The European **e-Business Market Watch**

Sector Report: *No. 03-I, May 2004*

Electronic Business in the **Electrical Machinery and Electronics Industries**

The quantitative picture:
Diffusion of ICT and e-business in 2003/04

e-business w@tch

European Commission

Enterprise publications

The *e-Business W@tch*

The European Commission, Enterprise Directorate General, launched the *e-Business W@tch* to monitor the growing maturity of electronic business across different sectors of the economy in the enlarged European Union and in EEA countries. Since January 2002 the *e-Business W@tch* has analysed e-business developments and impacts in 17 manufacturing, financial and service sectors. Results are continuously being published on the Internet and can be accessed or ordered via the Europa server or directly at the *e-Business W@tch* website (www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm or www.ebusiness-watch.org).

This document is the first Sector Impact Study on the Manufacture of Electrical Machinery and Electronics published in the 2003/04 period. It presents the results of the e-Business Survey 2003 (for more information about the survey, see annex on methodology). The second study on this sector (to be published in August 2004) will analyse in more depth specific issues which are most relevant for this sector, feature case studies and draw conclusions about business implications of the empirical findings presented in this report.

Disclaimer

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Table of Contents

Index of tables and charts

Introduction to the *e-Business W@tch*

The *e-Business W@tch* – observatory and intermediary since late 2001

The *e-Business W@tch* monitors the adoption, development and impact of electronic business practices in different sectors of the European economy. The eEurope 2002 Action plan provided the basis for targeted actions to stimulate the use of the internet for accelerating e-commerce, acknowledging that "electronic commerce is already developing dynamically in inter-business trading […]" and that "it is important for SMEs not to be left behind in this process […]." The eEurope 2005 Action Plan, endorsed by the Seville European Council in June 2002, confirmed and built further upon these objectives with Action 3.1.2. "A dynamic e-business environment", which defined the goal "to promote take-up of e-business with the aim of increasing the competitiveness of European enterprises and raising productivity and growth through investment in information and communication technologies, human resources (notably e-skills) and new business models".

It is against this background that the European Commission, Enterprise Directorate General, launched the *e-Business W@tch* in late 2001, with the objective to provide sectoral analysis based on sound empirical research, including annual enterprise surveys in all countries of the enlarged European Union. Special emphasis is placed on the implications for SMEs.

Since its launching, the *e-Business W@tch* has published e-Business Sector Studies on 17 sectors of the European economy, two comprehensive synthesis reports about the status of electronic business in the European Union, statistical pocketbooks and further resources (newsletters, presentations, special issue reports). These are all available on the website at www.ebusiness-watch.org.

The quantitative analysis about the diffusion of ICT and e-business is based to a large extent on annual, representative surveys among decision makers of European enterprises. The 2002 survey included 9,264 enterprises from the 15 EU Member States. In 2003, the regional scope of the survey was extended to the EEA and Acceding Countries, with about 10,500 companies in total.

Survey results confirm the initial assumption and rationale of the *e-Business W@tch* that the sector in which a firm operates and the size of a company are main determinants of its e-business activity, rather than the location of a company. The large demand for the various publications and statistics provided by the *e-Business W@tch*, and their exploitation by other research institutions (for example, in the EITO Yearbook 2003 and in the OECD Information Technology Outlook 2004), documents that there has clearly been a demand for sectoral e-business analysis.

Facilitated by positive responses and the growing interest in its analysis, the *e-Business W@tch* is increasingly developing from an observatory into a think-tank and intermediary, stimulating the debate about the economic and policy implications of e-business among stakeholders at an international level.

The wide-angle perspective: the *e-Business W@tch* provides the "big picture" as a basis for further research

The mission of the *e-Business W@tch* is to present a "wide-angle" perspective on e-business developments and practices in the sectors covered. This has important implications regarding the level of detail in which various issues can be explored, both in terms of the quantitative picture (survey) and in terms of the qualitative assessment and background research.

Over the past 10 years, "electronic business" has increased from a very specific to a very broad topic to be studied. The OECD defines e-business in 2004 concisely as "automated business processes (both intra-and inter-firm) over computer mediated networks". This definition is useful as it makes clear that e-business is more than e-commerce (which focuses on commercial transactions between companies and their customers, be it consumers or other companies) and that e-business includes internal processes within the company as well as processes between companies. Furthermore, the OECD definition implicitly indicates that the focus and main objective of electronic business is to be found in business process automation and integration and the impacts thereof.

This implies that the potential scope for e-business analyses has also broadened. The measurement of e-commerce transactions (the volume of goods and services traded online) can and should be complemented by studies analysing the degree to which business processes, including intra-firm processes, are electronically linked to each other and have become digitally integrated.

In such a context, it becomes practically impossible to cover in depth all areas and facets of e-business in one study. The scope of such a study needs to be carefully defined and – as in photography – it must decided whether to "zoom in" or to use a "wide-angle" perspective. 'Zoom-in' studies investigate one specific aspect of electronic business in much detail. 'Wide-angle' studies adopt a broader perspective and investigate more issues at the same time, which necessarily puts limits to the level of detail in which each single issue can be explored. This must be considered when using this series of Sector Studies prepared by the *e-Business W@tch*. The second series of these Sector Studies (to be published in August 2004) will investigate and analyse specific issues in more detail also taking into account feedback from a number of case studies.

The role of economic analysis in the Sector Reports

The first chapter of each *e-Business W@tch* Sector Study provides background information on the respective sector. This overview includes the definition of the sector (on the basis of NACE Rev. 1 classification), some basic industry statistics, as well as information about the latest trends and challenges concerning the specific sector.

It appears that this practice, combined with the growing interest in the *e-Business W@tch* analysis, has caused some confusion: Some readers mistakenly consider that an *e-Business W@tch* "sector report" is a piece of economic research on the sector itself, and not a report focussing on the use of e-business in that particular sector. It is, therefore, necessary to underline that, while some background information is provided in order to better understand the context and the economic impact of e-business, the *e-Business W@tch* reports are neither intended nor could substitute more detailed and specific industrial analysis and statistics on each particular industry.

The same applies to the industry statistics presented in this first, introductory chapter of the *e-Business W@tch* reports. These data are mainly derived from official statistics prepared by Eurostat. However, in order to close the many gaps in the official statistics, DIW Berlin imputed missing data based on extrapolations and their own calculations. The *e-Business W@tch* cannot go beyond the presentation of this consistent set of statistics in the context of its principal assignment.

The mission of the *e-Business W@tch* is to monitor, analyse and compare the development of e-business in different sectors of the European economy – not the sectors themselves. Its objective is to provide reliable results, based on commonly accepted methodologies, which are not readily available from other sources and would trigger the interest of policy-makers, researchers, and other e-business stakeholders for more in depth analyses (or statistical surveys). The *e-Business W@tch* has adopted a 'wide-angle' perspective in its approach and the necessary trade-offs are transparently depicted in all its deliverables.

The definition of sectors and the adequate level of aggregation

Economic sectors constitute the main level of analysis for the *e-Business W@tch*. In 2003/04, the sample consists of ten sectors. Their configuration and definition are based on the NACE Rev. 1 classification of business activities. The aggregation of various NACE divisions and groups into a "sector" was guided by the aim to produce results which are relevant for the dynamics of the economy as a whole as well as with the intention of covering the most important features of e-business provision and adoption in Europe. The configuration of sectors partly followed aggregations that are also used in the "Panorama of European Businesses" published by Eurostat.

In the context of its 'wide-angle' perspective, the *e-Business W@tch* analysis is covering a large part of the European economy rather than focusing on very specific (sub-)sectors. Therefore, the statistics presented in these reports need to be carefully treated when making comparisons between countries and, occasionally, companies' size-classes. Against the previously described background, some generalisation and approximation has to be accepted, while the definition of sectors could be revisited during the implementation of the *e-Business W@tch*.

The 10 sectors analysed in 2003/04

The 10 sectors which are being monitored and studied in 2003/04 include eight sectors that were already covered in 2002/03 (thus allowing the continuous monitoring of changes and progress), as well as two new ones (namely the textile, clothing and footwear industries and the craft and trade sector). The regional coverage has been extended to the EEA (European Economic Area) and the Acceding Countries.

Exhibit: Sectors covered by the e-Business W@tch in 2003/04

Textile, clothing and footwear industries	The textile and footwear industries account for about 5% of total value added in manufacturing in the EU-15 and about 9% of employment. SMEs and co-operative SME networks are playing a vital role.
The chemical industries	ICT and the Internet in particular have fuelled the globalisation of markets for chemical products. E-business may have considerable future impact on this sector which accounts for ~15% of the production value of EU manufacturing.
The electrical machinery and electronics industries	The electronics industry is very suitable for e-business because of the high degree of standardisation of products, globalisation of production, and specialisation of firms along the value chain. Its dynamic development calls for continuous monitoring.
The manufacture of transport equipment	The transport equipment industries are precursors for economic development in Europe. Large companies are forerunners in using e-business, with considerable implications for all stakeholders in the value chain.
Craft & trade	The craft sector, which includes firms with less than 50 employees from a number of business activities, is vast, in terms of number of enterprises, employment and value added. E-business may become crucial in order for many craft firms to stay competitive with industrial production.
Retail	The retail sector represents a cornerstone of economic activity within Europe, with around 3 million retail enterprises currently in the EU, employing nearly 14 million people. As there is still untapped potential, ICT may eventually have major implications for the retail value chain.
Tourism	Tourism employs about 8 million people and is one of the fastest growing sectors in the European economy. SMEs play a very important role: 99% of firms employ fewer than 250 individuals. In some respects, the tourism sector has always been a forerunner in using ICT. E-commerce is exerting a huge impact on the sector, challenging intermediaries.
ICT services	The ICT services sector in many respects is the leading sector, and thus acts as a kind of benchmark with respect to e-business application. E-business can change the nature of ICT services, which has important implications for other sectors which use them.
Business services	Business services are a huge sector, involving more than two million enterprises – 99% of which are SMEs – and employing close to 13 million people. ICT and e-business have significant implications for those areas of the business services sector that are based on information and knowledge.
Health and social work	As national health systems suffer from increasing costs and political pressures to constrain these, it is hoped that strategies for the development of an e-health and e-business infrastructure will become key drivers of change.

Rationale for the selection of sectors to be monitored in 2003/04

The selection of the ten sectors to be monitored in 2003/04 was guided by the aim of producing results relevant to tracking the dynamics of the economy as a whole as well as with the intention of covering the most important features of e-business provision and adoption in Europe. There are, however, additional factors that have been taken into consideration for the selection process. An important aspect to be considered is that any sector which is not going to be covered during the 2003/04 period is a candidate for analysis in 2004 onwards, provided that the *e-Business W@tch* contract will be renewed.

Primary selection criteria

(a) The economic importance of the sectors for the EU economy: For the representation of e-business impacts in the economy as a whole, "large" sectors play a major role, since changes in their production models, their purchasing and marketing behaviour as well as their productivity and dynamics of growth have a very major effect on the performance of the entire economy. The assessment of the economic importance was mainly based on two standard economic indicators: the sector's share of employment and the amount of value-added by the sector.

(b) The relative importance of electronic business within the sector: As the *e-Business W@tch* has demonstrated in the first phase (2002/03), the intensity and nature of ICT and e-business usage differs considerably between sectors. Some sectors, although still small in absolute terms, are growing rapidly and/or illustrate the role which ICT and electronic business may play in other sectors in the future. The statistical proxy for the relative importance of e-business in a sector is the Pilot Index which was computed for 15 sectors (cf. European E-Business Report 2003), based on the eEurope 2005 E-Business Index.

Secondary selection criteria

In addition to these two fundamental criteria, some other selection criteria were applied in cases where the economic and e-business relevance appeared to be equal or similar. These criteria were:

- Balance of business activities: There should be a balanced mix of manufacturing and service sectors. Sectors could include a public service sector for comparison.
- The SME dimension continues to be very important. Sectors with a higher share of SMEs could therefore given priority over sectors where large companies dominate.
- Policy relevance: The selection needs to consider the policy relevance from the perspective of DG ENTR, that is for which sectors the DG has responsibility.
- Roll-out strategy: Some new sectors (not covered in 2002/03) should be included in order to broaden the monitoring scope of the *e-Business W@tch*. Among sectors with a comparable economic size, new sectors (not yet covered) may be given priority.

In order to come to an initial ranking of economic importance, the *e-Business W@tch* has computed a simple Index using two component indicators: the number of persons employed, and value added. The Index reflects the contribution of the sector to the total of all sectors compared.

The next step in the selection process was an attempt to make a joint consideration of the sector's contribution to employment and value added together with the relative importance of ICT and e-business in the sector. For this purpose, the *e-Business W@tch* has computed an Index that combines the two components. In such a ranking, Business Services comes out on top, followed by Health, Retail, the Financial Services sector and ICT Services.

Based on this statistical evidence and the considerations presented above, the *e-Business W@tch* proposed a role-out plan and a configuration of 10 sectors for the period 2003/04 that provide good coverage of relevant business activities, issues and countries, as well as being manageable in the organisation designed for the *e-Business W@tch* and the resources available.

The Electrical Machinery and Electronics Sector: The use of ICT and e-business in 2003/04 [1]

1 Economic profile

1.1 Definition

The report analyses activities within the following NACE Rev. 1 classifications: manufacture of office machinery and computers (DL 30); manufacture of electrical machinery and apparatus (DL 31); and manufacture of radio, television and communication equipment and apparatus (NACE Rev.1 92.2).

Exhibit 1-1: Configuration of the electrical machinery and electronics industries (NACE Rev. 1)

NACE Rev. 1		Activity
Division	Group	
30		Manufacture of office machinery and computers
	30.1	Manufacture of office machinery
	30.2	Manufacture of computers and other information processing equipment
31		Manufacture of electrical machinery and apparatus
	31.1	Manufacture of electric motors, generators and transformers
	31.2	Manufacture of electricity distribution and control apparatus
32		Manufacture of radio, television and communication equipment and apparatus
	32.1	Manufacture of electronic valves, tubes and other electronic components
	32.2	Manufacture of television and radio transmitters and apparatus for line telephony
	32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods

For the purpose of this study, NACE 31 is referred to as the “electrical engineering” or the “electrical machinery” industry. The remaining sectors (NACE 30 and 32) can, to a large extent, be classified as the ICT-producing industry, loosely known as the “electronics sector”. It is thus possible to distinguish two groups of industries within this aggregated sector:

- The electronics sub-sectors (NACE 30 and NACE 32) that form a cluster of closely interrelated firms within the electronics industries. In particular, a major part of the products of NACE 32.1 are microelectronics (including semiconductors, passive components and electromechanical devices), which are inputs for the manufacture of products related to NACE Groups 32.2 and 32.3 and NACE Division 30. In particular, microelectronics are inputs to the manufacture of computers and other information processing equipment, as well as for many consumer electronics products which are part of NACE 32.2 and 32.3.
- The electrical machinery and apparatus industries (NACE Division 31) evolve in a rather distinct value chain and operate in markets with different profiles, even though an increasing number of final products include both electrical and electronic components. The electrical machinery and apparatus industry provides its products to three distinct markets (building industry, manufacture industries and energy production industry).

[1] This report was prepared before 1st May 2004. Hence, if not stated otherwise, the term "EU-15" refers to the 15 Member States until 30th April 2004, while the term "Acceding Countries" is used for the 10 new Member States which joined the European Union on 1st May 2004.

1.2 Economic profile

This section gives an overview of the size and structure of the Electrical Machinery and Electronics industries, using key economic indicators from the New Cronos database of Eurostat. New Cronos is structured in nine parts ("themes"). Most of the data used in this chapter are derived from theme 4 "Industry, trade, and services", and here from the collection sbs (structural business statistics). The chapter updates the respective section in the previous Sector Impact Studies on e-business in the electrical machinery and electronics industries by the *e-Business W@tch* from 2002/03.

Statistics presented in this chapter were prepared by DIW Berlin, which obtained the most recent data available from Eurostat in November 2003. Gaps in the official statistics resulting from missing data for individual countries or the respective year in the time-series of a country were computed based on economic calculations and estimates by DIW. The most recent official statistics for industry-wide macro-economic indicators are those for 2001 at best. For the new EU Member States, the most recent national accounts usually date back to 2000.

The figures in the following exhibits of the chapter do not include the calculation of purchasing power parities between countries. Consequently, minor differences in terms of production value, value added, added value per person employed between countries are not necessarily significant and should be analysed cautiously.

1.2.1 Industry structure

From an industrial structure point of view, the industry mainly gathers small companies employing less than 10 people. These small companies represent 76% of the total number of companies (73,749) of the sector.

The electrical machinery and electronics industry in the EU is characterised by a high degree of concentration. Large companies, while accounting for only 2% of all companies in the sector, contribute 66% to the sector's employment. The traditional electrical machinery sub-sector (NACE 31) is still the largest of the three divisions included in this report. Meanwhile, industry concentration is particularly pronounced in the electronics industries (corresponding to NACE 30 and 32), where rapid technological progress and the production of standardised high volume electronic products enhanced economies of scale and hence the concentration process.

Exhibit 1-2: Structure of the electrical machinery and electronics industries in the EU

		Enterprises with … people employed			
	Total (EU-15)	**1-9**	**10-49**	**50-249**	**250+**
NACE	**Number of enterprises**	Structure in % of total			
30	6,467	80.0	13.2	4.7	2.1
31	45,981	70.9	21.3	5.9	1.9
32	21,301	77.9	14.7	5.2	2.2
	Number of people employed	Structure in % of total			
30	2,060	6.1	9.1	16.0	68.8
31	13,941	7.1	14.6	21.0	57.3
32	8,346	4.6	8.1	14.6	72.7

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

As for the sub-sector electrical machinery and apparatus, a few major European players are leaders in most of the segments of the EU market. They capitalise on their advantages of having an international presence and, above all, on their many locations in Europe. European leaders comprise companies such as Siemens, ABB, Schneider Electric and Legrand, which compete mainly with the American worldwide leader General Electric.

By contrast, European manufacturers are less present in the office machinery and computers sub-sector, where mostly American companies dominate (IBM, HP-Compaq, Dell, Xerox).

The rest of European electronics industry (i.e. NACE 32) remains very competitive. The overall market situation in the various sub-sectors can be summarised as follows:

- In the manufacture of electronic components (32.1) sub-sector, the semiconductor industry (chips and microprocessors) is dominated by American players (Intel, Texas Instruments, Motorola) and Asian companies (Samsung Electronics, Renesas, Toshiba, NEC), even if European players (ST Microelectronics, Infineon, Philips semiconductors) are also to be found among the worldwide top 10.
- Europe keeps a strong position in the consumer electronics industries (NACE 32.2 and 32.3), where Philips and Thomson essentially compete with Japanese worldwide leaders (Sony, Matsushita/Panasonic, Sharp, Toshiba).
- The European telecommunications systems sector is also very competitive, with its global players Nokia, Alcatel, Siemens, Bosch and Ericsson contending on a worldwide scale with Motorola, Sony and Samsung.

The following exhibit presents the top 10 of the European companies focused on the electronics industry (NACE 30 and 32).

Exhibit 1-3: Top 10 European companies in the electronics industry

Rank	Company	Country	Electronics revenues*, 2002 (in millions of Euro)
1	Siemens	Germany	35,623
2	Nokia	Finland	30,016
3	Philips Electronics	Netherlands	23,356
4	Alcatel	France	16,547
5	Ericsson	Sweden	15,914
6	Bosch	Germany	13,999
7	Thales	France	11,105
8	Thomson multimedia	France	10,187
9	STMicroelectronics	France/Italy	6,678
10	Infineon	Germany	5,207

* The Electronics revenues refer to revenues of these companies with restriction to products of NACE 30 and NACE 32, and also a limited part of NACE 33 (medical, measure and control electronics).

Source: Reed Electronics Research

1.2.2 Production value and regional distribution

In NACE 30, three of the four biggest markets in terms of production value and value added are located in the three largest populated countries of the EU 15 (DE, UK and FR), with the notable exception of Italy which is less present in the overall electronics industry (NACE 30 and 32). Ireland shows a high production value of office machinery and computers, mainly due to outsourcing from US companies, but a lower value added from production.

Exhibit 1-4: Production value and value added in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of office machinery and computers

NACE 30	Production value		Value added	
Country	**Euro (million)**	**% of EU-15**	**Euro (million)**	**% of EU-15**
BE	184.9	0.2	47.4	0.3
DK	302.8	0.4	118.6	0.8
DE	14,907.3	18.5	3,234.7	21.6
ES	3,197.0	4.0	703.4	4.7
FR	13,805.3	17.2	3,148.8	21.1
IE	19,153.7	23.8	2,582.5	17.3
IT	4,228.3	5.3	1,121.7	7.5
NL	2,043.9	2.5	479.1	3.2
AT	611.1	0.8	86.2	0.6
PT	50.6	0.1	11.1	0.1
FI	93.5	0.1	21.0	0.1
SE	759.5	0.9	207.4	1.4
UK	21,133.7	26.3	3,180.9	21.3
Other*	1.7	0.0	0.2	0.0
EU-15	**80,473.3**	**100.0**	**14,943.0**	**100.0**
LV	15.7	0.0	2.2	0.0
MT	3.9	0.0	0.4	0.0
PL	265.6	0.3	101.5	0.6
SI	86.4	0.1	19.9	0.1
SK	32.2	0.0	9.2	0.1

* Greece and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

Exhibit 1-5 provides a country breakdown of production value and value added for the electrical machinery industry (NACE 31). Germany holds by far the largest share in production value in these sectors in Europe followed by Italy, France and the UK. A country is said to have “specialised” in an industry sector if the share of this sector in total manufacturing is clearly above the average share of all manufacturing sectors across a number of countries. By this measure, Germany has specialised in NACE 31, whereas this industry plays only a minor role in many other countries such as Greece, Luxembourg or Portugal. The value added shares of the industry are particularly high in Germany compared to the other European economies, which points to a higher degree of vertical integration of German enterprises in the electrical machinery sector than on average.

In fact, the largest European producing countries of the electrical machinery and electronics industries are located in the four largest economies of the EU (DE, IT, FR, UK). The electrical machinery and apparatus sector (NACE 31) is characterised firstly by the fact that company activities are mainly based on their domestic market due to national product standardisation, and secondly by the presence of a large number of national SMEs. This also applies to the situation in the Acceding Countries, albeit to a lesser extent.

Exhibit 1-5: Production value and value added in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of electrical machinery and apparatus

NACE 31	Production value		Value added	
Country	Euro (million)	% of EU-15	Euro (million)	% of EU-15
BE	4,523.8	2.2	1,515.9	2.3
DK	3,713.5	1.8	984.8	1.5
DE	84,255.1	40.7	28,259.6	42.0
ES	13,342.1	6.4	3,937.5	5.9
FR	27,988.8	13.5	8,697.4	12.9
IE	2,480.1	1.2	1,021.4	1.5
IT	29,045.0	14.0	8,122.8	12.1
NL	3,805.5	1.8	1,168.2	1.7
AT	4,365.2	2.1	1,634.1	2.4
PT	2,173.8	1.0	605.0	0.9
FI	3,141.8	1.5	972.4	1.4
SE	5,454.2	2.6	1,474.5	2.2
UK	22,296.5	10.8	8,636.7	12.8
Other*	680.9	0.3	186.9	0.3
EU-15	**207,266.4**	**100.0**	**67,217.2**	**100.0**
CY	33.1	0.0	13.5	0.0
CZ	3,028.0	1.5	867.3	1.2
EE	68.8	0.0	23.2	0.0
HU	4,659.7	2.3	923.4	1.3
LV	60.2	0.0	21.0	0.0
MT	100.8	0.0	41.2	0.1
PL	3,639.0	1.8	1,188.3	1.6
SI	692.6	0.3	200.6	0.3
SK	722.0	0.4	152.0	0.2

* Greece and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

Regarding the manufacture of radio, TV and communication equipment and apparatus (NACE 32), the UK, France and Germany account for the largest shares of the European production value. France in particular has a long-standing, strong position in this sub-sector within the EU, with clusters of firms that are covering the whole range of electronics products (of NACE 32). These clusters are organised around market leaders, with respect to communication equipment (Alcatel, Sagem) as well as for consumer electronics (Thomson Multimedia) and for electronic components (ST Microlectronics). Germany is the second most important European producer, also with major players such as Siemens, Bosch and Infineon.

Most of the Acceding Countries are still far behind EU-15 countries in terms of production value and value added (at constant prices), although some of them are already well positioned. In Hungary and Poland, the industry has seen a promising and rapid development and plays an important role both in a national and international context.

During the past decade, electronics manufacturing companies such as Philips have relocated some production sites to Eastern European countries, even if there is a current trend to relocate the same sites to Asia. Labour-intensive volume manufacturing is being shifted to Contract Equipment Manufacturers (CEMs) in Asia, while Europe and the US retain the high-end, knowledge-intensive stages of the value chain, such as product development and R&D.

Exhibit 1-6: Production value and value added in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of radio, television and communication equipment and apparatus

NACE 32	Production value		Value added	
Country	**Euro (million)**	**% of EU-15**	**Euro (million)**	**% of EU-15**
BE	5,084.6	2.8	1,234.2	2.9
DK	1,636.4	0.9	407.7	0.9
DE	31,456.9	17.4	8,013.8	18.7
ES	6,009.3	3.3	1,595.3	3.7
FR	37,199.0	20.5	8,113.0	18.9
IE	5,136.1	2.8	2,002.8	4.7
IT	15,987.8	8.8	4,988.1	11.6
AT	6,589.4	3.6	2,329.5	5.4
PT	3,019.5	1.7	601.2	1.4
FI	17,668.1	9.8	6,708.2	15.6
SE	15,552.5	8.6	-185.8	-0.4
UK	26,171.0	14.5	4,906.5	11.4
Other*	9,544.0	5.3	2,236.5	5.2
EU-15	**181,054.5**	**100.0**	**42,951.0**	**100.0**
CY	0.2	0.0	0.1	0.0
CZ	1,184.3	0.6	312.5	0.5
EE	77.7	0.0	35.9	0.1
HU	3,208.6	1.5	497.4	0.8
MT	1,761.3	0.8	297.2	0.5
PL	2,406.4	1.1	417.5	0.7
SI	395.6	0.2	107.4	0.2
SK	265.0	0.1	54.1	0.1

* Greece, Netherlands and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

1.2.3 Employment, productivity and labour costs

The electrical machinery and electronics industries (NACE 30-32) provide jobs for about 2.4 million people in the EU-15. The sector with the highest absolute employment figure is the traditional electrical machinery industry with approximately 1.4 million employees. Within NACE 31, the majority of jobs are located in Germany, which accounts for more than one in three jobs in these industries in Europe.

Exhibits 1-7 to 1-9 demonstrate the low cost of labour in the Acceding Countries compared to the EU-15. Labour costs are only about one quarter to one third (on average) of those in the EU-15 according to Eurostat statistics. These harmonised official statistics date back 2-3 years, and the gap may have narrowed in the meantime. However, the difference is still considerable by all measures.

Exhibit 1-7: Employment, productivity and labour costs in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of office machinery and computers

NACE 30	Employment		Productivity		Labour Costs	
Country	People employed	In % of manu-facturing total	Value added per person employed	In % of manu-facturing total	per employee (1000 Euro)	In % of manu-facturing total
BE	882	0.1	53,741	82.3	44,213	102.3
DK	1,644	0.3	72,141	144.0	44,486	125.1
DE	46,311	0.6	69,847	127.6	54,302	128.4
ES	9,363	0.4	75,125	191.6	48,022	186.0
FR	38,109	0.9	82,626	162.3	68,469	182.1
IE	20,470	8.0	126,159	96.0	30,595	99.2
IT	16,659	0.3	67,333	160.4	33,258	114.9
NL	8,687	1.0	55,151	89.3	41,931	109.2
AT	1,008	0.2	85,516	150.1	33,635	85.9
PT	342	0.0	32,456	165.0	19,394	153.9
FI	485	0.1	43,299	60.7	34,864	92.2
SE	4,380	0.5	47,352	90.7	43,952	111.1
UK	47,839	1.2	66,492	112.9	53,220	141.8
Other*	126	0.0	1,589	3.7	10,332	43.6
EU-15	**196,305**	**0.7**	**76,121**	**148.6**	**51,328**	**143.8**
CZ	3,722	0.3	8,329	85.7	na	na
HU	11,225	1.5	20,811	168.4	6,067	105.7
MT	41	0.1	9,756	33.2	14,286	101.5
PL	na	na	na	na	10,928	158.3
SI	na	na	na	na	14,936	126.9
SK	1,519	0.4	6,122	82.3	5,026	106.0

* Greece and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

As for activities of NACE 30, Ireland shows by far the highest employment rate in % of manufacturing total (8%). Furthermore, Ireland has the highest value added per person employed resulting from low labour costs. Other countries, such as the United Kingdom, the Netherlands and France also have a high employment level.

Among the 10 new Member States of May 2004, the manufacture of office machinery and computers appears to be particularly important and productive in Hungary where it accounts for 1.5% of total manufacturing employment and shows a statistically much higher productivity than the manufacturing average (168% in % of manufacturing total).

Compared to other sub-sectors, the manufacture of office machinery and computers shows the highest rates of productivity and labour costs in % of manufacturing total (149% of manufacturing total). Double-digit annual average growth rates in labour productivity are not unusual in producing sectors such as office machinery and computers.

Exhibit 1-8: Employment, productivity and labour costs in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of electrical machinery and apparatus

NACE 31	Employment		Productivity		Labour Costs	
Country	People employed	In % of manu-facturing total	Value added per person employed	In % of manu-facturing total	per employee (1000 Euro)	In % of manu-facturing total
BE	25,348	3.8	59,804	91.6	46,364	107.3
DK	22,590	4.7	43,593	87.0	35,836	100.8
DE	529,806	7.0	53,340	97.5	47,430	112.1
ES	95,017	3.6	41,440	105.7	28,877	111.9
FR	171,257	4.2	50,786	99.8	38,975	103.7
IE	15,159	6.0	67,379	51.3	27,584	89.4
IT	209,854	4.3	38,707	92.2	29,418	101.7
NL	22,655	2.5	51,564	83.5	38,483	100.2
AT	28,794	4.6	56,751	99.6	40,795	104.2
PT	34,130	3.8	17,726	90.1	14,702	116.7
FI	17,151	3.9	56,696	79.5	37,604	99.5
SE	43,466	5.4	33,923	65.0	35,260	89.1
UK	165,244	4.3	52,266	88.7	38,443	102.4
Other*	5,227	2.0	35,765	82.6	22,479	95.0
EU-15	**1,385,697**	**4.9**	**48,508**	**94.7**	**39,404**	**110.4**
CY	564	1.5	23,936	89.4	14,312	92.8
CZ	104,525	7.6	8,298	85.4	na	na
EE	2,642	2.2	8,781	122.8	5,858	128.1
HU	73,743	9.8	12,522	101.3	6,330	110.2
LV	2,975	1.9	7,059	101.4	4,104	114.9
MT	1,156	3.7	35,640	121.4	15,263	108.4
PL	na	na	na	na	7,477	108.3
SI	na	na	na	na	12,514	106.4
SK	28,877	7.0	5,264	70.8	4,366	92.1

* Greece and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

Manufacture of electrical machinery and apparatus requires more manpower than other sub-sectors of the electronics and electrical machinery industries, employing 4.9% of the total manufacturing labour. Germany, Ireland and Sweden are the biggest employers in EU-15 (in % of total manufacturing). Germany is by far the leader in terms of people employed within the industries of NACE 31 (7% of total manufacturing). The German electrical industry includes a high number of electrical equipment manufacturers and industry leaders such as Siemens. The other major countries (Italy, France and UK) are well behind, despite the fact that these industries represent more than 4% of total manufacturing for these countries.

Regarding the Acceding Countries, some of the Eastern European countries (Hungary, Czech Republic and Slovakia) show higher employment rates on average.

Furthermore, the productivity of this sub-sector in the EU-15 (94.7% of manufacturing total) is lower than manufacturing productivity in the two other sub-sectors (148.6% for NACE 30 and 103.7% for NACE 32).

Exhibit 1-9: Employment, productivity and labour costs in the electrical machinery and electronics industries in European countries – sub-sector Manufacture of radio, television and communication equipment and apparatus

NACE 32	Employment		Productivity		Labour Costs	
Country	People employed	In % of manu-facturing total	Value added per person employed	In % of manu-facturing total	per employee (1000 Euro)	In % of manu-facturing total
BE	18,469	2.7	66,828	102.4	56,127	129.9
DK	13,980	2.9	29,161	58.2	31,451	88.4
DE	159,656	2.1	50,194	91.7	50,889	120.3
ES	33,493	1.3	47,631	121.5	38,208	148.0
FR	166,952	4.1	48,595	95.5	47,833	127.2
IE	14,549	5.7	137,655	104.8	35,063	113.7
IT	102,806	2.1	48,520	115.6	35,181	121.6
AT	29,525	4.7	78,899	138.5	56,804	145.1
PT	16,681	1.8	36,041	183.2	23,240	184.5
FI	38,489	8.8	174,289	244.5	42,492	112.4
SE	52,900	6.6	na	na	46,395	117.3
UK	116,757	3.0	42,023	71.3	52,553	140.0
Other*	44,767	3.8	49,959	86.6	41,291	117.9
EU-15	**809,023**	**2.9**	**53,090**	**103.7**	**46,050**	**129.0**
CY	7	0.0	14,286	53.4	20,000	129.7
CZ	30,755	2.2	10,161	104.6		
EE	5,649	4.7	6,355	88.8	4,624	101.1
HU	39,677	5.2	12,536	101.4	6,361	110.8
MT	2,958	9.3	100,473	342.3	17,735	126.0
PL	na	na	na	na	9,105	131.9
SI	na	na	na	na	13,353	113.5
SK	11,146	2.7	4,854	65.3	4,545	95.8

* Greece, Netherlands and Luxembourg

Source: Eurostat New Cronos 2003, estimates and calculation by DIW Berlin (2003)

The manufacture of radio, television and communication equipment apparatus (NACE 32) is especially developed in Finland, Sweden, Ireland and Hungary, with high relative employment rates of 5-9% of total employment in manufacturing. This sector is particularly productive in Finland with a productivity of 245% of the manufacturing average).

Productivity, measured as value added per employee, shows significant variances throughout Europe. The discrepancies of productivity measures for NACE 32 across the EU-15 are even larger than for NACE 30 and 31, ranging from 29,161 Euro value added per person employed in Denmark to 174,289 Euro in Finland. Ireland has the second highest value added (137,655 Euro) per person employed, resulting from low labour costs.

A major point which is not directly shown by the figures of Exhibit 1-9 is that variances to the average productivity (104% of manufacturing total) differ according to the specific products of the sub-sector NACE 32. The productivity is especially high for products of sub-sectors needing highly complex operating processes, heavy transactions loads or technically sophisticated products. In the semiconductor industry for instance, the rapid increase in the complexity of chips designs required ever-stricter process controls and diagnostics. That spurred the development of sophisticated new information systems for managing chip fabrication, boosting productivity throughout the semiconductor industry.

1.3 Trends and challenges

The sub-sectors covered in this report exhibit different dynamics, value chains, and market players. Electrical engineering (NACE 31.1 and 31.2) is the more traditional sector. This segment is dominated by companies and products which have been in the market for long periods of time.

The electronics industries (NACE 30 and 32), in contrast, belong to the very dynamic and volatile high-tech market. The electronics sector has been the fastest growing business sector in many European countries during the 1990s, contributing considerably to productivity and economic growth.

However, the last two years confronted the industry with a recessive demand scenario in Western Europe, with a fall of Western European electronics component and equipment markets of about 13% in 2002 and 2% in 2003[2]. To improve its situation and emerge from the crisis, the industry is trying to increase investment in research and development, which is a key competitive advantage in the sector. In particular, the primary competency of fab-less[3] companies is R&D: some fab-less companies spend 20% of their revenue on R&D.

The R&D issue is addressed by several European programmes. The most important ones for this sector are the European RTD Framework Programmes, and here the IST (Information Society Technologies) Programme in particular, as well as the EUREKA cluster programmes (such as the JESSI/ MEDEA[4] programme). The major objective of these programmes is to support European industries in facing the strong competition with the Japanese and the US ICT manufacturing industries. One of the main drivers of this competition remains the efficiency of standardisation processes which enable compatibility and thus penetration of European standards and products. Fostering targeted R&D activities is a most important objective and challenge for EU countries, including the new Member States of May 2004. The major impact expected from R&D activities in the electronics industry is to reduce the time to market and to increase the diversity of commercial applications.

The electrical machinery sub-sector (NACE 31) and the electronics sector (NACE 30 and 32) exhibit significant differences in their production schemes and their degree of vertical integration. In electrical engineering, Original Equipment Manufacturers (OEM) are often highly vertically integrated, keeping large parts of the entire production and value-creation process in-house. In contrast, the electronics industry is characterised by high specialisation of firms along the value chain. The highly modular set-up of electronic products allows OEMs to outsource production steps and to purchase parts and modules from specialised manufacturers. As a consequence, the value chain in the electronics industry is more complex, involving more players and stages and the industry structure has changed over the last decades. Most companies in these supply chains now concentrate on their core-competences, typically no more than one or two processes. Non-core processes are outsourced to (specialized) partners, and increasingly to the EMS (Electronics Manufacturing Services) industry, to achieve cost reductions, increased asset management efficiency, shorter time to market, to share business risks and to focus on core competences.

The production of electronics has become an entirely global business with all its concomitants: international mergers and acquisitions, global price competition, and the formation of regional production clusters that specialise in one particular production activity (for instance, hard-disks in Singapore or LCD screens in Taiwan). Throughout the entire electronics value chain, some trends are omnipresent: labour-intensive, volume manufacturing has been shifted to Contract Equipment

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[2] Source Yearbook of Electronics Data 2004, West Europe, Reed Electronics Research, December 2003; estimation as for 2003.

[3] Companies that do not fabricate their own products and outsource the manufacture and assembly to a foundry. Their focus is on component or product design.

[4] Micro-Electronics Developments for European Applications

Manufacturers (CEMs) in Asia, while Europe and the US retain the high-end, knowledge-intensive stages of the value chain, such as product development and R&D.

Many electronic companies have outsourced elements of their manufacturing to CEMs in order to cut costs. These manufacturers are an extension of the electronics manufacturer supply chains. Companies are looking for economies of scale and sharing R&D efforts across product lines. This enables electronics companies to focus on its core competencies, and allows the contractor to keep up with engineering challenges and maintain skilled workforce. For example, IBM has outsourced parts of its manufacturing activities to Selectron and Sanmina-SCI. IBM was able to cut costs by having fewer employees and reducing manufacturing space.

On the other hand, the manufacture of less standardised, know-how intensive products of the electrical engineering sector (such as engineering intensive motors, generators) remains largely within the EU. If relocation of the production takes place, it is mainly to lower-wage countries in Europe. Another reason is that the markets for some electrical engineering products, such as high-voltage generators, are strongly regulated for safety reasons, which makes outsourcing more difficult because of the necessary control and supervisory work. Germany traditionally dominates many electrical engineering sub-sectors. Most OEMs in this segment are big European players such as ABB, Siemens and Schneider Electric, or US American enterprises such as General Electrics.

Recent trends

Intense competition, rapidly declining prices, unpredictable customer demand, and constrained material supplies are facts of life in the global electronics supply chain. The pursuit of higher prices and margins leads to a continuous stream of new products, each able to command a premium price for a short period of time before becoming commoditized. This challenging cycle is faced every day by most of the companies operating in virtually every segment of the electronics industry.

Time to market is extremely important to electronics manufacturers. Better management of the engineering and supply chains assure less time for product development and reduced costs.

Issues such as globalisation, low margins, short product lifecycles, short time-to-market, the need for customer-specific products, and last but not least the continuously decreasing prices (of parts, and end products), have been around for decades, but these issues have become more stringent in recent years.

To summarize, the electronics industry is currently facing the following business environment and challenges:

- Concentration in the industry, in particular in the supply chain
- Increasing speed of innovation processes: first-to-market, time-to-market and time-to-volume are critical
- Reduced (and short) product lifecycles (between 0.5 and 1 year)
- Decreasing prices and over-capacities in the chip industry
- High Research and Development (R&D) and marketing costs
- Globalisation of the markets
- In the EMS industry: continuing outsourcing, broader service offering, Asia's growing importance (operations in low-cost locations, less volume production in Western countries), consolidation, polarisation and specialisation
- An overall business climate that remains volatile, especially for the electronics sector, keeping up the pressure on firms to innovate and to become both more flexible and efficient

The industry in the Acceding Countries suffers from a chronic lack of financial resources that slows down the technological development and the modernisation of production means. Abundant foreign investments and large financing by the public sector have facilitated the expansion of the electronics and electrical machinery industry in these countries. Government usually encourages both local initiatives and foreign investment (for example the creation of industrial parks in order to attract foreign companies). International foreign manufacturers, mainly from Europe, have made substantial investments in these countries and dominate the sector. The major part of their industrial output is being exported, mainly to the EU countries.

The Acceding Countries also represent a prominent target for foreign direct investment, due to low-cost qualified labour, export potential and generous incentives. Future prospects for the sector are quite good due to increasing export competitiveness (decreasing comparative disadvantage, better quality of exports) and growth potentials on domestic markets. On the negative side, developments on international markets (information technology, automotive industry) are currently weakening, and import competition on domestic markets is strong. Moreover, in some Acceding Countries such as Hungary, production costs tend to increase, due to a growth of the minimum wage. This trend could induce a decrease in the relocation of companies to these countries.

E-business environment in the New Member States

Most countries in Eastern Europe still have deficits in ICT availability compared to Western Europe. The access to basic telephone lines is still limited in many areas. Fixed networks are still mainly controlled by former state-owned monopolies. Average prices for normal voice telephony and for Internet access are very high, especially when considering purchasing powers in these countries.

On the other hand, mobile telephone networks have been put in place and have rapidly gained popularity. In most countries, there are more than just one big company competing for mobile telephone customers. Established telecommunication providers from Western Europe (e.g. Deutsche Telekom, Vodafone, KPN) have invested in Eastern Europe and now often own large shares of the incumbent providers or have established their own mobile infrastructures. But mobile networks do not yet provide a comfortable and affordable alternative to Internet access via fixed lines. Consequently, both telephone and Internet access rates in Eastern Europe remain below the average levels observable in the EU-15. An exception to this general trend is Estonia, which already has a very advanced ICT infrastructure and has leap-frogged many Western European countries in its development.

Czech Republic

Czechs remain wary of the Internet in general, and e-commerce in particular. Outside of larger companies, computer penetration and Internet access remain low. Less than 20% of Czechs use the Internet regularly, and those who do access the web predominantly through computers at work, according to a study conducted in June 2002 by TNS Interactive. Although Czechs are relatively well educated and computer literate, high access costs, low PC penetration, and low-income levels limit the growth of Internet access and e-commerce applications. Also, the ratio of telephone lines per 100 inhabitants is still comparatively low. The privatisation of the national incumbent, Cesky Telecom (CT), has been delayed. Price deregulation was completed in 2002, with full carrier selection and number portability to be in place in 2005. However, delays in market liberalisation have been numerous, inhibiting the growth of alternative carriers and forcing some smaller service providers out of business. [cf. ebusinessforum, 2003a]

Hungary

Hungary's telephone rates were the highest in the OECD in 2001. The monopoly of the national incumbent, Matav, has been difficult to break. Although Matav's long-distance and international voice call monopoly expired at the end of 2001, local services did not become fully competitive until November 2002. Number portability for the easy switching of customers between operators is only envisaged for 2004. Internet penetration in Hungary was 17.5% in August 2001, according to NetSurvey. The number of regular Internet users is probably much lower. The main obstacles to the growth of Internet use in Hungary are the high cost of access and the relatively low numbers of personal computers for home use [cf. ebusinessforum, 2003a]. This could set boundaries to the Internet literacy of the population and might thus limit e-business development in Hungary.

Poland

Poland's telecommunication infrastructure is still underdeveloped. In the current Network Readiness Index Ranking of the World Economic Forum, Poland was only ranked 47th out of 102 countries, trailing countries such as India and Jordan [World Economic Forum, 2003]. Although infrastructures have improved since 1989, progress has been uneven. The market is still dominated by the former state monopolist, Telekomunikacja Polska (TP SA). The company showed a remarkable reluctance to open its lines to competition for a long time, which has provoked serious controversy and sparked litigation. However, as a result of EU pressures combined with those of the domestic antitrust authority, some progress has recently been made. International telecommunications between business centres and in the largest towns are efficient, but domestic telephone links, particularly in the countryside, remained poor even in the late 1990's. However, this was in part compensated for by the spread of cellular phones. But cellular networks are, as generally known, not yet a complete substitute for Internet access via fixed lines. And, although expanding rapidly, fixed-line penetration is still low by European standards in Poland. Consequently, Internet access is expensive compared with average earnings, and access is often slow and unreliable. In 2001, an estimated 3.5 million people, the equivalent of only 8% of the population, were using the Internet at least once a month [cf. ebusinessforum, 2003a].

Estonia

In contrast to most other Eastern European countries, Estonia has made very rapid progress towards the Information Society. Many Estonians who now rely on wireless phones never had a land-line phone. And most who now use the Internet to pay bills have never used a Western-style chequebook [Wired News, 21. April 2003]. The development of ICT infrastructures and usage took off so rapidly due to the proximity of technologically advanced companies in Sweden and in Finland, and to the openness of Estonians to adopt modern technology,. The Estonian telecommunication market has been fully liberalized since 2000. The government played a very active role in promoting the development and usage of Internet infrastructures. For example, the Estonian Parliament approved a proposal in February 2000 to guarantee Internet access to each of its citizens [cf. ebusinessforum, 2001] and immediately began to take action. The Estonian government kick-started the high-tech drive by setting up 500 public computer centres across the country. The centres are found in cities but also in tiny Baltic Sea islands and converted barns in desolate forests [Wired News, 21 April 2003]. The government also makes very active use of Internet technologies itself, playing the role of an "e-champion" in Estonia. Today, Estonia is the ICT leader amongst Eastern European countries and ranked 25th out of 102 countries (ahead of Italy, Spain, Portugal, and Greece) in the latest ICT study by the World Economic Forum [World Economic Forum, 2003].

2 The use of ICT and e-business in 2003/04

2.1 Introduction

This chapter analyses the use of ICT and e-business in the European electrical machinery and electronics industries. Companies of the electronics and electrical machinery industry cope with a dynamic business environment, and leading electronics companies are driving toward major structural and process changes to reduce cost.

At a strategic level, the electronics industry has evolved dramatically during the last years. Vertically integrated companies have restructured themselves, focusing on core competencies, slashing costs and building networks of suppliers and partners that are also specialized and cost competitive. Cutting-edge products now come together not solely from individual companies but from networks of companies, each contributing a specialized, high-value aspect of the total solution.

In this complex manufacturing environment, with the challenging product introduction cycles of the industry, information and communication technologies (ICT) are an instrumental part of the companies' strategy, and collaboration across the supply chain has become a crucial element in the creation of business value. Moreover, easy access to information on customers, products and trends can be a competitive advantage by offering better customer service, accurate product data and up to date forecasts.

At the structural level, several features of the electronics industry make the sector particularly suitable for e-business:

- Electronics is a truly global business. Product design, production and related marketing activities are frequently carried out in different parts of the world, exploiting comparative advantages of regions.
- Components and products are highly standardised, easy to describe and traded in considerable quantities.
- Value chains are complex and deep. Outsourcing is very common and requires intense co-operation between enterprises, often across cultural and geographical borders.
- Product life cycles are short. Time to market is one of the most important strategic variables in the industry. In addition, technological progress means rapid depreciation of products and components.
- Manufacturers of electronics equipment are naturally IT-savvy and open to experiment with IT-driven management solutions.

A variety of Internet-based tools help the sector communicate efficiently and automate processes, thus saving time and reducing costs. These e-business potentials also exist for the electrical machinery industry, but not to such a large extent. The sector is clearly among the early adopters of e-business, with the electronics industry being even more advanced than the electrical machinery sector. Basic Internet infrastructures are widely implemented and no longer constitute a major barrier to e-business.

Furthermore, the character of its production and distribution processes largely shapes the e-business sector's activities.

The Electrical Machinery and Electronics sector has already been covered by the *e-Business W@tch* survey and analysis in 2002/03. Previous reports can be downloaded from the "publications" section of the website at www.ebusiness-watch.org.

Exhibit 2-1: Previous reports on the electrical machinery and electronics industries in the EU

Titles of reports	Publication date
Impact study No. 10/I: Background, issues and key figures on e-business (full document and summary)	October 2002
Impact study No. 10/II: The statistical picture: facts & figures (full document and summary)	May 2003

Source: www.ebusiness-watch.org

2.2 E-business indicators – the statistical picture

Information presented in this section is predominantly based on the e-Business Surveys of the *e-Business W@tch*. The first survey was conducted in April 2002 and covered more than 9,000 enterprises from 15 sectors and all EU Member States. The 2003 survey was conducted in two waves. In March 2003, about 3,500 enterprises from seven sectors and five countries (France, Germany, Italy, Spain and the UK) were interviewed about their use of ICT and e-business. The second wave of interviews (about 7,000) was conducted in October and November 2003. It added new sectors and extended the regional coverage to the EEA and Acceding Countries.

In the second wave, some new indicators were introduced. Thus, although the main parts of the questionnaires used in the two waves were the same, not all information is available for all sectors or countries, depending on whether the survey of this particular sector in a country took place in the spring or autumn wave of the 2003 survey. The footnotes of the exhibits show the time, base, number of observations and weighting schemes for data reported.

More information about the methodology of the survey (definitions, sampling, weighting principles) and about the coverage of sectors and countries is available in the Annex to this report and on the website of the *e-Business W@tch* at www.ebusiness-watch.org.

The statistic results of the e-Business Surveys cover various e-business activities within the firm and between companies, including the following:

1. Infrastructure and skills development
2. Internal business processes, such as human resource management or internal collaborations
3. Electronic procurement processes and supply chain management
4. Electronic marketing and sales activities
5. Functions of the extended enterprise, such as collaboration with suppliers to develop products or forecast demand

The analysis below follows this structure, with a final focus on the future outlook of e-business.

2.2.1 Infrastructure and skills development

IT and network infrastructure in the company

In most aspects of ICT infrastructure, the electrical machinery and electronics industries are ahead of the industry average (that is, in the context of this study, the aggregate value of nine sectors from the EU-5). The share of employees who work in companies that have at least one of the more sophisticated infrastructures implemented (such as a wide area network or remote access) is significantly higher in this sector than on industry average. This supports the argument that the electronics industry is a leading user of ICT compared to other sectors. The widely available infrastructure provides the technological and organisational basis for the adoption of a range of e-business applications.

Basic computer usage is available in nearly 100% of firms in all countries. A LAN (Local Area Network) and remote access are relatively well deployed, whereas a fortiori wireless LAN is much less spread out. A Wide Area Networks (WAN) is predominantly used by large firms, many of which connect their different establishments or departments by means of a WAN.

Exhibit 2-2: Use of physical network infrastructure in the electrical machinery and electronics industries (2003)

	Use computers	Local Area Network	Wide Area Network	Remote Access
Sector total (EU-5)				
% of employment	100	89	55	61
% of enterprises	99	60	11	27
0-9 employees	99	53	8	24
10-49 employees	100	74	9	24
50-249 employees	100	93	31	52
250+ employees	100	95	75	73
All (9) Sectors (EU-5)				
% of employment	96	61	29	37
% of enterprises	89	32	5	16
DE Germany	100	94	69	77
EL Greece	100	84	6	15
ES Spain	100	84	37	43
FR France	100	86	56	50
IT Italy	100	86	34	47
FI Finland	100	90	70	79
SE Sweden	100	97	81	66
UK United Kingdom	100	88	50	61
EE Estonia	100	83	31	34
HU Hungary	100	81	24	26
PL Poland	98	70	26	37
SI Slovenia	100	95	46	60
SK Slovakia	100	88	49	50

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.
Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

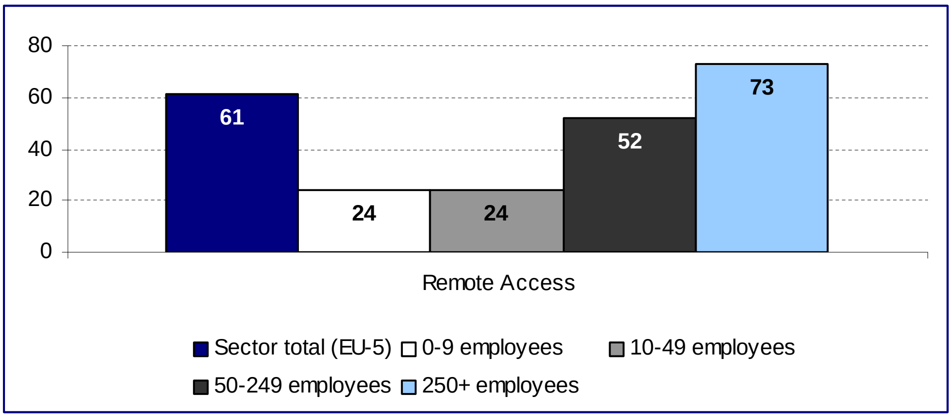
Taking all physical network infrastructures into account, small firms unsurprisingly show much lower adoption rates than large firms. Whereas 95% of large enterprises in the EU-5 have a Local Area

Network (LAN), only 53% of small firms with less than 9 employees (micro-enterprises) have such a network infrastructure. Large firms also lead in the adoption of remote and wireless access systems to their computer networks.

Moreover, the gap increases with the complexity level of the network. More sophisticated network applications only make sense for companies that exceed a certain minimum size, as indicated in the case of WAN usage above. Some adoptions such as Intranets do not make much sense in a firm with just a few employees. Thus it is a rational decision not to introduce them for very small firms. In addition, there are strong economies of scale in the generation of complex networked systems, and the level of operation at which these firms are located does not justify the expenditure.

From a national point of view, companies in Germany, Finland and Sweden exhibit the highest adoption rates, whereas enterprises in Greece, Poland and Hungary are still trailing behind in ICT infrastructure adoption in this sector.

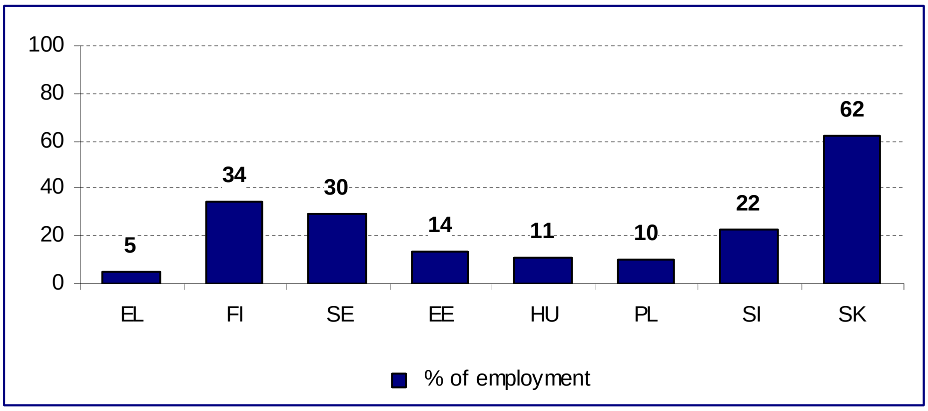
Exhibit 2-3: Enterprises enabling remote access to their computer system (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-4: Enterprises using a Wireless LAN (2003)



Base: all enterprises (N~50-100 per country). Weighting: Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Internet access and use of basic Internet applications

Taking all countries into account, nearly 100% of employees have access to the Internet. The average rate of the electrical machinery and electronics industries is higher than all the 9 other sector average in the EU-5. Basic usage of the Internet, e-mail and WWW usage, are also very well developed. Very few differences are noticeable in terms of development rate according to company size.

The growth of the Internet has spawned a number of new application software solutions that are designed to reduce transaction costs and increase communications efficiency. These new solutions can connect trading partners through the Internet so companies can collaborate on design issues, provide customer service in innovative ways, and communicate more effectively both up and down the supply chain. Many of these new solutions simplify most, if not all, of the technical implementation requirements from users.

Exhibit 2-5: Internet access and use of basic Internet applications (2003)

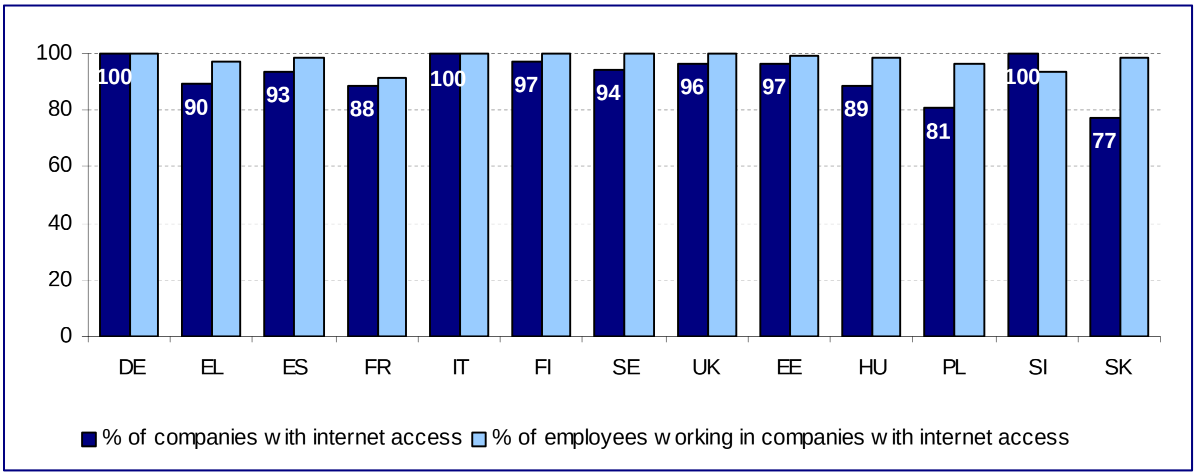
	Have access to the internet	Use e-mail	Use the WWW
Sector total (EU-5)			
% of employment	98	98	95
% of enterprises	98	96	84
0-9 employees	97	95	81
10-49 employees	99	97	89
50-249 employees	100	100	97
250+ employees	98	98	97
All (9) Sectors (EU-5)			
% of employment	88	84	77
% of enterprises	76	68	58
DE Germany	100	100	99
EL Greece	97	97	89
ES Spain	98	98	82
FR France	92	91	91
IT Italy	100	99	92
FI Finland	100	100	99
SE Sweden	100	100	99
UK United Kingdom	100	100	100
EE Estonia	100	99	100
HU Hungary	99	99	98
PL Poland	97	94	96
SI Slovenia	94	94	93
SK Slovakia	99	99	99

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.
Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

In terms of Internet usage in Western Europe, French enterprises are slightly less developed in terms of connection than firms from other countries. This backwardness could be partly due to the large number of SMEs in the French industrial structure, negatively affecting Internet connection and Web application rates. Among the Acceding Countries, Estonian firms enjoy one of the highest Internet penetration rates (same trend for mobile phones and PC penetration rates). Estonian developments in the ICT sector, like those of most of the countries in this area, have been initiated and largely financed by the public sector. By contrast, the Slovenian companies seem to slightly fall behind.

Exhibit 2-6: Companies having Internet access (2003)



Base: all enterprises (N ~ 50-100 per country). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Types and quality of Internet connections used

The quality of e-business solutions is highly dependent on the network capacity that firms can use. The more bandwidth their systems have, the more comfortable is the use of the network and the more features can be realised. Often frustration and a negative experience with e-business systems derive from attempts to operate complex systems in low-bandwidth networks. Exhibit 2-7 presents survey results relating to bandwidth.

If nearly all companies have access to the Internet, few of them (15% in EU-5) have invested in a broadband connection equal to or above 2 Mbit/s. 37% of employees in the sector work in firms that have Internet access with more than or equal to 2 Mbit/s bandwidth, whereas only 7% of sector employees work in companies that still use analogue dial-up modems to access the Internet.

The majority of employees (54%) in the sector work in companies that still use Internet connections with less than 2 Mbit/s, which is equal to the all sectors average. Nevertheless, the percentage of employees working in companies with broadband access in this sector (37%) is rather higher than in the all sectors average (31%).

Exhibit 2-7 also reveals major differences of broadband usage across countries. Analogue dial up modem Internet connection is less and less widespread, except in Greece (33%) and some Acceding Countries, such as Poland, where a significant part of employees (25%) still access the Internet through a narrowband connection.

On the other end of the spectrum, broadband is most common in Finland, Sweden and Germany where 60-70% of employees work in firms with a broadband access. At the other end, broadband connection rates are surprisingly low (below 10%) in France and in Greece.

Among companies from the Acceding Countries covered by the survey, an average of 27% of employees benefit from a broadband connection whereas only about 12% on average are connected through a dial-up analogue modem. Internet development has started later in the New Member States (in particular in Eastern European countries) than in Western Europe. For this reason, some companies located in Eastern Europe have not experienced the first technological steps of Internet development. Benefiting from technological upgrades and price decreases, they have directly used a broadband connection.

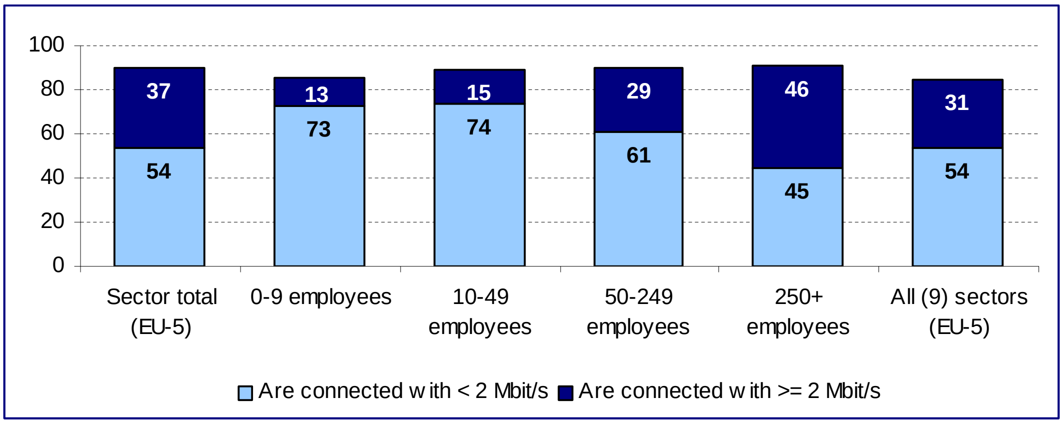
Exhibit 2-7: Quality of Internet connection used by companies (2003)

	Still use analogue dial-up modem	Are connected with <2 Mbit/s	Are connected with >= 2 Mbit/s
Sector total (EU-5)			
% of employment	7	54	37
% of enterprises	18	72	15
0-9 employees	21	73	13
10-49 employees	10	74	15
50-249 employees	11	61	29
250+ employees	4	45	46
All (9) Sectors (EU-5)			
% of employment	16	54	31
% of enterprises	27	64	15
DE Germany	2	40	57
EL Greece	33	92	7
ES Spain	4	41	44
FR France	13	73	6
IT Italy	5	62	30
FI Finland	1	7	69
SE Sweden	3	35	62
UK United Kingdom	16	60	28
EE Estonia	7	48	34
HU Hungary	1	76	24
PL Poland	25	72	23
SI Slovenia	12	48	38
SK Slovakia	16	86	14

Base: enterprises connected to the Internet. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-8: Quality of Internet connection by size-band (2003)



Base: enterprises with Internet access. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
Weighting: Figures for size-bands in % of enterprises. Figures for "Sector total" and "All sectors" are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

As can be expected, the quality and speed of the Internet connection increase sharply with the size of the company. The percentage of enterprises using a connection of more than 2 Mbit/s is almost three times higher (46%) for large than for very small companies (13%). This reflects the higher demand of large companies for bandwidth that results from their larger number of in-house Internet users. Consequently, large firms with many employees have a larger demand for overall bandwidth than small firms with a low number of Internet users.

More generally, IT solutions require substantial fixed costs. Large firms can scale these fixed costs over many more employees and higher revenues, which makes IT investments relatively more attractive to large firms. This is one of the most important reasons for the slower adoption of IT and e-business in small firms – these solutions are often simply too expensive compared to their benefits. This implies that for many complex IT solutions there is a critical minimum size that firms need in order to operate these solutions profitably and to gain benefits from them. Not adopting unprofitable IT solutions can therefore be a plausible and market-efficient decision.

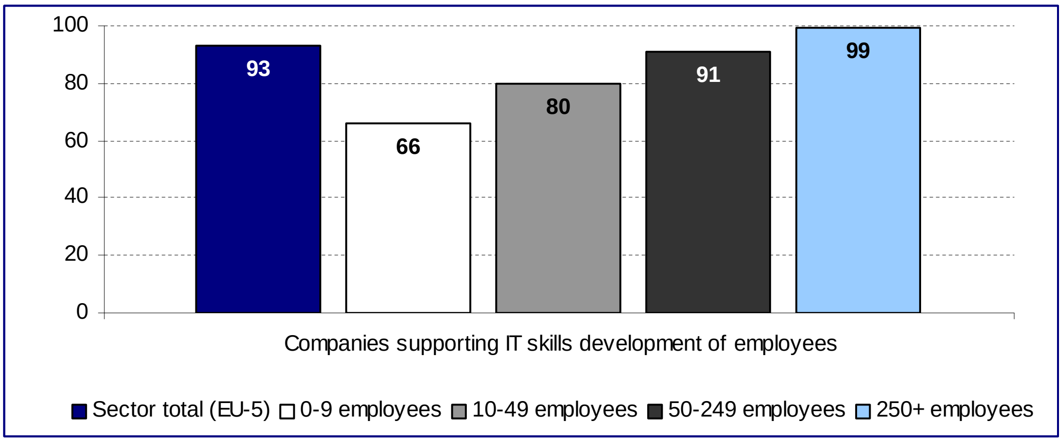
ICT skills – demand and supply

The IT skills shortage is frequently referred to but rarely quantified. The *e-Business W@tch* survey has therefore included questions that are concerned with measuring the extent of IT skills shortage and how firms deal with this issue. This is significant because if the electrical machinery and electronics sector recruits more than the all sectors average in the EU-5, it could also face more problems in recruiting qualified labour.

ICT investment is accompanied by concomitant expenditures on the skills required and, possibly, for managing organisational change. IT skills are a main issue enabling the improvement of productivity performance. Moreover, emerging technologies that may render obsolete significant parts of existing product portfolios involve a permanent and precise management of skills available inside the company.

The overwhelming majority of European enterprises in this sector support some kind of networking and IT skills development of their employees. 93% of sector employees work in firms that provide some kind of computer training for an average of 77% of employees for the all 9 sectors, with only slight deviations across the five countries. However, small firms fall slightly behind (only 66% of enterprises with less than 10 employees offer some kind of IT training support for their employees).

Exhibit 2-9: Companies supporting any kind of IT skills development (2003)

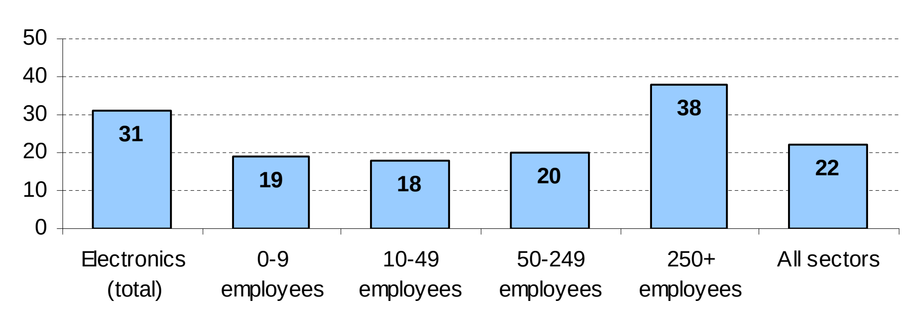


Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-10: Recruitment activities, expected qualifications and outsourcing of IT activities in the electrical machinery and electronics industries (2003)

Have made recruitment efforts during past 12 months' period (EU-5)



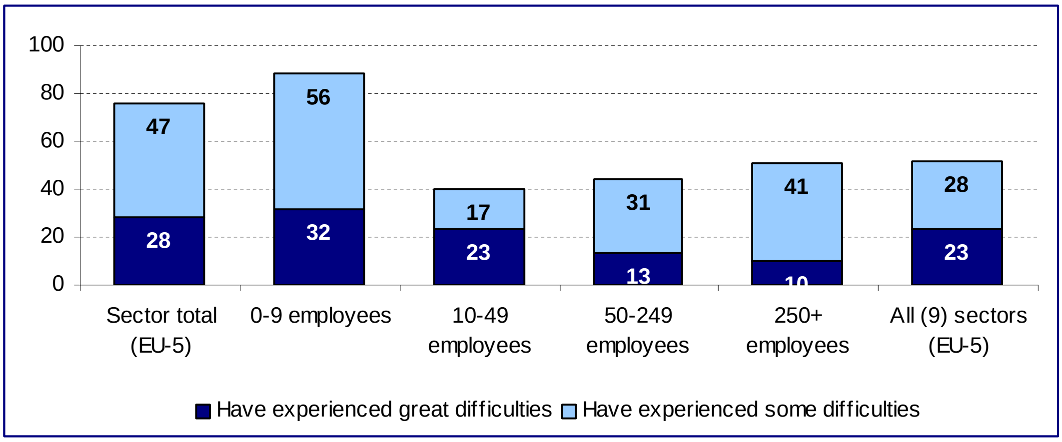
	Have made recruitment efforts during past 12 months' period	Of those expected: Academic degree (Master, PhD) *	Of those expected: IT certificate *	Have outsourced some of their IT activities
Sector by country (in % of employment)				
EL Greece	16	37	81	47
FI Finland	20	1	94	40
SE Sweden	31	11	94	61
EE Estonia	47	7	65	83
HU Hungary	23	48	100	46
PL Poland	6	24	51	49
SI Slovenia	26	5	62	81
SK Slovakia	46	49	68	49

Source: *e-Business W@tch* (2003/04)

Exhibit 2-10 summarizes information on company activities for recruiting IT staff. It points out some national differences in IT recruiting activities. Western European firms had almost all the same level of activity in recruiting IT specialists in 2003, except for Greek companies. In the Acceding Countries, this recruiting activity was especially intense in companies in Estonia and Slovakia. 47% and 46% respectively of enterprises have made recruitment efforts during the past 12 months' period. By contrast, only 6% of Polish enterprises have done so. In terms of skills, an IT certificate is required by a majority of companies in the framework of recruitment.

Micro-enterprises – if they tried to recruit – report significant difficulties in finding qualified IT personnel (nearly 90% of those that had made efforts reported at least some difficulties), whereas large firms had less trouble (only 10% reported great difficulties, 50% some difficulties). These survey results indicate that the IT skills gap remains an issue on the agenda, specifically for smaller enterprises, which often do not have a structured approach to training their employees in IT skills.

Exhibit 2-11: Companies having experienced difficulties in recruiting IT staff (2003)



Base: enterprises having recruited or tried to recruit. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Figures for "Sector total" and "All sectors" are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

2.2.2 Internal business processes

Knowledge management and e-learning

An Intranet constitutes a central internal tool for knowledge sharing and processing, especially for enterprises which are strongly vertically integrated. Their value chain has to be organised within the enterprise (and not externalised) in order to optimise continuous workflows. This observation is particularly relevant for the electrical machinery industries. In this sector, intranet-based applications are implemented for various purposes, with the overall expected result of increasing productivity and lowering costs by improving information workflows. A relevant example of such implementations in the sector is the intranet use at Siemens AG (see Business example No. 1, this chapter).

The diffusion of Intranets among companies belonging to the electrical machinery and electronics industries is nearly twice the percentage as on the all sector average (39% compared to 21%). This is directly linked to the larger penetration of WAN and Internet use within the electrical machinery and electronics industries, since an Intranet is often the first, comparatively simple, application which companies can develop within a corporate network.

Not surprisingly, Intranet network infrastructure is much more developed among large companies than among SMEs, as Intranets are implemented and adapted to multi-site enterprises. This is consistent with the structure of the electrical machinery and electronics industry in the EU which is characterised by a high degree of concentration, with large companies contributing 66% to the sector's employment. As a consequence, applications based on Intranet infrastructure such as e-learning and special knowledge management applications (enabling collection, structuring and access of all the knowledge capitalized by the company) are also mostly developed in large enterprises.

From a national point of view, Intranet infrastructures are relatively well developed in Europe, with particularly high penetration rates for Northern European countries (again, in countries where the penetration of WAN and internet use is higher as well). Furthermore, special knowledge management applications are not yet widely diffused, with no clear differences between Western European and Acceding Countries.

Exhibit 2-12: Knowledge management and e-learning (2003)

	Use an intranet	Use a special knowledge management application	Use an e-learning application
Sector total (EU-5)			
% of employment	77	11	26
% of enterprises	39	8	9
0-9 employees	34	8	7
10-49 employees	44	6	11
50-249 employees	71	9	11
250+ employees	89	13	34
All (9) Sectors (EU-5)			
% of employment	46	10	13
% of enterprises	21	5	5

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Business example No. 1:

Siemens uses an Intranet-based reporting tool to lower controlling cost

Siemens AG provides a relevant example of how an intranet-based application can be used as a competitive tool to lower controlling costs.

The German world leader in electronics and electro-technology operates in more than 190 countries and employs more than 440,000 workers. The ICN EN (Information and Communication Networks) sub-division of Siemens AG offers customized telecommunication and cable-supported communication solutions.

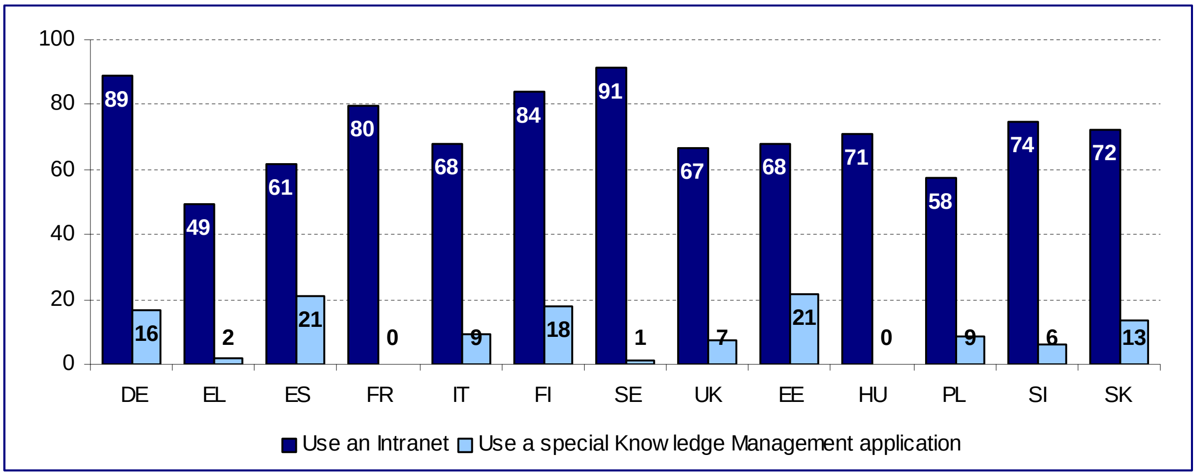
Providing international support is a critical task for Siemens ICN EN. More than 1000 employees process approximately 20,000 problem messages annually, which pass through up to three different support levels. The company's more than 7,000 technicians require information for solutions to customer problems.

Over 30 servers were migrated to central web architecture for ICN EN. An intranet-based application was developed to manage the support and reporting process. All messages are passed on to workers through a continuous workflow. The new system and process offers quality control of problem processing regarding costs, frequency and operating time. Siemens can now control daily business and complete the escalation process with efficiency. The centrally-located reporting tool results in lowering controlling cost. The ease of use associated with the application has led to user acceptance.

This type of rationalisation throughout a workflow tool proves to be especially efficient and cost reductive (i.e. generating economies of scale) in large organisations with a high number of employees working on the same process. This is a major reason why intranet-based applications are more present in large companies than in SME's (see Exhibit 2-12).

Source: www.siemens.com

Exhibit 2-13: Knowledge management: Use of intranets and special applications in the electrical machinery and electronics industries by country (2003)



Base: all enterprises (N ~ 50-100 per country). Weighting: Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Use of online technologies to support internal business processes

The electrical machinery and electronics sectors are very advanced compared to other sectors in the usage of online technologies to support internal processes. The most widely used application is sharing documents online and performing collaborative work using the Internet. 26% of firms in the sector currently use this basic application. Other applications, such as automatic reimbursement of travel costs online, are used to a lesser extent. Applications listed in Exhibit 2-14 are explicitly used to make internal processes more efficient and – subsequently – to save costs. This can be highly relevant for large firms, where many people perform these processes on a regular basis. The advantages of these technologies for small firms are, however, limited in relation to the required fixed investments.

Companies in Germany, Finland and Sweden appear to be the most advanced in using online technologies for supporting their internal processes. Diffusion among firms from the Acceding Countries is close to the average of the sector, or even higher in some cases.

Exhibit 2-14: Use of online technologies to support internal business processes in the electrical machinery and electronics industries (2003)

	To share documents internally / for collaborative work	To automate travel reimbursement	To track working hours / production time	To support human resources management
Sector total (EU-5)				
% of employment	54	24	36	35
% of enterprises	26	5	8	5
0-9 employees	21	5	4	2
10-49 employees	31	3	14	10
50-249 employees	49	10	34	22
250+ employees	63	35	43	49
All (9) Sectors (EU-5)				
% of employment	40	11	20	21
% of enterprises	22	3	5	5
DE Germany	63	39	52	40
EL Greece	47	6	10	8
ES Spain	51	17	20	42
FR France	48	8	35	32
IT Italy	34	11	36	26
FI Finland	69	46	66	67
SE Sweden	85	52	59	30
UK United Kingdom	59	26	13	34
EE Estonia	63	6	45	20
HU Hungary	81	1	25	23
PL Poland	59	11	10	6
SI Slovenia	68	2	44	23
SK Slovakia	59	9	56	61

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

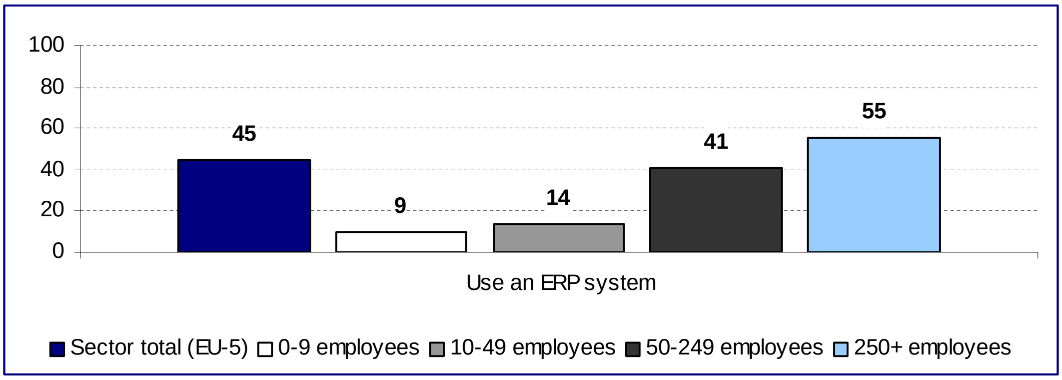
Use of ERP systems

ERP (Enterprise Resource Planning) is a sophisticated and integrated application enabling companies to manage several fields of business electronically (finance, commercial activity, human resources, logistic, production). As outlined in the introductory chapter to this report, time to market constitutes a big issue throughout the electronics industry. One of the challenges that the industry has to meet is deciding which products should be manufactured on a continuous basis and which ones on a discrete scheduled basis, with a view to handling market changes and shortened product life cycles. The ability to tie customer point of sale data via a company's advanced planning and scheduling system and ERP system to the plant floor is providing significant competitive advantages to leading companies.

ERP systems are used by 13% of enterprises of the sector (representing 45% of employment) in the EU-5 area, and mostly by large companies (55% have implemented this kind of application, compared to only 9% of micro-enterprises). This dichotomy is to be expected, because – as with many other IT tools – ERP systems are primarily targeted at larger enterprises with their complex organisational structure and processes. Most ERP systems are way too complex and too expensive to be an attractive application for smaller companies. Survey results show that only companies with at least 50 employees (medium-sized and large firms) make significant use of ERP systems.

ERP systems require high investment and planning efforts. The Return on Investment (ROI) is the increase of process efficiency measured in terms of cost reduction of the processes. However, this type of economy of scale is reached mostly in large organisations.

Exhibit 2-15: Companies using an ERP (enterprise resource planning) system (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

2.2.3 Procurement processes and supply chain management

Procurement is a most interesting domain for manufacturing companies in the electronics industry with a view to electronic business. Most market studies show that about 80% of their costs of goods sold stem from materials which are sourced from suppliers. In the back office, streamlining the relationship with suppliers is driving demand for SCM and e-Procurement systems.

E-Procurement solutions provide electronics companies with access to parts catalogues and give them the opportunity to place orders at any time with contracted distributors. Procurement related optimisation is possible within the own organization, but supply chain collaboration can bring even larger benefits.

In particular, the shift from network issues to business issues has a significant impact on the role of telecommunication equipment manufacturers (TEM) suppliers such as Alcatel, Ericsson, Nokia, and others. Thus TEMs should focus attention on their business processes. The mobile phone divisions are key for their growth in a global market (including the huge emerging markets in India and China) and are sensitive to time to market and to the supply chain performance issues.

Furthermore, suppliers to electronics equipment manufacturers range from very small to very large companies, providing basic raw materials for a variety of components from sub-assemblies to complete products. Many supplier parts are seen as commodities by their customers. Electrical manufacturers use a small number of speciality suppliers that build parts directly for customer specifications. Many of the second and third tier electronics industry suppliers are midsize manufacturers whose margins are more critical than volume. Many suppliers have begun to use portals for placing orders.[5]

Moreover, a major feature of the electronics industry, and to a lesser extent in the electrical machinery industry, is its global supply chains. A global supply chain is necessary to remain competitive. Through

5 Many of these products can be reviewed at www.globalspec.com, a web portal where companies can find and compare products from more than 10,000 online catalogues (for all types of electric and electronics products) and find services and expertise.

mergers and acquisitions, competition has become borderless. With the goal of reducing cost, most electronics companies are establishing manufacturing facilities in Asia to take advantage of lower labour rates, lower import and export taxes, and lower regulatory burdens. This brings up a new challenge for firms: they need to procure materials from geographically dispersed suppliers, while keeping on delivering their assembled products as quickly as possible to their customers, mainly retailers. As a consequence, creating efficiencies in the supply chain is critical to an electronic or electronics manufacturer's success.

Buy-side electronic commerce activities

Exhibit 2-16: Online purchasing activities by companies (2003)

	Make online purchases	Of those online purchase of MRO goods*	Of those online purchase of direct production goods*
Sector total (EU-5)			
% of employment	59	72	61
% of enterprises	51	68	67
0-9 employees	49	70	68
10-49 employees	53	64	69
50-249 employees	59	65	52
250+ employees	62	77	58
All (9) Sectors (EU-5)			
% of employment	46	62	50
% of enterprises	31	60	53
DE Germany	72	73	67
EL Greece	12	43	80
ES Spain	54	56	18
FR France	33	69	68
IT Italy	42	71	61
FI Finland	87	69	56
SE Sweden	94	63	68
UK United Kingdom	76	74	56
EE Estonia	53	29	96
HU Hungary	16	22	20
PL Poland	44	67	93
SI Slovenia	40	57	37
SK Slovakia	61	41	55

* Maintenance, repair and operations goods (indirect production goods)

Base: all enterprises/*enterprises purchasing online. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

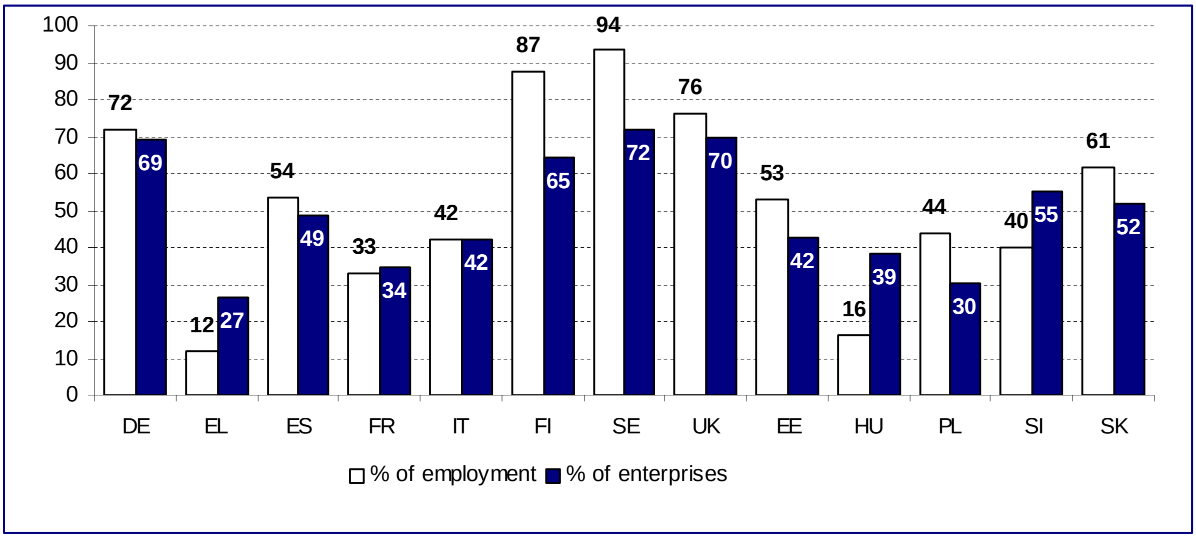
Source: *e-Business W@tch* (2003/04)

Thus, unsurprisingly, purchasing online is one of the most widely used e-business applications in the sector, in all size-bands of firms and indiscriminately for MRO (maintenance, repair and operations) goods as well as for direct production goods. Approximately 51% of enterprises in this industry already purchase goods or services over the Internet (comprising 59% of sector employees). The online purchasing rate of MRO goods is even higher than for the purchase of direct production goods.

There are, however, strong national differences regarding online purchasing activities. Enterprises in Sweden, Finland, the UK and Germany are in the lead, with well over 70% using e-purchasing.

Firms in Slovakia (61%), Spain (54%) and Estonia (53%) follow, while firms in Greece and Hungary appear to be still far behind.

Exhibit 2-17: Companies from the electrical machinery and electronics industries making online purchases by country (2003)



Base: all enterprises. N ~ 50-100 per country. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Types and relative importance of online purchases by companies

Whereas EDI is not widely used by companies from the electrical machinery and electronics industries, Extranet, and in particular B2B marketplaces and suppliers' websites, are the preferred distribution platforms for online purchases. There are no clear differences in terms of usage in the size of companies, except for B2B marketplaces, which are more used by large companies (57%) than by smaller firms.

The electronics industry is – in the aggregate, and compared to the all sectors average – leading in the use of e-marketplaces. This can be partly explained by the high level of standardisation of a large part of electronic components used as inputs in the production of electronic systems. The very short time to market and the short lifecycle of electronic components also enhance the industrialisation and automation of purchasing process throughout e-procurement systems between component suppliers and system manufacturers (component buyers).

A good example of this automation is the world market for semiconductors, especially for memories (RAM, random access memories or DRAM, Dynamic RAM). The marketplace for these components operates with spot prices and thus requires real time purchase systems. DRAM is a key component of computer systems. As a consequence, the price of DRAM is very sensitive (high price volatility) to any DRAM supply shortage in the computer production.

Exhibit 2-18: Distribution platforms and protocols used for online purchases in the electrical machinery and electronics industries (2003)

	Website of suppliers	B2B Marketplaces	Extranet	EDI
Sector total (EU-5)				
% of employment	78	48	31	5
% of enterprises	84	30	36	1
0-9 employees	83	28	38	0
10-49 employees	88	36	31	4
50-249 employees	84	24	27	2
250+ employees	77	57	33	8
All (9) Sectors (EU-5)				
% of employment	88	24	28	6
% of enterprises	85	21	22	3

Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=295 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

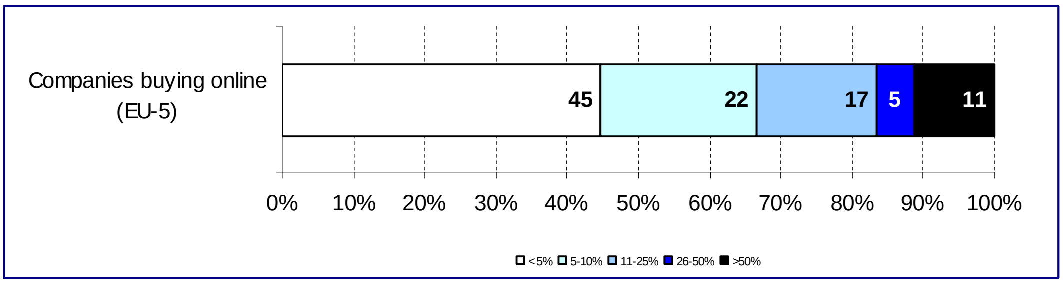
Source: *e-Business W@tch* (2003/04)

This observation is also consistent with the fact that the electronics industry was one of the first sectors to develop special B2B sites. Among them, e2Open[6] has been quite successful. It is an electronics component exchange made up of 10 founders and 300 buyers. Their first live auction was in September 2000. It offers not only online purchasing throughout "open markets" (auctions), but also design collaboration, supply chain and B2B Integration and infrastructure.

Thanks to the high level of sophistication of e-marketplaces in the sector, the number of firms actually using B2B e-marketplaces is growing. Slightly more than 30% of all enterprises in the sector currently participate in an online marketplaces.

However, the fact that a firm declares that it purchases online does not quantify the relative importance of online purchases compared to the total purchasing volume of a company. Exhibit 2-19 shows that the relative share of online purchases is still rather low. 45% of the enterprises that purchase online report that the online share of their purchases is below 5% of their total purchasing volume. Only 11% of companies that purchase online report that more than 50% of the total purchases is processed online.

Exhibit 2-19: Share of online purchases (all platforms) as % of total purchases in the electrical machinery and electronics industries (2003)



Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=295. In % of enterprises. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

6 www.e2open.com

Business process integration in e-commerce (buy-side)

A measure for the sophistication of e-commerce systems is to what extent IT systems of enterprises are integrated with those of its business partners. Integration allows, for example, the automating of purchasing routines between companies.

Exhibit 2-20 summarizes three measures of e-procurement sophistication. It shows that in the EU-5 online technologies (other than free text e-mail) to exchange documents with suppliers are much more developed than the two other, more sophisticated, business processes. 45% of sector enterprises use online technologies other than free text e-mail to exchange documents with suppliers, whereas the use of online ordering[7] and SCM is limited to respectively 5% and 2% of sector enterprises. These numbers correspond to a large degree with the all sectors average.

Exhibit 2-20: IT integration with suppliers (2003)

	Use of online technologies* to exchange documents with suppliers	IT system is integrated with that of a supplier for placing orders	Use an SCM (Supply Chain Management) system
Sector total (EU-5)			
% of employment	45	12	11
% of enterprises	40	5	2
0-9 employees	38	5	0
10-49 employees	49	7	4
50-249 employees	36	4	7
250+ employees	48	19	14
All (9) Sectors (EU-5)			
% of employment	37	8	6
% of enterprises	24	6	2
DE Germany	37	15	16
EL Greece	18	2	0
ES Spain	52	15	13
FR France	56	1	0
IT Italy	34	2	4
FI Finland	61	10	15
SE Sweden	62	27	26
UK United Kingdom	59	26	15
EE Estonia	73	24	0
HU Hungary	18	1	0
PL Poland	51	2	0
SI Slovenia	31	3	1
SK Slovakia	47	14	13

* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.
Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-20 also shows that a much higher share of large enterprises than SMEs has begun making integration efforts beyond their own borders. Obviously, large enterprises with their high ordering volumes see much more cost-saving potential in automating purchasing routines than their smaller

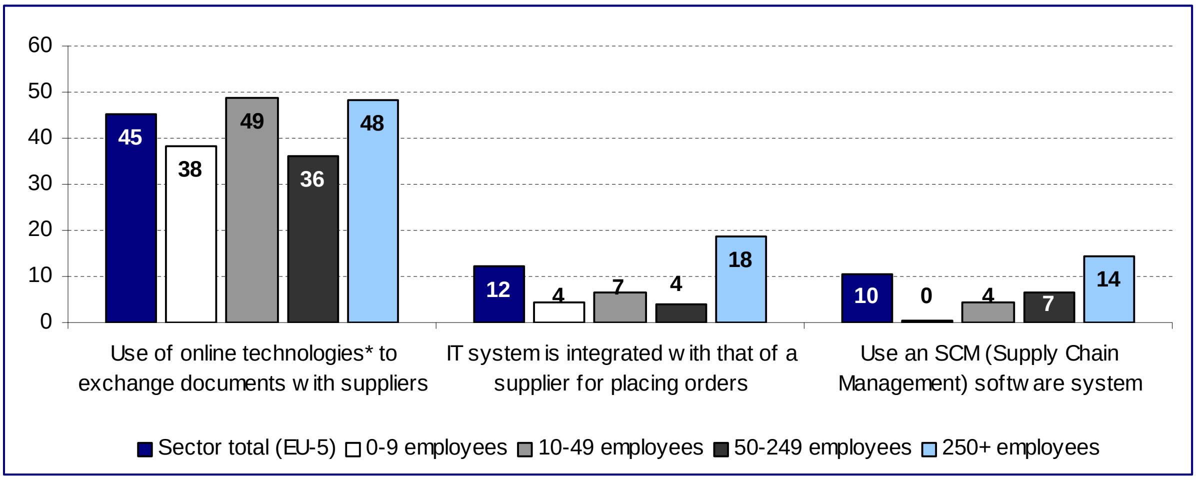
[7] IT system is integrated with that of a supplier for placing orders.

counterparts. Moreover, large companies act as early adopters and drivers to impose complex SCM solutions to their smaller suppliers thanks to their market power. The Siemens example (Business example No. 1, chapter 2.2.2) shows potential objectives of an SCM solution in the electrical machinery and electronics industries and the resulting reduction of process costs which a large company can derive from it. However, supply chain management systems are still a rather rare application, except for larger companies.

The analysis by country shows that enterprises in Sweden, Germany and the UK are leading in the adoption of SCM tools. By contrast, firms in the new Member States report comparably lower figures (except in Slovakia) and are trailing behind.

The figures vary more with the enterprises' size as regards IT integration processes with suppliers for placing orders and as regards the use of an SCM. Large firms more frequently use both applications, as they require substantial up-front investments. Again, as mentioned for Exhibit 2-20, one can argue that large enterprises, with their high ordering volumes, see much more cost-saving potential in automating purchasing routines than smaller enterprises.

Exhibit 2-21: IT integration with suppliers (2003)



* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Figures for "Sector total" are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Business example No. 2:

Siemens: an SCM system for better collaboration among trading partners

The type of advantages a large company, with a high number of suppliers in the electrical machinery and electronics industries, can get from SCM are shown by the example of Siemens, the German leading electronics and electrical equipment company.

The objectives of the SCM solution were to coordinate Siemens' procurement, logistics and accounts payable divisions and its supply base.

Siemens' main business requirements were to:

- *Streamline its manufacturing supply chain activities with key suppliers;*
- *Link the enterprise processes of sourcing and procurement, manufacturing, transportation and fulfilment, as well as customer-facing strategies, such as CRM;*
- *Integrate order management into its supply chain;*
- *Enable trading partner collaboration for reduced cycle times and increased order accuracy.*

The SCM implemented solution is based on MySAP Supply Chain Management application and the Commerce One Collaborative Platform.

This new SCM system has enabled a better collaboration among trading partners that leads to reduced cycle times, increased order accuracy and, ultimately, happier customers; a reduction of the cost of direct materials purchases, as well as purchasing process time, from approximately three days to real-time; and the possibility to process emergency orders for its customers within 24 hours, thereby significantly improving customer satisfaction.

As a result of more effective collaboration with suppliers, but also internally between departments, Siemens has noticed 40% saving in process costs, logistics and accounts payable divisions and its supply base.

Source: CRMDaily.com, 2002.

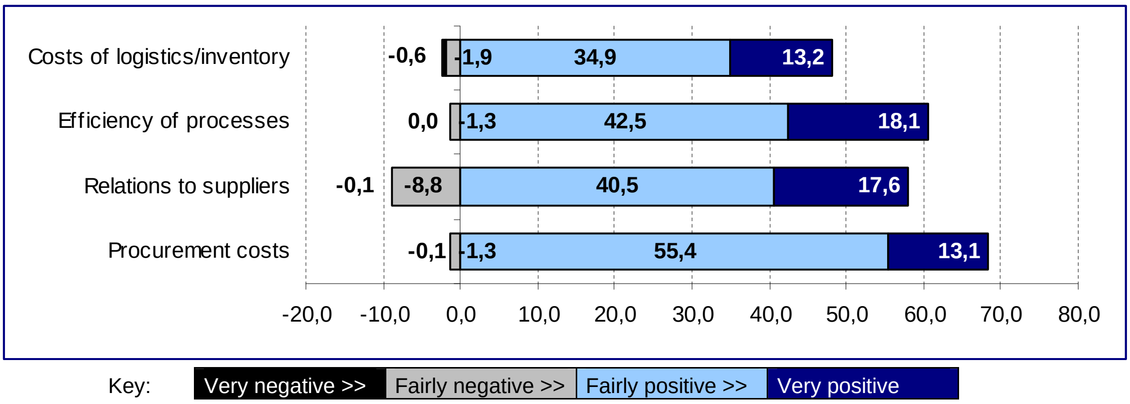
Perceived impacts of purchasing online

The e-Business Survey 2003 included some qualitative questions to assess the perceived effects of purchasing online on the cost of logistics, the efficiency of processes, the relations with suppliers and procurement costs.

Exhibit 2-22 shows the opinion of enterprises about these effects. The most frequently mentioned positive effect of purchasing online is lower procurement costs (68% of enterprises reporting positive or very positive effects). The majority of enterprises using online purchases also reported positive effects on the efficiency of processes (61% of enterprises reporting positive or very positive effects) and the relations with their suppliers (58%). However, 9% also reported negative impacts in terms of relations with their suppliers. Online purchases seem to have less impact on costs of logistics and inventory for most enterprises.

It appears that e-purchasing has little impact on the number of suppliers. For the majority of the companies interviewed, the number of suppliers has stayed the same despite the use of e-purchasing processes.

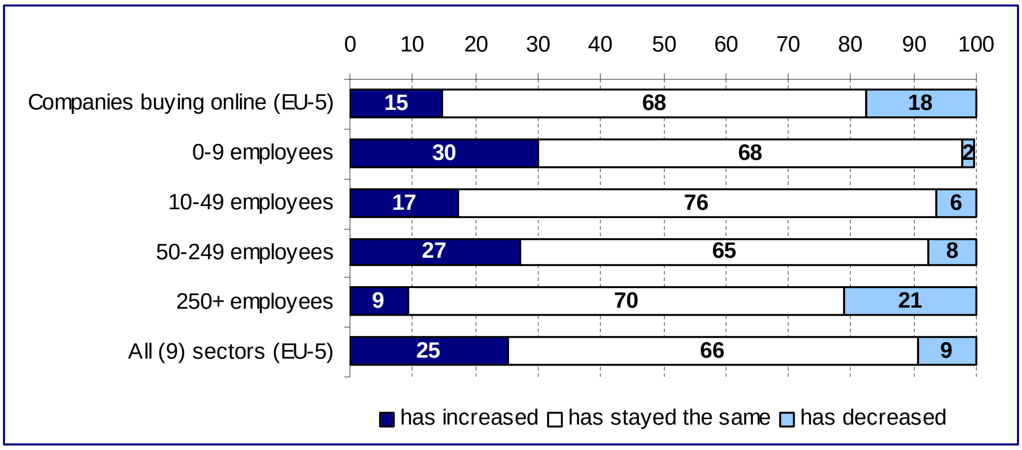
Exhibit 2-22: Perceived effects of purchasing online in the electrical machinery and electronics industries (2003)



Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=295. In % of enterprises. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-23: Reported effect of e-purchasing on the number of suppliers (2003)



Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=295. Figures for size-bands in % of enterprises. Figures for "Companies buying online (EU-5)" and "All sectors" are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

2.2.4 Marketing and sales

A major issue to be tackled by electronics (and especially consumer electronics) firms is that errors in the sales and distribution process may cause substantial retailer compliance charge-backs and inventory misallocations. The sector has very different customers. The following types of companies are among the most important ones:

- PC manufacturers
- Appliance manufacturers
- Warehouse stores
- Retail distribution networks (Note: For retailers, a key success factor is the ability to be continuously supplied with products without having to use too much storage. In the future, there

will be increasing pressure on manufacturers to deliver small numbers of items directly to the stores)

- Independent retailers, the businesses that sell to consumers. Retailers want inventory levels to be as low as possible but still be able to guarantee product availability on the shelves.
- Wholesale distributors, which act as agents between the manufacturer and the retailers. They provide sales and merchandising services to the large number of small retailers.

An important segment in the sector value chain, prior to reaching the final customers, is manufacturer distribution networks, which can be as simple as a single shipping warehouse or as complex as a multilevel international network. For example, manufacturers of electrical distribution equipment are selling to a large extent via indirect distribution channels (retail and wholesale distributors), mainly because the customers are widely dispersed – in the form of "atomised demand" coming from many electrical installation micro-enterprises.

A good example of this policy is the French electrical equipment manufacturer Legrand, which sells almost 100% of its production via indirect distribution channels (major distributors having many sales branches), thus allowing the establishment of long-term relationship with these distributors.

Sell-side electronic commerce activities

This section focuses on customer facing e-commerce activities of companies. 61% of firms from the electronics and electrical machinery sector have a website, the most simple means of using the Internet for sales side activities to provide information about the company, its products, and how to contact it. This rate is significantly above the all sectors average (35%). There are still differences between large and small companies. Whereas 94% of large enterprises in the sector have a website, only 55% of micro-enterprises firms do. Websites are most frequently used by firms in Finland, Sweden and Germany.

Enterprises that actually conduct transactions with customers online, however, are still the exception. Even though the sector is among the most intense users of e-business, only 8% of its companies make online sales. This is below even the all sectors average (10%).

It appears that online marketing and e-commerce activities in this sector are often limited to e-relations with distributors that include online information, promotion tools and orders management (availability of products, tariffs, orders), but do not include the accomplishment of transactions. This is, for instance, the case at electrical distribution equipment manufacturers such as Schneider Electric or Legrand. Schneider Electric, for example, practises e-commerce on the basis of national information sites and extranet sites for international corporate customers and for specific market segments in some countries. These sites provide information about promotional issues, the launch of products, the specification of products (installation guides, calculation software), the range of products (online catalogues, guides to help online choice), software downloading and orders management (availability of products, tariffs, online orders).

Consequently, payment tools and online systems enabling secure transactions are not widely dispersed across the sector. The most advanced companies in this respect appear to be located in Spain, the United Kingdom and Finland.

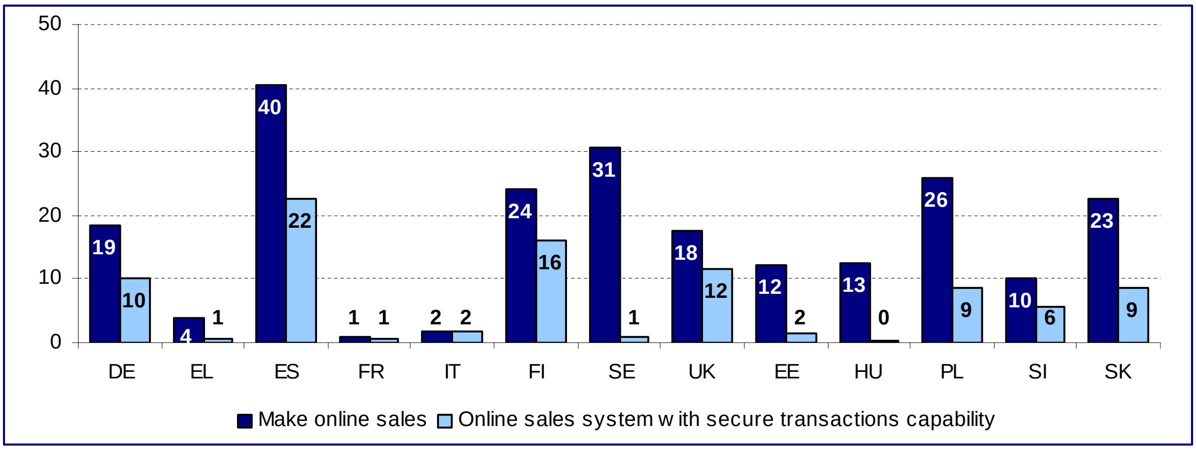
Exhibit 2-24: Online marketing and e-commerce activities (2003)

	Have a website on the internet	Make online sales	Allow online payment of goods/services ordered	Online sales system with secure transactions capability
Sector total (EU-5)				
% of employment	87	14	4	8
% of enterprises	61	8	3	4
0-9 employees	55	7	3	4
10-49 employees	74	10	1	4
50-249 employees	86	11	3	6
250+ employees	94	17	7	11
All (9) Sectors (EU-5)				
% of employment	66	16	7	9
% of enterprises	36	10	4	4
DE Germany	95	19	1	10
EL Greece	39	4	1	1
ES Spain	88	40	18	23
FR France	75	1	0	1
IT Italy	80	2	1	2
FI Finland	98	24	1	16
SE Sweden	98	31	1	1
UK United Kingdom	90	18	13	12
EE Estonia	80	12	5	2
HU Hungary	73	13	0	0
PL Poland	91	26	1	9
SI Slovenia	84	10	4	6
SK Slovakia	83	23	9	9

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-25: Companies selling online by country (2003)



Base: all enterprises (N ~ 50-100 per country). Weighting: Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Types and relative importance of online sales

Exhibit 2-26 provides information about the type of online channels the companies selling online have used. Figures need to be interpreted with care (especially the size class breakdown) because of the low number of observations (68 firms selling online). Almost all companies that sell online use their website as a channel (89%), across all firm sizes. Some companies selling online, especially large companies, also make use of electronic marketplaces (41%)..

Exhibit 2-26: Distribution platforms and protocols used for online sales in the electrical machinery and electronics industries (2003)

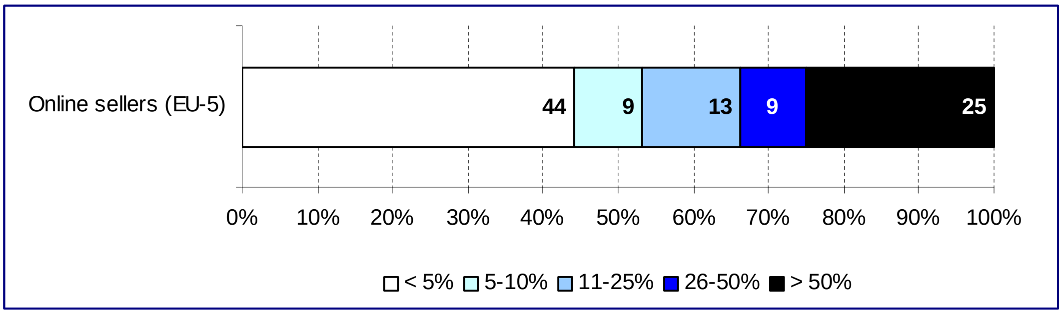
	Own company website	B2B Marketplaces	Extranet	EDI
Sector total (EU-5)				
% of employment	92	62	16	13
% of enterprises	89	41	6	3
0-9 employees	94	47	3	0
10-49 employees	76	24	11	5
50-249 employees	82	38	10	12
250+ employees	96	68	23	19
All (9) Sectors (EU-5)				
% of employment	81	34	15	14
% of enterprises	79	38	4	5

Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=68 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-26 also indicates that, amongst the enterprises selling online, the share of enterprises selling on B2B marketplaces is slightly higher in the electrical machinery and electronics industries (41%) than on average across sectors (38%). This difference increases if measured in employment-weighted percentages, (62% compared to 34%), due to the activity of large firms. It shows that marketplaces are an accepted sales channel in the sector, among those companies that use the Internet to sell their products. Moreover, this point is consistent with findings regarding online purchases (cf. comments on Exhibit 2-26[8]). The percentage of firms using Extranets and EDI is lower, and even below the all sectors average regarding EDI usage.

Exhibit 2-27: Share of online sales (all protocols) as % of total sales in the electrical machinery and electronics industries (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=68. In % of enterprises.
Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

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8 Distribution platforms and protocols used for online purchases in the electrical machinery and electronics industries.

44% of companies selling online say that these sales constitute less than 5% of their total sales volume. However, it appears that for a significant part of companies selling online (about 25%), online sales represent more than 50% of their total sales. Thus there is some dichotomy between specialists focusing on the online channel for their sales, and companies preferring traditional transaction channels.

Business process integration in e-commerce (sell-side)

In most of the companies selling online (63%), an incoming order simply generates an automatic e-mail that is then processed manually in some way. The use of fax for this purpose is less common (9% of enterprises), especially in large companies.

Only 15% of enterprises in this sector say that their online sales are fully integrated with their back-end system (e.g. ERP). However, this is more than twice as many as on average in the other sectors (6%). This type of integration is much more widespread in large companies employing more than 250 people (64% of them) than in smaller companies, so that a majority of the employees of the sector (56%) work for enterprises where ordering systems are integrated with back end system.

The size-class breakdowns need to be interpreted with caution, though, due to the low number of observations for this sector (68 firms selling online). But it is very likely that large firms are more advanced, as the implementation of such systems requires a highly developed IT infrastructure (including Intranet, ERP, and standardized processes), is costly (e.g. programming of middle-ware and interfaces) and therefore less suitable for small firms.

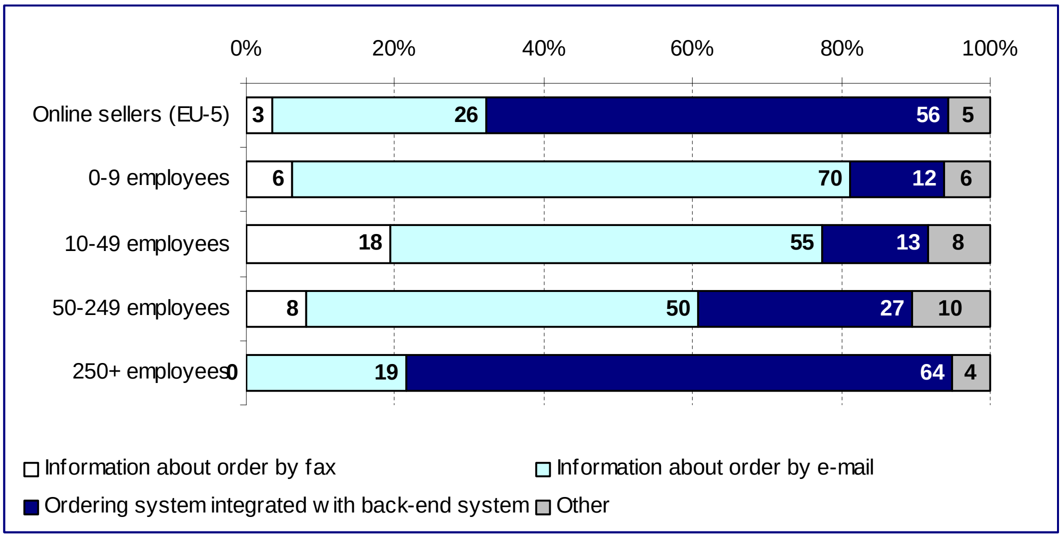
Exhibit 2-28: Business integration of online sales systems in the electrical machinery and electronics industries (2003)

	Information about order by fax	Information about order by e mail	Ordering system integrated with back end system	Other
Sector total (EU-5)				
% of employment	3	26	56	5
% of enterprises	9	63	15	7
0-9 employees	6	70	12	6
10-49 employees	18	55	14	8
50-249 employees	8	50	27	10
250+ employees	0	19	64	4
All (9) Sectors (EU-5)				
% of employment	5	53	33	7
% of enterprises	8	78	6	6

Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=68 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Exhibit 2-29: Sophistication of online sales systems in the electrical machinery and electronics industries by size-band (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=68 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Figures for “Online sellers (EU-5)” are weighted by employment. Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Another alternative for measuring the sophistication of the sell-side e-commerce activities is to consider whether the online sales system is in some way integrated with the customers’ IT system. Again, a higher degree of integration means a higher degree of technological complexity and more costly implementation, but promises greater efficiency gains in the form of process cost savings due to automation of transactions. This implies that a higher degree of sophistication is primarily attractive for large companies that have to carry out a high number of standardised transactions with a limited number of business partners. Only a small share (2%) of enterprises in the sector in the EU-5 have integrated their IT system with that of a customer to receive automatic orders.

36% of enterprises, however, use online technologies other than free text e-mail to exchange documents with customers. Compared to the other 9 sectors, the online exchange of documents with customers is thus more widely used. This application is particularly common among Swedish firms (by companies representing 86% of sector employment), and to a lesser extent in France (58%) and in Finland (55%).

In the second part of the e-Business Survey 2003, the *e-Business W@tch* introduced a question on the use of electronic invoicing systems. Data are therefore only available for 8 countries (that were covered in this part of the survey). It appears that electronic invoicing systems in enterprises are already widespread in most countries, including the Acceding Countries. However, it is possible that there are some misunderstandings about the definition of what constitutes an e-invoicing system, particularly in interviews with small firms. This is unavoidable in large-scale, representative telephone interviews.

Exhibit 2-30: Exchange of documents and standardised data with customers (2003)

	Use of online technologies* to exchange documents with customers	IT system is integrated with that of a customer for receiving orders	Use of an electronic invoicing system
Sector total (EU-5)			
% of employment	42	3	n.a.
% of enterprises	36	2	n.a.
0-9 employees	32	1	n.a.
10-49 employees	52	1	n.a.
50-249 employees	42	3	n.a.
250+ employees	39	5	n.a.
All (9) Sectors (EU-5)			
% of employment	33	5	n.a.
% of enterprises	23	3	n.a.
DE Germany	37	0	n.a.
EL Greece	18	0	59
ES Spain	36	3	n.a.
FR France	58	0	n.a.
IT Italy	33	1	n.a.
FI Finland	55	16	44
SE Sweden	86	2	32
UK United Kingdom	46	13	n.a.
EE Estonia	49	10	27
HU Hungary	28	0	28
PL Poland	43	9	26
SI Slovenia	35	3	12
SK Slovakia	24	22	38

* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.
Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

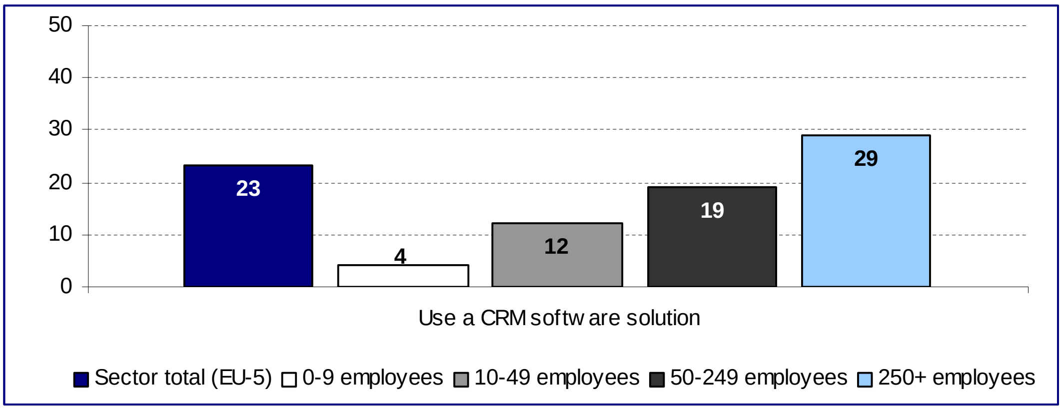
Source: *e-Business W@tch* (2003/04)

Customer relationship management

Customer Relationship Management (CRM) is about acquiring and retaining customers. It helps to provide a single view of the customer, increasing the profitability of the “top” customer and improving customer service and loyalty. CRM can, therefore, be critical to the success of a business where maximizing customer intelligence is an important success factor. CRM systems are used to optimise the management of customer relations for companies where individual customer contact is not possible and therefore needs to be complemented and supported by electronic means of communication. The ultimate goals are to reduce transactional costs, to increase customer satisfaction, and to make optimal use of information about customers.

Potential benefits of CRM increase with the number of customers and thus with the size of the company. Therefore it is not surprising that it is large firms in particular that use this application (29%).

Exhibit 2-31: Companies from the electrical machinery and electronics industries using a CRM (customer relationship management) software application (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

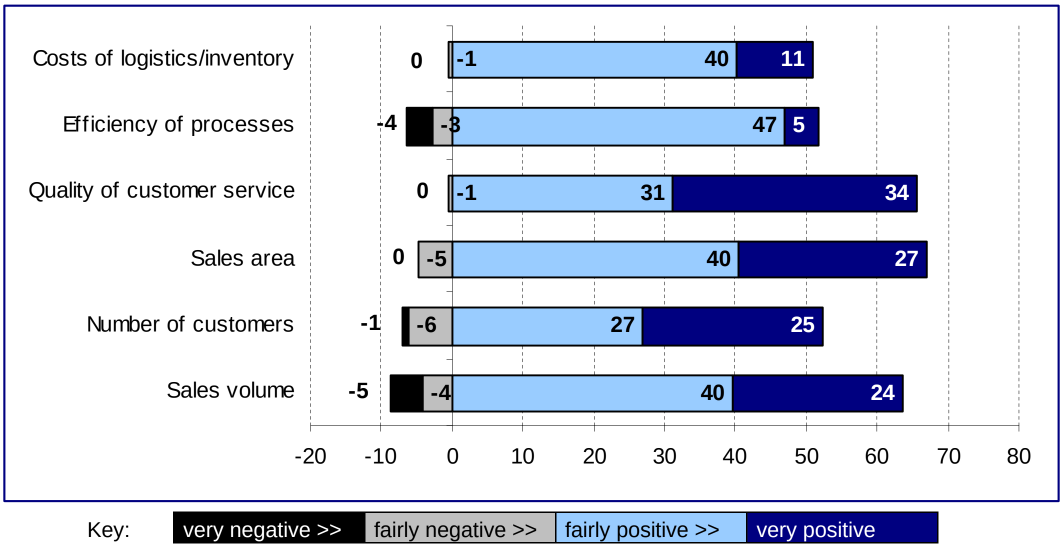
Source: *e-Business W@tch* (2003/04)

Perceived impact of online selling

Exhibit 2-32 shows the response of firms to questions dealing with the perceived impact of online sales. The majority of companies selling online in the electronics and electrical machinery sector reported positive or very positive effects on the volume of sales (64%), the sales area (67%), and the quality of customer service (65%). These positive effects provide evidence that selling online helps companies to sell more in a wider area, and simultaneously increases customer satisfaction. Conversely, 9% of enterprises also reported negative or very negative impacts on their sales volume, and 7% on the number of customers respectively.

The remainder had predominantly positive experiences: 51% report positive or very positive impacts on the costs of logistics and inventory, and 57% on the number of customers. The impact of selling online on the efficiency of internal business processes is judged somewhat ambiguously. While 52% report positive or very positive experience, 7% report negative or very negative effects.

Exhibit 2-32: Perceived effects of selling online on sales and business processes efficiency in the electrical machinery and electronics industries (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=68. In % of enterprises.
Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

2.2.5 Functions of the extended enterprise

"Functions of the extended enterprise" mean all activities that are neither purchasing nor selling, but still involve interaction, collaboration and exchange of information with people or organisations outside the company itself. This includes activities such as collaborating with business partners to design new products, to forecast demand, manage capacities, negotiate contracts, provide e-support or e-learning for customers (partnership) or exchange documents. Online technologies are available to support these processes. Exhibits 2-33 and 2-34 provide the current usage figures for business processes between companies and standards supporting data exchanges.

In terms of online technologies usage for business processes between companies, the electronics and electrical machinery industry exhibits usage figures that are clearly above the all sectors' average. These applications are slightly more used in large companies than in small ones, except for contract negotiation.

Online collaboration with business partners to design new products and to negotiate contracts is conducted by 16% and 15% respectively. Using the Internet to manage capacities and forecast product demand is less common (11% of enterprises).

From a national point of view, use appears to differ considerably between countries and the business processes considered. In general, enterprises in Finland and Sweden appear to be the most advanced in terms of using online technologies for business processes between companies. Among the Acceding Countries, firms in Poland and Slovenia are most likely to exchange standardised data with other companies.

Exhibit 2-33: Use of online technologies (other than free text e-mail) for business processes between companies (2003)

	Collaborative product design	Collaborative demand forecast	Capacity / inventory management	Contract negotiation
Sector total (EU-5)				
% of employment	20	17	20	10
% of enterprises	16	11	11	15
0-9 employees	15	11	11	15
10-49 employees	19	12	10	18
50-249 employees	13	7	15	15
250+ employees	23	23	25	7
All (9) Sectors (EU-5)				
% of employment	17	12	14	13
% of enterprises	12	8	7	11
DE Germany	18	10	18	2
EL Greece	35	33	5	5
ES Spain	16	14	19	10
FR France	20	25	17	7
IT Italy	17	13	16	13
FI Finland	44	52	54	44
SE Sweden	29	4	30	3
UK United Kingdom	27	26	28	25
EE Estonia	10	17	12	42
HU Hungary	2	13	13	17
PL Poland	26	14	29	37
SI Slovenia	22	28	11	9
SK Slovakia	29	31	15	53

Base: enterprises with Internet access. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Among the various standards, a relative majority of manufacturers of electronic products use Electronic Data Interchange (EDI), a standards-based mechanism for trading partners to electronically communicate with each other despite disparate systems, software and architectures installed. In the past, EDI was considered expensive and difficult to implement. Much of the expense was attributed directly to transaction fees charged by value added networks (VANs). Today, EDI is growing in popularity because transaction fees can be avoided by leveraging the Internet as the communications transport mechanism.

One the other hand, new XML based standards allow an optimised integration of components within a system, not only for marketplace purchase and supply but also for Content Management and Document Management (such as workflows) of technical information in electronics and electrical systems. The XML based standards are a major development for these industries, as they open new opportunities in the field of structured exchange of data.

Exhibit 2-34 shows data stemming from a question that was only introduced in the second part of the 2003 survey. Results are therefore only available for companies from some countries and it is difficult to have a global overview of the development rate of the different standards. Firms in Finland and Sweden seem to use these standards more intensively than those in the other countries.

Exhibit 2-34: Exchange of standardised data between companies (2003)

	Any standards	Type of standard				
		EDI based	XML based	STEP	Proprietary standards	Other
All (9) Sectors (EU-5)						
% of employment	37	18	10	2	19	9
% of enterprises	25	5	3	1	5	6
EL Greece	54	30	7	3	9	5
FI Finland	94	65	19	8	26	23
SE Sweden	83	53	26	25	2	52
EE Estonia	33	12	4	0	20	3
HU Hungary	29	11	0	0	3	1
PL Poland	63	29	5	2	25	14
SI Slovenia	54	27	17	8	17	2
SK Slovakia	33	1	22	0	0	8

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

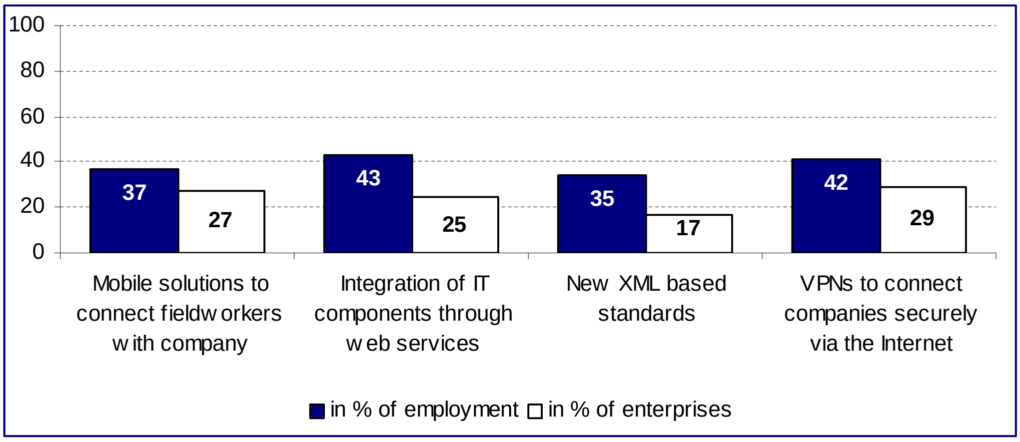
2.2.6 Outlook: What will be important

To conclude the statistical picture, this final chapter presents an outlook on issues that are likely to become important for the future development of e-business in the electronics and electrical machinery industries. Companies were asked in the second part of the 2003 survey to assess the importance of the following emerging technologies for their own business activity in the future.

- Mobile solutions to connect workers with the company
- Integration of IT components through Web services
- New XML based standards (ebXML or RosettaNet for instance)
- Virtual Private Networks (VPNs) to connect companies securely via the Internet

The results are reported in Exhibits 2-35 and 2-36. Figures are only available for countries covered in the second part of the survey (Greece, Finland, Sweden, Estonia, Hungary, Poland, Slovenia and Slovakia).

Exhibit 2-35: Assessment by companies: The future importance of new developments



% of companies or employees saying this will be "important for their company"

Base: all enterprises. N~50-100 per country (EL, FI, SE, EE, HU, PL, SI, SK).
Reporting period: March/November 2003.

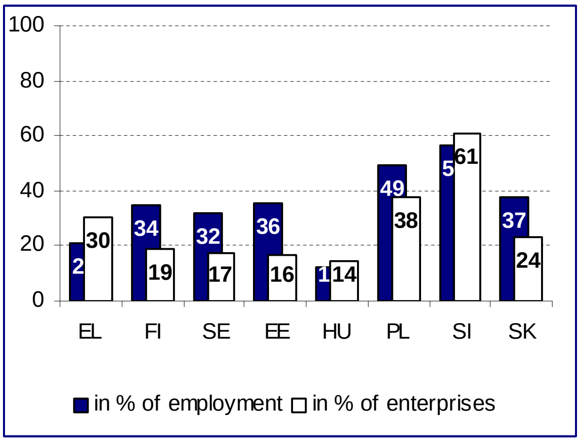
Source: *e-Business W@tch* (2003/04)

It appears that no application emerges as clearly dominant at this point of time. For instance, only 17% of enterprises (representing a third of employment in the sector) think that XML based standards will play an important role in the future. The figures for the other items asked are quite similar. Secured IP VPNs appear to be the most promising new innovation encouraging companies to develop e-business applications. This is probably due to the flexibility and savings this type of solution offers (see Business example No. 3 on Elcoteq, this chapter).

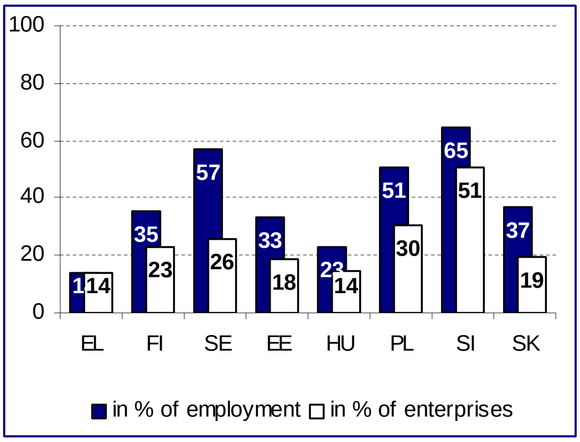
Perceptions differ widely between firms from different countries, though. Slovenian companies seem particularly interested in and convinced of the new technologies and standards. More than half of the interviewed companies think that they will play an important role in their future business. The awareness is also comparatively high in Poland, although the current level of e-business is still lagging behind the EU average. This indicates that firms in these countries are working on strategies to increase their e-business activities in the medium and long run. By contrast, Hungarian companies appear to be unconvinced of the importance of the technologies proposed.

Exhibit 2-36: Assessment by companies: The future importance of new developments

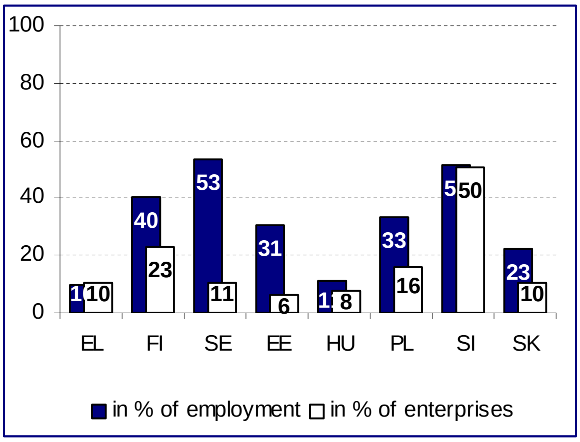
Mobile solutions



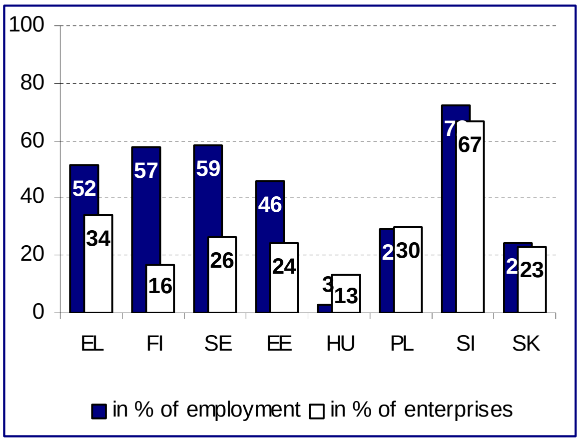
Web services



XML



VPNs



% of companies or employees saying this will be "important for their company"

Base: all enterprises. N~50-100 per country.
Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

Business example No. 3:

Elcoteq Network Corporation: improving the efficiency of the network through a VPN

Secured IP VPNs appear to be the most promising new innovation encouraging companies to develop e-business applications, due in particular to their flexibility.

Elcoteq, one of the largest European electronics manufacturing services (EMS) company, has implemented an MPLS[9] IP VPN solution, connecting 10 sites and providing the company with an infrastructure to support voice and video over IP services (ERP, application server software and e-mail among key applications).

The Finnish company's main business requirements were:

- *To support uniform systems and processes for the 11,000 employees and 12 countries in which it operates;*
- *To maintain business focus with volume production in low-cost countries;*
- *To build a reliable and secure global network to support its fast-paced production processes between factories, warehouses and customer service centres worldwide.*

The implementation of an MPLS IP VPN solution has enabled the company to reduce network latency, to reduce management load by sourcing to a single service provider, to increase network capacity and functionality without having to increase the budget and to unify Elcoteq sites in Japan, China, Hong Kong, Hungary, Switzerland, Germany, Finland, Mexico and the United States.

In fact, the implementation of an IP VPN allows large companies and SME'S to build secure, uniform, efficient and rather low cost intranets (compared to e-business network infrastructure technologies used in the past). It also allows the establishment of extranets with business partners. Moreover, IP VPN can include Classes of Services (CoS) in order to operate segmentation and prioritisation of IP flows depending on the type of application.

- *Real time applications (real time traffic, voice over IP, video and multimedia applications*
- *Mission critical business applications: ERP, SCM, CRM, database applications*
- *Less delay-sensitive applications designed to carry standard business applications*
- *Non time-critical application file transfer and batch, web browsing, email and data base replication ...*

Source: Yankee Group and IDATE, 2003.

9 MultiProtocol Label Switching, a norm used for the implementation of IP VPN corporate networks allowing the management of a network with Classes of Services (CoS)

2.3 The European e-Business Sector Scoreboard

2.3.1 Introduction

This Scoreboard compares the importance of ICT and e-business applications in 9 sectors of the European economy using 16 key indicators. For reasons of consistency and comparability, all indicators are based on data obtained through the e-Business Survey 2003 of the *e-Business W@tch*. Normally, benchmarking activities of this type imply that a higher score stands for a better performance. In this context, however, the main objective of the Scoreboard is not to make a statement about sectors' e-business performance. The goal is rather to make visible at a glance the fundamental differences between sectors with respect to the role and the relative importance of information technology and electronic business applications. For instance, the Scoreboard for the tourism sector shows that e-business is very important for marketing and sales, while the e-business intensity is below average in other business areas. For the chemical industries, the finding is just vice versa.

The indicators

The Scoreboard is composed of 16 component indicators for ICT and e-business which are grouped into four categories according to the business functions they refer to. These categories are: (i) the connectivity of the enterprise, (ii) Internal business process automation, (iii) procurement and supply chain integration, and (iv) marketing and sales. The scoreboard compares the level of e-business across different sectors in each of these categories.

The selection and definition of component indicators was driven by pragmatic requirements, considering data availability (a selection criteria was that data were available for all sectors monitored and for the EU-5 countries) as well as data reliability (in the sense that only a minimum of indicators which reflect subjective perceptions of the interviewee were used). Some of the component indicators consist of more than one variable by themselves. The Exhibit on the next page explains all 16 component indicators and their definition.

The Scoreboard is flexible in terms of scope and choice of indicators. Additional categories could be added on demand. If component indicators are modified or exchanged, however, aggregate values for the respective category will obviously be affected.

Percentages and index values

The Scoreboard presents data both as percentages and as indexed values.

- **Percentages** express the share of employees from a sector that work in enterprises using an application as defined in the following table.
- **Indexed values** take into account the percentages from all sectors and show how a specific sector differs from the all-sector-average. An index value is based on mean values and standard deviations. Constituting values are z-values, i.e. z=(x - mean(x))/stddev(x). This procedure results in a distribution with mean(z)=0 and stddev(z)=1. Thus, index values express the multiple of the standard deviation (1 or (-1)) for a specific sector and the selected indicator. 0 equals the mean value for all sectors, a value of +1 that the percentage is higher than the mean percentage of all sectors by the extent of the standard deviation. Negative values show that the percentage is lower than the mean percentage of all sectors.

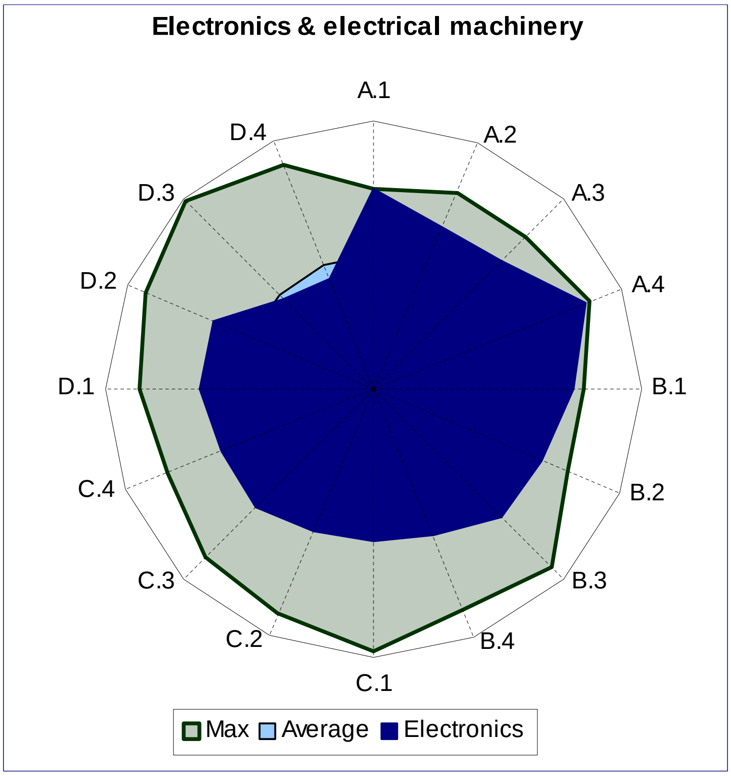
All spider diagrams are based on index values. The reason for preferring indexed values over simple percentages is that they adjust data for typical cross-sectoral gaps.

Exhibit: Definition of component indicators used for the E-Business Sector Scoreboard

A	**Connectivity of the enterprise**	
A.1	Enterprises connecting computers with a LAN	= the percentage of employees from a sector working in enterprises that have connected computers with a Local Area Network (LAN).
A.2	Internet connectivity	= the percentage of employees working in enterprises that are connected to the internet, with a supplementary indicator for the type of internet connection in terms of bandwidth. The percentage of employees working in enterprises that are connected with a bandwidth of less than 2 Mbit/s is computed with a factor of 0.5, enterprises connected with >= 2 Mbit/s bandwidth with a factor of 1.0. The maximum value of 100 would be returned if all employees from a sector work in enterprises connected to the internet with >= 2 Mbit/s bandwidth.
A.3	Remote access to the company network	= the percentage of employees from a sector working in enterprises where it is possible to access data from the company's computer system from a remote location.
A.4	Wireless access to company network	= the percentage of employees from a sector working in enterprises where it is possible to access the company network through wireless technology, for example by means of a wireless LAN (W-LAN).
B	**Internal business process automation**	
B.1	Use of an intranet	= the percentage of employees working in enterprises that use an intranet.
B.2	Use of online technology to track working hours and/or production time	= the percentage of employees working in enterprises that use online technologies for production process controlling purposes by tracking working hours of employees and / or production times
B.3	Use of ERP systems	= the percentage of employees working in enterprises that have implemented an ERP (enterprise resource planning) system
B.4	Perceived impact of e-business on internal work processes	= the percentage of employees working in enterprises that say that the use of e-business applications has significantly or somewhat changed their internal work processes
C	**Procurement and supply chain integration**	
C.1	Enterprises purchasing at least 5% of their supplies online	= the percentage of employees working in enterprises saying that they purchase at least 5% of their supplies online via the Internet or other online networks (for example via EDI based connections to their suppliers)
C.2	Use of SCM systems	= the percentage of employees working in enterprises that use an SCM (supply chain management) system
C.3	Integration of the IT system with that of a supplier	= the percentage of employees working in enterprises that purchase some of their supplies online and have integrated their IT system with that of a supplier for this purpose
C.4	Electronic exchange of documents with suppliers	= the percentage of employees working in enterprises that exchange documents (other than plain text e-mails) electronically with their suppliers
D	**Marketing and sales**	
D.1	Enterprises maintaining a website with a content management system	= the percentage of employees working in enterprises that have a website and use a content management system to maintain and update the website
D.2	Use of CRM software systems	= the percentage of employees working in enterprises that use a CRM (customer relationship management) software to organise data about their customers electronically
D.3	Enterprises selling at least 5% of their goods & services online	= the percentage of employees working in enterprises saying that online sales via the Internet or other online networks (for example via an extranet) constitute at least 5% of their total sales volume
D.4	Enterprises with an online sales system offering the capability of secure transactions	= the percentage of employees working in enterprises that make online sales and whose online sales system offers the capability of secure transactions by means of a secure server, for example using SSL, TLS or a comparable technical standard

2.3.2 E-Business Scoreboards for the electronics industries

Indexed scoreboard: component indicators



Indicators

A.1) LAN

A.2) Internet connectivity

A.3) Remote access to company network

A.4) Wireless access to company network

B.1) Use of an intranet

B.2) Use of online technology to track working hours and/or production time

B.3) Use of ERP systems

B.4) Perceived impact of e-business on internal work processes

C.1) Enterprises purchasing at least 5% of their supplies online

C.2) Use of SCM systems

C.3) Integration of IT system with supplier(s)

C.4) Electronic exchange of documents with suppliers

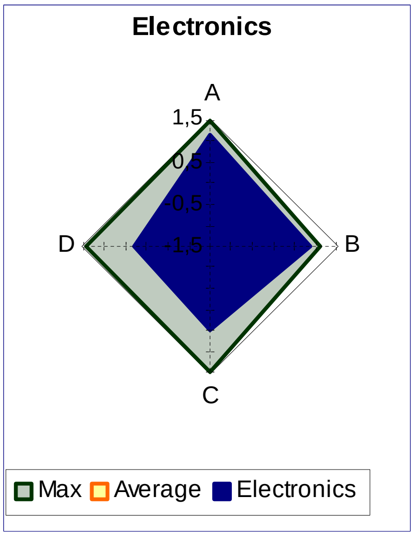
D.1) Enterprises maintaining a website with a content management system

D.2) Use of CRM software systems

D.3) Enterprises selling at least 5% of their goods & services online

D.4) Enterprises with an online sales system offering the capability of secure transactions

Indexed scoreboard: categories (aggregate)



Categories

A) Connectivity of enterprises

B) Internal business process automation

C) Procurement and supply chain integration

D) Marketing and sales

Max = maximum indexed value for one of the 9 sectors

Average = mean value for the 9 sectors

Assessment: Manufacturing sector with an intensive use of e-business

Companies from the electrical machinery and electronics industry are leading adopters of e-business. They tend to be intensive users, clearly above the average use rates of all nine sectors benchmarked. All indicators are above average, except those regarding secure transaction capability for making online sales.

More generally, e-marketing and e-sales applications are not as widely used and spread out as other e-business activities. The e-business focus of the sector is on business process automation and supply chain integration.

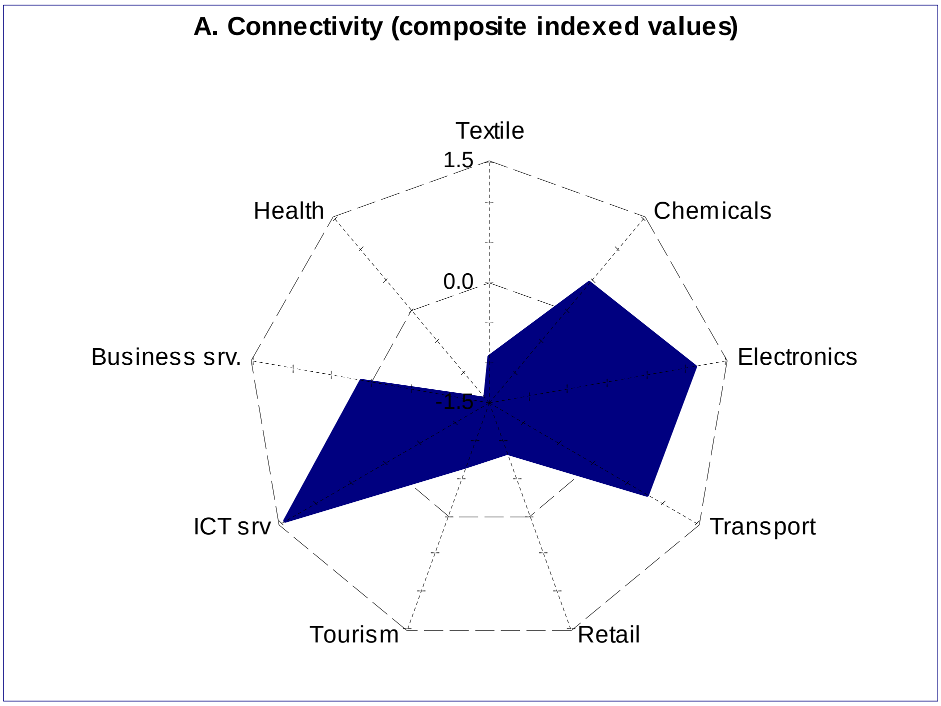
2.3.3 Cross-sector Scoreboards

Scoreboard A) Connectivity of the enterprise

Indicator	A.1 LAN		A.2 Internet		A.3 Remote access		A.4 Wireless access	
Sector	%	Index	%	Index	%	Index	%	Index
Textile	50	-0.94	50	-0.99	26	-0.89	6	-0.88
Chemicals	83	0.82	63	0.31	57	0.63	12	0.01
Electronics	89	1.18	67	0.69	61	0.84	25	1.69
Transport equipment	88	1.13	71	1.10	70	1.25	9	-0.44
Retail	51	-0.91	51	-0.96	24	-1.03	9	-0.43
Tourism	49	-1.00	55	-0.49	28	-0.79	10	-0.36
ICT services	87	1.06	74	1.41	73	1.42	26	1.78
Business services	68	0.02	66	0.59	43	-0.08	12	-0.08
Health services	42	-1.36	43	-1.66	17	-1.35	3	-1.29
All sectors	**61**	(-0.33)*	**58**	(-0.26)*	**37**	(-0.38)*	**11**	(-0.25)*
Crafts & trade **	30	-1.68	42	-1.55	10	-1.50	3	-1.15

* Due to the larger number of firms and persons employed, service sectors have more weight in the "all sectors" percentage. In contrast, the mean percentage of nine sectors which is used to compute the index ed values, does not consider different sector sizes. Therefore, the indexed value of the percentage for "all sectors" is not zero.

** Figures for the crafts & trade sector were not included for computing the all-sector average and the indexed values for other sectors, because "crafts & trade" only include small enterprises. Values for crafts & trade result from a separate computation where this sector was included.



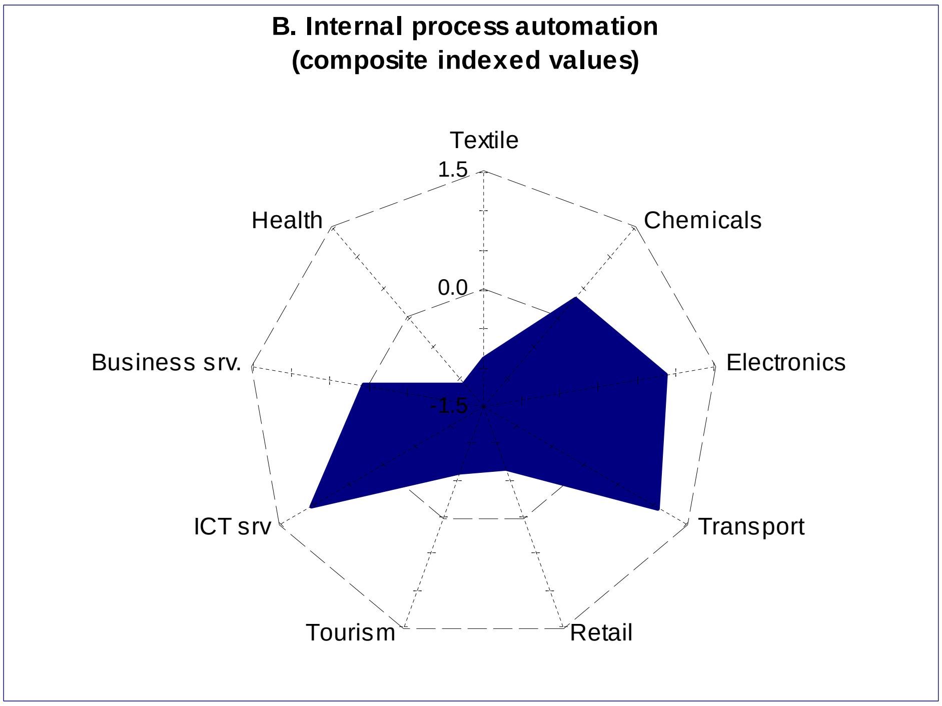
The connectivity scoreboard compares sectors with respect to the functionality of their IT networks. In general, companies from manufacturing sectors tend to be equipped with more powerful IT architectures than businesses from service sectors. The textile industries and the ICT services sector are the exceptions to this rule among the sample of sectors analysed by the *e-Business W@tch*. Results reflect the dominance of large enterprises with complex and sophisticated networking architectures in some manufacturing sectors (for instance in transport equipment manufacturing), compared to sectors such as business services, retail or tourism, where large players are less dominant. If only SMEs were considered, the connectivity gap would be much less pronounced.

Scoreboard B) Internal business process automation

Indicator	B.1 Intranet		B.2 Track production time		B.3 ERP use		B.4 Impact on work organisation	
Sector	%	Index	%	Index	%	Index	%	Index
Textile	32	-1.01	15	-0.74	18	-0.43	12	-1.39
Chemicals	62	0.47	33	0.60	48	0.96	16	-0.81
Electronics	77	1.18	36	0.85	45	0.84	25	0.47
Transport equipment	81	1.34	42	1.29	72	2.12	18	-0.51
Retail	37	-0.75	11	-1.06	13	-0.66	21	-0.13
Tourism	34	-0.91	10	-1.14	7	-0.96	26	0.57
ICT services	77	1.18	43	1.37	21	-0.28	34	1.80
Business services	49	-0.16	25	0.00	12	-0.71	29	1.09
Health services	25	-1.33	9	-1.18	9	-0.87	14	-1.08
All sectors	**45**	(-0.35)*	**20**	(-0.39)*	**19**	(-0.40)*	**23**	(0.11)*
Crafts & trade **	16	-1.48	8	-1.14	5	-0.95	11	-1.70

* Due to the larger number of firms and persons employed, service sectors have more weight in the "all sectors" percentage. In contrast, the mean percentage of nine sectors which is used to compute the index ed values, does not consider different sector sizes. Therefore, the indexed value of the percentage for "all sectors" is not zero.

** Figures for the crafts & trade sector were not included for computing the all-sector average and the indexed values for other sectors, because "crafts & trade" only include small enterprises. Values for crafts & trade result from a separate computation where this sector was included.



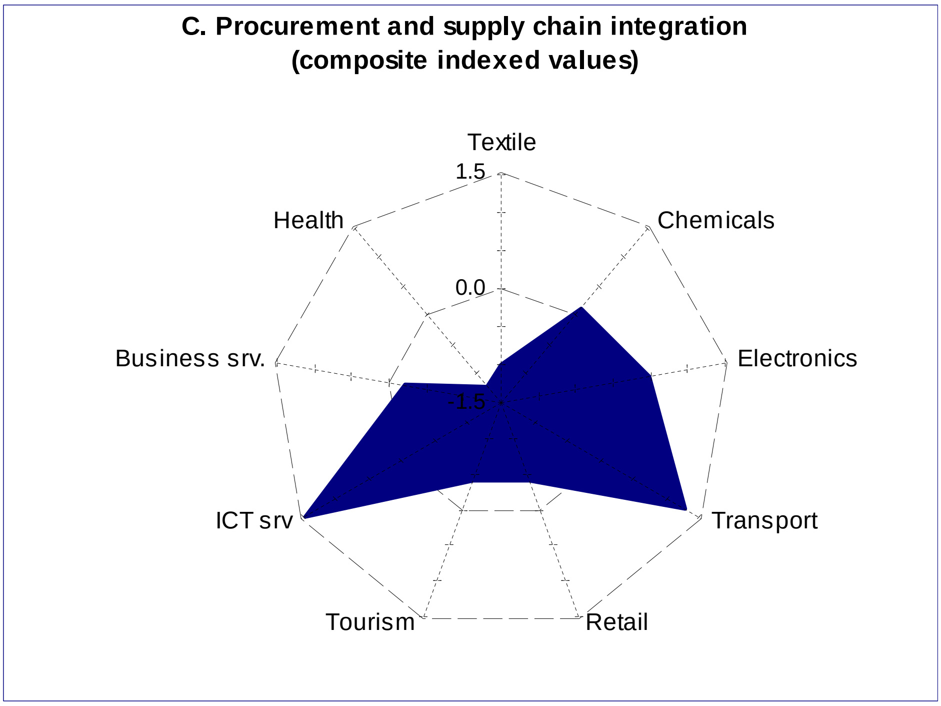
This scoreboard indicates to what extent sectors use ICT to automate internal business processes. Results are largely in line with the connectivity scoreboard. Again, the scoreboard suggests that companies from manufacturing sectors where large enterprises are particularly dominant tend to be most advanced in linking and automating internal business processes. This could be expected considering that many internal e-business applications such as ERP systems are clearly more relevant for manufacturers and for large companies. However, service companies also use applications to link their internal processes, most of all the ICT services and the business services sectors.

Scoreboard C) Procurement and supply chain integration

Indicator	C.1 E-procurement intensity		C.2 SCM use		C.3 IT integration with suppliers		C.4 Online exchange with suppliers	
Sector	%	Index	%	Index	%	Index	%	Index
Textile	6	-1.56	7	-0.22	2	-1.31	31	-0.93
Chemicals	23	-0.23	13	0.91	6	-0.55	43	0.33
Electronics	30	0.34	10	0.36	12	0.62	45	0.56
Transport equipment	31	0.47	19	1.98	14	1.03	55	1.58
Retail	16	-0.81	5	-0.63	11	0.43	34	-0.59
Tourism	28	0.16	3	-1.05	7	-0.37	35	-0.49
ICT services	54	2.29	11	0.53	19	1.89	50	1.05
Business services	23	-0.18	6	-0.44	6	-0.62	43	0.34
Health services	20	-0.47	1	-1.44	3	-1.12	21	-1.85
All sectors	**23**	(-0.18)*	**6**	(-0.42)*	**8**	(-0.19)*	**37**	(-0.27)*
Crafts & trade **	10	-1.11	3	-0.97	6	-0.58	30	-0.86

* Due to the larger number of firms and persons employed, service sectors have more weight in the "all sectors" percentage. In contrast, the mean percentage of nine sectors which is used to compute the index ed values, does not consider different sector sizes. Therefore, the indexed value of the percentage for "all sectors" is not zero.

** Figures for the crafts & trade sector were not included for computing the all-sector average and the indexed values for other sectors, because "crafts & trade" only include small enterprises. Values for crafts & trade result from a separate computation where this sector was included.



This scoreboard compares sectors with respect to the intensity and sophistication of their e-procurement activities. Results suggest that two sectors are outstanding in this regard: The ICT services sector and the automotive industries. Of the other sectors, only electronics and the chemical industries have indexed scores above average. The retail and the tourism sector are closer to the sector average (= 0 in the spider diagram) than in the scoreboards for their industry-wide connectivity and internal process automation. E-procurement activities in the textile industries seem to be at a surprisingly low level for a manufacturing sector where managing the supply chain is a core business function.

Scoreboard D) Marketing and sales

Indicator	D.1 Website with CMS		D.2 CRM use		D.3 E-commerce		D.4 Secure transaction capability	
Sector	%	Index	%	Index	%	Index	%	Index
Textile	7	-1.64	7	-1.05	1	-1.11	4	-1.24
Chemicals	17	-0.51	16	-0.01	2	-0.95	5	-0.83
Electronics	28	0.73	23	0.73	8	-0.11	8	-0.27
Transport equipment	23	0.13	26	0.98	13	0.63	8	-0.16
Retail	17	-0.53	7	-0.97	9	0.00	9	-0.04
Tourism	26	0.48	14	-0.28	24	2.36	18	1.92
ICT services	38	1.78	36	2.03	11	0.33	16	1.56
Business services	28	0.70	13	-0.35	6	-0.30	8	-0.25
Health services	12	-1.14	6	-1.07	3	-0.85	6	-0.70
All sectors	**22**	(-0.03)*	**13**	(-0.36)*	**9**	(0.03)*	**9**	(0.04)*
Crafts & trade **	6	-1.51	3	-1.24	1	-0.95	1	-1.50

* Due to the larger number of firms and persons employed, service sectors have more weight in the "all sectors" percentage. In contrast, the mean percentage of nine sectors which is used to compute the index ed values, does not consider different sector sizes. Therefore, the indexed value of the percentage for "all sectors" is not zero.

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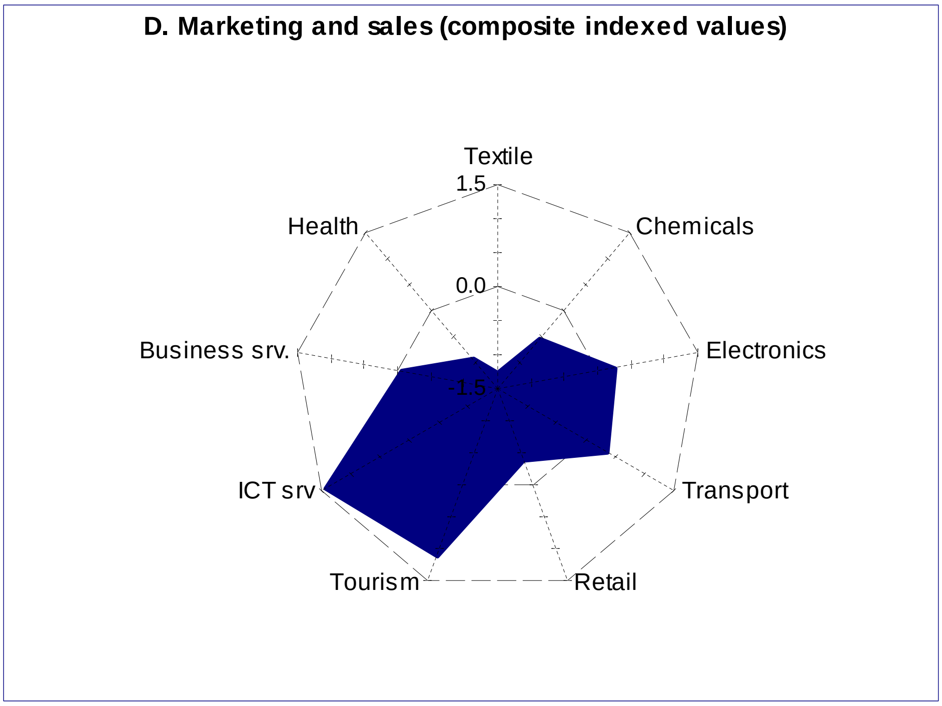
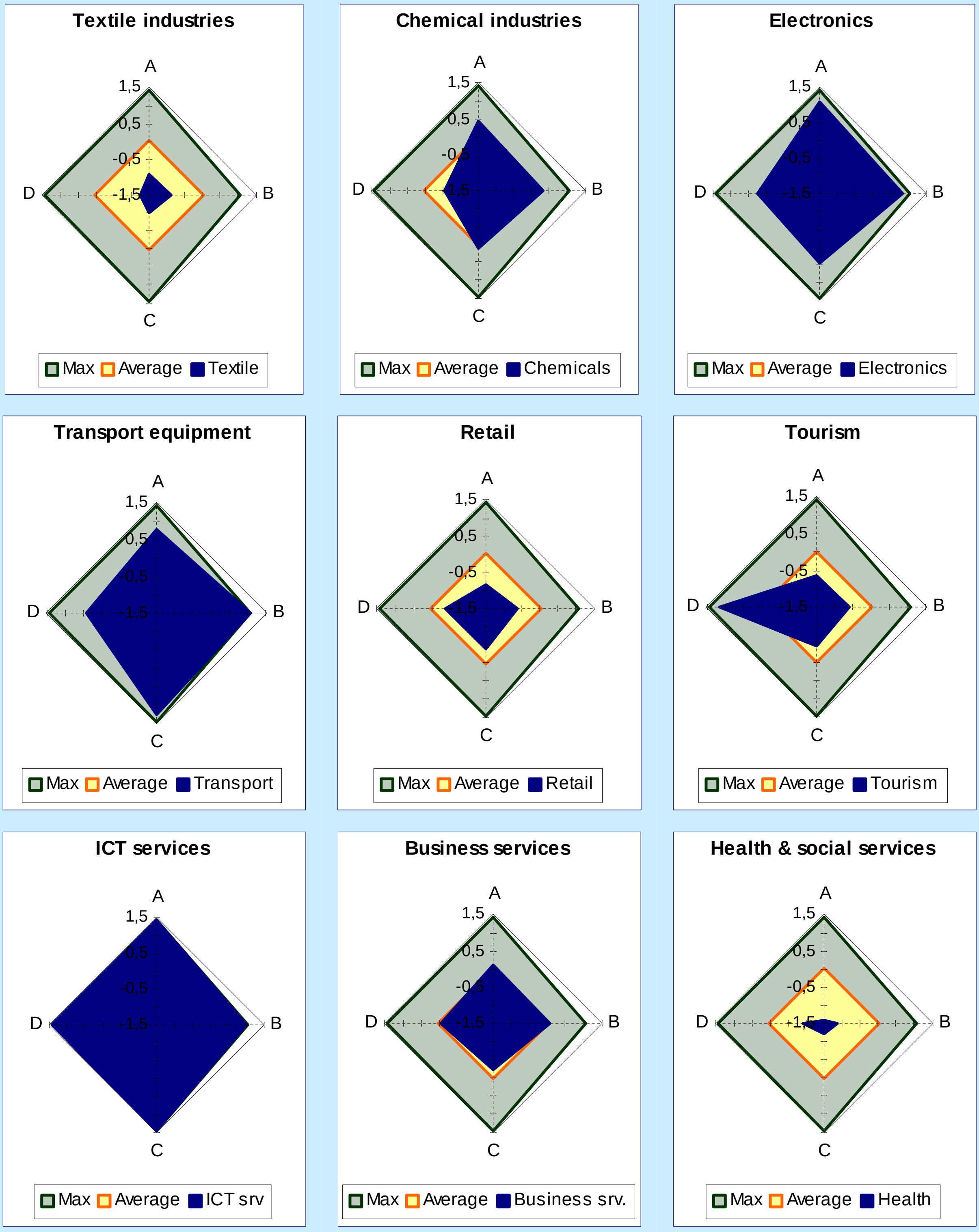


This scoreboard compares sectors with respect to e-marketing and e-sales activities. Results are quite different from the other scoreboards and show that using e-business for marketing and sales is a different story than, for instance, automating procurement and supply chain. Tourism, which is below average in all other sectors, is a leader and forerunner in the use of customer facing e-business applications. The sector is topped only by companies from ICT services which manage a large deal of their customer relationship electronically. Retail also scores higher than in the other business areas, although still below average, which is quite astonishing considering the e-commerce boom in specific retail markets (for instance books, software).

2.3.4 Sectors in profile



Indexed values by business functions (categories A-D). Each index is based on 4 key component indicators.
(A) = Connectivity of the enterprise; (B) = ICT use for internal business process automation
(C) = E-procurement and supply chain integration; (D) = E-marketing and sales
Max = Highest value in one of the 9 sectors benchmarked; Average = Mean value of all 9 sectors

3 Summary and conclusions

3.1 Summary of main findings

As outlined in the introductory chapter, the electronics and electrical machinery sector comprises both the rather traditional electrical engineering industry as well as the more recent and innovative electronics industry. The latter experienced dynamic growth in the last decade and was the fastest growing business sector in many European countries during the 1990s. However, with the end of the Internet-hype in late 2000, this industry dived into a deep recession, just about emerging in 2004. Employment reduction was significant in Europe between 1991 and 2002, reaching almost 50% in computer manufacturing. Recent evolutions in this industry, such as business globalisation, the highly modular set-up of products enabling outsourcing and specialisation and the value chain becoming more complex, have all contributed to massive outsourcing of labour-intensive volume manufacturing to Contract Equipment Manufacturers (CEM) in Asia, forming highly specialised geographic production clusters. In this new configuration, Europe and the United States have retained high-end, knowledge-intensive tasks.

Compared to electronics, the electrical machinery industry was more in line with the overall economic development. This industry faced a moderate increase in production between 1991 and 2002 (about +25%) and experienced a decrease in employment of around 28%. Much less volatile than the electronics sector, the electrical machinery industry is composed of highly vertically integrated OEMs. Moreover, outsourcing and globalisation are not as pronounced as in the electronics industry, and the majority of manufacturing facilities remain inside Europe. In fact, national standardisation (for instance for electrical plugs) and regulatory aspects in the electrical machinery sector have so far limited the outsourcing of activities. By contrast, in the electronics sector, standardisation is widely and successfully established on a European scale (as in the case of GSM), and to a large extent even on a worldwide scale, in particular in the cases of telecommunications and of de facto standards in consumer electronics.

Sector is an early adopter of e-business

Basic Internet access and standard Internet applications such as e-mail and use of the World Wide Web have already reached very high diffusion levels in the electronics and electrical machinery sectors throughout Europe. 98% of sector companies in the EU-5 have Internet access and use e-mail, 95% of the employees work in companies that also use the WWW, and 77% in companies that use an intranet.

The entire electronics and electrical machinery sector is already advanced in e-business usage, but the electronics industry seems more advanced than the electrical machinery sector. Nevertheless this is not a direct finding of this survey, which presents aggregate sector figures. As a consequence, the figures have to be analysed cautiously, taking into account the potential differences between sub-sectors in the adoption of e-business[10].

Some examples in this report showed that the electronics industry, and the micro-electronic industry in particular (semiconductors), is very suitable for e-business.

In the overall electronics sector, the main drivers of e-business adoption are the high level of its IT know-how, the high competitive pressure, the high degree of standardisation of products and components, the specialisation of firms along a complex value chain, the globalisation of production, and globally dispersed production schemes. In addition, this sub-sector is naturally IT-savvy and pre-destined to be open to experiment with new technology-driven management solutions. Consequently, in the electronics industry, e-business enables and drives innovative production and logistic schemes, globalisation and specialisation.

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[10] This issue will be discussed within the forthcoming Sector Impact Study No. 03-II (August 2004).

In the semiconductor industry, the early success of e-business can be partly explained by the high level of standardisation of a large part of electronic components used as an input in the production of electronic systems, combined with the very short time to market required and with the short lifecycle of electronic components. These factors strongly enhance the industrialisation and automation of the purchase process throughout e-procurement systems between component suppliers and system manufacturers (component buyers).

National differences in adoption

The survey results indicate that basic Internet infrastructures are widely implemented within the electronics and electrical machinery industries across Europe, even in the 10 new Member States. Thus the lack of IT infrastructures no longer constitutes a major barrier to e-business.

However, there are differences with respect to the availability of broadband Internet connections, remote and wireless access technologies. In general, companies in Nordic countries (Sweden and Finland) lead in these areas of ICT application, while French and Italian firms seem to fall behind, despite generally highly developed infrastructures.

There are also significant differences in e-business adoption between the countries covered by the e-Business Survey 2003 in this sector. As a general trend, German enterprises and firms in the UK lead in e-business adoption, whereas French firms remain sceptical. While Spanish companies exhibit mostly average or above average usage figures, Italian firms appear to be entering into a dynamic catching-up process. The French companies' falling behind cannot be fully explained by a lack of infrastructure or IT-skills, neither by the Minitel history nor by lower per-capita income. Cultural aspects may possibly play a more important role, since the business culture in France displays a marked preference for face-to-face interaction and a tendency towards IT-scepticism. In the Acceding Countries, companies are found to lag slightly behind in most e-business application areas, but there are exceptions, depending on the application.

Online purchasing currently the most widely adopted application

The survey results show that purchasing online is currently the most widely adopted e-business application. More than 50% of all enterprises in the sector made online purchases in 2003, while only 8% of firms made online sales themselves.

The low rate of enterprises selling online may be explained by the fact that online marketing activities most often do not include the actual completion of transactions. Nevertheless, the Internet does not seem to have a major role for marketing and customer relation purposes in this sector, in particular for electrical equipment manufacturers. Firms may have e-relations with distributors, but this does not include online sales in most cases. Data exchange is limited to online information, promotion tools and the information management of (traditionally accomplished) orders (availability of products, tariffs).

Furthermore, the share of enterprises using B2B marketplaces and/or extranets for online purchases and for selling is higher in the electrical and electronics industries sectors than on the all sectors average. It shows that marketplaces are an accepted channel, knowing that the electronics industry was one of the first sectors to develop Business to Business sites such as e2Open. Finally, other applications have not yet reached such a high level of acceptance as e-purchasing. For example, only 16% companies use the Internet for product design, and 5% use Internet-based solutions to support human resource management.

Differences between small and large firms

Large firms lead in almost any of the more complex e-business applications, such as ERP or SCM. ERP systems, for instance, are used by 13% of enterprises of the sector representing 45% of employees in the EU-5 area, which means that they are used specifically by large companies (55% have implemented this kind of application, compared to only 9% of SMEs).

This confirms that critical applications (ERP, SCM) still tend to be too complex and too expensive to be attractive for SMEs and micro-enterprises. Technologies that are explicitly used to make internal processes more efficient and cheaper are more applicable to large firms, where many people perform these processes on a regular basis. Examples are automating travel cost reimbursement for employees over the Internet, human resource management, or CRM tools. The advantages of these technologies for small firms are limited in relation to the required fixed investments and the resulting lower economies of scale. Moreover, the penetration of ERP and SCM in a sector seems as much linked to the size of the enterprise as to the particular features of this sector.

However, on the whole, SMEs in this sector are not lagging behind significantly, at least not if compared to the gaps observed in other sectors. In fact, with respect to a variety of e-business applications, SMEs from the electrical machinery and electronics industry show similar adoption patterns as those of large firms. For example, there are no great differences across size-classes in the percentage of companies collaborating online to design new products, exchanging documents with suppliers or customers, or purchasing online.

In those areas where large companies still have higher adoption rates, this does not necessarily reflect an underdevelopment of e-business among SMEs, nor does it imply that small firms automatically have a comparative disadvantage. In fact, many of these solutions deal with problems primarily experienced by large firms. As a consequence, the *e-Business W@tch* attests to both large and small firms in this sector a comparatively high state of e-business development, despite varying adoption rates across size-classes for some applications.

3.2 Business impacts

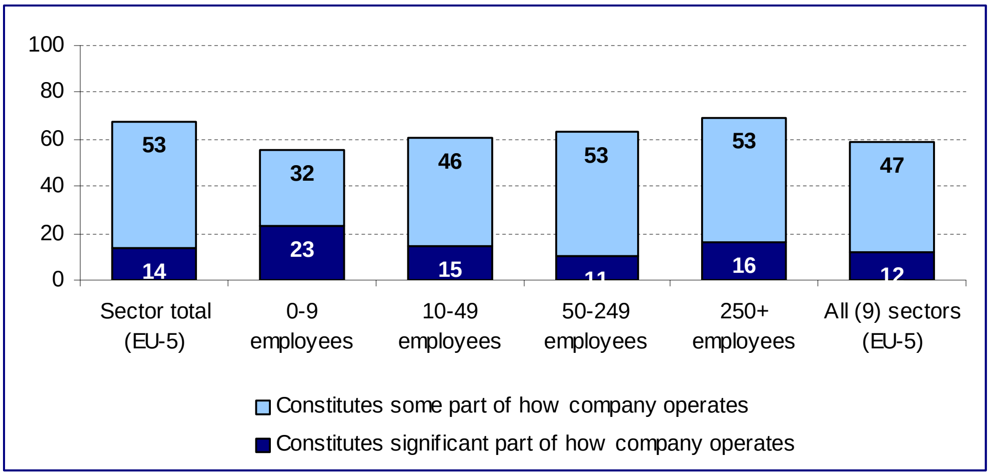
This chapter presents both the economic impacts of e-business development on individual enterprises and the implications for the industry. This first-level analysis on the economic impacts will be consolidated and revised in the elaborated analysis to be presented in the forthcoming report (August 2004).

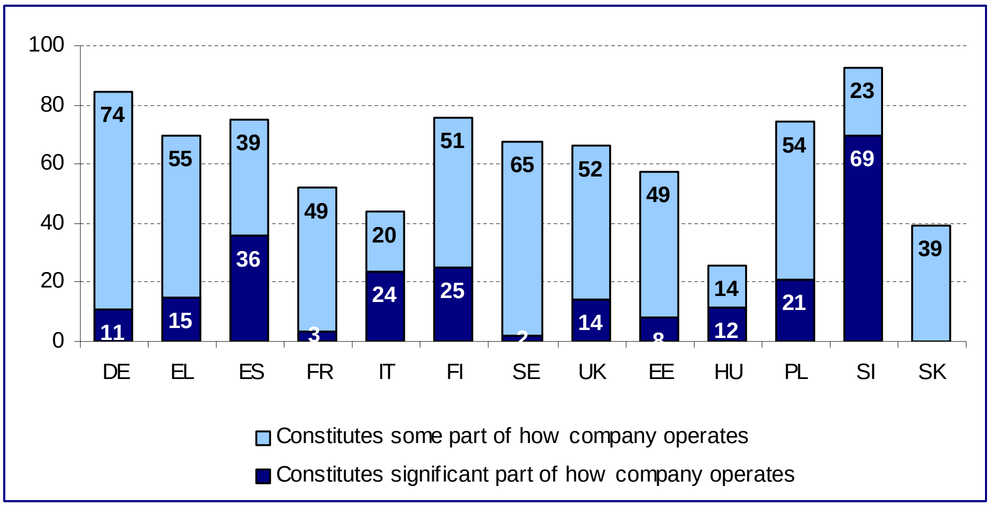
3.2.1 Impacts on individual enterprises

As shown in Exhibit 3-1, electronic business constitutes already at least "some part", or even "a significant part" of how companies operate, for a majority of firms in this sector. This applies to 69% of large companies, with small firms (0-9 employees) not falling far behind (55%). Notably, 23% of small firms even consider that e-business constitutes a significant part of how they operate.

Thus, compared to the all sectors average, the sector appears to be an advanced user of e-business. 67% of the employees in the sector are working in enterprises where e-business constitutes at least some part or even a significant part of the way these companies operate (against 59% as for the all sectors average).

Exhibit 3-1: Overall significance of e-business for companies in 2003 (by region and by size-band)





Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country. Weighting: Figures for size-bands in % of enterprises. Figures for "Sector total" and "All sectors" are weighted by employment ("enterprises comprising …% of employees"). Figures for countries are weighted by employment ("enterprises comprising …% of employees"). Reporting period: March/November 2003.

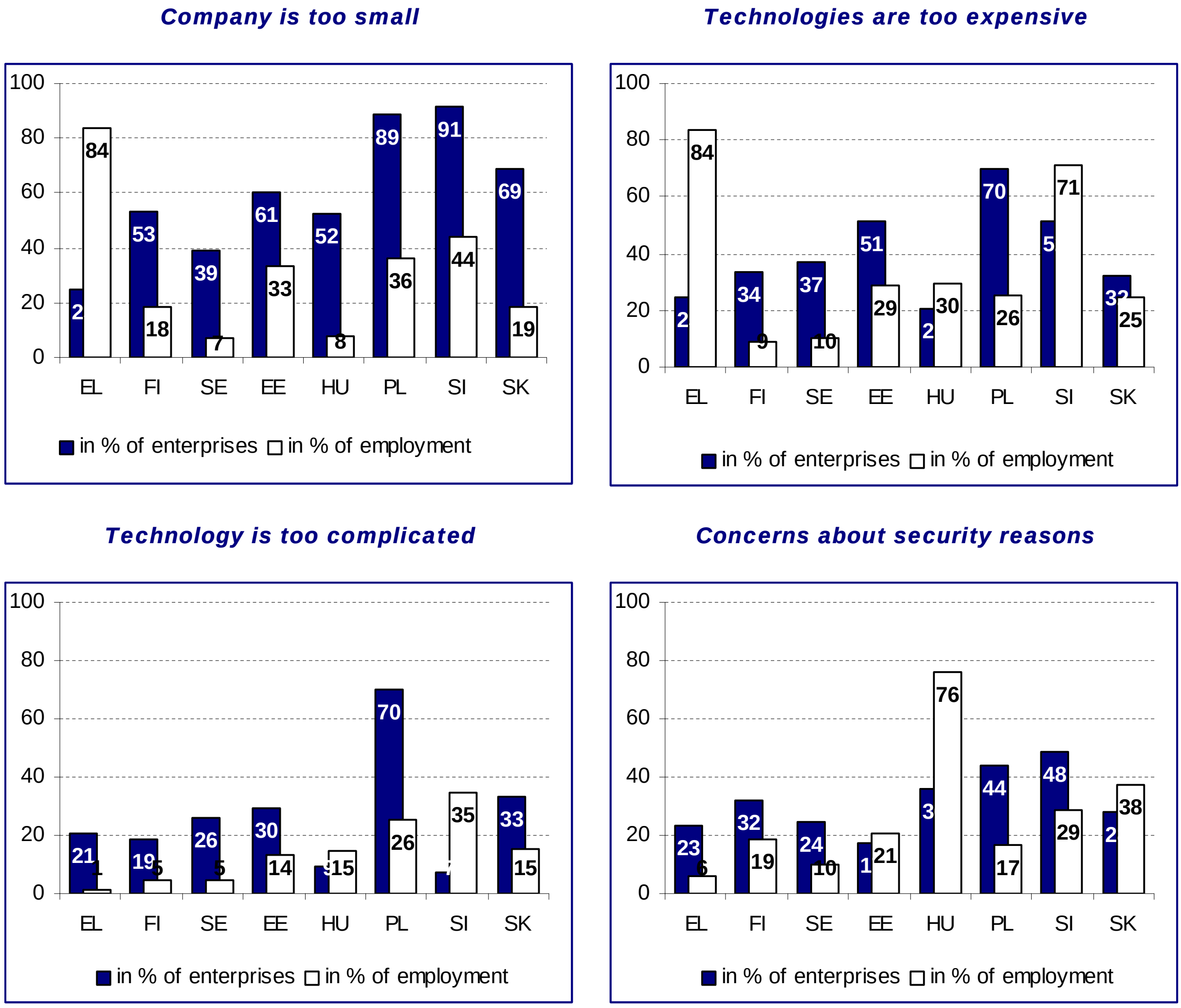
Source: *e-Business W@tch* (2003/04)

Companies responding that e-business does not play a role for them were asked why this is the case. Exhibit 3-2 summarizes the results. It shows that the most important barrier to the development of the e-business is the size of the company. This is the reason more often given by companies in Poland, Slovenia and Slovakia.

Even if SMEs do not fall far behind large companies in terms of e-business usage in the electronics and electrical machinery industries, it appears that technologies which are explicitly used to make internal processes more efficient and cheaper are more applicable to large firms, where many people perform these processes on a regular basis.

The high cost of technologies often also acts as a hindrance in e-business expansion, especially Estonian, Polish and Slovenian companies. By contrast, it seems that the complexity of technologies and security problems are no longer considered by companies as major barriers to the spread of e-business.

Exhibit 3-2: Reasons why e-business does not play a role in companies



Base: enterprises not using e-business applications. N~7-55 per country[11].
Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

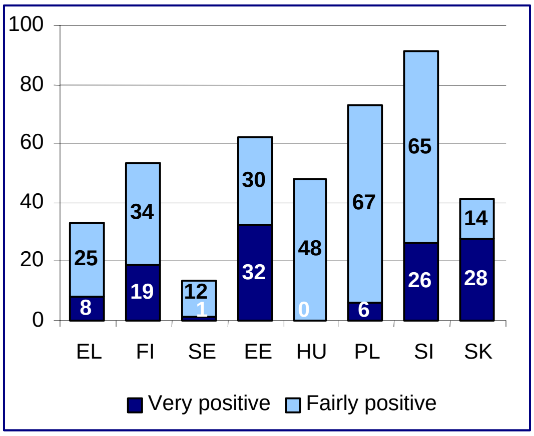
Exhibit 3-3 summarizes how firms perceive the impact of e-business on their own company. The most important changes perceived concern the availability of information for management and controlling inside the company. A large majority of companies say that the Internet and e-business technologies have fairly positive or even very positive impacts on this field. Collaboration and knowledge exchange between employees also seem to be improved by electronic business.

Conversely, perceived impacts of the Internet and e-business technologies on internal processing of commercial transactions and on product innovation are less obvious. Electronic business should be regarded as an ongoing process that has not yet reached its full impact. E-business tools are used to support and enable the ongoing restructuring and optimisation within firms, value chains, and industry groups. As such, they appear jointly with firms' initiatives to transform and develop their business models in search of comparative advantages and new business opportunities. The potential of e-business has not yet been fully exploited by many firms (and could not be, given the relatively short timeframe since the first introduction of appropriate tools).

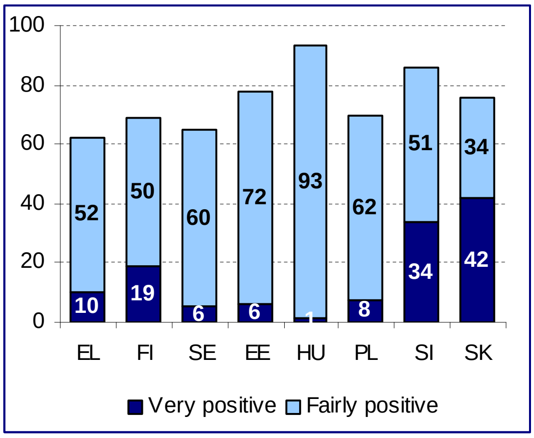
[11] These figures have to be analysed cautiously, taking into account the low number of interviewed companies (between 7 and 55 according to the countries).

Exhibit 3-3: Perceived impacts of the Internet and e-business technologies

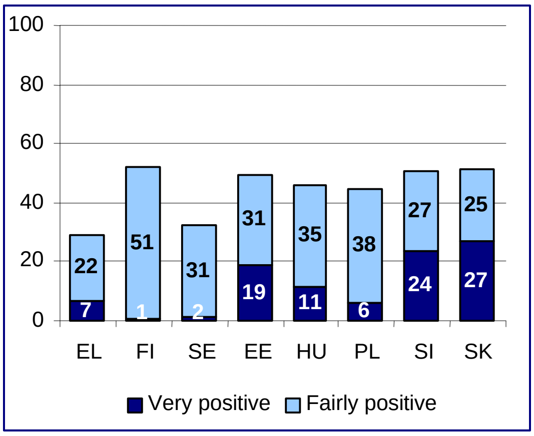
Impact on collaboration and knowledge exchange between employees



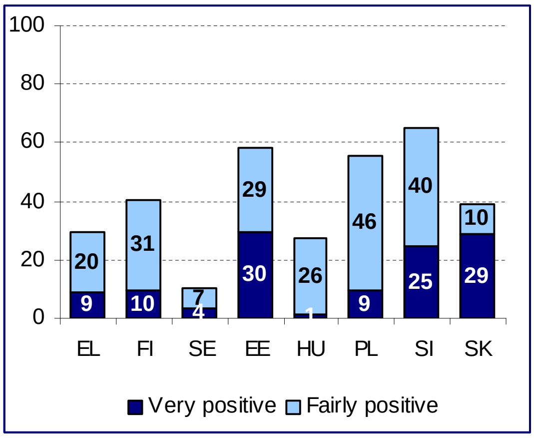
Impact on availability of information for management and controlling



Impact on internal processing of commercial transactions



Impact on product innovation



Base: enterprises using the Internet. N~39-73 per country.
Weighting: figures for countries are weighted by employment ("enterprises comprising …% of employees").
Reporting period: March/November 2003.

Source: *e-Business W@tch* (2003/04)

3.2.2 Implications for the industry

The wide diffusion of electronic business technologies enables further disintegration of the electronics industry. This could boost further specialisation of firms from the sector.

Outsourcing has been one of the most important trends in the electronics industry (NACE 30 and 32) during the last decade. The entire value chain is changing and reshaping into a more horizontal structure in which companies are focusing their activities on one particular production layer (such as semi-conductor components, hardware and assemblies, or system integrators). Companies outsource the engineering and production responsibilities of increasingly complex modules to their suppliers. This requires close co-operation and efficient communication between OEMs and their supplier network.

Against this background, the availability of efficient communication technologies (based on e-procurement platforms and SCM systems) will provide a favourable infrastructure for further exploration of outsourcing and co-operation possibilities. The use of e-business applications will be impossible to bypass in order to manage this structural change (horizontal market structure) in the business process and to ensure efficient communications between OEMs and their supplier networks.

The introduction of e-business solutions will not change the basics in the electrical machinery sub-sector

In contrast, in the more traditional manufacture of electrical machinery, globalisation trends are less pronounced than in the electronics industry. This sub-sector is characterised by strong national regulatory frameworks and standardisation. As a consequence, the market is mainly local requiring close relationships with providers.

Moreover, the general attitude of firms from the electrical machinery sector tends to be more conservative (although not negative) towards information and communications technologies. This industry will not refuse innovation once applications seem mature enough to withstand circumspect risk management and to promise real return on investment. In this way, manufacturers of electrical machinery are rather followers than early adopters of e-business technologies. This attitude seems to inhibit the fast penetration of e-business technologies in this (sub-)sector, at least in the short term.

3.3 Policy implications

Recommendation to give priority to interventions in favour of the electrical machinery sub-sector

As outlined before, one can observe a dichotomy between the two (sub-)sectors aggregated for the purposes of this study[12]: the manufacture of electronics (NACE 30 and NACE 32) on one side, and the electrical machinery and apparatus industries (NACE 31) on the other side. The latter appear to be the more traditional industry (sub-)sector. It is characterised firstly by the fact that companies' activities are mainly based on their domestic market, due to national product standardisation, and secondly by the dominant role of a large number of local SMEs.

Considering these characteristics and the (relative) backwardness of the electrical machinery (sub-)sector in the use e-business technologies, this industry seems particularly in need of public intervention. Policy initiatives could try to further encourage the development of standardisation processes and to increase awareness for these issues at European level to favour interoperability

[12] This issue will be discussed within the Sector Impact Study No. 03-II.

between electrical systems. Standardisation processes on the European level are an important prerequisite for further e-business adoption in this sub-sector. Furthermore, companies will to some extent have to change their conservative attitude with respect to business process innovation.

As a consequence, the *e-Business W@tch* suggests that public policy should give priority to the electrical machinery sub-sector. This objective could be achieved through promotion of e-business adoption, mainly addressing the numerous SMEs of this (sub-)sector. A precursor to reach this objective is to consolidate and further develop the good basis of co-operation with trade associations and national and regional standardisation bodies in the field of electrical machinery.

Encourage the SMEs in the electronics sub-sector to adopt most complex business applications through financial incentives

The survey indicates that SMEs do not fall far behind large companies in terms of e-business usage in the electronics and electrical machinery industries, at least in comparison to other sectors. However, the size of a company is still the most important "barrier" to the development of e-business. Statistics show that large firms take the lead in using the more complex e-business applications, such as ERP or SCM systems, which promise the highest efficiency gains.

The implementation of such systems can be a high risk for SMEs, mainly because of the large set up cost, but also because of the complexity of the process itself. Exploiting the opportunities of these critical applications often implies considerable process reengineering efforts.

In the electronics sub-sectors (NACE 30 and NACE 32), supply chain integration constitutes a major competitive advantage for SMEs, allowing them to reduce stock and procurement costs and to reduce cycle times. As a consequence, the *e-Business W@tch* suggests developing public incentives through financial support for SMEs of the electronics industries (for example through innovation funds for co-financing e-business projects), in order to encourage them to adopt more advanced e-business applications related to supply chain management.

Encourage the use of online selling and other e-business applications through support of standardisation efforts in the sector

While purchasing online is currently the most widely adopted e-business application in the electronics and electrical machinery sector, selling online is not yet widely diffused. However, encouraging and innovating electronic marketing and sales strategies could become an important asset of firms in a globalised competitive environment. The *e-Business W@tch* therefore suggests considering initiatives to stimulate the uptake in this area.

One of the actions to encourage activities could be the promotion of "open" e-business standards used in the more advanced forms of e-commerce. New standards such as XML allow an optimised integration of components within a system, not only for purchasing and selling on marketplaces, but also for Content Management and Document Management (such as workflows) of technical information in electronics and electrical systems. XML based standards are a major development for these industries, as they open new opportunities in the field of structured exchange of data.

To stimulate this evolution, the *e-Business W@tch* suggests that the responsible national and European public authorities should support standardisation processes in this field to the best they can, bearing in mind that standardisation is a rather voluntary process.

Moreover, the collection and distribution of best practices in online purchasing in the sector could be used to stimulate electronic marketing and sales. Best practices could be presented in the form of case studies and should include standardisation issues.

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Annex I: Methodological Notes on the e-Business Survey 2003

Background

Most of the data presented in this report are results of a decision-maker survey about e-business in European enterprises in 2003. This is an annual survey carried out by the *e-Business W@tch* – the first one took place in 2002 –, constituting a cornerstones of its monitoring activities. For organisational and contractual reasons, the e-Business Survey 2003 was split into two parts. The first consisted of 3,515 telephone interviews, which were conducted in March 2003 with decision-makers in enterprises from five EU countries. The second part had a scope of 4,570 interviews in the EU, 100 interviews in Norway and 2632 interviews in the 10 new EU Member States (NMS) and was conducted in November 2003. The questionnaires used in the two parts of the survey were largely the same. A few new questions were added in the second part in order to cover issues of special topical interest for policy.

Fieldwork

The fieldwork of the surveys in the EU-15 and in Norway was carried out by Ipsos Germany in co-operation with its partner organisations on behalf of the *e-Business W@tch*. Fieldwork in the 10 new Member States was carried out by NFO Aisa (Czech Republic) and its network.

Country	Organisation	Country	Organisation
Belgium	INRA Belgium, Avenue de la Couronne 159-165, 1050 Brussels	UK	Continental Research, 132-140 Goswell Road, EC1V 7DY London
Denmark	Gallup TNS Denmark, Masnedogade 22-26, 2100 Copenhagen	Norway	Norfakta Markedsanalyse, Kjøpmannsgt. 5, 7013 Trondheim
Germany	INRA Deutschland GmbH, Papenkamp 2-6, 23879 Mölln	Cyprus	Synovate (member of the Aegis Group plc), Nicosia
Greece	Synovate, 24 Ippodamou St., 11635 Athens	Czech Republik	NFO AISA s.r.o., Slezská 113, 130 00 Praha 3, Česká republika
Spain	IPSOS ECO Consulting, Avda. de Burgos, 12-8a, 28036 Madrid	Estonia	Saar Poll, Veetorni 4, 10119 Tallinn, Estonia
France	Ipsos Insight Marketing, 99, rue de l'Abbé Groult, 75739 Paris Cedex 15	Hungary	MEDIAN, Opinion and Market Research, POB 551, BUDAPEST, H-1539
Ireland	TNS mrbi, Blackrock, Co. Dublin 2	Lithuania	BALTIC SURVEYS, 6A Šermukšnių str., Vilnius LT-2001, Lithuania
Italy	Ipsos-Explorer, Via Mauro Macchi 61, 20124 Milano	Latvia	TNS – baltic data house, Kronvalda Blvd. 3 – 2, Riga LV-1010, Latvia
Netherlands	INRA in Belgium, Avenue de la Couronne 159-165, 1050 Brussels	Malta	MISCO – Market Intelligence Services Co. Ltd., Valetta
Austria	Spectra Marktforschung: Brucknerstr. 3-5/4, 4020 Linz	Poland	CASE Consumer Attitudes & Social Enquiry, ul. Nowy Świat 64, PL 00-357 Warsaw
Portugal	Ipsos Portugal, Rua Joaquim António de Alguiar 43-5.°, 1070-15 Lisbon	Slovenia	CATI – Marketing, Media and Social Research & Consulting, Tržaška 2, 1000 Ljubljana
Finland	Taloustutkimus Oy, Lemuntie 9, 00510 Helsinki	Slovakia	NFO AISA s.r.o., Slezská 113, 130 00 Praha 3, Česká republika
Sweden	GfK Sverige, Box 401, 221 00 Lund		

Interview method

The fieldwork was carried out using mostly computer-aided telephone interview (CATI) technology. Face-to-face interviews were used in Lithuania, and a mixed approach in Malta. The decision-maker in the enterprise targeted by the survey was normally the person responsible for ICT within the company, typically the IT manager. Alternatively, particularly in small enterprises without a separate IT unit, the managing director or owner was interviewed.

Population coverage and sampling

The highest level of the population for the e-Business Survey was the set of all enterprises which are active at the national territory of one of the respective countries and which have their primary business activity in one of the sectors specified by NACE Rev. 1 categories (see table). The selection and composition of sectors took into account their economic importance and the relevance of e-business activities.

The most important viewpoints used for breakdown of the population in the survey were (i) the economic activity, (ii) the national territory of the enterprise and (iii) the size in terms of employees. The survey was carried out as an enterprise survey, i.e. data collection and reporting focus on the enterprise (rather than on the establishment), defined as a business organisation of one or more establishments comprised as one legal unit.

The sample drawn was a random sample of companies from the respective sector population in each country where the respective sector was to be surveyed with the objective of fulfilling strata with respect to company size class. Strata were to include a share of at least 10% of large companies (250+ employees) per country-sector cell, 30% of medium sized enterprises (50-249 employees) and 25% of small enterprises (10-49 employees). Micro enterprises with less than 10 employees were also included in the survey. Samples were drawn locally by fieldwork organisations based on acknowledged business directories and databases (see table).

Population coverage of the e-Business Survey (2003)

No.	NACE Rev. 1 Section	Division/Group	Sector Name
01	D	17, 18, 19	Manufacture of textiles and textile products, leather and leather products
02	D	24, 25	Manufacture of chemicals and chemical products
03	D	30, 31 *(except 31.3 - 31.6),* 32	Manufacture of Electrical machinery and electronics
04	D	34, 35	Manufacture of transport equipment
05	D	Parts of (17-19), 20, (30-32), (34-35), 36, 45	Crafts And Trade: In addition to companies from sub-sections covered by other sectors: Manufacture of wood products; manufacture of furniture; construction and site preparation. Only enterprises with 0-49 employees.
06	G	52.11, 52.12, 52.4	Retail
07	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
08	K	74	Business services
09	I / K	64.2, 72	Telecommunications and computer-related services
10	N	85.11, 85.12, 85.3	Health and social services

Country	Directory / Database	Country	Directory / Database
Austria	Herold BUSINESS MARKETING database	UK	Dun & Bradstreet
Belgium	Dun & Bradstreet	Norway	Dun & Bradstreet
Denmark	KOB (Købmandsstandens Oplysnings Bureau)	Cyprus	Census of economic activity
Germany	Heins und Partner Business Pool	Czech Republic	Merit – CDF, Meritum Software, Enterprises database 2003
Finland	Blue Book - TDC Hakernistot OY	Estonia	Estonian statistical bureau + Krediinfo (register of taxpayers)
France	IDATA, based on INSEE Siren file (the National Institute of Statistics) and other directories	Hungary	Company Information Data Store, provided by Hungarian Central Statistical office
Greece	ICAP directory (the major database for Greece)	Lithuania	Department of Statistics and National Register at Ministry of Economics
Ireland	Bill Moss	Latvia	Business Register of Republic of Latvia
Italy	Dun & Bradstreet	Malta	National Statistics Office, Employment and training corporation
Netherlands	Dun & Bradstreet	Poland	REGON (GUS) data (National register of business)
Portugal	MOPE database	Slovenia	IPIS directory, published by Noviforum (list of active Slovenian enterprises)
Spain	Dun & Bradstreet	Slovakia	Albertina, Albertina Data, Enterprises database 2003
Sweden	Swedish Post Address Register (PAR)		

Scope of the e-Business Survey 2003: No. of interviews per country and sector

Scope	Part I (March 2003)	Part II (Nov/Dec 2003)
No. of sectors covered	7 sectors	10 sectors
No. of EU Member States involved	5 countries	25 countries
No. of sector-country-cells	35	98
No. of interviews	3515	4670 (EU+NO) + 2632 (NMS) = 7302

	Food, beverages and tobacco	Textile industries	Chemical industries	Electronics	Transport equipment	Crafts & trade (Construction ; Wood & furniture)	Retail	Tourism	ICT services	Health & social services	Business services	Total int.
Belgium			101				100				100	301
Denmark							67	67		66		200
Germany	100*	100	100*	100*	100*	100	100*	101*	100*	100	100	1101
Greece		84		76	89	75		75				399
Spain	100*	101	100*	100*	100*	108	100*	100*	100*	101	100	1110
France	100*	100	100*	100*	101*	101	101*	99*	100*	100	100	1102
Ireland			70					70	71			211
Italy	102*	100	101*	101*	100*	100	102*	102*	101*	100	101	1110
Luxembourg **												0
Netherlands		100							101	102		303
Austria					68			132		100		300
Portugal					104		100				100	304
Finland		75		75					76			226
Sweden			80	75	79						80	314
United Kingdom	100*	100	101*	101*	100*	100	101*	100*	101*	100	100	1104
Cyprus							64					64
Czech Republic			60		60			60	60	60		300
Estonia		50	50	50	21	65	50	50	50	50	50	486
Hungary				80	80						80	240
Lithuania							57					57
Latvia		51	49				51					151
Malta								51				51
Poland		80	80	80	80	80	80	80	80	80	80	800
Slovenia				56				51	53	55	58	273
Slovakia		50		50			50				60	210
Norway		30					70					100
TOTAL	**502**	**1021**	**992**	**1044**	**1082**	**729**	**1193**	**1138**	**993**	**1014**	**1109**	**10817**

* interviews carried out in March 2003 ** was covered in the e-Business Survey 2002

Problems encountered

No major problems were reported by the fieldwork organisations with respect to interviewing (e.g. comprehensibility of the questionnaire, logical structure). The overall feedback from the survey organisations was that fieldwork ran smoothly and that they had the impression that the questionnaire was well understood by most respondents. Some difficulties occurred, though, mainly with respect to the following issues:

- The main challenge was the fulfilment of quotas regarding company size-bands. In many countries, it was not possible to accomplish the objective of including a minimum share of large or even medium-sized enterprises in specific sectors. In such a case, these were replaced by interviews with smaller companies or from other sectors.
- Another well-known issue in this type of survey stems from the difficulties of conducting research projects among ICT decision-makers in general. Dedicated ICT professionals are heavily researched and therefore securing their participation can be difficult. This is a particular problem in larger companies.
- In some countries it was difficult to carry out interviews within businesses and retailers not using or with a very basic use of computers, because of the number of questions on related issues. The French fieldwork

organisation, for instance, reported that the questionnaire was too specific for some organisations, for example for small companies in the health & social services sector. These are mostly doctor's surgeries, where it was felt that the e-business related questions were not applicable to them. Also, small companies from the crafts' & trade sector, which often have just a computer but no network at all felt that the questionnaire was not sufficiently adapted to their activities.

- A related issue is that there are some compromises to be made if the same questionnaire should be used for micro-enterprises as well as for large companies. Some of the questions, while only scratching the surface of e-business activities in large companies, are hardly relevant for micro-enterprises with less than 10 employees. The Hungarian survey company, for instance, reported that some questions seemed to have little relevance for companies with only one or a few employees.
- Finally, an issue which was known in advance but is unavoidable in telephone interviews is that there is no "ideal target person" to be interviewed. Fieldwork organisations reported that sometimes a data processing manager is not very aware of the consequences of e-business on the whole of the company, on the personnel and on the financial level. On the other hand, the general manager may not always be aware of the technical implementation status. The Irish fieldwork organisation, for instance, reported that some of the smaller companies were not familiar with technical terms such as used for standards ("EDI" or "EDIFACT").

Weighting principles

Two weighting schemes have been applied: weighting by employment and by the number of enterprises. Data are presented in either way depending on the kind of the analysis to be made.

- Values that are reported as weighted by employment should be read as "enterprises comprising x% of employees". To give an example: The indicator "percentage of companies selling online" – if weighted by employment – is defined as "companies comprising x% of employees sell online". The reason for using employment weighting is that there are very many more micro enterprises than non-micro enterprises. The unweighted figure would effectively represent mainly the smallest sizes of firm.
- Values that are reported as enterprise-weighted figures are to be read as "x% of enterprises", reflecting the number of enterprises as legal entities but not their relative economic importance in terms of employment.

Eurostat based weighting on the latest available universe figures. Missing or undisclosed universe data had to be imputed. The imputation procedures depended on auxiliary or proxy data availability, taking into account where available information about higher industry aggregations, nearest neighbour data, turnover-employment correlation and secondary sources other than Eurostat. It also allowed for the constraint of predetermined ranges such that imputed data had to be contingent with published sectoral, national and European universe totals as well as for final plausibility checks for every single imputed data item. The weighting cells correspond to the data-reporting pattern used as regards industries and employment size-classes. Uniform expansion factors are applied to enterprises within one of the four size-classes per industry per country. As for data that refer to a base other than the universe of all enterprises (e.g. indicators appropriately reported for online selling enterprises only), expansion factors are adjusted to the different shares of observations per cell that build the computation base.

Variables - indicators

The set of ICT and e-business indicators for which data were collected in this survey was organised into the following modules:

- Background information (basic company data, innovation activities),
- ICT infrastructure and e-skills development in the company,
- E-commerce and e-business activities (internal business process automation, procurement and supply chain integration, exchange of standardised data between trading partners, marketing and sales activities, use of e-business software),
- Impact of e-business (impact of selling and procuring online, perceived effects on work processes, satisfaction with outcome),
- Assessment of future importance of various e-business technologies.

The choice of indicators considers relevant statistical work by the OECD and Eurostat and includes a basic set of widely accepted measures for e-commerce and e-business, but also tries to introduce innovative indicators which have a pilot character and are not yet widely tested.

The full list of variables which was the basis for preparing the questionnaires can be downloaded (as a spreadsheet) from the *e-Business W@tch* website (http://www.ebusiness-watch.org).

Annex II: Glossary of Technical Terms

Term	Definition
Access	The ability to retrieve information and to communicate online through the use of digital information and communication technologies.
B2B	Business to Business. Electronic transactions between companies.
B2B e-marketplace	Electronic trading platforms on the Internet where companies can sell and/or buy goods or services to/from other companies. They can be operated by a single buyer or seller or by a third party. Many marketplaces are industry-specific. Some marketplaces require registration and membership fees from companies that want to conduct trade on them.
B2C	Business to Consumer. Electronic business processes between companies and consumers.
Bandwidth	The physical characteristic of a telecommunications system that indicates the speed at which information can be transferred. In analogue systems, it is measured in cycles per second (Hertz), and in digital systems in binary bits per second. (Bit/s).
Broadband	High bandwidth internet access. In this report, broadband is defined as the capacity to transfer data at rates of 2Mbit/s (megabits per second) or greater.
Channel	In communications, a physical or logical path allowing the transmission of information; the path connecting a data source and a receiver.
CRM	Customer Relationship Management. Software systems that promise the ability to synthesize data on customers' behaviour and needs and thus to provide a universal view of the customer.
Dial-up	The process of establishing a temporary connection (to the Internet) via the switched telephone network.
DSL	Digital Subscriber Line. A family of technologies generically referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as "twisted copper pairs") into high-speed digital lines, capable of supporting advanced services. ADSL (Asymmetric Digital Subscriber Line), HDSL (High data rate Digital Subscriber Line) and VDSL (Very high data rate Digital Subscriber Line) are all variants of xDSL
E-business	Electronic business. The *e-Business W@tch* uses the term "e-business" in the broad sense, relating both to external and to company internal processes. This includes external communication and transaction functions, but also ICT supported flows of information within the company, for example, between departments and subsidiaries.
E-commerce	Electronic commerce. As distinct from the broader concept of e-business, e-commerce refers to external transactions in goods and services between companies (B2B), between companies and consumers (B2C), or between companies and governments (B2G) and may therefore be seen as a subgroup or component of e-business activities.
EDI	Electronic Data Interchange. A way for unaffiliated companies to use networks to link their businesses by using a common technical standard for exchanging business data. While electronic mail between companies is common, electronic data interchange passes bigger bundles that replace large paper documents such as bills and contracts. Besides saving paper, computers could save time by taking over transactions such as regular purchase orders that now require human intervention.
E-readiness	Readiness for e-business is defined as the capability to engage in electronic transactions. This comprises appropriate network access (including sufficient bandwidth), internal hardware and software solutions as well as the procedural and managerial readiness to deal with online transactions from simple web presence through to fulfilment of customer orders and related after sales services.

ERP	Enterprise Resource Planning. A software system that helps to integrate and cover all major business activities within a company, including product planning, parts purchasing, inventory management, order tracking, human resources, projects management, and finance.
Extranet	A network using Internet protocols that allows external organisations (for example customers or suppliers) access to selected internal data. Essentially it is an Intranet which gives external users restricted access (often password protected) to information through the firewall.
ICT	Information and communication technology. ICT includes networks, computers, other data processing and transmitting equipment, and software. The application of ICT in business processes leads to e-business, if non-proprietary networks are used.
Information security	Measures taken to protect information systems against unauthorised use and attacks
Internet	The world's largest computer communication system, with an estimated 600 million users worldwide.[13] The Internet is a loose confederation of principally academic and research computer networks. It is not a network but rather the interconnection of thousands of separate networks using a common language.
Interoperability	The technical features of a group of interconnected systems (includes equipment owned and operated by the customer which is attached to the public telecommunication network) which ensure end-to-end provision of a given service in a consistent and predictable way.
Intranet	An internal Internet, that is an internal network running using TCP/IP, which makes information available within the company. Most intranets are connected to the Internet, and use firewalls to prevent unauthorised access.
ISDN	Integrated Services Digital Network. An international telecommunications standard for transmission of voice and data over dial-up lines running at 64 Kbit/s (kilobits per second). It allows sharing of multiple devices on a single line (for example, phone, computer, fax).
LAN	Local Area Network. The most common way of connecting computers in a small area (typically inside a building or organisation) for sharing databases and communication facilities. The two most common versions are Ethernet and Token Ring. Implementation is based on coaxial cables or plain wires. Speed achieved ranges from 10 Mbps to 100 Mbps.
Leased line	A private communication channel leased from the common carrier. It is usually a dedicated fixed-route link (e.g. point-to-point frame relay).
M-commerce	Mobile commerce. E-commerce that takes place using mobile connection devices and through data transmission via technical standards for mobile communication.
Micro enterprise	A company with less than 10 employees.
Modem	Modulator/Demodulator. A device that modulates outgoing digital signals from a computer or other digital device to analogue signals suitable to be transmitted through a conventional telephone line (copper twisted pair telephone). The reverse procedure takes place for incoming signals.
MRO goods	Maintenance, repair and operating goods. Supplies which companies need to maintain their operations, for example office supplies, in contrast to "direct production goods" which are components of the goods and services the company produces.
Processes	Business processes are operations that transform the state of an object or a person. This can, for example, be an order placed via the internet. Ordering an object or a service creates a liability for the supplier to deliver, and initiates the transfer of property

[13] cf. Nua Internet Surveys, How many online, June 2003 (http://www.nua.com/surveys/how_many_online/index.html).

	rights from one entity to another. The electronic handling of processes is likely to speed them up and to introduce new processes in the realisation of the same transaction.
Remote access	The ability of a company computer network's transmission points to gain access to a computer at a different location.
SCM	Supply Chain Management. Software that helps businesses to match supply and demand through integrated and collaborative planning tools.
Sector	Sectors of the economy with comparable business activities. These constitute the main research unit of the *e-Business W@tch*. Aggregated information at the industry level is used to document the diffusion of activities within the industries as well as the overall importance of the observed phenomena for changes in the economy as a whole. The definition of sectors follows NACE Rev.1 classifications.
SME	Small and medium-sized enterprises with 0-249 employees. To be classed as an SME, an enterprise has to satisfy the criteria for the number of employees and one of the two financial criteria, i.e. either the turnover total or the balance sheet total. In addition, it must be independent, which means less than 25% owned by one enterprise (or jointly by several enterprises) falling outside the definition of an SME or a micro-enterprise, whichever may apply. The thresholds for the turnover and the balance sheet total will be adjusted regularly, to take account of changing economic circumstances in Europe.
Transaction	Electronic transactions can be subdivided into several steps, each of which initiates a process. There are pre-sale (or -purchase) phases, sale and after-sale phases. Typically a transaction starts with information gathering, price and quality comparisons and possibly pre-sale negotiations. During the sale phase contracting and delivery are the core processes, and payment is the final stage of this phase. After-purchase transaction stages comprise customer service, the administration of credit payments and the handling of returns as well as marketing activities preparing for the next purchase.
Value added	Gross output minus intermediate inputs. It is valued at producers' prices and includes all indirect taxes but excludes VAT and subsidies.
WAN	Wide Area Network. A network allowing the interconnection and intercommunication of a group of computers over a long distance.
WAP	Wireless Application Protocol. A communication protocol for delivering data over mobile telephone systems, allowing cellular phone sets and other mobile hand-set systems to access WWW pages and other wireless services.
Website	A related collection of World Wide Web files that includes a beginning file called a home page.
Wi-Fi	Short for "wireless fidelity", popular term for a high-frequency wireless local area network (W-LAN). Wi-Fi technology is rapidly gaining acceptance as an alternative or complementary infrastructure to a wired LAN.
W-LAN	Wireless Local Area Network. An implementation of a LAN with no physical wires, using wireless transmitters and receivers. It allows a mobile user to connect to a LAN or WAN through a wireless (radio) connection. A standard, IEEE 802.11, specifies the technologies for wireless LANs.
WWW	World Wide Web. The collection of pages in html format which reside on web-servers. Although WWW and the internet are different, the terms are increasingly becoming interchangeably used.

Annex III: Sector Impact Studies of the *e-Business W@tch* in 2003/04

No.	Sector	Date
1	Textile, clothing and footwear industries	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
2	Chemical industries	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
3	Electrical machinery and electronics	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
4	Transport equipment manufacturing	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
5	Crafts' and trade sectors	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
6	Retail	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
7	Tourism	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
8	ICT services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
9	Business services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004
10	Health and social services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Assessment and Case Studies: Economic implications and policy recommendations.	August 2004