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Measurement of ICT usage in enterprises and electronic commerce

A proposal for a model questionnaire

Session 3

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1. Introduction

As the use of information and communication technology, ICT, is becoming more and frequent and exerting a major impact on the profitability, productivity and employment levels, the statistical offices are experiencing a growing demand for ICT statistics, including statistics based on an internationally harmonised framework. Benchmarking ICT-performance against other countries is seen as a key issue in the information society characterised by an increasing globalisation.

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 statistics in the area already late 1970's. However, at present there is no commonly agreed global framework available to make such comparisons.

As a consequence of the missing internationally harmonised definitions and survey tools, the Nordic statistical offices in 1998 established a project to establish a set of guidelines for measuring ICT usage in enterprises[1]. The guidelines were already winter 1998/1999 tested by Statistics Denmark and Statistics Finland in the first round of surveying[2]. In order to avoid duplication of work and to ensure the greatest degree of harmonisation from the earliest possible point in time the OECD Working Party on Indicators on the Information Society (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.

Based on the discussion at the WPIIS of the experiences from the test survey a draft proposal for a model questionnaire was presented at the Voorburg Group on Services Statistics meeting in Christchurch October 1999. With the input from the Voorburg Group a revised model questionnaire was developed and tested end of 1999/first half of 2000 by Statistics Denmark, Statistics Finland, Statistics Norway and Statistics Sweden. The results from these surveys together with experiences from similar surveys carried out by Australian Bureau of Statistics, Statistics Canada and DTI in United Kingdom combined with the discussions at the WPIIS meeting in April 2000 formed the input to the revision of the model questionnaire to this version to be presented at the Voorburg Group meeting in Madrid September 2000 with the aim of agreeing on a model questionnaire on ICT usage in enterprises and electronic commerce at the WPIIS spring 2001.

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[1] 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.

[2] A publication comparing the Danish and Finnish results on a harmonised basis has been published by Statistics Denmark and Statistics Finland: Use of ICT in Danish and Finnish Enterprises 1999., Copenhagen 2000 and www.dst.dk/ict.

[3] Peter Boeegh Nielsen, Martin Lundoe, Jan-Erik Lystad, Anders Hintzeand Samuli Rikama: ICT Usage in Enterprises. A draft proposal for a model questionnaire, Christchurch 1999.

2. Framework

2.1 General approach

The proposed model questionnaire on ICT usage in enterprises 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 be updated - and is expected to be - 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 has been 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 requiring 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 and e-commerce. This is a methodological challenge for the statistical institutes on the one hand to update the questionnaire with relevant questions fulfilling user needs 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 Internet usage and e-commerce 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 relatively high response rates of the non-mandatory surveys (DK: 61%, FIN: 54%, NOR: 77%) support the strategy chosen.

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 ‘t-1 or earlier, t (referense year), planned for t+1’. For the questions related to barriers or motivations, 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 functions 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.

2.2 The scope of the model 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, if required by user needs at a later stage.

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 the first round of Danish and Finnish surveying clearly show that it is difficult to collect this kind of data in the survey as it 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, even if the questionnaire has originally been designed to operate at the level of enterprises. It is obvious that the choice of the statistical unit has influence on the results obtained i.e. in larger units some ICT functions (as intranet) are used more frequently than in smaller units. The survey experiences show on the other hand that belonging to a group of enterprises can constitute a problem in submitting data on enterprise level, since the ICT operations are often centralised in a special unit within the group of enterprise.

As there exists an urgent need for statistics on ICT usage and e-commerce especially, combined with a need for such data being internationally comparable, the highest priority has been given to the elaboration of a set of core modules - acknowledging that the model questionnaire is not fully developed at the moment. But it is our attitude that the user needs are so urgent that the statistical offices are forced to react; the proposed model questionnaire being the result of this reaction.

As the draft model questionnaire has already been tested since 1998 in different forms 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 "final" model questionnaire on ICT usage. Updating of the contents of the modules in a dynamic developing area of ICT - Internet - e-commerce use, should be considered as a constant process and any rigid framework cannot be applied. By now the approach contains relatively few questions solely on "impacts" (see annex II for further information). Questions on impact can be easily added to the model questionnaire in the future. The question applied by Statistics Canada asking enterprises if Internet has replaced another previously used medium for advertising, is an illustration of a genuine impact question.

2.3 The model questionnaire and the OECD framework

The ministers of the OECD Member countries approved on an action plan for electronic commerce at their meeting in Ottawa 1998. This action plan included a definitorial framework for measuring electronic commerce. The development of such a framework has been carried out by the WPIIS since then, and has till now resulted in a set of working definitions of electronic commerce and a preliminary list of statistical indicators.[5]

For the statistical institutes engaged in the elaboration of a model questionaire on ICT usage and e-commerce the correspondence to the definitorial work carried out by OECD has been of utmost importance. Even if the elaboration of the first versions of questionnaire and surveys carried out has taken place prior to the OECD work, efforts have been put into establishing a coherence between the two activities. The set of definitons concerning electronic transactions is referred to in paragraph 3.3 and the coherence between the preliminery set of indicators and the model questionnaire is shown in annex II. The conclusion is that the proposed questionnaire shows a close correspondence with the indicators elaborated by OECD and indicates a sound basis for the future development of the definitorial framework of measuring electronic commerce with the purpose of producing internationally comparable statistics.

3. General design principles of the model

The model questionnaire on ICT use in enterprises has been divided into five different modules, which are presented separately under chapters 3.1 - 3.5. The draft model questionnaire is presented as *annex I*, preliminary references to the OECD framework are made in *annex II. Annex III* provides background information of the surveys carried out in Canada, Denmark, Finland, Norway and Sweden.

The model includes the following five modules:

A: General information about ICT systems
B: Use of Internet
C: E-commerce via Internet
D: E-commerce via EDI
E: Barriers on use of ICT in general together with Internet and e-commerce in particular

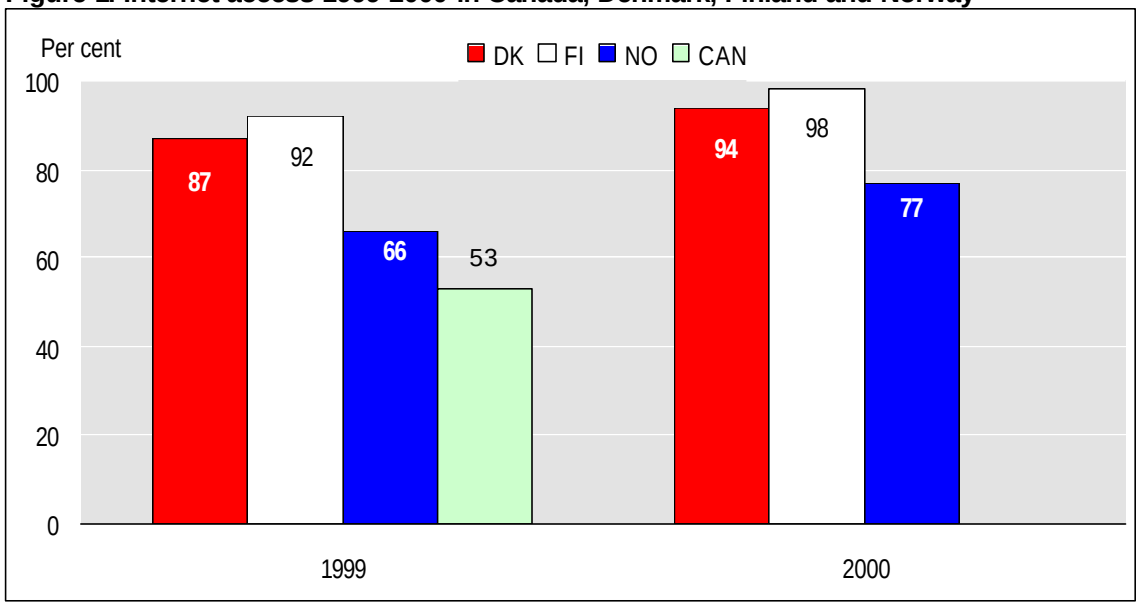
3.1 General information about ICT systems

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 surveys carried out the questions have functioned without major difficulties, as they seem to have been easily understood by the respondents.

[5] For more details, see OECD: Defining and measuring electronic commerce: A provisional framework and a follow-up strategy (DSTI/ICCP/IE/IIS(2000)3/REV1)

Figure 1 illustrates the Internet access in Denmark, Finland and Norway in enterprises employing 10 or more employees and in Canada for enterprises with revenues lareger than 100 000 CAN $. Internet penetration can be to be close to 100 per cent in all the studied countries within a couple of years, especially when referring to enterprises with 10 or more employees. Therefore, the issue tends no more to be whether the enterprise have Internet access or not but rather how they are extracting the benefits from Internet usage. The Internet penetration ratios are, however, expected to be lower within micro enterprises with less than 10 employees not included here.

Figure 1. Internet access 1999-2000 in Canada, Denmark, Finland and Norway



Source: National ICT usage in enterprises surveys. The figures cover enterprises with 10+ employees in Denmark, Finland and Norway and in Canada enterprises with an annual revenue > 100 000 CAN $. Please note that the Canadian and Norwegian figures are raised. The Danish and Finnish figures reflect non-raised survey data

3.2 Use of Internet

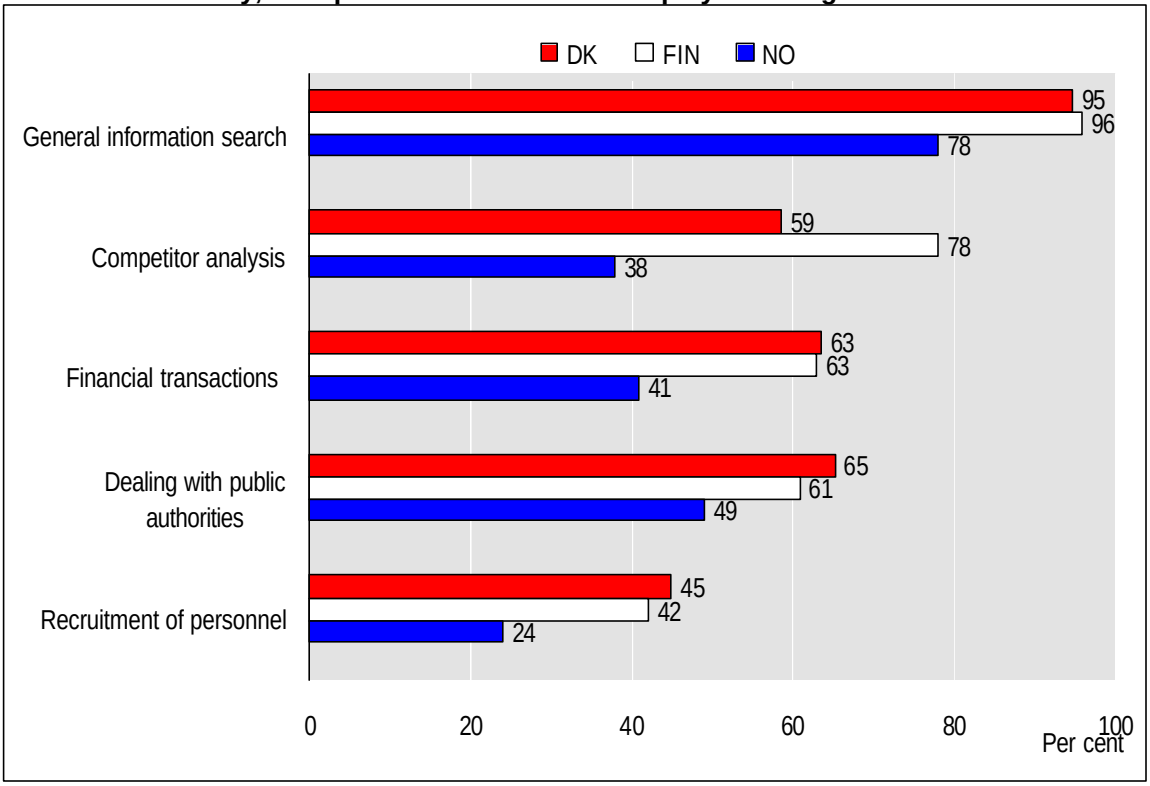
This module focuses only on Internet including elements related to e-commerce. The section is divided into three questions. One includes the general areas of Internet use. In addition, it was considered important from an analytical point of view to monitor separately the enterprises from the supply as well as the demand side i.e. the enterprises as providers of goods and services and as customers of 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 expected Internet use by the end of 2000 in Denmark and Finland together with the actual situation in Norway by 1999. General information search is the most common task carried out with the help of Internet. Financial transactions and dealing with public authorities were quite commonly used in Denmark, Finland and Norway. Recruitment of personnel was somewhat less frequently carried out via Internet.

The first experience also shows that up till now the enterprises have mainly operated as customers on the Internet, but they are currently expecting a breakthrough in introducing

their own homepages for the purpose of receiving orders, sales of digital products and after sales support via Internet.

Figure 2. The percentage of enterprises using Internet for specific purposes in Denmark, Finland and Norway, enterprises with 10 or more employees using Internet.



Source: National ICT usage in enterprises surveys. The figures cover enterprises with 10+ employees in Denmark, Finland and Norway. Please note that the Norwegian figures are raised. The Danish and Finnish figures reflect non-raised survey data.

3.3 E-commerce via Internet

The development of this module has been suffering from the complexity of the subject and the lacking definitions on e-commerce. The Nordic countries used in the surveys carried out winter 1999/2000 as a working definition of e- commerce:

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

Sweden used a slightly more narrow definition which stated that on-line ordering is defined as orders plased on a form on a webpage.

Statistics Canada used in their survey the following definition:

"The value of customer orders received over the Internet, extranets and EDI on the Internet, regardless of whether the transaction was made with or without on-line payment."

Data was also collected by Statistics Canada using a narrower concept; namely the value of customer orers received over the Internet with on-line payment.

The definitions used put focus on that the transaction implies decision about sales or purchases, ie a transfer of ownership or rights to use goods or services. It is the general opinion of the statistical institutes that it is feasible for the enterprises to detect the sales which is based on ordering received or placed via the Internet.

During summer 2000 the WPIIS has come to a set of provisional definitions on e-commerce[6]:

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

- **A narrow definition:** An *Internet transaction* is the sale or purchase of goods or services, whether between businesses, households, individuals, governments and other public or private institutions, conducted over *Internet-protocol based* networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or off-line.

As a consequence of the above elaborated set of working definitions, we have chosen to elaborate two modules on e-commerce; namely Internet based e-commerce and EDI, acknowledging the fact that the technological development complicates precise and unambigous definitions to be easily implemented in statistical surveys.

The original 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. Thus it would not give the extent volume in monetary terms, but rather a well-founded estimation of the growing importance of e-commerce.

Statistics Canada has in their survey results raised the figures concerning e-commerce and USBC has been raising figures in their retil trade survey.When the statistical offices have agreed upon a harmonised set of variables to collect, they need to discuss methods of raising the collected data. Table 1 shows that the total value of customer orders received over the Internet, with or with on-line payment, was CAN $ 4.2 in the private sector in 1999. This amount represents only 0.2% of total operating revenues during the year. In fact, no industrial sector were estimated Internet sales higher than 1.5'% of that sector's total sales.

[6] For more details, see OECD: Defining and measuring electronic commerce: A provisional framework and a follow-up strategy (DSTI/ICCP/IE/IIS(2000)3/REV1)

Table 1. Value of Internet sales in Canada

	Internet sales with or without on-line payment	Total operating revenue, 1999	Internet sales as percentage of total operating revenue
	CAN $ millions		
Manufacturing	900.0	568.346	0.2
Retail trade	610.6	231.622	0.3
Information and cultural industries	552.7	55.910	1.0
Accommodation an food services	429.3	32.474	1.3
Professional, scientific and technical services	406.1	52.116	0.8
Finance and insurance	320.8	222.483	0.1
Transport and warehouse	164.3	65.268	0.3
Wholesale trade	156.3	290.440	0.1
Real estate and rental and leasing	114.8	37.954	0.3
Other services (except public administration)	27.4	37.439	0.1
Utilities	15.8	24.499	0.1
Mining and oil and gas extraction	15.0	67.517	0.0
Health care and sicial assistance (private sector)	10.0	11.441	0.1
Other industry sectors	456.6	104.577	0.4
All private sector	**4.179.7**	**1.802.086**	**0.2**

Source: Statistics Canada. The Daily. Thursday, August 10, 2000

3.4 E-commerce by EDI and other computer-mediated networks

Internet is not the only computer-mediated network for carrying out e-commerce. Of other media could be mentioned EDI, Telecom plus different wireless networks (especially in USA). It could also be argued that WAP services are not a fully integrated part of the Internet. Because WAP is fairly new, it is not a formal standard yet, and the special WAP protocol and language are not quite synonymous with the traditional HTML-standard of the WWW.

There are two reasons why these different networks are interesting. The first is the same as for measuring the impact of Internet: The networks have a great influence on enterprises that in many ways correspond the impacts of the Internet. The second is to separate the turnover from these networks from the Internet sales.

In some countries EDI has been the most serious competitor to the Internet. Asking for e-commerce via EDI not only reveals that e-commerce still might be larger than the Internet-commerce but also precludes some of the confusions between the different electronic channels by the mere mentioning of the alternative to Internet. Not including or mentioning dominant channels as EDI in a questionnaire could mean a considerable overestimation of the Internet-commerce.

E.g. in the case of Denmark, EDI is still an important factor, and in 1999 about the same number of enterprises had e-commerce from EDI as from the Internet. Measuring the volume, EDI-commerce showed up to be significant larger than Internet-commerce, as EDI more often accounted for larger shares of the total turnover. Asking for Internet-commerce the respondents were reminded not to include EDI-commerce[7] in the Internet-commerce. Despite these precautions, contacts to the enterprises with both EDI- and

[7] So-called 'browser-EDI' was included under Internet-commerce in the questionnaire. EDI based on the EDIFACT standard were included under EDI-commerce.

Internet-commerce revealed some double counting, especially concerning those with large e-commerce.

The Nordic countries have been collecting information on EDI separately in their surveys, even if such questions have not been part of the draft model questionnaire. Although Statistics Canada hve not and does not have plans to collect e-commerce via EDI data, Statistics Canada agree with its inclusion in the proposed model survey. In order for such data to be useful, it is best to restrict the scope of EDI to proprietary EDI, and to include EDI over the Internet in module C (e-commerce via Internet). This approach would allow to measure the migration towards Internet.

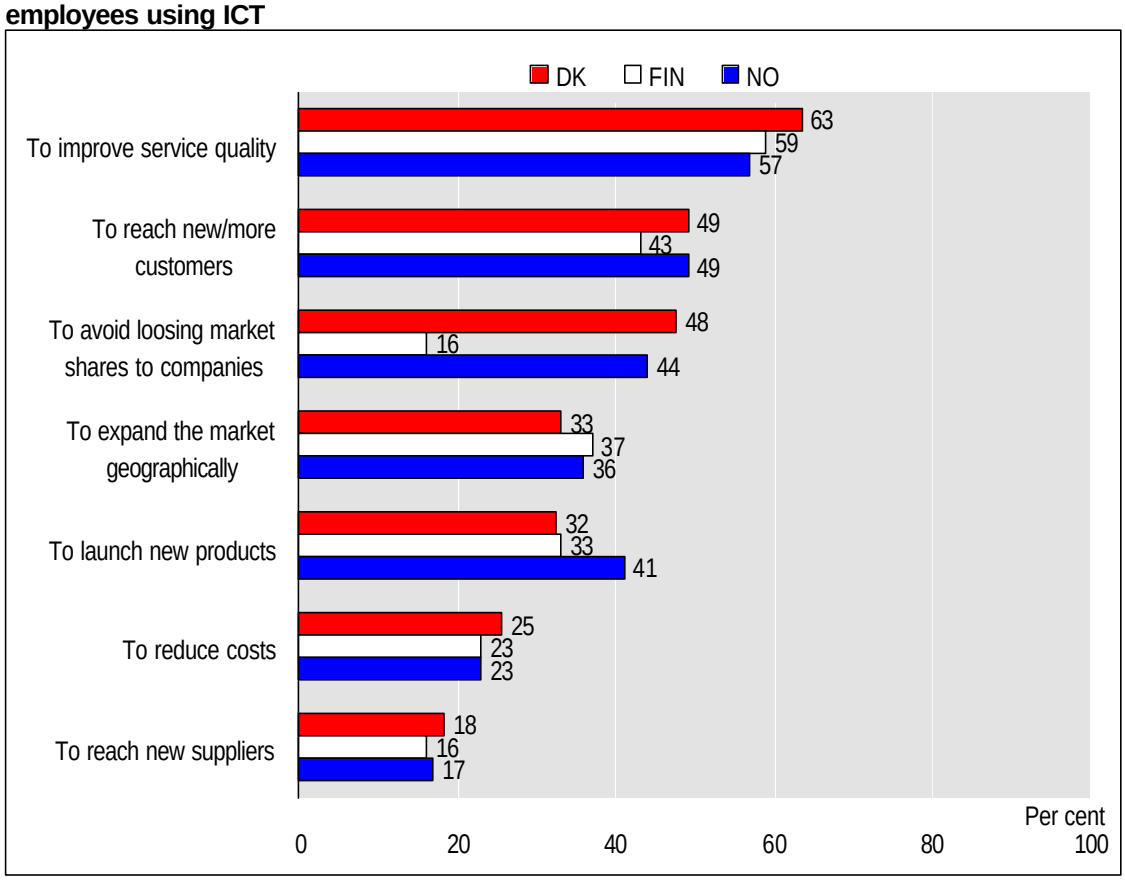
EDI could thus be seen as an example of 'other computer-mediated networks'. The questions in the EDI module could, with minor changes, be applied on similar e-commerce networks.

However there is still definition work to be done in this field. Not only the transportation media but also the message format and contents etc. define the 'network' as concepts. The technological convergence between e.g. Internet and EDI challenges these definitions seriously. Similar new types of network will emerge. Rather than defining all these networks, efforts should firstly be put on more precise - yet solid - definitions of the Internet-commerce.

3.5 Barriers on use of ICT in general together with Internet and e-commerce in particular

In all the countries enterprises considered most often improvement in service quality as a significant motivation factor - about six out of ten enterprises. Also reaching more customers was considered important in all the countries. However, the Finnish enterprises appeared to be least worried about loosing market shares to other companies already using e-commerce. Enterprises clearly did not consider cost reduction as an important motivation factor – only about a quarter of the enterprises reported cost reduction to be important reason for carrying out e-commerce activity.

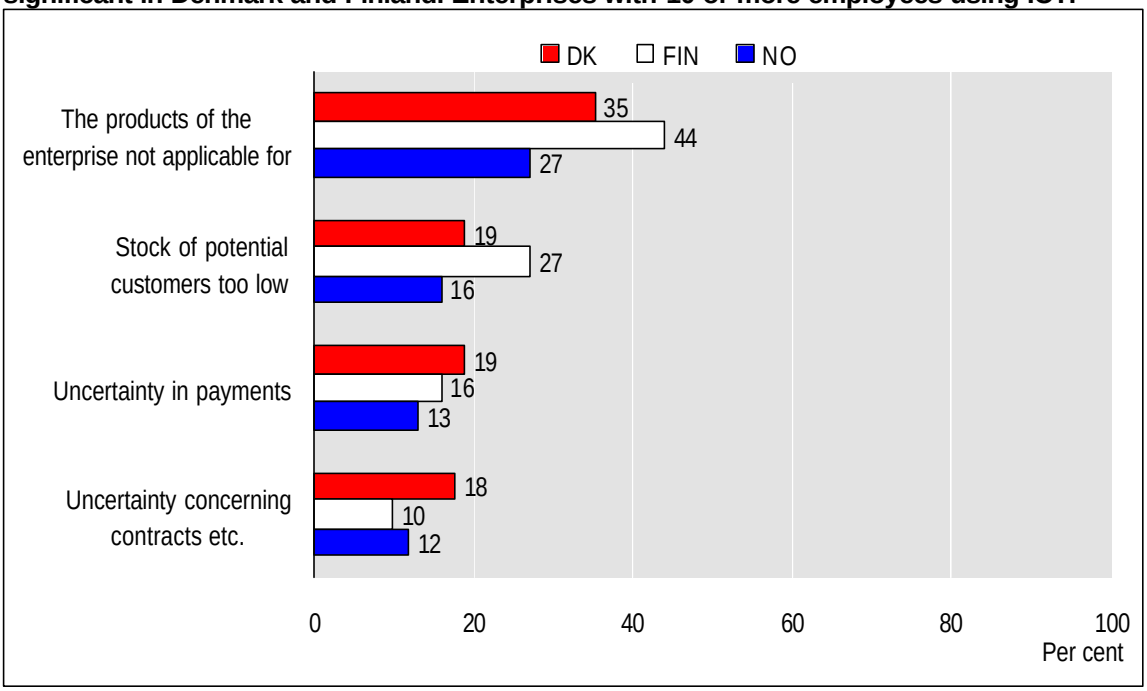
Figure 3: The percentage of enterprises considering motivation factors for e-commerce significant in Denmark, Finland and Norway. Enterprises with 10 or more employees using ICT



Source: National ICT usage in enterprises surveys. The figures cover enterprises with 10+ employees in Denmark, Finland and Norway. Please note that the Norwegian figures are raised. The Danish and Finnish figures reflect non-raised survey data.

The most severe barrier related to e-commerce was in all countries that the products of the enterprise were not applicable for Internet sales. Too low stock of potential customers was also hampering e-commerce activity. These two barriers were experienced somewhat more severe in Finland compared to Denmark and particularly Norway. 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. Less than one-fifth of the respondents in each country evaluated uncertainty in payments a severe problem hampering e-commerce.

Figure 4. The percentage of enterprises considering the e-commerce related barriers significant in Denmark and Finland. Enterprises with 10 or more employees using ICT.



Source: National ICT usage in enterprises surveys. The figures cover enterprises with 10+ employees in Denmark, Finland and Norway. Please note that the Norwegian figures are raised. The Danish and Finnish figures reflect non-raised survey data.

4. 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.

But the convergence of ICT is a problem when measuring usage of ICT. As technology is rapidly changing, e.g. new emerging ICT related services as mobile data communication services related to cellular phones (e.g. WAP) and personal digital assistants (PDA), the readiness cannot only be measured by the number of PCs available in the enterprises. The module on infrastructure need to be continously revised. In the long run the main focus has to be on measuring the use of networks which allows the enterprises to connect to customers and suppliers and thereby automising business processes. The ideal situation would be to be able to measure this shift from non automised business process to automised business processes. These processes are more stable over time than different kind of network technologies which shift raidly and are therefore more suitable for time series.

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.

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.

Gradually the interest is expected to shift from readiness of ICT to intensity and impact measurement. An 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, as is the case in France where INSEE aks about the view of the enterprises on e-commerce impacts (competition, prices, costs, etc.). Another approach could be to measure impact in a more indirect way by using other statistical registers in order to measure a possible increase in productivity or 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.

The model survey proposes a breakdown by class of customer, but no breakdown by destination of sales (foreign versus domestic). The reason being that the Canadian survey showed very poor results concerning this question. As the destination of sales is of considerable interest for policy makers. Despite this difficulty Statistics Canada believes it is important to renew attempts to collect such data. The participants are invited to address this issue.

Initially, the draft model questionnaire included a module on ICT investments. The response rate for this module was relatively low and the quality of the collected answers relatively low in the first round of surveying in Denmark and Finland. As a consequence, the module has been deleted and the proposal made to include ICT information only in annual accounting statistics. But it should be discussed, if the model questionnaire as a data model should include an investment module - even if data are actually collected in other surveys.

It is also the intention to develop the methodological aspect further, ie to develop proposals for raising of data in order to ensure comparability across countries. Raising of data has been carried out by Statistics Canada and USBC and Denmark, Finland and Norway plan to publish the raised results of the national surveys in a common publication later this year.[8] But we argue for a discussion of common weighting principals.

The Voorburg Group is invited to discuss the proposed model questionnaire and the problems raised in this paper with the aim of producing an input for a "final" version to be adopted at the WPIIS meeting in spring 2001.

[8] Sweden can not take part in this work since their survey data will not be compiled at this time and therefore intends to make a separate comparative analysis at a later stage.

ANNEX I: Correspondence between the model questionnaire and surveys carried out

Column variables

The following column variables are applied to each question - if not differently stated:

Starting year of ICT or Internet usages:	*t-1 or earlier* / *t* (reference year) / *Planned for t+1*
Evaluation of barriers or motivations:	*No importance* / *Some importance* / *Much importance*
General residual cathegory:	*'Do not know/not relevant now'* *(- could optionally be broken down into two seperate cathegories)*

Contents of the questionnaire

Module A: General information about ICT systems

		DK	FIN	NOR	SE	CAN
A1.	**Does the enterprise use personal computers, workstations or terminals?**	X	X	X	X	X
A2.	**The share of the total no. of employees who have access to**					
	Personal computer, workstation or terminal	X	X	X	X	X
	E-mail	□□□ □□[9]	□□	□	X	X
	Internet (www)	(X)[10]	(X)[6]	(X)[2]	(X)	X
A3.	**Does the enterprise use or plan to use ICT in the following areas ?** [11]					
	E-mail	X	X	X	X	X
	E-mail reached by mobile telephone	□□□	□□	□□	□□	□□
	Internet (www)	X	X	X	X	X
	Intranet	X	X	X	X	X
	Extranet	X	X	X	X	X
	EDI	X	X	X	X	X
	WAP	□□□	□□	□□	□□	□□
A4.	What is the largest possible capacity of the external access to the Internet within the enterprise (bandwidth in Kbps/Mbps per second) ?[12]	□□	□□	□□	□□	(X)

[9] The 1998 survey indicated that e-mail is almost synonymous with Internet. For that reason percentage of employees with e-mail is not included in the questionnaire used 1999.
[10] DK and FIN included a question asking for share of PC's with Internet access. Percentage of employees can be calculated using share of PC's.
[11] The questions about these 'ICT systems' should be integrated in possible seperate modules as filter questions in order not to duplicate the questions.
[12] For practical reasons this question requeres cathegorisation by intervals. As these intervals probably are best defined on national basis, international comparisons of bandwith could be difficult

Module B: Use of Internet

(asking those with ICT)

		DK	FIN	NOR	SE	CAN
B1.	**Does the enterprise use or plan to use Internet?**	X	X	X	X	X
B2.	**For what purposes does the enterprise use or plan to use Internet?**					
B2-1.	**General areas of Internet use**					
	General information search	X	X	X	X	X
	Transmitting and receiving data files	□□	X	□□	□□	X
	Competitor analysis	X	X	X	X	□
	Information to/from public authorities	X	X	X	□	□
	Financial transactions (banking etc.)	X	X	X	X	□
	Recruitment of personnel	X	X	X	X	(X)[13]
B2-2.	**Use in link with suppliers (the surveyed enterprise as a customer)**					
	Information search on suppliers' homepages	X	(X)	X	X	□
	Use of commercial databases and similar sources	□	X	□□	X	□
	Ordering goods and services	X	X	X	X	X
	Electronic payment	X	X	X	X	X
	Receiving digital products	X	X	X	X	□
B3.	**Does the enterprise have or plan to have a homepage?**	□□	□□	X□□	□□	□□
B3-2.	**Use in link with customers (the surveyed enterprise as a supplier)**					
	General marketing of the company	X	X	X	X	X
	Marketing of specific products	X	X	X	X	X
	Access to databases	X	X	X	X	X
	Receiving orders	X	X	X	X	X
	Receiving electronic payments	X	X	X	X	X
	Sale of products in digital form	X	X	X	X	X
	After sales support	X	X	X	X	(X)[7]

Module C: E-commerce via Internet[14]

(asking those with Internet)

C1.	**Purchases via Internet (www)**					
	If the enterprise orders goods and services on-line by Internet, what proportion of your total purchases does this represent?	□	□	□	X	(X)[7]
	If the enterprise pays for goods and services on-line by Internet to the supplier, what proportion of your total expenditure on goods and services does this represent?	□	□	□	□	□
C2.	**Sales via Internet (www)**					
	(asking those with Internet + homepage)					
	If the enterprise receives orders on-line by homepage, what proportion of your total turnover does this represent?	X[15]	X[16]	X	X	X
	If the enterprise receives electronic payments on-line by Internet from the customer, what proportion of your total turnover does thi represent ?	□	□	X	□	X
C3.	**Breakdown of Internet sales**					
	If the enterprise have sales via homepage, please break down thi turnover into the following customer groups (estimate in percentage): 1) Other enterprises 2) Public sector 3) Households (total turnover from Internet = 100%)	□	□	□	□	□

[13] Similar concept collected
[14] Filter: Only enterprises with turnover from Internet within 2000
[15] Internet turnover below 1 per cent is not included
[16] Internet turnover to be tick marked in fixed percentage categories

		DK	FIN	NOR	SE	CAN
C4.	**Motivations for e-commerce via Internet** *(asking those with Internet + homepage + sales by Internet)*					
	To reduce costs	X	X	X	X	☐
	To reach new/more customers	X	X	X	X	☐☐
	To expand the market geographically	X	X	X	X	☐
	To improve service quality	X	X	X	X	☐
	To launch new products	X	X	X	X	☐
	To avoid loosing market shares to companies already using e-commerce	X	X	X	X	☐

Module D: E-commerce via EDI

(asking those with ICT)

D1.	**Does the enterprise use or plan to use EDI ?**	x	x	x	x	☐
D2.	**Use of EDI in relation to**	x	x	x	x	☐
	Customers	x	x	x	x	☐☐
	Suppliers	x	x	x	x	☐
	Other cooperating partners (i.e. consultants)	x	x	x	x	☐
	Banks/Financial institutions	x	x	x	x	☐
	Public organisations/institutions	x	x	x	x	☐
D3.	**Purchases via EDI** If the enterprise order goods and services via EDI, what proportio of your total purchases does this represent?	☐	☐	☐	☐	☐
D4.	**Sales via EDI** If the enterprise receives orders via EDI (that is ...), what proportion of your total turnover does this represent ?	X	☐	X	X	☐
D5.	Does the enterprise plan to replace EDI message formats such a EDIFACT with Internetbased formats ?	☐	☐	☐	X	☐

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

(Asking those with ICT, general barriers also asking those without ICT)

E1.	**Barriers on the use of ICT in general**					
	ICT expenditure higher than expected	X	X	X	X	☐
	New versions of existing software are introduced too often	X	X	X	X	☐
	Demand for ICT services is not met by the suppliers	X	X	X	X	☐
	The level of ICT skills is too low among the employed personnel	X	X	X	X	☐
	Difficult to find qualified ICT personnel	X	X	X	X	☐
	Existing personnel reluctant to use ICT	X	X	X	X	☐
	Lack of management time to address the issues	☐	☐	X	☐	☐
	No significant benefits for the enterprise	☐	☐	☐	☐	☐
E2.	**Barriers on use of Internet**					
	Risk of viruses or hackers	X	X	X	X	☐
	Technically too complicated	X	X	X	X	☐
	Lack of perceived benefit	☐	☐	☐	☐	☐
	Cost of developing and maintaining an internet system	X	X	X	X	☐
	Lost working time because of irrelevant surfing	X	X	X	X	☐
	Data communication is too slow or unstable	X	X	X	X	☐
E3.	**Barriers on carrying out Internet commerce**					
	The products of the enterprise not applicable for Internet sales	X	☐	X	X	X
	Stock of potential customers too small	X	X	X	X	(X)[7]
	Uncertainty in payments	X	X	X	X	(X)[7]
	Uncertainty concerning contracts, terms of delivery and guarantees	X	X	X	X	(X)[7]
	Cost of developing and maintaining an e-commerce system	☐	X	X	X	(X)[7]
	Logistical problems	☐	X	☐	☐	☐
	Considerations for existing channels of sales	X	☐	X	X	☐

ANNEX II: Reference of the questionnaire with OECD framework

1. Questions broken down by type of indicator

		ICT/e-commerce		
Module A: Use of ICT		Read-iness	Inten-sity	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		
A4	What is the largest possible capacity of the external access to Internet	X		
Module B: Use of Internet				
B1	Does your enterprise use or plan to use Internet?	X		
B2.1	General areas of Internet use		X	
B2.2	Use in link with your suppliers		X	
B3	Does your enterprise have or plan to have a homepage?	X		
B3.1	Use in link with your customers		X	
Module C: E-commerce (Internet commerce)				
C1	Purchases via Internet		X	X
C2	Sales via Internet		X	X
C3	Breakdown of Internet sales by customer groups		X	X
C4	Motivations for e-commerce		X	X
Module D: E-commerce via EDI				
D1	Does the enterprise use or plan to use EDI?	X		
D2	Relations of EDI use		X	X
D3	Purchases via EDI		X	X
D4	Sales via EDI		X	X
D5	Does the enterprise plan to replace EDI message formats such as EDIFACT with Internet based formats			X
Module E: Barriers on the use of Internet and ICT in general				
E1	Barriers on the use of Internet		X	X
E2	Barriers on use of E-commerce		X	X
E3	Barriers of the use of ICT in general		X	X

2. Indicators for electronic commerce

	LIST OF INDICATORS	MODEL QUESTIONNAIRE	
1.	Number and proportion of economic units with computers	X	A1
2.	Number and proportion of employment in economic units with computers	X	A2
3.	Number and proportion of economic units with access to the Internet	X	A3&B1
4.	Share of employment in economic units with access to the Internet	X	A2
5.	Number and proportion of economic units undertaking specific business processes/activities (to be developed)	(x)	B2.1-B2.2, B3.1
6.	Number and proportion of economic units with Web sites	X	B3
7.	Number and proportion of economic units undertaking specific business processes/activities on Web sites (to be developed)	(X)	B2.1-B2.2, B3.1
8.	Number and proportion of economic units which recognise specific barriers to e-commerce	X	E3
9.	Number and proportion of economic units which consider that they would obtain specific benefits from e-commerce	X	C4
10.	Number and proportion of economic units which plan to use Internet protocol-based networks	X	A3 + B1
11.	Number and proportion of economic units planning to undertake specific business processes/activities (to be developed)	(x)	B2.1-B2.2, B3.1
12.	Number and proportion of economic units conducting sales/purchases over Internet protocol based networks	X	C1 + -C2
13.	Number and proportion of economic units conducting sales/purchases over other computer mediated networks[17]	(x)	D3 + D4
14.	Value of sales/purchases conducted over Internet protocol based networks	(x)	C1 + C2
15.	Value of sales/purchases conducted over other computer mediated networks[13]	(x)	D3 + D4
16.	Proportion of sales/purchases conducted over Internet protocol based networks	X	C1 + C2
17.	Proportion of sales/purchases conducted over other computer mediated networks[13]	(x)	C1 + C2
	X=YES		
	O=NO		
	(X)=Partly		

[17] Only EDI included in the questionnaire

ANNEX III: Survey results. Response rate for "Do not know/not relevant now"

Please note that the numbering refers to the model questionnaire presented at last years Voorburg Group meeting.

		DK	FIN	NOR
Module A: Use of ICT				
A1.	**Does the enterprise use personal computers, workstations or terminals?**	n.a.	n.a.	n.a.
A2.	**The percentage of the total employees who have access to**			
	Personal computer, workstation or terminal	2	2	n.a.
	E-mail	n.a.	n.a.	n.a.
	Internet (www)	6	4	n.a.
A3.	**Does the enterprise use or plan to use ICT in the following areas?**			
	External e-mail	9	7	9
	Internal e-mail	n.a.	n.a.	n.a.
	Internet (www)	6	2	9
	Intranet	48	42	47
	Extranet	72	59	76
	Edi	2	n.a.	54
Module B: Use of Internet				
B1.	**Does the enterprise use or plan to use Internet?**	6	n.a.	n.a.
B2.	**For what purposes does the enterprise use or plan to use Internet?**	□	□	□
B3.	**General areas of Internet use**			
	General information search	5	4	9
	Transmitting and receiving data files	n.a.	14	□
	Competitor analysis	41	22	52
	Financial transactions	37	37	50
	Recruitment of personnel	55	58	58
	Informations to/from public authorities	*35*	*39*	□
B4.	**Use in link with suppliers (the surveyed enterprise as a customer)**			
	Information search on suppliers' homepages	17	40	14
	Use of commercial databases and similar sources	n.a.	□	□
	Ordering goods and services	45	40	41
	Electronic payment	51	63	60
	Receiving digital products	42	59	34
B5.	**Use in link with customers (the surveyed enterprise as a supplier)**			
	Does the enterprise have or plans to have of a homepage?	12	13	n.a.
	Marketing through homepages	17	6	7
	Access to databases	53	29	54
	Receiving orders	57	52	50
	Receiving electronic payments	80	78	83
	Sale of products in digital form	83	74	81
	After sales support	61	53	57

Module C: E-commerce (Internet commerce)[18]

C1. Motivations for using e-commerce	DK	FIN	NOR
To reduce costs	7	11	28
To expand results with existing suppliers	n.a.	n.a.	□
To reach new suppliers	10	13	27
To expand relations with existing customers	n.a.	n.a.	□
To reach new/more customers	7	8	23
To expand the market geographically	9	11	26
To improve service quality	6	8	22
To launch new products	10	12	26
To avoid loosing market shares to companies already using e-commerce	8	13	25
Other motivations, please specify	n.a.	n.a.	□
C2. E-commerce purchases			
If you order goods and services on-line, what proportion of your total purchases does this represent?	n.a.	n.a.	□
If you pay for goods and services on-line directly to the supplier, what proportion your total expenditure on goods and services does this represent?	n.a.	n.a.	□
C3. E-commerce sales			
If you receive orders on-line, what proportion of your total turnover does this represent?	14	n.a.	27
If you receive electronic payments on-line directly from the customer, what proportion of your total turnover does this represent?	n.a.	n.a.	□

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

D1. Barriers on use of Internet			
Risk of viruses or hackers accessing confidential company information	8	7	12
Technically too complicated	9	6	11
Lack of perceived benefit	n.a.	n.a.	□
Cost of developing and maintaining an internet system	9	8	9
Lost working time because of irrelevant surfing	11	8	12
Data communication is too slow or unstable	14	9	14
Expenditures on hardware/software	7	□	□
Expenditures on consume	7	□	□
D2. Barriers on use of e-commerce			
Stock of potential customers too small	25	16	24
Uncertainty in payments	30	23	30
Uncertainty concerning contracts, terms of delivery and guarantees	30	23	31
Cost of developing and maintaining an e-commerce system	n.a.	18	27
Logistical problems	n.a.	21	□
The goods/services not applicable for e-commerce	18	□	□
Consideration for existing channels of sale	28	□	□
Cost of reengineering working processes	27	□	□
D3. Barriers on the use of ICT in general			
ICT expenditure higher than expected	14	6	14
New versions of existing software are introduced too often	15	8	14
Demand for ICT services is not met by the suppliers	18	10	18
The level of ICT skills is too low among the employed personnel	14	5	10
Difficult to find qualified ICT personnel	25	10	27
Existing personnel reluctant to use ICT	15	7	12
Lack of management time to address the issues	n.a.	n.a.	12
No significant benefits for the enterprise	n.a.	n.a.	□
Other barriers, please specify			

Denmark's additional questions are marked with italic

Denmark

[18] Filter: Only enterprises with turnover from Internet within 2000

Changes compared to model questionnaire (previous Voorburg version 1999)

- Filter before supply side questions (homepage 1999 or 2000)
- Only one residual cathegory is used: 'Do not know/Not relevant now'
- Only year t and t+1
- Extra question in B4 use in link with suppliers:
  - competitor monitoring
- Extra question in D2 barriers on use of e-commerce:
  - goods/services not applicable for e-commerce
  - cost of reengineering working processes
  - considerations for existing channels of sales

- EDI-module:

- The use of EDI in relation to:

a) Customers
b) Suppliers
c) Other cooperating partners (i.e. consultants)
d) Banks/Financial institutions
e) Public organisations/institutions

- Share of company's turnover from orders received by EDI

Activity Group	**NACE Rev. 1**	**Number of enterprises**	**Sample**	**Accepted responses**	**Responses rate**
Manufacturing industry	15-36	4908	1593	989	62
Construction	45	3174	600	361	60
Distributive trade, Hotels and restaurants	50, 51, 52, 55,	5349	1165	678	58
Transport and Telecommunication	60-63	978	223	133	60
Business services	70-74	1874	446	279	63
Total		**16283**	**4027**	**2440**	**61**
Number of persons employed					
10-19		8009	805	467	58
20-49		5333	1068	622	58
50-99		1590	803	507	63
100+		1351	1351	844	62

Finland

The question on e-commerce was formulated as follows:
-Which proportion of your total turnover do the orders received via Internet represent? The enterprises were given the following options to tick mark: nothing, 1% or less, 2-4%, 5-9%, 10-24%, 25-49%, 50% or more, do not know / not relevant.

Main changes in Finnish approach compared to model questionnaire (Voorburg version 1999)
- Filter before supply side questions (homepage 1999 or 2000)
- only 1 residual category: 'Do not know / not relevant'
- only year t and t+1
- extra question in B3 general areas of Internet use ' information to / from public authorities'

For C1 motivations for e-commerce added 'corporate image'
For C also the importance of different client groups were asked
Extra question in D2 barriers on e-commerce :
- goods and services not applicable for e-commerce

As extra question Finland asked about:
- the use of EDI / EDI communication partners.
- how advanced ICT users the enterprises considered themselves compared to competitors.

Activity Group	**NACE Rev. 1**	**Number of enter-prises**	**Sample**	**Accep-ted re-sponses**	**Respon-ses rate**
Manufacturing industry	15-40	2178	724	418	57,7
Construction	45	1727	319	168	52,7
Distributive trade, Hotels and restaurants	50, 51, 52, 55,	3658	778	389	50,0
Transport and Telecommunication	60-64	1108	289	152	52,6
Business services	70-74	1839	421	208	49,4
Total		**12574**	**3188**	**1718**	**53,9**
Number of persons employed					
10-19		6486	645	337	52,2
20-49		3708	739	378	51,2
50-99		1125	559	306	54,7
100+		1255	1245	697	56,0

Norway

Norwegian sample: 4857 enterprises, of which 1001 enterprises with 1-9 employees. Response rate= 75,2 per cent. Response rate for enterprises with 10+ employees was 77,2 per cent.
In addition to the questions ticked in the form attached, the following modules/-questions/alternatives were used in the Norwegian survey. Our experiences with these additions were positive. No specific problems to report. Some of the alternatives (ie. D2 products not suited ..) gave a high score.

1. A separate module on the use of EDI:

1.1. The use of EDI in relation to
a) Customers
b) Suppliers
c) Other cooperating partners (i.e. consultants)
d) Banks/Financial institutions
e) Public organisations/institutions

1.2 Share of company's turnover from orders received by EDI

Items added under the other modules:
A2:
Intranet was added as an alternative

B3:
Information to/from public authorities

C3:
Share of internet orders received from abroad

D1:
Cost of harware/software
Cost of use (subscriptions, actual use)

D2:
Products not suited for internet sales
Relations to existing customers
Reduced possibilities for customer service

D3:
Lack og IT-strategies

Activity Group	**NACE Rev. 1**	**Number of enter-prises**	**Sample**	**Accepted respon-ses**	**Respon-ses rate**
Manufacturing industry	15-40	3 942	1 176	921	78,3
Construction	45	1 761	306	236	77,1
Distributive trade, Hotels and restaurants	50, 51, 52, 55,	7 218	1 341	1011	75,4
Transport and Telecommunication	60-64	1 233	324	262	80,9
Business services	70-74	2 354	527	405	76,9
Total		**16 508**	**3 674**	**2 835**	**77,2**
Number of persons employed					
10-19		9 241	896	686	76,6
20-49		4 725	929	753	81,1
50-99		1 343	672	538	80,1
100+		1 199	1 177	858	72,9

Sweden

In Sweden a Nordic harmonised survey with a sample size of 3205 enterprises was launched spring/early summer year 2000. By the middle of august, before the last reminder, the response rate was approximately 61 per cent. The results from the survey will be compiled in November.

The Swedish survey differs from the model questionnaire mainly in the sense that it has a slightly different order in the questions. Sweden has furthermore added a question on the importance of different customer categories regarding e-commerce over the Internet. The different categories are "individual customers", "enterprises", "local/central authorities" and "other organisations".

In addition to that it has a special module on EDI which covers if the company uses EDI, when it was introduced for what tasks and in what extent order over EDI contributes to the turnover. There also is question on if the enterprises have plans to migrate from EDI (EDIFACT) to an Internet based system

I should also be noted that Sweden, as Finland, uses tick marks in the questions about which proportion that sales through the Internet/EDI contributes to the turnover. The alternatives where: Nothing, 1% or less, 2-4%, 5-9%, 10-24%, 25-49%, 50% or more.

Sweden also had a number of country specific questions; the most significant of these questions were:

- Share of employees which rent a home computer from their employer
- Share of employees which get a free home computer from their employer
- When enterprises started using or plan to start using video conference equipment
- Share of teleworkers
- What kind of teleworking equipment that enterprises supply their employees with
- Additional motives for deploying e-commerce; "getting products on the market" and "avoiding loosing market shares to other e-commerce enterprises"
- Additional barriers for deploying e-commerce; "costs for redesigning business processes", "in consideration of present retail dealers" and "because of problems with delivering service".

Activity Group	**NACE Rev. 1**	**Number of enter-prises**	**Sample**	**Accep ted respon-ses**	**Respon-ses rate**
Manufacturing industry	15-40	7409	1623	n.a.	n.a.
Construction	45	2772	118	n.a.	n.a.
Distributive trade, Hotels and restaurants	50, 51, 52, 55,	8314	453	n.a.	n.a.
Transport and Telecommunication	60-64	2058	391	n.a.	n.a.
Business services	70-74	4472	448	n.a.	n.a.
Total		**25025**[19]	**3033**[20]	n.a.	n.a.
Number of persons employed[21]					
10-19			15 016	n.a.	n.a.
20-49			27 380	n.a.	n.a.
50-99			26 388	n.a.	n.a.
100+			386 833	n.a.	n.a.

[19] Sweden deployed a cut off limit of enterprises with 10 or more employees when conducting the survey.
[20] Note that Sweden also included NACE Rev 1 65-67, Financial Intermediation, why the total sample was 3205 enterprises.
[21] Approximate figures.

Canada

The Canadian questionnaire mainly differs from the model questionnaire (Voorburg version 1999) in the following area.

B2:
To access data base of customer
To share or perform collaborative R&D
Education/training
To automate or eliminate steps in production and/or distribution with suppliers
To automate or eliminate steps in production and/or distribution with customers
Tracking of orders
Information about the company
Product or service information
List of available goods and services
Private policy statement

D2:
Goods or services do not lend themselves to transactions on the Internet
Uncertain of benefits of the technology
Potential for fraud and related costs
Already have significant investment in non-Internet network
Concern about competitors analyzing company information
Resistance to technological change
Internet is too slow
Internet is not reliable

E:
Other topics covered by the Canadian survey
Brandwidth used to access the Internet
- Telephone connected with standard modem (64 kbps or less)
- Up to and including T1 lines (>64 kbps and <1.544 mbps)
- Greater than T1 line and up to T3 line (>1.544 mbps and 44.736 mbps)
- Greater than T3 line

- Has using the Internet replaced another previously used medium for advertising
- What was the approximate cost of setting up your Web site? (choice of ranges)
- What was the approximate cost of maintaining or upgrading your Web site? (choice of ranges)