VOORBURG GROUP ON SERVICES STATISTICS

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ICT Usage in Enterprises

A draft proposal for a model questionnaire

Session 5

Abstract

The use of information and communication technology (ICT) is recognised to be one of the key factors contributing to countries' performance on both micro and macro economic level. In spite of the increasing demand for data on ICT use, a harmonised framework for data collection is still non-existent. The aim of this paper is to develop a draft model questionnaire as a first step towards internationally harmonised surveys on ICT use, with the emphasis on Internet and e-commerce. The model takes it starting point from the Nordic project carried out in 1998.

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Contents[1]

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1. Introduction

The use of information and communication technology, ICT, is expected to exert a major impact on the profitability, productivity and employment levels. International comparisons are becoming increasingly important as the use of ICT is generally considered to be a critical factor contributing to national performance on both micro and macro economic level.

Statistical offices are increasingly experiencing higher demand for ICT statistics concerning both the supply and demand side. Benchmarking ICT-performance against other countries is seen as a key issue in the information society characterised by an increasing globalisation. However, at present there is no commonly agreed framework available to make such comparisons.

Private institutes have to a great extent, carried out statistical descriptions of the use of ICT in enterprises. Different questions and methods have been used in different surveys. The results have therefore produced scattered descriptions of ICT usage making it difficult to obtain a clear picture of how and to which extent ICT is used in enterprises in different countries.

Statistical offices have in the last years increasingly been engaged in developing tools for describing the change towards the information society, including the usage of ICT in enterprises. Various surveys have been launched providing information mainly for national demand. Among the first countries, Statistics Netherlands has started up compiling statistic in the area already late 1970's, see also chapter 2.

The need for internationally harmonised definitions and methodology is particularly highlighted by international organisations as OECD and Eurostat. Especially the Working Party on Indicators for the Information Society at OECD (WPIIS) is concerned with the development of harmonised definitions and survey tools concerning the usage of ICT in enterprises, including e-commerce.

The Nordic countries have developed the till now most harmonised survey tool to be used across countries. In 1998 a Nordic project was established to draw up guidelines[2] for measuring ICT use in enterprises; guidelines which were regarded as the first step towards harmonised Nordic surveys in this area. The approach has already been tested in Denmark and Finland with rather encouraging results, see also annex III.

In order to avoid duplication of work and to ensure the greatest degree of harmonisation from the earliest possible point in time the WPIIS at its meeting in April 1999 decided to establish close cooperation with the Voorburg Group on Services Statistics to elaborate a model questionnaire on usage of ICT in enterprises. This paper reflects the progress made in the area since then in order to stimulate the discussion on the issue.

2. Review of existing statistics

Surveys carried out by national statistical agencies covering enterprises use of ICT are not yet part of the traditional statistical systems.

In the paper *Identifying and Comparing Surveys on ICT use in enterprise in OECD countries*, an overview of surveys on ICT use in enterprises across different countries was presented at the 1999 OECD WPIIS meeting. The countries, which reported such activities, were Australia, Canada, Denmark, Finland, the Netherlands, Norway, Sweden, UK and the USA. Information were gathered from these countries on the types of questions used in the different surveys. Just two of the reporting countries conducted recurrent

[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.

surveys on use of ICT in enterprises. Surveys conducted by the rest of the reporting countries were not produced on a regular basis.

An analysis was conducted regarding which questions were used in a majority of the studied countries. It was found there was a significant difference between countries regarding the use of qualitative questions, 'tick mark questions', and quantitative questions, i.e. investments in and costs for ICT. To some extent, these differences could be explained by different policy needs and availability of other sources.

The result from the analysis also pointed out that questions on use of Internet (as part of the e-commerce), e-mail, investments and costs for ICT were generally included. These questions are not, however, formulated in the same way and they often reflect different aspects of e.g. use of Internet. Questions that were used by a large number of countries indicated that there is a common information need to gather data on these issues. It should also be noted that the countries reporting to have conducted surveys represent only a smaller part of the total number of OECD countries.

It was also found that the countries often surveyed different industries. One explanation is that the industries are of different importance for the national economies. In addition, a considerable amount of resources is needed to cover the whole scale of economic activities.

3. Framework

3.1 General approach

The proposed model questionnaire on ICT usage in enterprises takes -as mentioned earlier- its starting point from the Nordic exercise, which is based on the following principles:

* the model questionnaire has been designed to be a flexible tool built up by modules allowing country specific features to be included
* the model questionnaire can -of the above mentioned reason- be updated to reflect the rapid changes in IC technology or use
* the model questionnaire is designed as a general survey tool for all economic activities
* the core of the model questionnaire is based on a qualitative approach which is considered to provide the most harmonised basis for country comparisons

A flexible approach was chosen for the questionnaire design as information and communication technologies themselves and the usage are supposed to develop rapidly over even short time periods. Consequently, new areas can be expected to be measured and thus to be included in the questionnaire. The proposed model should therefore be regarded as a core model, which will need regular revisions in the future. Normally, questionnaires for statistical data collection are supposed to remain unchanged for longer periods, but this cannot be expected in the area of collecting information on ICT usage. This is a methodological challenge for the statistical institutes on the one hand to update the questionnaire with relevant questions fulfilling user need and on the other hand to secure robust indicators allowing for time series analysis.

As the area of monitoring ICT usage, as mentioned above, already is crowded with private players on the market the respondent burden has been judged of major importance as the questionnaire has been developed as a survey tool for non-mandatory surveys. Thus, high priority has been given to construct a questionnaire that is easy to fill in and as a result, in practice most of the questions are designed on the principle of multiple choice. Especially in a complex area such as ICT usage this was expected to have great impact on

the response rate and the quality of the answers - also keeping in mind the purpose of international comparability.

The column variables of the questionnaire operate in two main dimensions. Firstly the year of using e.g. e-mail or establishing home pages for the first time is asked as '1997 or earlier - 1998 (referense year)-planned for 1999'. For the questions related to barriers, an evaluation of the importance of the barriers were asked by using a scale 'no importance - some importance - much importance'.

The questions on adoption of certain ICT function the first time allow compilation of time series even though the survey would be carried out only every second year. When the survey is conducted on a continuous basis, this time dimension can be modified, but taking the rapid change into consideration the question on future expectations seems necessary, even if this is not a traditional element in surveys carried out by statistical institutes.

3.2 The scope of the questionnaire

The questionnaire has been formulated in a general fashion i.e. it would be in principal applicable to any chosen activity in the private sector. The issues on the use of ICT in general, together with Internet and e-commerce in particular comprise the core of the questionnaire.

The questionnaire would not cover e.g. how use of ICT affects the organisation in the enterprise or how ICT is used in production processes. ICT use in production of goods (e.g. automation, process control) is mainly related to manufacturing industries, and therefore falls beyond the more general scope of this approach. But more sector specific questions can be built in as new modules of the survey questionnaire.

It was considered difficult to measure new emerging ICT applications in quantitative terms. Originally also ICT expenditures were included in the Nordic approach. The experiences from Danish and Finnish surveys clearly show that it is difficult to collect this kind of data in the survey as the survey mainly covers issues related to IT-managers' or marketing directors' area of responsibility. It was concluded that the specific accounting data related to ICT would better fit into annual accounting surveys providing data for e.g. national accounts.

The data collection unit can be flexibly chosen. The Nordic countries generally operate at the level of enterprises, but the unit could as well be the establishment or the group of enterprises. In the pilot studies it was sometimes difficult for the large enterprises to submit data on enterprise level, since the ICT operations are often centralised at the group of enterprises level.

The first draft does not cover e.g. factors related to motivations (except e-commerce) or consequences of using ICT. In addition, the model does not explicitly recognise cellular phones or mobile data communication as part of ICT, which might be relevant for the future as the information and communication technologies are increasingly converging. In any case modules of these kind could easily be supplemented into the approach, see also below.

As the Nordic draft model questionnaire has already been tested by two statistical institutes, Statistics Denmark and Statistics Finland, showing the feasibility of the questionnaire, see also annex III for a brief description, this approach has been chosen as the basis for the development of a model questionnaire on ICT usage. But revisions and supplements have been added to the first draft version for improvement.

4. General design principles of the model

The model questionnaire on ICT use in enterprises has been divided into four different modules, which are presented separately under chapters 4.1 - 4.4. The draft model questionnaire is presented as *annex I*, preliminary references to the OECD framework are made in *annex II.* A*nnex III* provides background information of the surveys carried out in Denmark and Finland.

The model includes the following four modules:

- *A: use of ICT*
- *B: use of Internet*
- *C: use of e-commerce (Internet commerce)*
- *D: barriers on use of ICT in general together with Internet and e-commerce in particular*

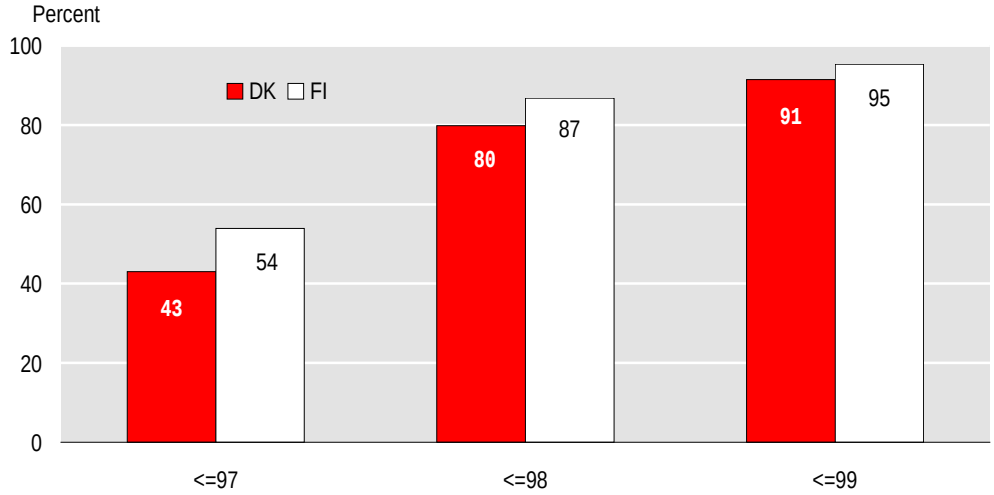
The original Nordic approach did not include e-commerce as a separate module due to problems with definitions and measurement. However, the need for information related to e-commerce has been constantly growing and it was decided here to devote a module of its own for measuring e-commerce. The module is by now not fully elaborated and therefore feedback is appreciated. In addition, elements related to e-commerce, e.g. barriers are placed in the context of other modules.

4.1 Use of ICT

The first section includes general questions related to the access and possibilities to use ICT and in particular Internet and e-mail. The percentage of employees having access to PC's, e-mail or Internet is asked for providing a kind of proxy for IT-intensity in the enterprise or by activity. Another core question is related to different IT-functions in use in the enterprise i.e. e-mail, Internet, intranet, extranet and EDI. In the Danish and Finnish surveys the questions have functioned without major difficulties, as they seem to have been easily understood by the respondents.

Figure 1 illustrates the Internet access in Denmark and Finland in enterprises employing 20 or more persons. The growth experienced has been very rapid in both countries; from 43 per cent in Denmark and 54 per cent in Finland of the enterprises with 20 or more employees using ICT in 1997 or prior to an estimated share of more than 90 per cent of the enterprises with 20 or more employees having Internet connection by the end of 1999. An even greater number of enterprises, that is 92 per cent in Denmark and 97 per cent in Finland, uses E-mail.

Figure 1: Internet access 1997-1999 in Denmark and Finland, enterprises with 20 or more employees using ICT



Source: ICT surveys 1998 and 1999. 1999 figures based on estimate by the respondents

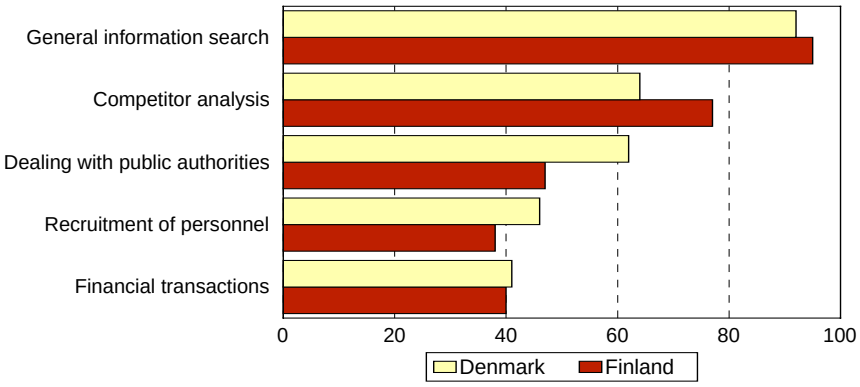
The comparison also shows that Denmark has been catching up on Finland in the last two years indicating that for both countries, these kind of questions related to ICT readiness loose their relevance. except smaller enterprises should be included in the sample They have to be substituted by questions related to the intensity and quality of ICT usage by enterprises.

4.2 Use of Internet

This module focuses only on Internet including elements related to e-commerce. The section is divided into three questions. One includes the general areas of Internet use. In addition, it was considered important from an analytical point of view to monitor separately the enterprises from the supply as well as the demand side i.e. the enterprises as providers of goods and services and customers transactions via Internet. The questions related to acting as a customer or supplier in the markets have been designed in a hierarchical fashion following the transactions of the supply chain so that they would yield information on the phases of electronic commerce practised by the enterprise.

Figure 2 below illustrates the pattern of Internet use in Denmark and Finland. General information search and competitor analysis appeared to be most commonly used in both countries. The most significant difference between the two countries in the use of Internet is that Danish enterprises are using Internet more frequently for dealing with public authorities than the Finnish ones.

Figure 2: The percentage of enterprises using Internet for specific purposes in Denmark and Finland, enterprises with 20 or more employees using Internet. Estimate for 1999



Source: ICT surveys 1998 and 1999.

The Danish-Finnish experience also shows that up till now the enterprises have mainly operated as a customer on the Internet, but in 1999 they are expecting a breakthrough in introducing their own homepages with the purpose of using the homepage as tool for receiving orders, sales of digital products and after sales support via Internet.

4.3 Use of E-commerce

The questions in this module are newly developed and have not been tested in the Nordic surveys. Moreover, the module was developed to satisfy the increasing needs for data on e-commerce. As stated earlier, the module is a draft and needs revision after feedback from the Voorburg Group and the WPIIS related to the approach and definitions used.

The Nordic approach voluntarily avoided the volume measurement of e-commerce. However, statistical institutes are increasingly facing demand for e-commerce measurement in quantitative terms. Then we necessarily need a harmonised definition to be used which is also recognised by the enterprises i.e. they are able to provide the information requested from their accounts. The questions introduced here ask for the percentage shares of e-commerce e.g. of total orders or turnover. It would thus not give the extent volume in monetary terms, but rather a well-founded estimation of the growing importance of e-commerce.

E-commerce has yet to be defined, but in this draft model questionnaire we are working with a relatively narrow definition of e-commerce:

“Transactional electronic commerce is the sale of goods or services over electronic networks, at any stage in the supply chain, whether between businesses, between businesses and consumers, or between the public and private sectors. The sale is transacted electronically, but ultimate delivery of the good or service may be conducted on or off-line.”

This definition put focus on that the transaction implies decision about sales or purchases, ie a transfer of ownership or rights to use goods or services. When it comes to the actual surveying an even more strict definition might be necessary in order to make it possible for the responding enterprise to identify the

proportion coming from electronic commerce. For instance it might be necessary to separate e-commerce into sales via the Internet and via EDI. No exact method is proposed due to complexity, for instance if an order is received by e-mail but is printed out and handled together with all orders received by normal mail - can the respondent identify these orders as part of e-commerce and is it finally of interest to measure this kind of electronic commerce? The opinion of the Group is welcomed on this issue.

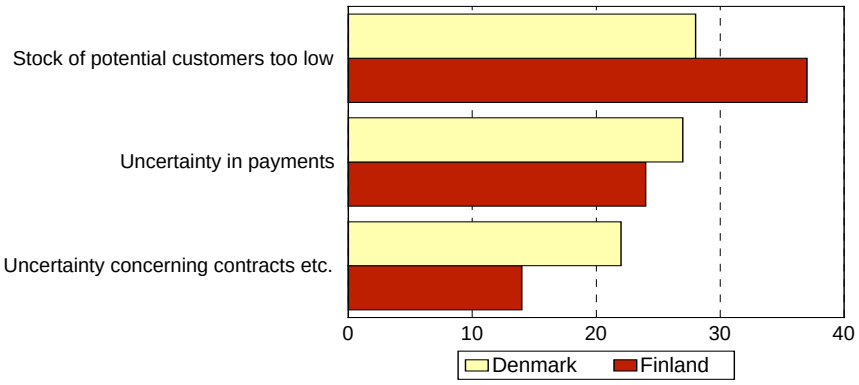
The motivation module included here is important in the first round of surveying where e-commerce still is a new element. What kind of factors can be found influencing the attitude of businesses towards e-commerce, i.e. is it mainly '*pull factors*' as growing market possibilities or '*push factors*' as concern about loosing markets if the businesses are not investing in e-commerce as much as their competitors do.

A third issue raised for discussion, is if the model also should cover the realised benefits of using e-commerce by asking it directly from the enterprises. This could include policy relevant items as increase in productivity and competitiveness. However, the implications of e-commerce are rather complex causing dramatic changes in the components of the supply chain and the organisation of the businesses. Therefore we at this stage have been somewhat hesitant to simplify this complex phenomenon by adding related questions in the module.

4.4 Barriers on the use of Internet and ICT

Questions on barriers on the use of Internet and ICT were asked in the Danish and Finnish surveys regarding three different areas: Internet in general, e-commerce specific and general barriers related to ICT use. The results of the Danish-Finnish pilot surveys show that risk of viruses and hackers is considered clearly the most severe problem with Internet in both countries.

Figure 3: The percentage of enterprises considering the e-commerce related barriers significant in Denmark and Finland, enterprises with 20 or more employees using ICT.



Source: ICT surveys 1998 and 1999.

The most severe barrier related to e-commerce was too low stock of potential customers. As the survey covered a wide range of activities this result should be interpreted with caution as not all types of business are suitable for e-commerce. Particularly the Finnish enterprises (37 %) considered this as a significant barrier. Probably the difference in the level between the two countries reflects the reality as Denmark

traditionally has a very open economy with even small enterprises operating on the world market. About one-fourth of the respondents in each country evaluated uncertainty in payments a severe problem hampering e-commerce. Uncertainty in contracts, terms of delivery etc. was seen a significant problem more often in Denmark

5. Concluding remarks

The questions that are presented in the model questionnaire represent a mainly qualitative approach to the information needs that can be found in many countries. The proposed questions primarily focus on the usage of ICT as tool, and constraints on this use, instead of asking for rapidly changing techniques deployed in enterprises. The reasoning behind this approach is that it makes the questions valid for a number of years. They can therefore be used to compile time series, which are important when describing evolving use of ICT in enterprises.

Although there is a common information need in many countries regarding enterprises use of ICT, country specific needs in this area also exist. The length of the model questionnaire therefore is adjusted for inclusion of country specific questions without making the questionnaire too time and resource consuming to answer.

It is obvious that we need to change our focus in time from measuring the ’readiness’ to measuring the ’intensity’ and ’impacts’ of ICT usage. The quality aspects should be more seriously taken into account as how efficiently the benefits of new ICT’s - as Internet - are extracted by enterprises. The benefits of ICT’s are realised in conjunction with the way and intensity they are used.

The WPIIS secretary will be undertaking an inventory of which methods that are used in different countries when conducting survey on ICT use in enterprises. The result from this study will be presented at the WPIIS meeting year 2000 and should be input to guidelines on statistical methodology when using the model questionnaire.

A model questionnaire will finally stimulate the implementation of surveys in the area of ICT use in enterprises. National surveys may well serve the national needs but international comparisons are needed for analysing the development of the global markets.

6. Issues for discussion

It is quite evident that one of the main challenges for the future is to develop a tool for measuring the growing volumes of e-commerce. The approaches and experiences used for this measurement are a key issue for discussions;

How can we meaningfully delineate e-commerce from other e-business - or business of the enterprises, especially thinking about the future development? We argue that in statistical terms we need to have a narrow definition making actual statistical data collection feasible - even if many of the policy makers are advocationg for a broad definition especially aiming at measuring the ecnomic and social impacts of e-commerce. What kind of definition does the Group prefer?

The convergence of ICT is also a problem when measuring usage of ICT. How to deal with the rapid changing technology as e.g.new emerging ICT related services as mobile data communication services related to cellular phones (WAP) and personal digital assistants (PDA)?

As an indicator on intensity some countries include questions related to technical specifications of the computers or other hardware actually used by the enterprise. These kind of questions have deliberatedly been skipped in the Nordic questionnaire due to partly the respondent burden problem, partly to the fast changing technology. What is the opinion of the Group ?

ANNEX I: A draft proposal for a model questionnaire

Contents of the questionnaire

Module A: Use of ICT

A1. Does the enterprise use personal computers, workstations or terminals?

A2. The percentage of the total employees who have access to…
a) personal computer, workstation or terminal
b) e-mail
c) Internet (www)

A3. Does the enterprise use or plan to use ICT in the following areas?
a) external e-mail
b) internal e-mail
c) Internet (www)
d) intranet
e) extranet
f) EDI

Module B: Use of Internet

B1. Does the enterprise use or plan to use Internet?

B2. For what purposes does the enterprise use or plan to use Internet?

B3. General areas of Internet use
a) general information search
b) transmitting and receiving data files
c) competitor analysis
d) financial transactions
e) recruitment of personnel

B4. Use in link with suppliers (the surveyed enterprise as a customer)
a) information search on suppliers' homepages
b) use of commercial databases and similar sources
c) ordering goods and services
d) electronic payment
e) receiving digital products

B5. Use in link with customers (the surveyed enterprise as a supplier)
a) marketing through homepages
b) access to databases
c) receiving orders
d) receiving electronic payments
e) sale of products in digital form
f) after sales support

Module C: E-commerce (Internet commerce)

C1. Motivations for using e-commerce
a) to reduce costs
b) to expand results with existing suppliers
c) to reach new suppliers
d) to expand relations with existing customers
e) to reach new/more customers
f) to expand the market geographically
g) to improve service quality
h) to launch new products
i) to avoid loosing market shares to companies already using e-commerce
j) other motivations, please specify

C2. E-commerce purchases
a) If you order goods and services on-line, what proportion of your total purchases does this represent?
b) If you pay for goods and services on-line directly to the supplier, what proportion of your total expenditure on goods and services does this represent?

C3. E-commerce sales
a) If you receive orders on-line, what proportion of your total turnover does this represent?
b) If you receive electronic payments on-line directly from the customer, what proportion of your total turnover does this represent?

Module D: Barriers on the use of Internet and ICT in general

How significant the following barriers are for the use of Internet in the enterprise?
D.1 Barriers on use of Internet
a) risk of viruses or hackers accessing confidential company information
b) technically too complicated
c) lack of perceived benefit
d) cost of developing and maintaining an internet system
e) lost working time because of irrelevant surfing
f) data communication is too slow or unstable

D.2 Barriers on use of e-commerce
a) stock of potential customers too small
b) uncertainty in payments
c) uncertainty concerning contracts, terms of delivery and guarantees
d) cost of developing and maintaining an e-commerce system
e) logistical problems

D.3 Barriers on the use of ICT in general
a) ICT expenditure higher than expected
b) new versions of existing software are introduced too often
c) demand for ICT services is not met by the suppliers
d) the level of ICT skills is too low among the employed personnel
e) difficult to find qualified ICT personnel
f) existing personnel reluctant to use ICT
g) lack of management time to address the issues
h) no significant benefits for the enterprise
i) other barriers, please specify

ANNEX II : The preliminary reference of the questionnaire with OECD framework

		ICT/e-commerce		
Module A: Use of ICT		Readiness	Intensity	Impacts
A1	Does your enterprise use personal computers, workstations or terminals	x		
A2	The percentage of your total employees who have access to . . .		x	
A3	Does your enterprise use or plan to use ICT in the following areas?	x		
Module B: Use of Internet				
B1	Does your enterprise use or plan to use Internet?	x		
	For what purposes does your enterprise use or plan to use Internet?			
B2	General areas of Internet use		x	
B3	Use in link with your suppliers		x	
B4	Use in link with your customers		x	
Module C: E-commerce (Internet commerce)				
C1	Motivations for using e-commerce		x	x
C2	E-commerce purchases		x	x
C3	E-commerce sales		x	x
Module D: Barriers on the use of Internet and ICT in general				
D1	Barriers on the use of Internet		x	x
D2	Barriers on use of E-commerce		x	x
D3	Barriers of the use of ICT in general		x	x

ANNEX III: Background information of the surveys carried out in Denmark and Finland

The data collection of the ICT usage was carried out as postal surveys on a voluntary with one reminder in both countries. In Denmark in October 1998 and in Finland at the beginning of 1999.

The original samples differed somewhat in terms of activities and size classes covered due to country specific preferences. In order to make country comparisons, both countries provided a subsample in accordance with agreed criteria. The industries cut-off were Construction, Transport and a minor part of Business services. 'Construction' and 'transport' in both countries were the industries with lowest levels of ICT-usage. It should be noted that Construction and Transport in both countries were the industries with the lowest levels of ICT-usage.Thus the data presented in this paper should be considered as indicative and cannot be compared with the statistical results presented nationally.

The reduction resulted in two subsamples consisting of the following activities:

Activity	**Nace rev. 1**
Manufacturing	15-36
Trade, hotels, rest.	50-55
Business activities, etc.	70-74

The final result reduced the Danish sample from 1.832 to 1.416 observations and the Finnish from 1.300 to 813 observations. The distribution across industries and size classes is shown below.

Number of responses, Denmark

	Size class (full-time empl.)				
Industry	20-49	50-99	100-199	200+	Total
Manufacturing	178	176	210	178	**742**
Trade, hotels, rest.	165	117	96	59	**437**
Business activities, etc.	69	67	56	45	**237**
Total	**412**	**360**	**362**	**282**	**1416**

Number of responses, Finland

	Size class (full-time empl.)				
Industry	20-49	50-99	100-199	200+	Total
Manufacturing	86	86	88	154	**414**
Trade, hotels, rest.	72	58	44	53	**227**
Business activities, etc.	84	35	34	19	**172**
Total	**242**	**179**	**166**	**226**	**813**