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Developing the e-commerce concept

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For some years Internet-based e-commerce seemed to be the most important aspect of the enterprises' ICT usage from many users' point of view. In parallel, the survey is often referred to as a survey of e-commerce. Taken from the statistical definition though, e-commerce is only a subset of several e-business processes, and other indicators of ICT usage.

The paper will look further at the measurement of e-commerce as a sales activity of enterprises and will discuss: 1) The reason behind the special focus on e-commerce 2) The development of the indicator in the Community Survey of ICT-usage in enterprises 3) Lessons learnt and possible future directions compared to the measurement of other e-business processes. Among the conclusions are that other networks than the Internet and other business processes than e-commerce plays important roles and need continued attention and further development in order to improve the statistics on the information society.

1. Background

1.1 Emergence of the Internet society

In the beginning of 2001 an extensive pilot survey on e-commerce in enterprises was launched by Eurostat. It was the first EU-survey of e-commerce where data was collected by national statistical offices and based on harmonised definitions and agreed methodology. It was followed by annual, voluntary surveys 2002-2005 with a broad participation and from 2006 and onwards the data collection is based on a legal framework¹ to assure data from all Member States, Iceland and Norway. Parallel surveys on ICT usage by individuals and households have been carried out from 2002, and both surveys provide data for the Policy Indicators used for the benchmarking of the Commission's eEurope Action Plans and the subsequent i2010 initiative.

¹ Regulation (EC) No 808/2004.

This new survey vehicle was the Commission's and NSI's answer to provide reliable and comparable data on e-commerce and other aspects of the information society².

The strong demand for data on Internet-commerce arose in the late nineties. The widespread diffusion of the Internet³ started effectively from 1995. Main factors behind this revolutionary transformation of communication were use of open, non-proprietary standards exploiting the existing communications network in combination with a user-friendly browser-based interface. Reduced prices and increased bandwidth made access affordable and attractive to users, and in the following years, Internet usage became common in the majority of European households and enterprises.

The Internet provided a worldwide platform for communication via a digital network, rather than through direct personal contact. The commercial advantages of selling commodities and services via the Internet were obvious (e.g. shorter distance between producers and consumers even across geographical boundaries, reduction of transactions costs, customized products).

Though Internet sales to end-consumers caught much attention due to its revolutionary nature, other business models were expected to have a great impact on trade between enterprises. Notable was the interest and expectations in Business-to-business (B2B) market places consisting of specialised web sites allowing buyers and suppliers to meet each other virtually and to trade.

1.2 *The dot.com wave*

E-commerce applies especially to the marketing of products that are easy to distribute. The perfect business model to reap the benefit of e-commerce, turned up as virtual shops selling products such as software, travels, financial services or any easily digitised product. The emergence and boom of "dot.com"-enterprises arrived with the Internet commerce: A group of new Internet-based companies that in many ways owed their rapidly increasing stock prices to the firm belief in these new business models. The expectations were not in all cases realistic and during 2000 and 2001 a large number of dot.com enterprises went out of business, with a significant and negative effect on the world economy.

² The activities of the international statistical community, however, took place some years earlier in working groups and at conferences in EU, OECD and the UN (namely WGISS, WPIIS and the Voorburg Group) effectively from 1996/97 with close mutual coordination. At the 83rd DGINS Conference in Helsinki 1997 the theme was "Information society and statistics".

³ The use of the term 'Internet' in this paper includes The World Wide Web and the use of websites.

1.3 *The need for data and a definition*

The attention devoted to Internet-commerce, was in the beginning of the dot.com era largely supported by anecdotal evidence, but also on the growth of activity and market valuation of on-line companies such as Amazon, Yahoo or eBay just to mention a few of them. The need for statistics on the volume of the e-commerce became evident. Although the initial value was believed to be low compared to the total economy, the potential growth rate caught the attention of policy-makers.

Before the national statistical offices entered the scene, figures were often provided by private companies. Their estimates and projections of the value of e-commerce could vary by as much as a factor of ten [1]. These divergences were partly due to lack of harmonized definitions of e-commerce, but also to lack of common methodology, statistical uncertainty from insufficient samples etc.

The term e-commerce has been attributed to several meanings in public. For the international statistical society it thus became a clear objective to prepare the ground for new statistics by establishing a common definition of e-commerce. In 2000 OECD member countries agreed on a definition of e-commerce transaction restricted to *ordering*. In short e-commerce is a “*method by which the order is placed or received, not the payment nor channel of delivery, which determines whether the transaction is an e-commerce transaction. The narrow definition of e-commerce transactions refers to those conducted over the Internet, while the broad definition refers to all computer-mediated networks*”⁴ [2]. The guidelines for the definition include automated transactions such as ‘EDI’ (Electronic Data Interchange). The “narrow” definition of Internet-commerce excludes specifically orders received by conventional e-mail.

E-commerce should thus be regarded as a subset of e-business. Accordingly, from the definition follows that activities related to the ordering, such as payment, delivery, marketing etc. should be regarded as ‘other e-business processes’. It is fair to say that, despite the important clarification this meant to the statistical measurement, other and broader definitions of the term e-commerce have continued to be in use in media and among policy decision-makers.

⁴ The exact definition is “An electronic transaction is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or offline”.

2. The EU enterprise surveys

2.1 The beginning

Eurostat started to develop its e-commerce questionnaire in 2000. The first draft questionnaire was largely based on a model questionnaire proposed to OECD, which had been used by the Nordic countries from 1998. Important principles in this questionnaire was the use of a flexible, modular structure, a preference for categorized questions rather than quantitative, and finally a ‘technology free’ approach where questions addressed the ICT usage rather than the possession of specific software and hardware.

The coverage of the survey is enterprises⁵ with at least 10 employees in all urban industries in the NACE subsections D, F, G, H (55.1+55.2), I, J, K and O (92.1 and 92.2). Section F, Construction was not included until 2003.

How did the Eurostat model survey meet the user-needs in the first years? The survey was referred to as “Community Survey on ICT usage in enterprises (E-Commerce)” and though Internet-commerce had a prominent place in the model questionnaire the survey also included sales and purchases through other computer mediated networks – all in conformity with the OECD definition. In addition, basic structural ICT variables such as Internet access and web sites were covered together with simple questions on other kinds of e-business, e.g. marketing via websites. Such variables gave an idea of the readiness to e-commerce together with questions on barriers and benefits of the Internet and e-commerce.

A question of integrating Internet-sales transactions electronically with other systems was also included and was later generalised to cover all kinds of ordering systems. Though difficult and altered over the years, this became the question that covered the more advanced aspects of e-business until 2007, namely integration of different business processes.

The e-commerce questions have been in use until 2007 with only small amendments and few replacements. In order not to increase burden on enterprises certain questions have been omitted in later year’s surveys in order to allow new questions. E.g. omitting the split of e-commerce, where

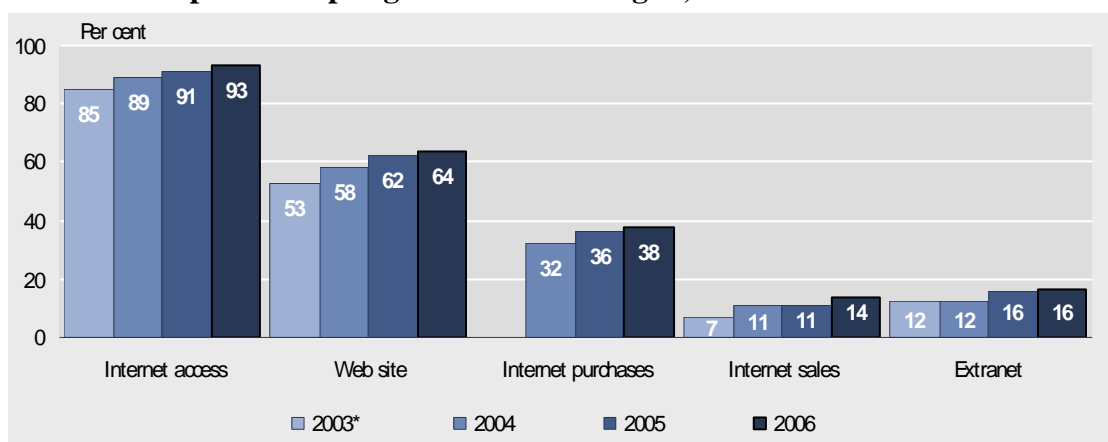
⁵ The legal unit

continued time-series are of less importance, has provided space for new indicators. From 2008 e-commerce is measured as a whole, without a split by network.

2.2 *The results*

A great majority of enterprises in EU25, 85%, had Internet access by 2003, and saturation seems to appear in 2006, where 93% had Internet access (chart 1). Another measure of readiness – particularly on the supply side of e-commerce – is web sites, which was in use by 53% of the enterprises, increasing to 64% in 2006.

Chart 1. Enterprises adopting various technologies, EU25



* EU15.

Sales and purchases via the Internet refer to ordering last calendar year, excluding manually typed e-mails.

Source: Eurostat

This high level of readiness has not yet been met by a similar appearance of enterprises active in Internet-commerce. Only 38% of the enterprises with at least 10 employees had in 2006 been active concerning purchase on the Internet the previous calendar year.

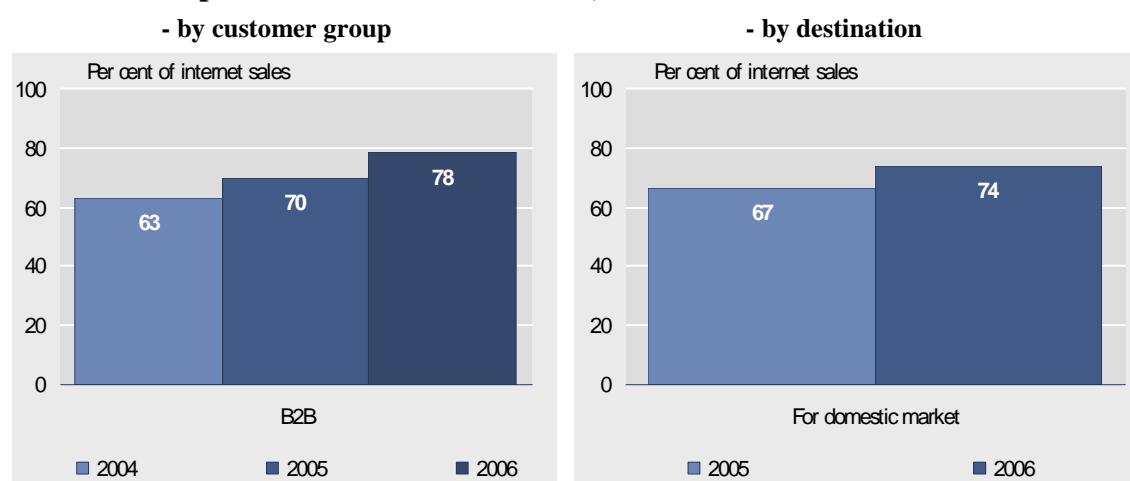
The share of enterprises being active in Internet sales was 7% in 2003, increasing to 14% in 2006 which is a marked lower level compared to the share of purchasing enterprises. The level of e-commerce varies a lot between the Member States and also between industries and size groups of enterprises. But in general, the share of enterprises involved in Internet-sales represent a minority of all Internet-users. In comparison, the spread of extranet⁶ among enterprises has during 2003-2006 been higher than the spread of Internet sales.

⁶ A secure extension of an Intranet that allows external users to access some parts of an organisation's Intranet.

All figures are obtained by Eurostat's database at www.epp.eurostat.ec.europa.eu. The presented figures can vary from figures published elsewhere due to different delimitations. When nothing else is mentioned, data in this paper refer to enterprises in EU25 with 10 or more employees and with activity in NACE sections DFGHIKO. The EU-totals are size-weighted. Enterprises figures for 2001 and 2002 are not included as they are not directly comparable with later years concerning industries covered.

Until recently the questionnaire included questions on the value of the Internet orders including a split of the sales by customer group or by destination. The figures provide, despite statistical uncertainty, a clear picture of sales to other enterprises – 'B2B' dominating the Internet sales in terms of value, and with an upward tendency from 2004-2006 (chart 2). The globalisation aspect of e-commerce is illustrated by an alternative breakdown of the Internet sales by destination. It shows that almost 3/4 of these sales were sold to the domestic market in 2006. Also these figures should be interpreted with caution, due to uncertainty, but it seems as if the home market is the primary market area for the Internet economy. Again this is an average perspective, figures vary between industries. Looking at the dominant B2B trade the cross-border Internet sales face the same barriers and perhaps even some more compared to traditional sales – that is integration with administrative procedures, e.g. custom formalities.

Chart 2. Composition of total Internet sale, EU25



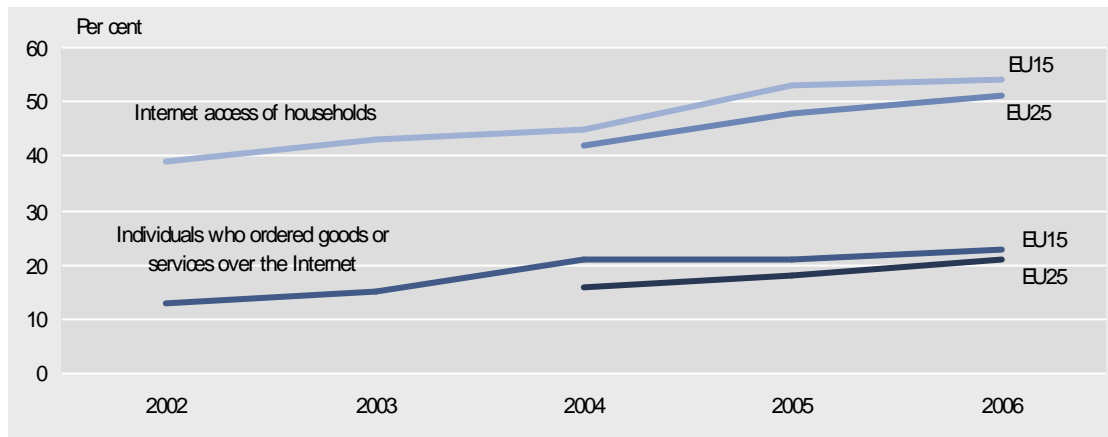
Figures on breakdown of e-commerce should be considered as indicative due to extra uncertainty. B2B is sales to other enterprises including governmental organisations.

Source: Eurostat

The share of enterprises that have sold products via specialised B2B market places over the last calendar year was 1.4% in 2004 with an increase to 2.6 in 2006. The share that have purchased via specialised B2B market places was 2% in 2003 (EU15) increasing to 11% in 2005.

A fundamental condition for the B2C sales is that the private consumers have Internet access. The share of European households with Internet access increased from 39%⁷ in 2002 to 54% in 2006 (chart 3). Though the Internet access in 2006 comprises more than half of the European households, purchasing via the Internet is not as common. In the same period the share of individuals who had ordered via the Internet in the last 3 month, has increased from 13% in 2002 to 23%⁸ in 2006.

Chart 3. Internet access and Internet purchases at home, EU25



Orders for private use, in the last 3 months.
Source: Eurostat

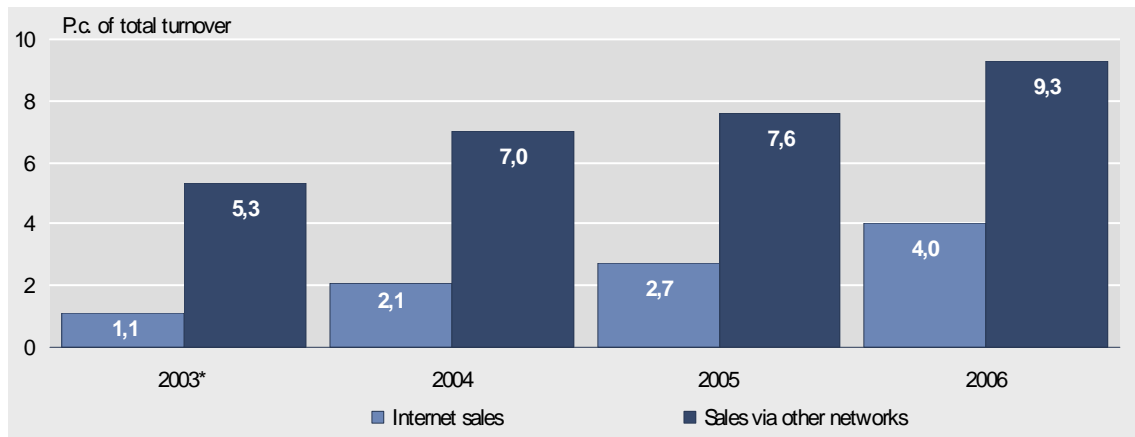
The most common purchases among households are films/music, books/magazines/e-learning material or computer software – items that 15% had bought via the Internet the last 12 month in 2006 (EU25). Almost as common is purchase of travel and holiday accommodation with 11% of the individuals, however, purchases of food/groceries only accounted for 3%.

Among enterprises, the value of all Internet sales accounted only for 1.1% of their total sales in 2003 (chart 4). This share increased to 4.4 in 2006 – a high growth rate, yet from a rather low level. However, sales via other networks than the Internet accounted for a much higher share, namely 5.3% in 2003 with an increase to 9.3% in 2006.

⁷ EU15 (51% in EU25).

⁸ EU15 (21% in EU25).

Chart 4. Value of e-commerce, EU25



* EU15. 2003-figures are only included to roughly show the level of e-commerce as they are not totally comparable to 2004-2006. Figures from the 2002-survey show a share of Internet sales of 0.9% and sales via other networks of 6.1%, however, exclusive enterprises in Construction that usually have e-commerce activities compared to other industries.

Source: Eurostat

The Internet sales thus made up only 15% of sales via other networks in 2002. This share increased to 50% in 2006. It means that the Internet is gaining importance compared to other networks, but still in 2006, sales via other networks have about twice the volume of Internet sales. The figures show an average of all enterprises, and the importance of e-commerce is notably higher in selected industries e.g. Hotels and restaurants, wholesale and travel agencies.

2.3 *E-commerce via other networks than the Internet*

Sales via other networks are most often performed as 'EDI' (Electronic Data Interchange) which describes exchange of structured messages such as orders, invoices or transport documents between enterprises etc. The aim is automatic 'machine-to-machine' transfer, so that repeated manual data entry can be avoided. This kind of e-business has a longer history compared to Internet commerce as it dates back from the eighties or in rare cases even before. Though more closed in nature and with higher entry costs than Internet commerce⁹, the savings from the high degree of automation could justify EDI involving high-volume transactions.

The Internet started as a facilitator of EDI-traffic, after security and standardisation issues were solved by the development of the XML-language from 1998. Thus a part of the Internet sales are today transmitted as 'EDI' and some of the growth of the Internet sales, shown in chart 4, could be

⁹ Opposed to Internet-commerce, EDI for many years was done via proprietary networks and with bilateral setups between the communicating partners, aided by industry organisations.

explained by migration of EDI solutions to the Internet platform. EDI over the Internet requires a less complicated set up than the traditional EDI, and today many enterprises might be using EDI in relation to business partners, banks etc. without using the term anymore.

2.4 *Methodological experiences with the e-commerce questions*

In general, the questions on e-commerce have worked well. Some of the problems that have been addressed but not necessarily solved will be mentioned in the following (see [2] for a more detailed description of the problems).

For *financial sector enterprises* it has been necessary to identify another measure than turnover. In the first EU survey years, turnover was simply substituted with 'gross income' (e.g. from interests). In 2004-2006 sector-specific questionnaires was constructed, however, due to the complexity of the issue, experiences have not been successful. In 2007 and 2008 the sector is included again like other sectors, without inclusion of the e-commerce questions though.

How should enterprises that *sell on the Internet by agents* report their e-commerce? This problem is not dealt with explicitly in the Eurostat model survey. OECD guidelines [2] suggest that the agent commission is reported from the agent, but that the sales value is reported by the client, so that the sales are allocated to the correct industry.

The question about split of value of Internet transactions by *customer group* or by *destination* can be difficult to report for respondents, as they do not know or keep stock of this information. This applies especially to the destination of the sales.

As regards Internet purchases, opposed to Internet sales, this is often a decentralised activity. The reporting unit/respondent in the survey often does not know the *value of the Internet purchases*, or maybe not even the total purchases. As figures on the purchase value are in high demand, the question has remained in the survey, though combined with purchases via other networks from 2008. A more robust measure has been allowed, where enterprises are asked about the value in broad categorised percentage bands instead of the exact value.

All indicators that measure the *value of Internet sales or other e-sales* suffer from a high level of *uncertainty*. Firstly, the percentage of e-sale reported by the enterprise is often a rough estimate, as the actual figure may not be available to the responding person. Secondly, the calculated value suffers from a high standard error, due to an uneven distribution and outliers in the samples. *The*

breakdown of the e-sales – by industry, size-group, customer or destination – has even higher relative standard errors, and therefore a large number of European countries, including Denmark, have limited the use of such data at a national level.

3. E-business processes

3.1 Developing the concept

The experience from the EU surveys has shown that the Internet orders still have a limited value to the total economy, but with a continuous, marked growth. E-commerce has also a broader sense than its usual meaning – purchases made over the Internet by end-consumers. Other networks play an important role, and B2B-transactions make up most of the e-commerce value.

E-commerce should be seen as part of globalisation, although measured by the volume of total Internet sales, export is not dominant. However, new patterns of global trade and organisation have emerged with the Internet economy. As regards the e-commerce part, we need additional measures and analysis to uncover e.g. who is trading with who – B2B and B2C – and what kind of products are traded.

Focus among policy decisions makers has changed towards other e-business processes than e-commerce, comprising the whole supply and distribution chains and their impact on enterprises' performance. The EU i2010 Benchmarking Framework puts it this way: *"ICT uptake by businesses has so far focused mainly on e-readiness, connectivity, and e-Commerce. While these core indicators will be kept, the scope of the analysis will be increased to look in more detail at the impact of internet related technologies on business processes and capture the wider adoption of advanced e-Business solutions"* and gives examples of this: *"Enterprise Resource Planning (ERP), customer relationship management (CRM), human resources functionalities, eSupply Chain Management (ESCM), eSupply Relationship Management (eSRM), e-Procurement."* [5].

It is most often assumed that the benefits of e-business processes are caused by *automation* in combination with *integration* of different processes and their use of information. Though such measures are considered important, the complexity is great as the relevance and understanding of business processes vary a lot between individual enterprises, industries or size groups. At the same time the ICT usage is changing – it is a moving target – while the surveys are planned. An OECD expert group in 2003 did not make a definition nor a conceptual model for e-business processes.

The measurement of e-business processes is still being developed, and probably will be so for a number of years. An ambition of covering all kinds of e-businesses is not realistic, and a pragmatic approach that prioritizes common and well-defined processes rather than the most advanced seems viable and realistic. In a way the measurement of e-commerce has been easier as the understanding of 'ordering' is less ambiguous than e.g. human resource management processes.

3.2 *The Danish experience*

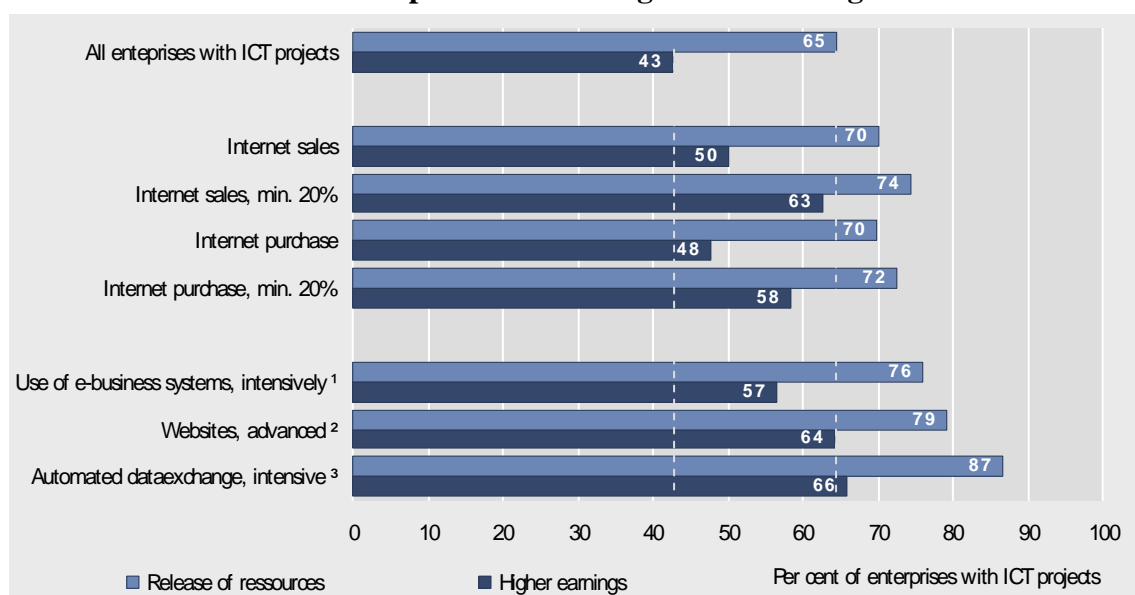
The EU enterprise survey for 2008 has taken the pragmatic approach concerning e-business that is expanded significantly by a specific module this year¹⁰. Part of the new contents has been taken from national surveys. Among these indicators are two that have been used in the Danish survey from 2005.

The first indicator measures enterprises use of *automatic data exchange between the business' systems and other entities' systems* - e.g. with banks, other enterprises or public authorities. Though this by definition involves a high degree of external integration, as many as 55% of Danish enterprises was involved in such arrangements, while a somewhat lower share, 35%, has received orders via the Internet [4]. This discrepancy might be caused by the levels of benefits.

As a matter of fact, this can be illustrated by use of the second indicator that measures enterprises' perceived impact of the recent 2 year's ICT projects. An analysis of 2006 data shows that enterprises with intensive use of automated data exchange or with advanced websites claim to have higher earnings or release of resources from their ICT projects than the average. Likewise, intensive use of e-commerce has a positive correlation to perceived effects, but not as strong as the use of automated data exchange (see chart 5).

¹⁰ i2010 tentative timetable for enterprises: 2007: skills, 2008: e-Business, 2009: e-Commerce and 2010: security.

Chart 5. Correlation between perceived earnings and ICT-usage. Denmark 2006



¹ Use of ICT systems for support of at least 4 in 5 possible business processes.

² Enterprises having at least 4 in 5 possible web-services/-facilities.

³ Enterprises using automated data exchange comprising at least 6 in 7 possible areas. Automated data exchange is electronic exchange of data between an entity's own ICT system and those of other entities.

Source: Statistics Denmark, "Informationssamfundet Danmark 2006", www.dst.dk/it

The mere use of technology, such as having a website, broadband access etc., however, does not seem to have a particular effect. Two other perceived effects from the survey were analysed: Process innovation¹¹ and product innovation¹². Both of these effects are correlated with higher earnings as well as with intensive ICT usage.

These results are only indicative¹³, but they support evidence from recent year's firm-level studies in OECD that

- productivity from ICT usage is most visible when accompanied by organisational changes
- e-commerce does not have a stronger isolated effect on productivity, than other ICT usages¹⁴.

¹¹ Reorganization and simplification of procedures

¹² Development of new products or services

¹³ For a further discussion of the indicators, see "Automated data exchange and the perceived effects in Danish enterprises", room document at OECD WPIIS 2006.

¹⁴ A study of ONS 2000/2001 data shows that e-buying enterprises in UK had a higher value-added per. employee than enterprises without e-commerce, however, this effect was not found at e-selling enterprises [6].

4. Future perspectives

Although the development of e-commerce may still be interesting to follow, it seems clear that e-business processes is the concept that puts e-commerce into a broader perspective and scope. At the same time e-business processes provide an improved context for future analysis.

E-business processes is a highly complex area, and we see various, customised solutions often unique to the individual enterprises. This in itself challenges the ICT statisticians. There is certainly no one-and-only solution to data collection about e-business processes. On the contrary, we need to be pragmatic and try to establish as much of the scattered, jig-saw puzzle as we can, and leave behind what is too complicated to measure.

This is the approach followed in the latest version of the EU enterprise ICT survey. Questions about e-business processes have been extended for the survey of 2008 and now form a theme in the questionnaire. It is planned that e-commerce be repeated as theme in 2009, though already covered extensively in the previous surveys. However, e-commerce should now be considered as an integral part of e-business.

Statistics Denmark agrees with this approach. New information will be created based on the e-business processes thematic questions. This information can further help and qualify the ongoing EU-studies regarding ICT impact on enterprise performance and productivity that in the near future can be based on far more sophisticated and detailed data.

Generally, Statistics Denmark supports that impact studies be prioritized and in particular those that can be conducted and based on existing data. Likewise we find that co-financed arrangements as the ongoing ICT impact study is a feasible model for future cooperation in this field.

The current legislation regarding ICT statistics comprises Regulation (EC) No. 808/2004 and expires in 2010. In preparation of a new legal framework Statistics Denmark considers reduced burdens on businesses as an important objective and we cannot expand the current enterprise questionnaire. At the same time we need to develop and continue ICT statistics but we need to be selective. We need to continue the good parts of the existing legal framework e.g. the possibility of changing the annual theme. We should also for the whole set of indicators introduce greater flexibility as to frequency - not all indicators need annual collection.

Moreover, we need to coordinate closely with those colleagues responsible for the e-indicators formerly laid down in the e-Europe framework and now in the i2010 initiative and together with them identify the future set of e-indicators.

The planned OECD Ministerial Conference 2008 in South Korea about the Internet economy will give us an excellent opportunity to take stock of the information society. The EU will have the possibility to demonstrate how far we have taken harmonized ICT statistics covering enterprises and households. Most important, we will have the possibility to listen to the politicians and other important stakeholders and take note of what they believe should be the future orientation and need for official ICT statistics.

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