. |

## Module I: ICT expenditure and acquisition

**Note:** Indicators in this module can present some overlaps with indicators on ICT skills (e.g. expenditures for ICT functions) and on use of given applications (e.g. software as a service). All variables should be computed net of VAT. Information on these indicators can also be gathered via other survey vehicles and/or using administrative sources.

| | | |
|---|---|---|
| **I1.** | **Expenditures on hardware, software or services** (% of enterprises) | In survey implementation, indicators I1 to I3 can be produced from values per category and channel.<br>Categories include (a,b) ICT equipment (divided into IT and CT), (c,d) software (divided into pre-packaged and custom) and (e) consultancy services.<br>Channels can include (a) purchase, (b) lease, (c) own account, and/or (y) capitalised vs. (z) non-capitalised expenditures, split into lease and other purchases.<br>Expenditure on maintenance and repairs might be excluded. |
| **I2.** | **Expenditures on hardware, software or services** (relevance of expenditure by type – values and %) | |
| **I3.** | **Channels used to acquire ICT goods and services** (relevance of each channel by type of expenditure) | |
| **I4.** | **Purchase of selected ICT services** (% of enterprises and expenditure on each type of service) | Categories considered might include: (a) Software as a service (SaaS – see Module G); (b) Website design or hosting services; (c) Database services (e.g. database design or management, data storage, data processing and reporting services (which might form a separate item) |

## Module J: Open Source Software (OSS)

**Definition**

An **Open Source Software (OSS)** is software where the source code available without any copyright cost and which provides the possibility of modifying and/or (re)distributing it.

| | | |
|---|---|---|
| **J1.** | **Use of third party open source software**<br>(% relevance of each type of application) | Classes considered might include<br>– Operating systems (e.g. Linux, Ubuntu, Android)<br>– Internet browsers (e.g. Mozilla Firefox)<br>– Email managers (e.g. Zimbra)<br>– Office software (e.g. OpenOffice)<br>– Software for web servers (e.g. Apache, Tomcat)<br>– Applications for information management (e.g. OpenERP, OpenCRM)<br>– Security software (e.g. Open SSL, SSH)<br>– Other open source software, such as e-learning platforms (e.g. Moodle) or e-mail servers (e.g. Send Mail, Postfix) |

## Module K: Use of social media

**Definition**

Use of **social media** refers to the enterprise's use of applications based on Internet technology or communication platforms for connecting, creating and exchanging content online, with customers, suppliers, or partners, or within the enterprise.

Enterprises using social media are considered those that have a user profile, an account or a user license depending on the requirements and the type of the social media. Enterprises that use social media only for posting paid adverts are out of the scope of the module.

| | | |
|---|---|---|
| **K1.** | **Use of selected social media**<br>(% relevance of each tool) | Social media might include: (a) social networks (other than paid advertisement), (b) blogs, (c) file sharing, (d) wiki-type knowledge sharing tools; |
| **K2.** | **Use of social media for selected activities**<br>(% relevance of each activity) | Activities might include: (a) Develop company image or market products (e.g. advertising or launching products, etc.); (b) Communicate with customers (opinions, reviews, questions etc.); (c) Involve customers in development or innovation of products; (d) Collaborate with partners or other organisations (this should specify whether via own profile account or third parties'); (e) Recruit employees; (f) Exchange views, opinions or knowledge within the enterprise |
| **K3.** | **Presence of a formal policy for using social media**<br>(% of enterprises) | |

## Module L: Adopting key ICT tools: perceived benefits, barriers and impacts – open indicators

**Note:** This module provides a frame for indicators aimed at assessing benefits (or barriers) and possible impacts from the adoption of generic ICT technologies, in a similar fashion to the indicators in some of the previous modules. Detailed information should be provided when administering questions based on such frame. Also, particular caution is recommended in both implementation and interpretation, as for the other subjective indicators included in this Model Survey.

| | | |
|---|---|---|
| **L1.** | **Benefits from selected ICTs not considered elsewhere** (% relevance of each item) | This indicator can be used for applications not considered in specific modules, e.g. Broadband, e-sales, ERP or CRM. Dimensions might include:<br>– Reduced costs of operations and/or labour<br>– Increased ability to respond to customer or supplier requirements<br>– Keeping pace with competitors<br>– Reduced transaction times<br>– Improved goods or services quality<br>– Improved flexibility of production or service provision<br>– Improved information sharing<br>Impacts might be graded (high, limited, none/not applicable) |
| **L2.** | **Changes in selected aspects of business organisation from ICT adoption**<br>(% relevance of each aspect) | These indicators might complement L1 with information on specific aspects on business organisation. They may be formulated with respect to specific applications (as above) or in more general terms. Elements considered might include (a) re-engineering of business processes, (b) data collection, storage, and maintenance, and (c) greater reliance on job rotation, multi-skilling |

## Background information

Information hereunder is often collected in other structural surveys and via administrative records, and is essential to compile basic indicators (industry, employment, turnover, purchases) or indicators based on other characteristics of the enterprise which are deemed to be related with adoption behaviour (belonging to a group, selling abroad).

| | | |
|---|---|---|
| **I.** | **Main economic activity of the enterprise** | Usually includes ISIC (or regional equivalent) code and description of activities. Main product classes might also be surveyed. |
| **II.** | **Belonging to a group and group features** | Useful information includes (a) the position of the enterprise within the group, (b) whether the group includes enterprises in foreign countries and (c) it is under foreign control |
| **III.** | **Sales on foreign markets** | Information might be binary (yes/no) or expressed in value or as a percentage of turnover. |
| **IV.** | **Number of persons employed** | Usually average employment during the reference year |
| **V** | **Turnover** | Values (in national currency units) should be expressed net of value added taxes. |
| **VI** | **Purchases** | |