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ICT & e-Business in the Electrical Machinery and Electronics Sector

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European Commission
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e-Business, ICT Industries
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Introduction

European policy is in a number of areas, including economic, innovation and SME policies, increasingly focused on promoting the business techniques and new ways of working which will provide the economic and social foundation of the information society in Europe. To help policy-makers define their programmes, and to monitor the effectiveness of these policies, some indication of progress and of areas requiring active support is essential. At the same time, many areas of European business lack information about the speed of technological update in European markets, which they expect to have a strong impact on their global competitiveness.

Despite the increasing number of studies and market research on electronic business, and especially on electronic commerce, there used to be a lack of reliable empirical information about the extent, scope, nature of and factors affecting the speed of e-business development in Europe at the sectoral level in an internationally comparative framework. This report aims to provide such information for the electronics and electrical machinery industries.

The e-Business W@tch

This report has been published in the framework of the European e-Business Market Watch. This is a market observatory established by the European Commission, DG Enterprise. Laying the groundwork for a continuous facility, the *e-Business W@tch* monitors and assesses the maturity of electronic business in 15 industry sectors across all EU Member States, including seven manufacturing and eight service sectors. At least two reports are to be published on each sector during the 18-month life-time of the *e-Business W@tch* (cf. publication schedule on the following page).

The research presented in these Sector Impact Studies is intended to help to benchmark progress and to assess how electronic business development can be further enhanced at the European level or at Member State level with the objective of strengthening the competitiveness of European businesses. Special attention is paid to the SME dimension of e-business. All reports, as well as an extensive collection of statistics on electronic business, can be downloaded from the website of the market observatory at www.ebusiness-watch.org.

The e-business decision maker surveys 2002 and 2003

Most of the data presented in this report are based on the recent European e-Business Survey 2003. The fieldwork of this enterprise survey was carried out by INRA Germany GmbH in co-operation with its international partner organisations in March 2003 using computer-aided telephone interview (CATI) technology. In total, 3,515 interviews with decision-makers in European enterprises were conducted. The survey included enterprises from five Member States (Germany, Spain, France, Italy and the UK) and from seven sectors of the economy. On average, about 100 interviews were conducted with enterprises from a sector in each of the five countries (i.e., 500 interviews per sector in total). More detailed information about the survey methodology is provided in the Annex to this report.

This was the second e-business decision-maker survey of the e-Business W@tch after the (larger) first survey in June/July 2002 which had a scope of 9,264 interviews and covered businesses from 15 sectors. In 2002, interviews were carried out in all 15 EU Member States, but only in the four largest states (Germany, France, Italy and UK) were all sectors covered. The first survey for the electronics and electrical machinery industries was carried out in the following countries: Germany, France, Italy, Finland, Sweden and the UK.

Sector Impact Studies of the e-Business W@tch: Publication schedule

No.	Sector	Date
1	**Food, beverages and tobacco industry**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
	• Report III: Recent trends (Survey 2003)	June 2003
2	**Chemical industries**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
	• Report III: Recent trends (Survey 2003)	June 2003
3	**Transport equipment manufacturing**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
	• Report III: Recent trends (Survey 2003)	June 2003
4	**Financial sector**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
5	**Insurance and pension funding services**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
6	**ICT services**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
	• Report III: Recent trends (Survey 2003)	June 2003
7	**Health and social services**	
	• Report I: Economic background / e-business issues	July 2002
	• Report II: The statistical picture (Survey 2002)	Feb. 2003
8	**Media and printing**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: The statistical picture (Survey 2002)	April 2003
9	**Metal products manufacturing**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: The statistical picture (Survey 2002)	April 2003
10	**Machinery and equipment manufacturing**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: The statistical picture (Survey 2002)	April 2003
11	**Electrical machinery and electronics**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: Recent trends (Survey 2003)	June 2003
12	**Retail**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: Recent trends (Survey 2003)	June 2003
13	**Tourism**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: Recent trends (Survey 2003)	June 2003
14	**Real estate sector**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: The statistical picture (Survey 2002)	April 2003
15	**Business services**	
	• Report I: Background, issues and key figures	Oct. 2002
	• Report II: The statistical picture (Survey 2002)	April 2003

The Electronics and Electrical Machinery Industries: Sector Profile & e-Business

1 Economic profile

1.1 Definition and focus

This chapter updates the introductory chapter to the first Sector Impact Study of the *e-Business W@tch* on the transport equipment industries, published in July 2002. 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).

Table 1-1: Classification of activities within the Electronics and Electrical Machinery Sector

NACE Rev.1	Activity
30	Manufacture of office machinery and computers
30.01	Manufacture of office machinery
30.02	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

1.2 Industry statistics

Sector structure

For the purpose of this report NACE 31 is referred to as the “electrical engineering” or the “electrical machinery” industry. The remaining sectors can, to a large degree, be classified as the ICT-producing industry, loosely known as the “electronics sector”.

All sub-sectors combined reached a production value of 471.9 billion Euro in 2001, which is approximately 9.8% of production value in the European manufacturing sectors. The share of the sub-sectors covered in this report in real production has slightly decreased compared to 1999 data, indicating that the electronics and electrical machinery industries have over-proportionally suffered from the sluggish economic development of the last few years. The ratio of value added to production value is approximately 30.7%, the remaining share is accountable towards purchased semi-finished products not produced by the sector itself or outside of the Member States.

The traditional electrical machinery sub-sector (NACE 31) is still the largest of the three divisions included in this report. Within NACE 31, the manufacture of electricity distribution and control apparatus has the largest share in production value (41%).

NACE 32, the second largest code, belongs to the ICT-manufacturing sector. Section 32.1 produces electronic intermediate goods such as valves, tubes, microprocessors and memory chips. Section 32.2, being the largest sub-sector within NACE 32 (58.6% of production value), is classified as investment goods production and contains the production of transmitters for radio and TV,

telecommunication infrastructure equipment and end-user equipment, such as mobile phones. Section 32.3 belongs to the more traditional electronic consumer goods production and comprises TV sets, radios, video recorders etc. Its share in production value in NACE 32 is rather small (16.7%).

Sub-sector 30.01 contains office machinery like photocopying machines and typewriters. Many products belonging to this section are relatively simple investment goods, partly even mechanical aids used for the organisation of offices. In most of the EU-15 countries for which data on NACE Rev. 1 30.01 exists, its share in sector 30 is negligible[1]. Sector 30.02 also contains investment goods and comprises the production of computers, screens, keyboards, scanners, printers, money machines etc. It is one of the most important manufacturing sectors of the ICT industry. The further analysis focuses on the NACE 30 aggregate, because of the low share of 30.01 in the aggregate and for reasons of data availability. NACE 30 is the smallest of the three codes covered in this report.

Table 1-2: Structure of the electronics and electrical machinery sector (DL30, DL31, DL32) in the EU 2001

NACE Rev. 1		Production value		Value added at factor cost (est.)	
		Euro (m)*	%	Euro (m)*	%
30	Manufacture of office machinery and computers	61,315.9	100.0	12,649.1	100.0
31.1	Manufacture of electric motors, generators and transformers	36,383.1	17.4	11,725.5	15.7
31.2	Manufacture of electricity distribution and control apparatus	85,866.6	41.2	33,912.5	45.5
31.3	Manufacture of insulated wire and cable	19,339.5	9.3	5,407.5	7.3
31.4	Manufacture of accumulators, primary cells and primary batteries	4,647.3	2.2	1,389.3	1.9
31.5	Manufacture of lighting equipment and electric lamps	14,857.6	7.1	5,772.6	7.7
31.6	Manufacture of electrical equipment n.e.c.	47,522.3	22.8	16,294.8	21.9
31	Manufacture of electrical machinery and apparatus n.e.c.	208,616.4	100.0	74,502.2	100.0
32.1	Manufacture of electronic valves and tubes and other electronic components 1)	49,872.3	24.7	17,287.5	29.9
32.2	Manufacture of television, radio transmitters and app. for line telephony or telegraphy 1)	118,330.7	58.6	31,388.3	54.3
32.3	Manufacture of television and radio receivers, sound or video rec. or repro. app. 1)	33,772.6	16.7	9,107.3	15.8
32	Manufacture of radio, television and communication equipment and apparatus 1)	201,975.6	100.0	57,783.1	100.0

* EU-12 = EU-15 excluding Greece, Ireland, and Luxembourg.

1) EU-11 = EU-12 excluding Netherlands.

Source: Eurostat New Cronos (2003), Estimations by DIW Berlin (2003).

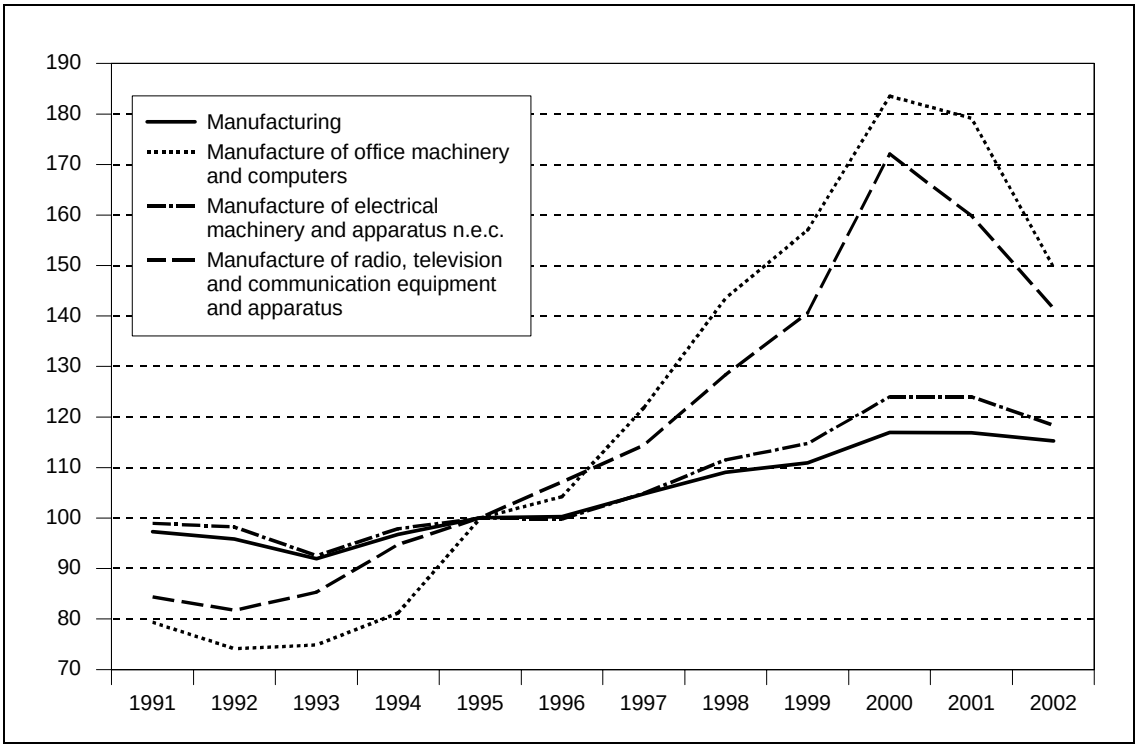
Production value and value added

Figure 1-1 shows the development of production value in the three codes of this report relative to total manufacturing, with 1995 as the reference point (1995=100). The figure shows that the highly dynamic ICT-producing sectors have clearly outperformed the average of all manufacturing sectors from 1992-2000. During this “boom-period”, production value in the ICT-producing sectors has more than doubled, compared to a 16% increase on average. However, the electronics industry has been in a deep recession since 2000, and production value fell back to the levels of 1998-1999 in 2002.

The more traditional electrical machinery industry was more in line with the average manufacturing development, still being able to outperform the average since 1995. Compared to the highly volatile ICT-producing sectors, the electrical machinery industry has proven much more resistant against the economic slowdown since 2000.

[1] An exception is Sweden where NACE 30.01 had a share of 45% at NACE 30 production value in 1999.

Figure 1-1: Production value in NACE 30, 31, 32, and total manufacturing in the European Union 1991-2002 – Index (1995=100) in%



Source: Eurostat New Cronos (2003), calculations and estimations by DIW Berlin (2003).

Table 1-2 provides a regional 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 (41.8%), followed by Italy (14.8%), France (13.2%), and the UK (11%).

It is said that a country has “specialised” in an industry sector if the share of this sector in total manufacturing in a country is clearly above the average share of the sector across a number of countries. By this measure, we can say that Germany and Denmark have specialised in NACE 30, whereas this industry plays only a minor role in the Netherlands and Belgium. 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.

The regional breakdown for the sectors producing ICT equipment (NACE 30 and 32) is given in table 1-3. Again, Germany has the largest share in European production value in this sector (21.9%). France exhibits the second largest (18.9%) and the UK the third largest share (18.7%), followed by Finland (12.6%) and Italy (10.9%).

Comparing the relative share of these industries in total manufacturing of the national economies, we find that Finland and Sweden have strongly specialised in the production of radio, television, and communication equipment (with Nokia in Finland and Ericsson in Sweden holding leading positions in the world market). In contrast, the sector has only minor shares in Spain and Denmark.

*Table 1-3: Production of electrical machinery and apparatus (DL31) in EU countries 2001 **

	Production value		Value added at factor cost		Share in total manufacturing	
	Euro (m)	%	Euro (m)	%	Prod. value	Value added
B	4,196.9	2.0	1,574.8	2.1	2.4	3.6
DK	4,009.6	1.9	1,180.0	1.6	5.3	4.5
D	87,294.6	41.8	34,214.2	45.9	6.7	8.3
E	13,322.2	6.4	4,020.9	5.4	3.5	3.8
F	27,466.5	13.2	8,350.1	11.2	3.2	3.9
I	30,968.8	14.8	9,409.5	12.6	3.9	4.5
NL	3,785.4	1.8	1,285.5	1.7	1.8	2.3
A	4,288.5	2.1	1,746.9	2.3	4.2	4.7
P	2,175.8	1.0	632.0	0.8	3.2	3.3
FIN	3,180.9	1.5	1,012.7	1.4	2.9	2.8
S	4,741.2	2.3	1,519.5	2.0	3.1	3.2
UK	23,186.0	11.1	9,556.1	12.8	3.4	4.1
EU-12 *	208,616.4	100.0	74,502.2	100.0	4.2	5.2
* EU-12 = EU-15 excluding Greece, Ireland, and Luxembourg.						

Source: Eurostat New Cronos (2003), Estimations by DIW Berlin (2003).

*Table 1-4: Production of ICT equipment (DL30 and DL32) in EU countries 2001 **

	Production value		Value added at factor cost		Share in total manufacturing	
	Euro (m)	%	Euro (m)	%	Prod. value	Value added
B	5,857.4	2.3	1,747.5	2.5	3.4	4.0
DK	2,294.0	0.9	719.6	1.0	3.1	2.8
D	56,855.2	21.9	17,383.8	24.9	4.4	4.2
E	9,208.0	3.5	2,254.8	3.2	2.4	2.1
F	49,195.2	18.9	11,738.2	16.8	5.7	5.5
I	28,348.1	10.9	6,796.3	9.7	3.5	3.2
A	6,278.8	2.4	2,431.8	3.5	6.2	6.6
P	3,423.4	1.3	788,7	1.1	5.0	4.2
FIN	32,856.8	12.6	10,642.6	15.2	29.5	29.8
S	17,306.9	6.7	2,521.3	3.6	11.3	5.4
UK	48,570.2	18.7	12,777.0	18.3	7.1	5.5
EU-11 *	260,194.0	100.0	69,801.6	100.0	5.5	5.1
* EU-11 = EU-15 excluding Greece, Ireland, Luxembourg, and Netherlands.						

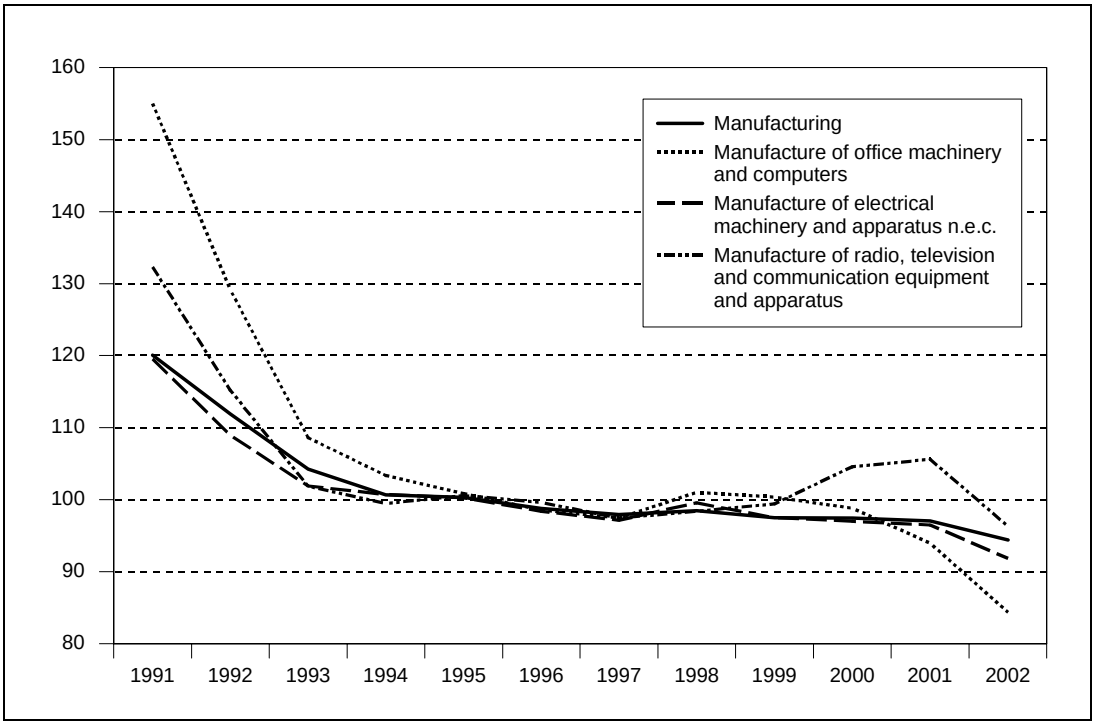
Source: Eurostat New Cronos (2003), Estimations by DIW Berlin (2003).

Employment, productivity and labour costs

Figure 1-2 shows the development of the number of persons employed in the three divisions of this report relative to total manufacturing, with 1995 as the reference point (1995=100). One can see that the development of employment figures was much more volatile for the ICT-producing sectors than for the electrical machinery industry and manufacturing total. The computer industry in particular shows a dramatic cut-back in employment from 1991 to 2002. During this period, almost every second job in this sector was lost. This development was only put on hold during the boom years of 1995-2000, after which employment began again rapidly to reduce in this sector. The cutback in jobs in this industry was most dramatic in Finland, Germany, Italy, and Spain, while Austria has been increasing capacities and employment in NACE 30 against the trend (see sector report no. 11, Oct 2002). Combined with the rapidly increasing production index for the computer industry over the same time span, the reduction of persons employed leads to increases in the productivity statistics for the computer industry. Part of the explanation for this development is the outsourcing of labour-intensive, volume production activities to Contract Equipment Manufacturers (CEMs) in Asian countries, while the more knowledge-intensive production steps have remained in Europe.

Employment figures in NACE 32 (ICT-producing industry excluding computers) are not as erratic as in the computer industry, but follow a similar pattern for the period between 1991 and 1998. In the period between 1998-2001, however, employment figures in NACE 32 were above the trend of total manufacturing. Finland, Ireland, Portugal, and Sweden have increased the number of employees in this industry during these years. This positive trend could not be retained after 2001 when the industry had to respond to sluggish demand by an above average reduction of employment. The electrical engineering industry (NACE 31) was in line with the generally negative employment trend in all manufacturing industries. From 1995 to 2001, employment figures in the electrical engineering industry increased in Denmark, Spain, Ireland, and Portugal, while Germany, Austria, Finland and the UK all lost jobs in the same period.

Figure 1-2: Number of persons employed in NACE 30, 31, 32, and total manufacturing in the European Union 1991-2002 – Index (1995=100) in%



Source: Eurostat New Cronos (2003), calculations and estimations by DIW Berlin (2003).

Overall, the sectors covered in this report accounted for approximately 2.32 million persons employed in the EU. The sector with the highest absolute employment figure is the traditional electrical machinery industry, with approximately 1.4 million employees (see table 1-4). Within NACE 31, the majority of jobs is located in Germany. Germany accounts for more than one in three jobs in these industries in Europe.

Productivity, measured as value added per employee, shows significant variance throughout Europe. Portugal, Sweden, and Italy report the lowest productivity figures, while Germany leads with 66,500 Euro value added per person employed. The productivity gap between Germany and Portugal is approximately 70%. This productivity gap is also reflected in labour cost figures: Employees in Portugal receive only 36% of the wages, salaries, and social benefits paid in Germany. The labour costs in this sector in Europe are highest in Belgium (45,700 Euro per employee) and the Netherlands (41,400 Euro), followed by Germany and Austria.

*Table 1-5: Employment, productivity and labour costs in the electrical machinery industry (DL31) in EU countries 2001 **

	Employment		Productivity		Labour Costs	
	Persons employed	In % of total manufacturing	value added per person employed 1)	In % of total manufacturing	per employee 1)	In % of total manufacturing
B	26,436	3.9	59.6	91.4	45.7	102.8
DK	24,550	5.1	48.1	88.9	36.8	101.8
D	514,874	7.0	66.5	119.1	41.3	100.4
E	95,026	3.6	42.3	105.7	29.0	112.0
F	165,980	5.1	50.3	76.7	39.7	84.7
I	226,459	4.5	41.6	98.9	29.2	101.7
NL	22,011	2.5	58.4	92.3	41.4	101.6
A	29,212	4.6	59.8	102.8	41.1	104.7
P	31,309	3.3	20.2	102.0	14.8	118.5
FIN	16,737	3.8	60.5	75.5	37.7	95.7
S	41,697	5.2	36.4	62.4	36.7	92.8
UK	175,515	4.4	54.4	93.1	37.1	100.3
EU-12 *	1,369,806	5.1	54.4	102.6	37.1	101.4

* EU-12 = EU-15 excluding Greece, Ireland, and Luxembourg. 1) in 1000 Euro.

Source: Eurostat New Cronos (2003), calculations and estimations by DIW Berlin (2003).

The regional breakdown of employment and productivity figures for the ICT equipment industries is given in table 1-5. In 2001, there were 1.37 million employees in the industries manufacturing ICT equipment. The largest shares of jobs are located in Germany (22%), France (21%), and the UK (21%) but the ICT industries are most important for Finland and Sweden, where the share of employment in this sector is particularly high compared to total manufacturing.

The productivity in this sector exceeds the average of all manufacturing sectors by almost 40%. Productivity is highest in Finland with 186,600 Euro value added per employee in 2001. Labour costs in Finland, however, are comparable to the EU average. These two factors together (high productivity and average labour costs) constitute a comparative advantage of the ICT industry in Finland, which is mostly attributable to Nokia and its suppliers.

*Table 1-6: Employment, productivity and labour costs in the "ICT equipment" industries (DL30 + 32) in EU countries 2001 **

	Employment		Productivity		Labour Costs	
	Persons employed	In % of total manufacturing	value added per pers. employed 1)	In % of total manufacturing	per employee 1)	In % of total manufacturing
B	20,031	3.0	87.2	133.9	57.2	128.7
DK	15,710	3.3	45.8	84.8	27.7	76.7
D	206,520	2.8	84.2	150.9	48.9	118.9
E	42,879	1.6	52.6	131.3	41.5	160.2
F	197,348	6.1	59.5	90.7	52.5	112.2
I	120,675	2.4	56.3	134.1	35.6	124.3
A	30,132	4.8	80.7	138.8	54.4	138.4
P	16,951	1.8	46.5	235.0	23.5	188.7
FIN	57,047	12.8	186.6	232.9	48.4	122.9
S	58,470	7.3	43.1	73.8	47.9	121.3
UK	180,215	4.5	70.9	121.2	48.0	129.9
EU-11 *	954,735	3.6	73.1	138.9	47.1	129.3

* EU-11 = EU-15 excluding Greece, Ireland, Netherlands, and Luxembourg. 1) in 1000 Euro.

Source: Eurostat New Cronos (2003), calculations and estimations by DIW Berlin (2003).

Industry structure by size-class distribution

The sector is characterised by a high degree of concentration. Large companies, which account for 2.0% of all companies in the sector, contribute 79.3% to the sector's turnover and 63.5% to employment (see table 1-6). Industry concentration is particularly pronounced in the ICT equipment industries, where rapid technological progress and the production of electronic mass products enhanced economies of scale and hence the concentration process. Taking advantage of these economies of scale contributes positively to productivity levels in large firms in this sector. As a consequence, large firms contribute more to turnover than to employment shares within the three size classes. The enormous growth rates of the ICT-producing sectors in the second half of the nineties were mainly achieved by a few very large firms in some of the highly specialised smaller countries, such as Nokia in Finland, Ericsson in Sweden, and American firms active in the Irish computer industry.

In sector 31, smaller sized firms are more efficient than the firms of the same size class belonging to sectors 30 and 32. In the former, the relationship of turnover and employment shares in the three lower size classes is higher than in the latter two sectors. The reason could be that the goods belonging to sector 31 are partly more specialised and tailor-made, such that smaller firms can efficiently supply these markets. However, in all three sub-sectors, only the largest size-class contributes more to turnover-shares than to employment-shares.

Table 1-7: Size class distribution in the electronics and electrical machinery industries (DL 30+31+32) in EU-15 countries in 2001

		Enterprises with ... persons employed			
	Total	**1 to 9**	**10 to 49**	**50 to 249**	**250 and more**
NACE	Number of enterprises	**Structure in % of total**			
30 + 31 + 32	73,746	73.7	18.6	5.6	2.0
	Turnover in million Euro	**Structure in % of total**			
30 + 31 + 32	566,099.2	2.6	6.3	11.8	79.3
	Number of persons employed	**Structure in % of total**			
30 + 31 + 32	2,434,600	6.2	11.9	18.4	63.5

Source: Eurostat New Cronos (2003), calculations and estimations by DIW Berlin (2003).

1.3 General economic trends and challenges

Sector specific issues and challenges were extensively discussed in report No. 11, published in October 2002. We briefly recall the main findings here.

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, albeit engineering-intensive sector. The ICT-producing 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.

Both sub-sectors 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.

The production of electronics is nowadays an entirely global business. We observe a high frequency of international mergers and acquisitions, global price competition, and the forming of geographic production clusters that specialise in one particular kind of production activity (e.g. hard-disks in Singapore, LCD's in Taiwan). Throughout the entire electronics value chain, some trends are omnipresent: Labour-intensive, volume manufacturing has been 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.

On the other hand, the less standardised products of the electrical engineering sector (engineering-intensive motors, generators etc.) are still manufactured mainly in the Member States. The electrical machinery sectors have seen some relocation of production to low-wage countries, but mostly inside Europe. The majority of the manufacturing facilities nevertheless remain inside the EU member countries because they have the know-how necessary. 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 dominates many electrical engineering sub-sectors. Most OEMs in this segment are big European or American enterprises, such as ABB, Siemens, Alcatel, or General Electric.

Recent trends

During the last months, a number of industry news pointed at recent trends and developments. The electronics and electrical machinery sectors are currently sceptic about business opportunities in 2003 and forecast that "in the best case" last year's revenues will be retained (VWD, 20.03.2003). German high-tech companies respond to this development by decreasing their R&D expenditures in 2003 for the first time in the last 8 years (Financial Times Deutschland, 26.02.03, p. 25).

The chip industry is still suffering from over-capacities and ruinous price-competition after the unrivalled boom period of the late 1990s. Most producers currently run a deficit, although chip prices have recently increased again. The sluggish demand for computers and telephone equipment is the main reason for this situation (Handelsblatt, 24.04.2003, p. 1).

On the other hand, there are also some positive developments. The proportion of electrical and electronic systems in a vehicle's value is likely to increase in a few years from presently 20% up to 35% (VDA, 2003, p. 52-53), providing attractive business opportunities for manufacturers of such components.

The rapid growth of WLAN technology is an attractive market. In 2002, the number of WLAN locations rose by 327% (3G, 11.02.2003). According to BITKOM, the WLAN technology has the potential for a mass market (VWD, 11.03.2003).

Overall, the business climate remains volatile, especially for the ICT-producing industries, keeping up the pressures on firms to innovate and to become both more flexible and efficient.

2 Usage of ICT & e-business

2.1 The role of ICT and e-business

In the first report on the electronics and electrical machinery industry (No. 11 / October 2002), we found that the sector is already advanced in e-business usage. Large firms led in some e-business applications, but SMEs did not seem to fall behind as markedly as in other sectors. We attributed this specific characteristic of the sector to the high degree of IT knowledge and experience that naturally exists in this sector, even in smaller firms.

The electronics industry was found to be clearly more advanced than the electrical machinery sector. Specific e-business drivers in the electronics industry are short product life cycles, standardised components and products, a complex value chain that exhibits an extremely high degree of outsourcing, IT-competence of firms in the electronics sector, and a truly globalised industry.

At the sector level, the Internet is speeding up the process of globalisation and specialisation. The trend towards specialisation (both of firms and of regions) is being supported and enabled by the widespread implementation of e-business solutions. This should lead to an exploitation of comparative advantages and thus improve overall sector productivity and economic growth. Increasing sector productivity does not, however, automatically mean that all regions and all firms will benefit equally. Exploitation of comparative advantages does involve re-allocation of production and development facilities to regions with especially profitable surroundings. The re-allocation of chip and component manufacturing facilities to Asia and the emergence of CEMs during the last decade is such a consequence. On the other hand, high value-added research, engineering, and development tasks often remain in the industrialised countries with high labour costs.

Further specialisation and outsourcing (especially within the electronics industry) could eventually contribute to a further disintegration of individual firms, strengthening the position of highly specialised firms, service providers and contract manufacturers.

Dual impact on SMEs

Industry-wide implementation of e-business has a dual impact on SMEs. The typical cost-benefit structure of e-business projects seems to imply that large firms can more easily profit from e-business than small firms (see also Chapter 2.4 in the June 2002 transport equipment sector report of the e-Business W@tch). But even large firms cannot fully exploit the advantages of external e-business applications (such as e-procurement and SCM) without winning the support and co-operation of their suppliers and business partners. Consequently, small firms are often confronted with external pressure and incentives from their larger business partners to join e-business initiatives. This offers benefits for small firms, such as maintaining or even amplifying good relations with their large customers. But it also creates problems, such as having to deal with implementation and maintenance costs, often increased price pressure and lock-in effects to consortium-led marketplaces or single customers.

Although the conflicts between business partners in implementing industry-wide e-business are less pronounced in this sector than in some others (e.g. automotive industry), we still found evidence through interviews, case-studies and publications in support of the argument that e-business adoption in SMEs is not just a straight and easy road to success, but creates challenges that require careful judgement and action. In fact, lock-in to certain customers or solutions might limit the strategic options of smaller firms. Increased price pressure usually intensifies the trend towards consolidation – that is, the emergence of a small number of price leaders at the expense of less cost-efficient (usually smaller) firms.

All parts of the electronics value chain promote e-business

In contrast to other industry sectors, where a “battle of power” and a systematic divergence of interests could be observed between different stages of the value chain (for example between System

Integrators and OEMs in the automotive industry), the advantages of e-business are clearly recognised and solutions are jointly promoted by all parts of the value chain in the electronics industry. However, the conflict of interest between SMEs and larger firms in the sector remain a central issue in industry-wide e-business adoption. At the level of individual firms, companies are still struggling with front-to-back-end integration of their e-business initiatives. This often requires consolidating individual solutions that have been tacked onto the existing organisation, without yet having a significant impact on structures. It also requires integrating legacy information systems such as EDI and other operating software (e.g. ERP). In addition, linking with customers and suppliers in an efficient and manageable way is another challenge.

Insights from the new survey

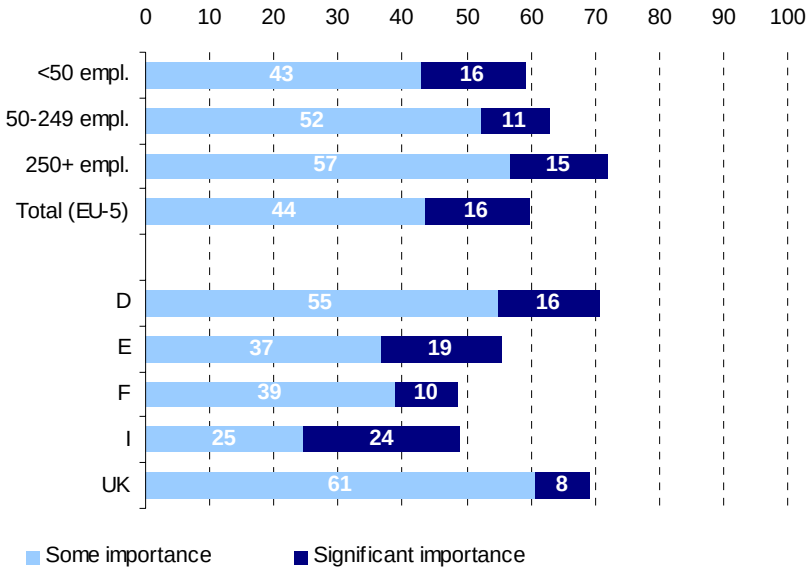
In the following, we will focus on presenting main findings from the new e-business survey that was conducted in March 2003 (see p. 6). Section 2.4 will put the new findings into perspective to the first report and the first e-business survey from June 2002.

Figure 2-1 shows that e-business has already gained wide acceptance in the electronics and electrical machinery industry. 60% of firms in the sector agreed that e-business already has some or significant importance for the way the company operates today. There are no significant differences between large and small companies in this respect. The regional breakdown shows that only France and Italy slightly fall behind in this respect.

Figure 2-1: Electronics and electrical machinery: Importance of e-business in 2003 as perceived by companies

Base: EU-5, all enterprises (N=502). In % of enterprises. Reporting period: March 2003.

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



The overall satisfaction with e-business is high (see figure 2-2). Almost 90% of firms reported that they are very or fairly satisfied with the overall effects of their e-business activities and initiatives. Only 9% of firms are fairly disappointed, and 2% are very disappointed. Although this provides evidence that most firms actually benefit from e-business, it also shows that success of e-business initiatives is not guaranteed.

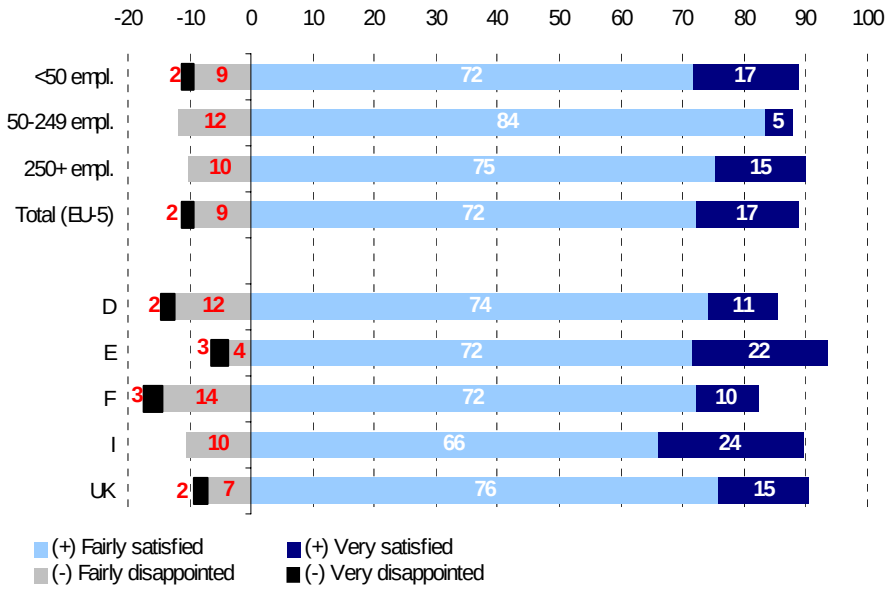
A breakdown by size class shows that the overall satisfaction with e-business is roughly the same for large and small firms. Only medium-sized firms with 50-249 employees reported slightly less positive experiences, but the variations to the average are not statistically significant.

Firms in Spain, Italy, and the UK reported highest satisfaction with e-business. France and Germany fall slightly behind, but again, deviations are not great. Recapitulating, we find that e-business has already gained wide acceptance in the sector and that there are no significant differences in the satisfaction with e-business across size classes and countries - the overwhelming majority of firms is fairly or very satisfied with the overall effects of their e-business initiatives.

Figure 2-2: Electronics and electrical machinery: Overall satisfaction with e-business in 2003

Base : EU-5, all enterprises (N=288). In % of enterprises. Reporting period: March 2003.

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



2.2 ICT infrastructure and skills development in the sector

2.2.1 ICT infrastructure

This section summarizes survey results about the available ICT infrastructure and proxies for the availability of IT know-how in the sector.

As table 2-1 shows, the most basic ICT infrastructure (computers, Internet access, e-mail and WWW usage) is available in nearly 100% of all firms. More complex IT network applications, such as Intranet, Extranet, LAN, and WAN, are also widely implemented. However, the more sophisticated network applications only make sense for enterprises that exceed a certain minimum size. Consequently, small firms exhibit much lower adoption rates than large firms in this regard. Large firms also lead in the adoption of remote and wireless access systems to their computer networks. This is also conclusive because only firms that have a computer network (at least a LAN or Intranet) can provide remote or wireless access to this network.

The employment-weighted figures in the table show that almost 100% of sector employees work in companies where basic ICT infrastructure is available. The share of employees that works in enterprises that have at least one of the more sophisticated infrastructures implemented (such as Intranet, LAN, or remote access), is significantly higher in this sector than in the all sector 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 organizational basis for the adoption of a range of e-business applications.

Table 2-1: Electronics and electrical machinery: Availability of IT infrastructure

Available ICT infrastructure	All (7) sectors°	Electronics and electrical machinery			
		Total°	<50 empl.	50-249 empl.	250+ empl.
Computer usage	93	99	99	100	100
Internet access	87	98	97	100	98
E-Mail usage	83	98	96	100	98
WWW usage	77	95	87	97	98
Intranet	49	77	39	71	90
Extranet	17	25	6	21	31
LAN	61	89	63	92	96
WAN	34	57	9	31	77
Remote access *	43	63	27	51	77
Wireless access *	14	27	7	14	37

Base: EU-5 (D, E, F, I, UK), all enterprises (N=3,515 for all sectors and N=502 for electronics and electrical machinery), except*: enterprises using computers (N=3,318 for all sectors and N=498 for electronics and electrical machinery).
Figures in% of companies, except °: Figures weighted by employment ("enterprises comprising …% of employees").
Reporting period: March 2003.

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

Table 2-2 provides a regional breakdown for the availability of IT infrastructures. Again, the most basic equipment is available in all five regions. Only Spain falls behind in WWW usage. Intranets are slightly less common in Spain and France than on average, but firms in these two countries seem to prefer extranets instead. LANs are slightly less common in France than in the other four countries. There are no significant regional differences in the figures for WAN adoption. The UK, Germany and Spain lead in remote and wireless access; Italy and France fall behind on this measure.

Table 2-2: Electronics and electrical machinery: Availability of IT infrastructure across countries

	D	E	F	I	UK	EU-5
Computer usage	100	98	99	100	97	99
Internet access	100	94	89	100	97	98
E-Mail usage	96	90	88	98	97	96
WWW usage	95	63	85	82	95	87
Intranet	45	35	32	39	47	41
Extranet	8	15	13	6	4	7
LAN	68	62	44	70	64	65
WAN	11	10	12	11	11	11
Remote access *	34	35	19	18	40	29
Wireless access *	12	11	0	2	14	8

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502), except*: enterprises using computers (N=498).
Figures in % of companies.
Reporting period: March 2003.

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

Figure 2-3 provides information about the usage of broadband technologies to access the Internet. Overall, 38% of employees in the sector work in firms that have Internet access with more than 2 Mbit/s bandwidth. The percentage of enterprises using broadband is almost three times higher for large than for small companies. This is because all Internet users in a company need to share the available bandwidth of the enterprise to access the Internet. Consequently, large firms with many employees have a larger demand for overall bandwidth than small firms with a low number of Internet users.

Figure 2-3 also reveals major differences of broadband usage across countries. Broadband is most common in Germany, where 60% of firms already have access. On the other extreme, the same item is only 7% for France. Spain also shows a comparably high share of broadband usage, with 40%. Italy and the UK are slightly below average with 32% and 29% respectively.

In summary, we can conclude that basic Internet infrastructures are available and already widely implemented in European enterprises in this sector. Access to the Internet therefore, no longer constitutes a barrier to e-business.

Figure 2-3: Electronics and electrical machinery: Companies having internet access with >2Mbit/s bandwidth

Base: EU-5 (D, E, F, I, UK), companies with Internet access (N=488).

Figures for EU-5 total and for countries weighted by employment ("enterprises comprising …% of employment). Figures for company size-classes in % of enterprises in the respective size-band. Reporting period: March 2003.

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

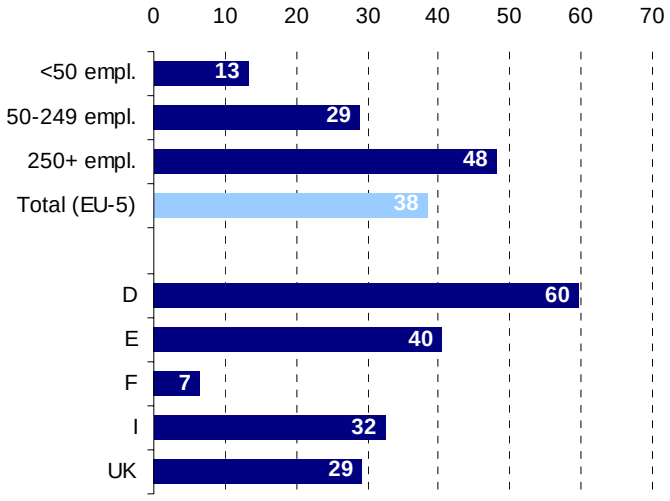


Table 2-3 shows the remarkable relative cost differences of IT solutions between large and small firms. The relative manpower needed to maintain IT and networks of an enterprise is more than eight times higher in small firms than in large firms, measured as headcount per 1,000 employees being occupied with this task. This implies that the relative personnel costs for maintaining IT infrastructure are on average eight times higher for small firms than for large firms.

These results highlight the argument that 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.

Compared to the all sector average, the electronics and electrical machinery sector seems to have a comparative IT cost advantage because it only counts 5.9% compared to 11.1% as average number of employees being occupied with IT and networks.

Table 2-3: Electronics and electrical machinery: Size of IT-department

	All (7) sectors	Electronics and electrical machinery			
		Total	0-49 empl.	50-249 empl.	250+ empl.
No. of employees per thousand employees occupied with IT and networks	111	59	154	31	18

Base: EU-5 (D, E, F, I, UK), all enterprises (N= 3,443 for all sectors and N=493 for electronics and electrical machinery). Figures in % of companies. Reporting period: March 2003.

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

2.2.2 IT skills development

The IT skills shortage is frequently referred to but rarely quantified. The *e-Business W@tch* survey tried to addresses this issue by including questions concerning IT training schemes and IT specialists. This is significant because IT capital investments cannot result in higher productivity levels when

employees lack the skills to use the available technological infrastructure efficiently. Capital-skill-complementarity is needed to unleash the potentials of IT investments.

As a proxy for the extent of the IT skills shortage in firms, the questionnaire asked companies if they have recruited or tried to recruit IT specialists in the past. If so, firms were asked whether they had some or even great difficulties in finding candidates that matched their needs.

Firms in Italy, Spain and France were almost twice as active in recruiting IT specialists than in Germany and the UK in 2002/2003. This is an indicator of the overall demand for IT specialists in a country and of the extent to which firms in a country tried to satisfy that demand by hiring external specialists (alternatively, firms can try to satisfy demand by internal qualification offers). This measure is evidently also subject to the cyclical business climate in a country. It is interesting to note that the percentage of companies trying to recruit IT specialists has significantly changed compared to the last sector report in Italy and Germany: The figure has increased from 12% to 26% in Italy, while it has decreased from 24% to 9% in Germany. Figures for the other countries remained almost unchanged. Reasons for this could be a "catching up" in Italy, and an incipient saturation of demand for IT specialists in Germany. But it could also be due mainly to cyclical reasons.

Figure 2-4 shows that currently only firms in Italy report great difficulties in finding qualified IT personnel (87% reported difficulties), whereas firms in Germany, France, and Spain had less trouble (25%-39% reporting difficulties). Interviewees in the UK did not report significant difficulties in this survey round. However, we do not want to conclude from these figures that the IT skills shortage problem has lost importance in the UK. Firstly, the number of firms answering the question if they had trouble finding IT specialists is too small to make statistical inference – thus, we do not know if these answers are representative. Secondly, even if they are representative, the decrease in demand for IT specialists could simply reflect the recessive business climate that the sector is currently in, and not a significant upgrade of IT skills in firms.

*Figure 2-4: Electronics and electrical machinery: IT recruitment intensity and difficulties**

*Difficulties in recruiting = companies reporting that they had experienced great or some difficulties in recruiting staff with special IT skills.

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502), except *: enterprises that have searched for IT specialists in 2002/2003 (N=95). Figures in % of companies. Reporting period: March 2003.

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

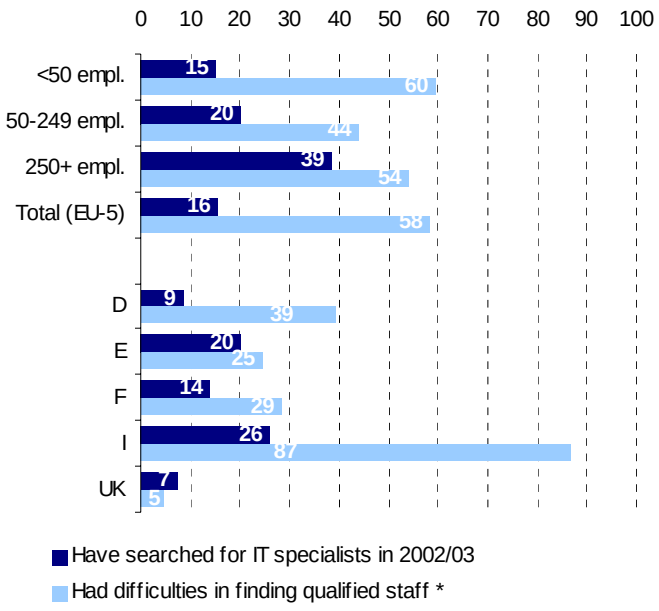


Figure 2-5 shows that the overwhelming majority of European enterprises in this sector support some kind of networking and IT skills development of their employees. 93% of sector employees work in firms that provide some kind of computer training, with only slight deviations across the five countries. However, small firms slightly fall behind – only 74% of enterprises with less than 50 employees offer some kind of IT training support for their employees. The country breakdown shows that only Spain

and Italy fall slightly behind in offering IT skills development support. In the other three countries, almost all sector employees work in firms where IT training is offered.

Figure 2-5: Electronics and electrical machinery: Companies supporting any kind of networking and IT skills development

Base: EU-5 (D, E, F, I, UK), all enterprises (N=501).

Figures for EU-5 total and for countries weighted by employment ("enterprises comprising …% of employment offer support"). Figures for company size-classes in % of enterprises in the respective size-band. Reporting period: March 2003.

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

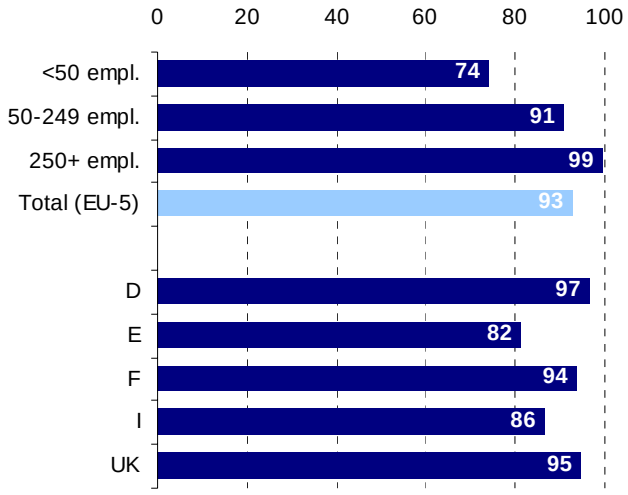


Figure 2-6 shows a size-class breakdown of which sort of IT training is being offered. In large firms, in-house computer training, IT training offered by third parties, and allowing employees to use working time for learning activities are all equally common. Roughly 75% of large enterprises offer at least one of these training measures.

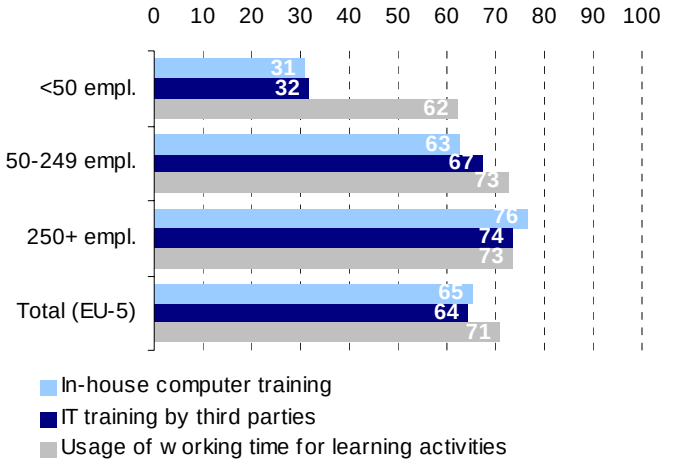
Figures for medium-sized companies are similar to those of large firms, only at a slightly lower level. Small companies, however, show a different pattern. Even though 62% of small enterprises allow their employees to use working time for learning activities, only 31% (32%) of them offer in-house computer training (IT training by third parties). Obviously, small firms do not take such a structured approach to training their employees in IT skills than larger firms do. Small firms seem to trust their employees that they will learn what is needed by themselves. The costs for structured courses (either in-house or by third parties) might constitute a barrier for smaller firms to offer courses. In addition, small firms often find it more difficult to compensate if one person (e.g. the receptionist, or the mechanic) is absent from work on a training program. In large firms, tasks are usually carried out by entire departments, where colleagues can help each other out.

We conclude that the IT skills gap remains an issue on the agenda, specifically in Italy and Spain. Demand for IT specialists might also increase again in Germany and the UK, when the business climate improves again. The large majority of firms in this sector offers some kind of IT training to their employees. Only small firms significantly fall behind in offering in-house computer training or IT training by third parties. This might be due to a cost-disadvantage of small firms in providing structured IT trainings, but it might also simply reflect a different, more demand- and employee-driven, learning culture in small firms.

Figure 2-6: Electronics and electrical machinery: IT training offered to employees

Base: EU-5 (D, E, F, I, UK), all enterprises (N=499). Figures weighted by employment ("enterprises comprising …% of employment offer …"). Reporting period: March 2003.

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



2.3 E-business activities and impacts

The empirical results with respect to various e-business activities are presented according to the area of usage within the firm. We differentiate e-business for

1. Internal processes, such as human resource management or internal collaborations;
2. Processes of the extended enterprise, such as collaboration with suppliers to develop products or forecast demand;
3. Purchasing;
4. Marketing & Sales.

The discussion follows this structure.

2.3.1 Internal processes

Internal collaboration

The industries covered in this report are already very advanced compared to other sectors in the usage of online technologies to support internal processes. The sector average for electronics and electrical machinery (see table 2-4) is clearly above the all sector average for all applications listed. The most widely used application is sharing documents online and performing collaborative work using the Internet. 30% of firms in the sector currently use this basic application. E-learning and tracking working hours and production time through online technologies is used by 10% of companies in the sector. Automatic reimbursement of travel cost and support of human resource management with online technologies is used in 5% and 7% of sector enterprises respectively.

The technologies listed in table 2-4 are explicitly used to make internal processes more efficient and cheaper. This is particularly 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. Consequently, all of these technologies exhibit a clear usage bias towards large enterprises, e.g. with a factor nine difference between usage rates of automatic travel cost reimbursement in large and small firms.

Table 2-4: Electronics and electrical machinery: Usage of online technologies

Online technologies used	All (7) sectors	Electronics and electrical machinery			
		Total	0-49 empl.	50-249 empl.	250+ empl.
To share documents/ to perform collaborative work	19	30	28	49	64
To automate travel reim-bursement of employees	3	5	4	10	37
To track working hours and production time	6	10	9	34	45
To support the human resources management	5	7	6	22	49
For e-learning	7	10	9	11	36

Base: EU-5 (D, E, F, I, UK), all enterprises (N=3,515 for all sectors, N=502 for electronics and electrical machinery).
Figures in % of companies.
Reporting period: March 2003.

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

2.3.2 Processes of the extended enterprises

With "processes of the extended enterprise" we mean all activities that are neither purchasing nor selling, but still involve interaction, collaboration and exchange of information with people or organisations outside of the company itself. This includes activities such as collaborating with business partners to design new products, to forecast demand, manage capacities, negotiate contracts, or exchange documents. Online technologies are available to support these processes. Table 2-5 provides the current usage figures for these technologies.

In this area, the electronics and electrical machinery industry exhibits usage figures that are also clearly above the average of all seven sectors. Exchanging documents with suppliers and customers are the most frequently used applications, being used by 47% of enterprises in the sector respectively. Using the Internet for these purposes does not require the set-up of expensive and sophisticated software. Consequently, these applications are being used regardless of enterprise size-classes.

Online collaboration with business partners to design new products and to negotiate contracts are conducted by approximately every fifth enterprise in the sector. Using the Internet to manage capacities and forecast product demand is not yet very common – only slightly more than 10% of enterprises in this sector make use of this application. A reason might be that implementation of such systems is very complex and costly.

Table 2-5: Electronics and electrical machinery: Usage of online technologies within the value chain

Value chain activities	All (7) sectors	Electronics and electrical machinery			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Online collaboration with business partners for designing products	12	19	19	13	23
Online collaborating with business partners to fore-cast product demands	10	12	12	7	21
Online management of capacity / inventory	10	11	10	15	25
Electronic exchange of documents with suppliers	37	47	48	36	48
Electronic exchange of documents with customers	28	47	48	42	40
Online negotiation of contracts	12	19	19	15	6

Base: EU-5 (D, E, F, I, UK), enterprises with internet access (N=3,128 for all sectors, N=488 for electronics and electrical machinery). Figures in % of companies. Reporting period: March 2003.

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

Table 2-5 shows size-class specific differences for some of the applications. However, a statistical test has revealed that these differences are not significant due to the small number of large firms in the sample. Thus, we do not know for sure if these differences are representative for the sector, or due to a sampling effect. Therefore we abstain from an interpretation.

CRM and SCM

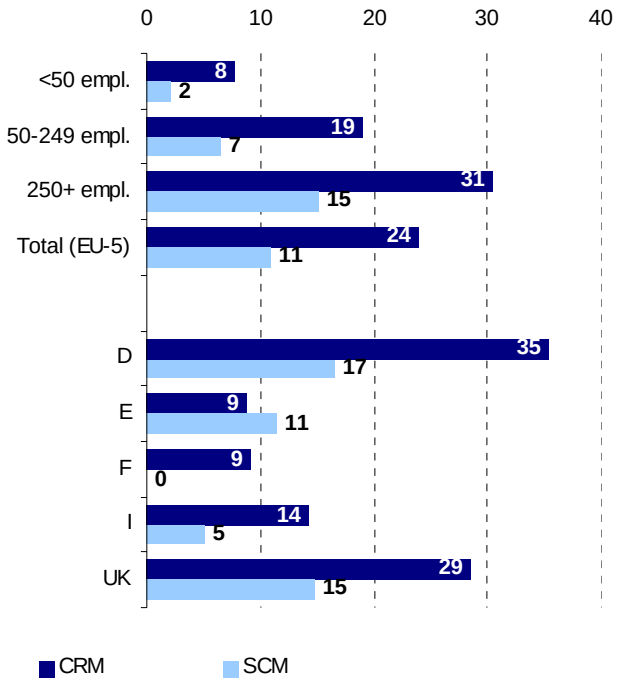
Figure 2-7 shows a size-class and country breakdown of Customer Relationship Management (CRM) and Supply Chain Management (SCM) usage in the sector. Both applications are more frequently used by large firms, because both applications require substantial up-front investments. SCM aims at reducing inventories and optimising the flow and timing of supply along the value chain. Saving potentials are increasing with the scale of production of a company. CRM is a tool used to optimise the management of customer relations for companies where individual customer contact is not possible and needs to be complemented by electronic means of communication. The goal is to reduce process costs, increase customer satisfaction, and make optimal use of information about customers. Again, potential benefits of CRM increase with the number of customers and thus with the size of the company. Large firms therefore use CRM and SCM tools more frequently than small firms.

Figure 2-7: Electronics and electrical machinery: Usage of CRM and SCM systems

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502).

Figures for EU-5 total and for countries weighted by employment ("enterprises comprising …% of employment"). Figures for company size-classes in % of enterprises in the respective size-band. Reporting period: March 2003.

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



The country breakdown shows that enterprises in Germany and the UK are leading in the adoption of SCM and CRM tools, whereas Spain, Italy, and France report comparable, lower figures. France is an exception in SCM – no company in France reported in this survey that they use a SCM tool.

CRM has gained a much wider acceptance than SCM. 24% of enterprises in the sector already use CRM, compared to 11% that use SCM. Interviews with sector experts indicated that SCM is frequently regarded as too complex and difficult to implement to gain wide acceptance in the industry.

2.3.3 Purchasing

In the previous sector report, we pointed out that purchasing online is one of the most widely used e-business applications in the sector. This finding is also supported by our new survey round. Approximately 55% of enterprises in this industry already purchase goods or services over the Internet (comprising 59% of sector employees – see figure 2-8). The UK and Germany lead with participation

ratios of well over 70%, followed by Spain (53%), Italy (43%), and France (32%). The low number of firms stating that they plan to start purchasing online by March 2004 seems to indicate that the diffusion of online purchases is approaching saturation levels.

Figure 2-9 shows the diffusion process of online purchases over time, compared to the all sector average. The electronics and electrical machinery industry had a head-start in introducing online purchases. Adoption gained momentum in 1999, when 15% of companies in the industry already purchased online. In 2001, the number had increased to 45% of firms. Since 2001, the diffusion process seems to have slowed down again, and it can be expected that it will reach its saturation level in approximately three to four years.

However, interviews with our sector experts pointed out that these extremely high diffusion figures need to be put into perspective. Despite promising diffusion figures, utilisation levels of the more complex e-procurement systems are often not yet very high. To reach positive ROI, bundling of best-in-class suppliers, re-design of company internal processes, and continuous activities to raise utilisation levels are indispensable. As a result, active support of senior management is needed to reach these objectives. Also, the fact that a firm declares that it purchases online does not say anything about the relative importance of online purchases compared to the total purchasing volume of a company.

Figure 2-8: Electronics and electrical machinery: Companies making online purchases

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502).

Figures for EU-5 total and for countries weighted by employment ("enterprises comprising …% of employment"). Figures for company size-classes in % of enterprises in the respective size-band. Reporting period: March 2003.

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

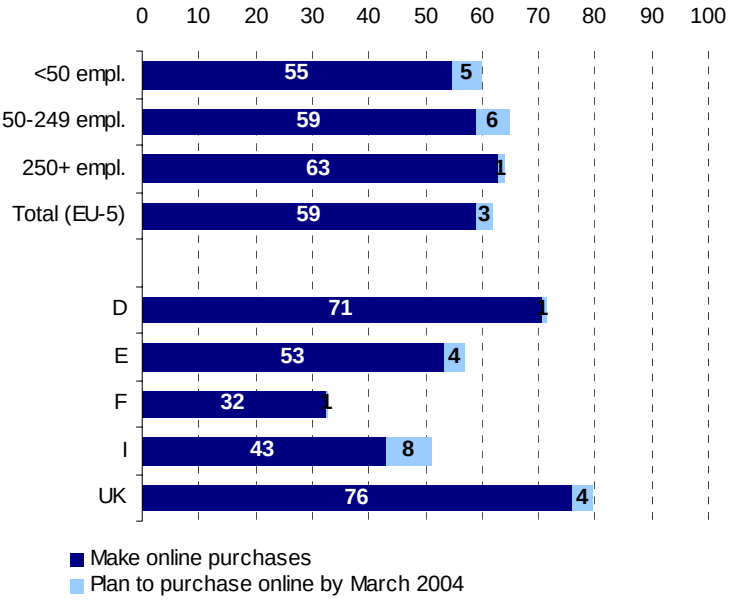


Figure 2-9: Electronics and electrical machinery: Diffusion of online purchases

Base: EU-5 (D, E, F, I, UK), enterprises purchasing online and reporting date of first activity (N=1284 for all sectors, N=236 for electronics and electrical machinery).

Figures in % of enterprises. Reporting period: March 2003.

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

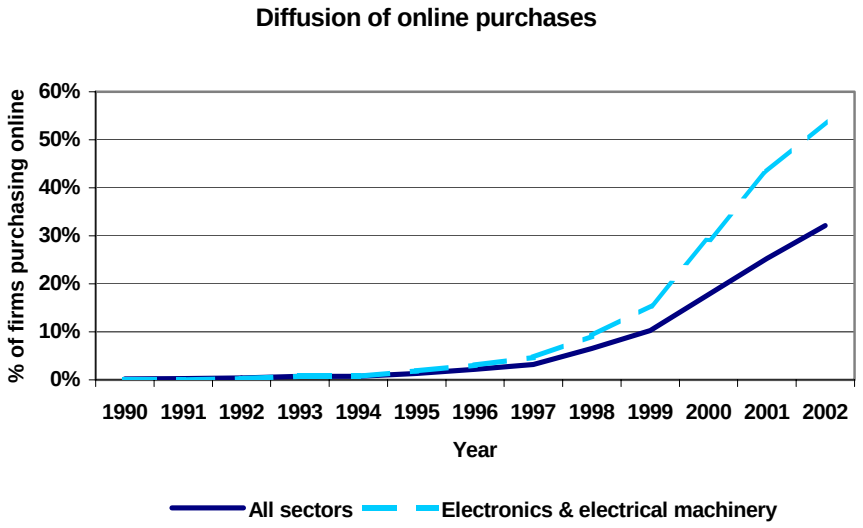


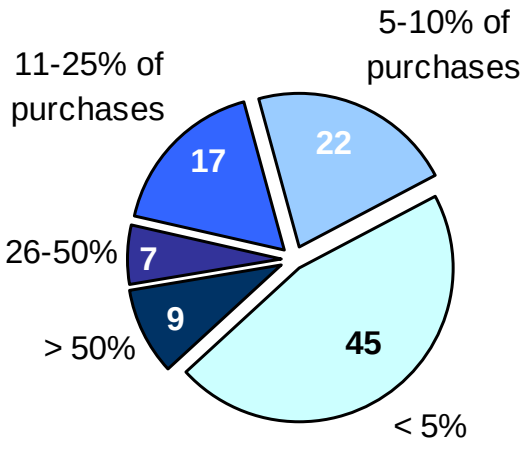
Figure 2-10 shows that the relative share of online purchases is still rather low. 45% of the enterprises that purchase online report that the online share of their purchases is below 5% of their total purchasing volume. Only 9% of companies that purchase online say that more than 50% of the total volume is procured online, and such high online transaction volumes are usually reported by small firms.

Figure 2-10: Electronics and electrical machinery: Share of online purchases in total procurement (2003)

Base: EU-5 (D, E, F, I, UK), companies purchasing online (N=250).

% of companies purchasing online reporting that they make x% of their total purchases online. Reporting period: March 2003.

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



B2B electronic marketplaces

As an alternative to company-specific e-procurement systems, firms can also participate in independent third-party or consortium-led online marketplaces. They are cheap to use and often offer implementation services to their participants for free. Another advantage is that well-established marketplaces which have reached critical mass provide access to potential customers and offer buyers greater transparency about price levels and availability.

But this high level of transparency can be a disadvantage for sellers because it lowers their ability to bargain with customers and often gravitates competition to prices, leaving sellers with lower margins. In addition, participating in public marketplaces can have negative side effects for sellers on their long-standing relations with other customers. For example, a firm which tries to sell over-capacities on an online marketplace, at a price level that is close to or even below the price level negotiated with a

long-standing customer who believes himself to be purchasing at a good price, might experience conflicts: If such low-price transactions become known to the long-standing customer, trust or even the entire business relationship could be jeopardised.

According to a PriceWaterhouseCoopers (PWC) study, the electronics industry is leading in e-marketplace usage. PWC argues that the close relationship between e-business and the products of the electronics industry is one reason for the leading role of the industry in online marketplace adoption. Secondly, many typical components needed by the electronics sector are predestined for electronic trading. For example, semiconductors are easily describable, highly standardised, easy to transport and to store, which makes them suitable for trading over long distances in general. In addition, manufacturers are located in many different regions of the world, having different languages, business habits and time zones. Online marketplaces can therefore help to communicate efficiently and to trigger business processes. The high volatility of chip prices also creates a need for market transparency, which can be offered by good online exchanges (PWC 2002, p. 44).

In the PWC survey, more than 100 marketplaces for the electronics industry were evaluated under different criteria, and the following results were found:

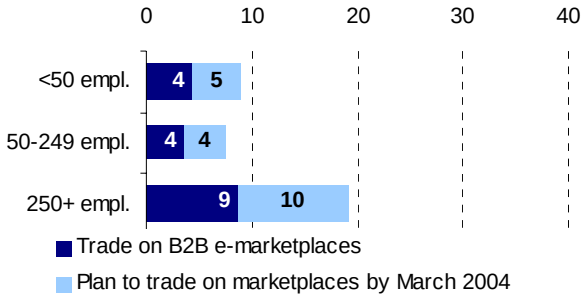
- The number of marketplaces in the electronics industry is higher than in other industries.
- Most marketplaces do not only offer a trading platform, but provide additional information and services as well.
- Integration of back-end-systems, such as inventory control systems, and of elements of users' supply chains, such as logistics, finance, insurance etc., is a weakness of most marketplaces. Users often have to adapt their systems to the marketplace, which is costly and time-consuming.

Despite the high level of sophistication of e-marketplaces in the sector, the number of firms actually using B2B e-marketplaces is still limited. Less than 5% of all enterprises in the sector currently participate in an online marketplace, showing no upward trend since the last survey in June 2002 (see figure 2-11). However, almost 5% of all enterprises said that they plan to trade on an e-marketplace by March 2004. If these plans are realised, the number of firms using online marketplaces could double in the near future.

Figure 2-11: Electronics and electrical machinery: Participation in B2B e-marketplaces

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502). In % of enterprises. Reporting period: March 2003.

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



Impact of e-purchasing on the company

In order to contribute towards the assessment of e-business impacts, the survey took a pragmatic approach and asked companies for a number of qualitative statements that tried to measure opinion trends concerning various e-business solutions. Figure 2-12 summarizes the response of firms to questions dealing with the impact of online purchases. The response of firms in the electronics and electrical machinery industry almost completely matches the all sector averages.

The most frequently mentioned positive effects of purchasing online are lower procurement costs (62% of enterprises reporting positive or very positive effects) and improvements of internal business processes (54% positive or very positive). The majority of enterprises using online purchases also reported positive effects on the relations to their suppliers (52% positive or very positive). However,

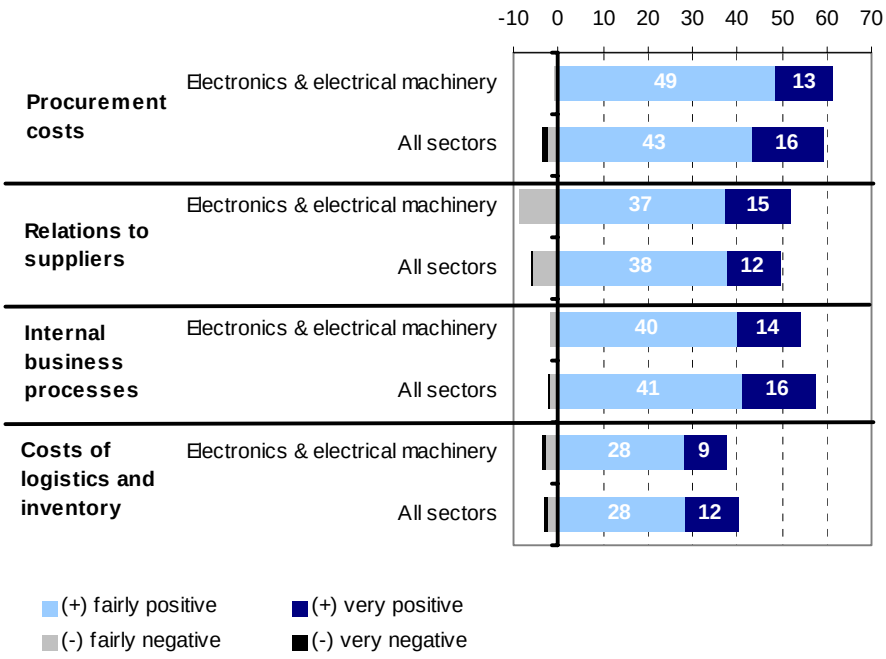
9% also reported negative impacts. Online purchases do not seem to have a significant impact on costs of logistics and inventory for most enterprises. Roughly 60% did not report any changes due to online purchases, while 37% report positive or very positive effects.

Overall, the experience of firms seems to support the finding that users are satisfied with the results and online purchases are keeping up to their promises – they reduce procurement costs, make internal processes more efficient, and improve relations to suppliers for the majority of users.

Figure 2-12: Electronics and electrical machinery: Impact of purchasing online on ...

Base: EU-5 (D, E, F, I, UK), enterprises purchasing online (N=1420 for all sectors and N=253 for electronics and electrical machinery).% of enterprises reporting positive or negative impacts. Reporting period: March 2003.

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



2.3.4 Marketing and sales

Marketing

In this last section, presenting e-business usage indicators, we focus on activities of companies on the sales side. The most simple means of using the Internet for sales side activities is to set up a website to provide information about the company, its products, and how to contact it. A website is therefore both an instrument for PR, marketing, initiation of customer contact, and the most basic requirement for implementing more sophisticated online sales solutions.

66% of companies in the electronics and electrical machinery sector have a website. This is significantly more than the all sector average (45%). There are still differences between large and small companies. Whereas 95% of large companies have a website, only 65% of small firms do. However, small firms currently report the highest figures for plans to install a website until March 2004 (18% of small firms). If these plans are realized, small firms will catch up in website usage.

Companies that make active use of their website, providing a rich variety of information and frequently updating them, can profit from so called Content Management Systems (CMS) that help to manage web contents and keep appearance and information on the website consistent and up-to-date. 22% of enterprises in this sector make use of a CMS, compared to 29% in all sectors. This indicates that although websites exist more frequently in the electronics and electrical machinery sector than on average, a large share of enterprises seems to maintain rather static web content such that a CMS is not as widely needed as in, e.g. the tourism sector.

Table 2-6: Electronics and electrical machinery: Enterprises with a website

Website	All (7) sectors	Electronics and electrical machinery			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Having a website	45	66	65	86	95
Plans to have a website	13	17	18	6	2
Usage of content management systems (*in % of enterprises with a website)*	29	22	22	21	39

Base: EU-5 (D, E, F, I, UK), all enterprises (N=3,515 for all sectors, N=502 for electronics and electrical machinery) / enterprises with a website (for third item).
Figures in % of companies.
Reporting period: March 2003.

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

Selling online

Enterprises that actually sell online are still rather rare, even though the sector is among the most intense users of e-business technologies. Currently, 9% of all enterprises in the sector sell online - 17% of large firms, 11% of medium-sized firms, and 9% of small enterprises. Together, these enterprises represent 14% of the sector employees (see figure 2-13). A large number of enterprises currently plans to start selling online by March 2004. If these plans are realised, the number of firms selling online could more than double within the next 12 months.

There are significant differences in the usage of online sales across countries. In Spain, companies selling online comprise 35% of employees, the highest figure reported. This is mainly because a high percentage of large firms in Spain reported using online sales. On the other extreme, online sales currently play hardly any role in France and Italy. This confirms the findings of our previous sector report. However, if plans to start selling online by March 2004 are realised, Italy will exhibit a significant catching up compared to the other countries.

Figure 2-13: Electronics and electrical machinery: Companies selling online

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502).

Figures for EU-5 total and for countries weighted by employment ("enterprises comprising …% of employment offer support"). Figures for company size-classes in % of enterprises in the respective size-band. Reporting period: March 2003.

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

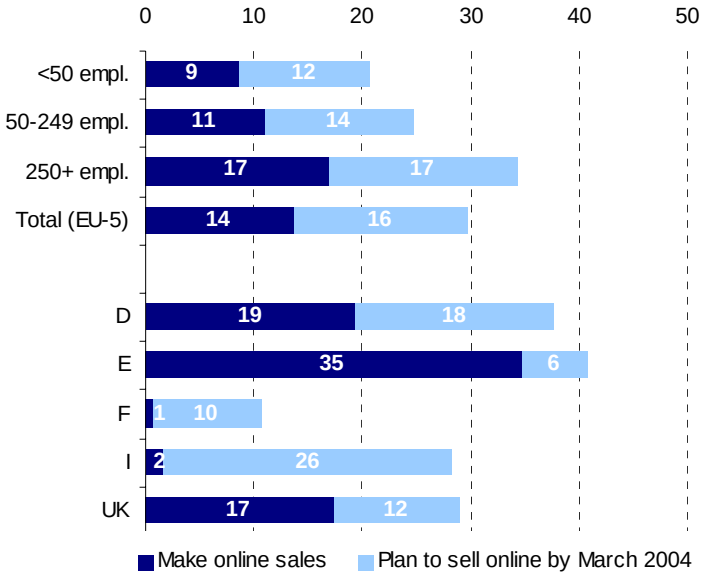


Figure 2-14: Electronics and electrical machinery: Diffusion of online sales

Base: EU-5 (D, E, F, I, UK), enterprises selling online and reporting date of first activity (N=455 for all sectors, N=46 for electronics and electrical machinery).

Figures in % of enterprises. Reporting period: March 2003.

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

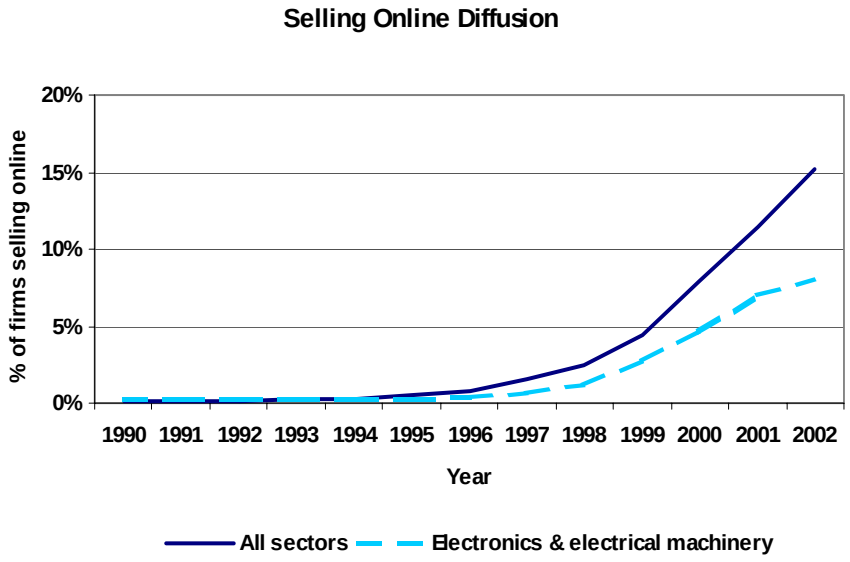


Figure 2-14 shows the diffusion of online sales over time, compared to the all sector average. The all sector average is turned up by three of the seven sectors that exhibit particularly high usage rates of online sales (tourism, retail, ICT services). Compared to this average, the electronics sector is currently lagging behind. However, the diffusion of online sales still exhibits an intact upward trend. The percentage of companies selling online has increased from 2% in 1998 to 10% currently. This upward trend could continue at a rapid rate, if firms realise their expressed plans to start selling online within the next few months.

Table 2-7 provides information about which online channels have been used by those companies that sell online. Figures need to be interpreted with care (especially the size class breakdown) because of the low number of observations (55 firms selling online). Almost all companies that sell online use their website as a channel (94%). A large share of companies selling online also makes use of electronic marketplaces (65%). The share of enterprises selling on B2B marketplaces is clearly higher in this sector than on average. This could be a positive indicator for operators of online marketplaces for the electronics industry. It shows that marketplaces are an accepted channel among those companies that use the Internet to sell their products. The percentage of firms using Extranets and EDI is also above the all sector average, while mobile e-commerce is very uncommon in this industry.

Table 2-7: Electronics and electrical machinery: Online sales channels used

Online sales channels: E-commerce through …	All sectors	Electronics and electrical machinery			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Company website	83	94	84	82	96
Electronic marketplaces	40	65	29	39	74
Extranet	5	16	5	10	19
EDI	3	14	2	12	16
Mobile e-commerce	4	0	0	0	0

Base: EU-5 (D, E, F, I, UK), all enterprises (N=542 for all sectors, N=55 for electronics and electrical machinery).
Figures I % of companies. Reporting period: March 2003.

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

Business integration of online selling

Table 2-8 provides information about how sophisticated online sales processes are, and in which way online sales are being processed. Again, size class breakdowns need to be interpreted with care because of the low number of observations for this sector (55 firms selling online).

About every fifth company that sells online receives orders through an IT system that is integrated with a specific customer (e.g. with e-procurement or SCM systems). Only 17% of enterprises in this sector say that their online sales are fully integrated with their back-end system (e.g. ERP). In the majority of enterprises selling online, an incoming order simply generates an automatic email or a fax that is then processed manually in some way (55% and 17% respectively). Consequently, only a smaller share of enterprises reports that online orders trigger some kind of business process (25%). The sophistication of online sales integration is significantly higher in large enterprises than in small ones. This makes perfect sense because the main reason for integration is to decrease process cost and to achieve data consistency, which is not such a high priority in small firms with limited number of orders coming in (small firms). In addition, 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.

Roughly every second company that offers online sales uses a save communication protocol for transactions (SSL), while every third company offers online payment options. A surprisingly large share of firms in this sector provide after-sales-services online (70% compared to 47% all sector average).

Overall, we can conclude that those firms in the sector that already use online sales are at least as sophisticated in doing so as the all sector average.

Table 2-8: Electronics and electrical machinery: usage of Integration system technologies

Integration system technologies …	All sectors	Electronics and electrical machinery			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
with customer(s) for receiving orders	24	22	22	28	24
Back-end system for processing of online orders	8	17	14	27	70
E-mail for processing of online orders	73	55	57	50	16
Fax for processing of online orders	8	14	15	7	0
Other forms	8	9	9	10	4
Online orders triggering business processes	31	25	23	38	51
Usage of an online sales system with SSL	43	45	43	59	62
Enabling online payment	36	29	29	30	35
After-sales-service provided online	47	70	71	33	93

Base: EU-5 (D, E, F, I, UK), all enterprises (N=542 for all sectors, N=55 for electronics and electrical machinery). Figures in % of companies, except °: Figures weighted by employment ("enterprises comprising …% of employees"). Reporting period: March 2003.

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

Impact of selling online on companies

This section closes with 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 (57%), the sales area (66%), and the quality of customer service (66%). These positive effects are even higher than the all sector average and provide evidence that selling online helps companies to sell more in a wider area, and simultaneously increases customer satisfaction. On the other side, 7% of enterprises also reported negative or very negative impacts on their sales volume, and 8% on the number of customers respectively. This shows again that success is likely, but not guaranteed.

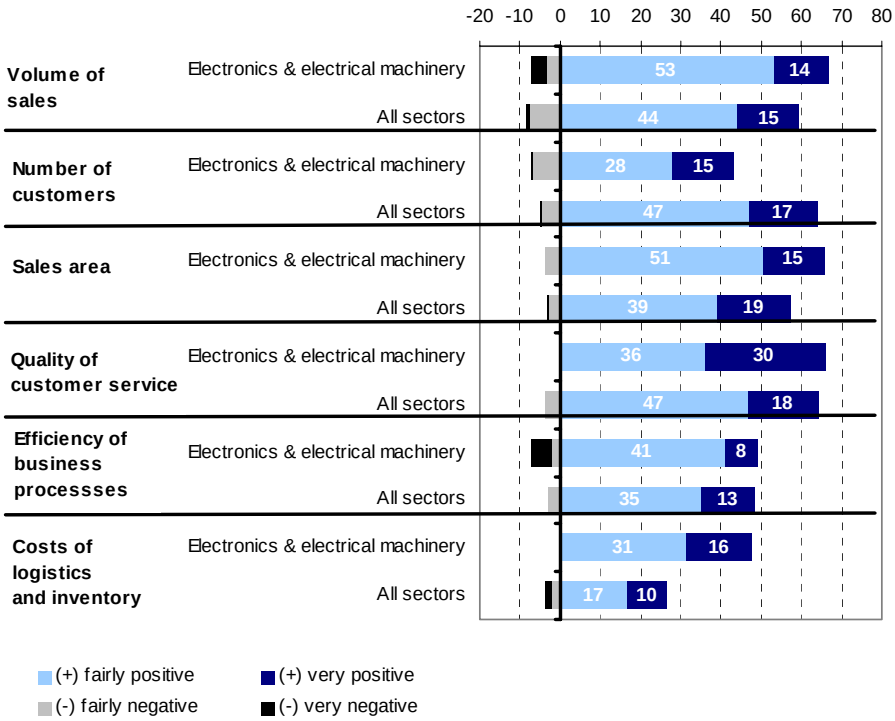
On two other items the majority of firms reported no significant changes due to online sales. However, the remainder had predominantly positive experiences: 46% report positive or very positive impacts on the costs of logistics and inventory, and 43% on the number of customers. The impact of selling online on the efficiency of internal business processes is judged somewhat ambiguously: While 49% report positive or very positive experience, 7% report negative or very negative effects. The remaining share did not experience significant impacts at all.

Overall, users seem to be satisfied with the results of selling online – specifically with respect to increases in sales volume, sales area, and customer satisfaction. These positive experiences of pioneer users could stimulate a further increase in firms selling online in the near future, as plans in figure 2-13 already seem to indicate.

Figure 2-15: Electronics and electrical machinery: Impact of selling online on ...

Base: EU-5 (D, E, F, I, UK), enterprises selling online (N=514 for all sectors and N=50 for electronics and electrical machinery).% of enterprises reporting positive or negative impacts. Reporting period: March 2003.

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



2.4 E-business development 2002 – 2003: main trends

In this section we try to identify some trends in e-business development in the electronics and electrical machinery sector, based on the new survey results and on comparisons with the first survey from June 2002.

Only eight months have passed between the first and the second survey round. This is a short time period for the purpose of identifying major trends in e-business uptake and usage based on rigorous comparison of the two surveys. However, for the purpose of identifying major trends, we compared percentages for this sector of the first and second survey, using a Chi-Squared-Test to see if there are any statistically significant differences between the two surveys (EU-4 only, because Spain was not included in the first survey round for this sector). It turned out that only very few indicators were significantly different. The majority of percentage changes (for online sales, online purchases, CRM, SCM, B2B online marketplaces etc.) are within the respective confidence intervals.[2] This means that for these indicators we cannot reject the hypothesis that differences are merely due to the fact that different companies were interviewed in both survey rounds. Practically speaking, the time interval between both survey rounds was too short to find statistically significant changes for most indicators. However, this does not imply that e-business development has slowed down or even stopped. On the contrary, results from the new survey suggest that e-business diffusion still continues at a rapid rate.

[2] Two indicators exhibit sign. decreases: E-learning and HRM. We attribute the changes in e-learning and HRM to a slightly different way of asking about these applications in the questionnaire.

Significant changes in the demand for IT specialists

One of the indicator that turned out to have changed significantly according to the Chi-Squared-Test was the demand for IT specialists. It has been pointed out in section 2.2.2 that there are significant changes in the demand for IT specialists in Italy (increase from 12% to 26%) and in Germany (decrease from 24% to 9%). Figures for the other countries remained almost unchanged compared to 2002. Trying to hire IT specialists is a measure for the extent to which degree firms try to satisfy demand for IT knowledge by hiring, rather than by trying to upgrade their internally available skills by means of training. Obviously, this is both an indicator that relates to the demand for IT skills and to the demand for new labour in general. As such, it is subject to business cycle effects (i.e. demand will increase in boom times, and decrease in a recession). It is difficult to tell which of these two factors dominates. In the case of Italy and Germany, it could reflect a "catching up" of Italian companies with respect to IT skills, and a beginning saturation of demand for additional IT skills in German companies. On the other hand, it might simply be that the more favourable business dynamics in Italy led to the increase, while the generally recessive scenario in Germany caused the decrease in demand. However, at least from the perspective of IT specialists we can make a clear statement: Their chances of finding employment in the electronics industry in Italy are currently much better than in Germany.

Intact upward trend for online sales and online purchasing

In addition to the comparison between both survey results, important conclusions can also be drawn from the new survey alone. Firstly, the figures presented in this report show that the electronics sector is already advanced in e-business usage and continues its development from a comparatively high base. Time-series diffusion figures (2-9, 2-14) show that we still exhibit an intact upward trend for usage of online sales and online purchasing. The percentage of companies selling online has increased from 2% in 1998 to currently 14%. An additional 16% of firms expressed that they plan to sell online until March 2004 (enterprise-weighted results). This can be interpreted as a sign that the diffusion process of online sales has only yet entered its most rapid phase where the technology starts to reach the early majority of possible adopters. Therefore, we expect an increasingly rapid uptake of online sales in this sector within the next 1-2 years.

The diffusion process of online purchases is much more advanced compared to online sales. With currently 59% of enterprises in the sector already being engaged in online purchases, the diffusion peak has already passed and is now slowly approaching its saturation level. Although the upward trend for online purchases is still intact, it will not be as dynamic as the expected uptake for online sales in the coming months. This is also reflected by the fact that only 3% of firms in the sector expressed that they plan to start making purchases online until March 2004 (as compared to 16% for online sales). However, despite the high ratio of firms using the Internet to purchase, utilisation levels of e-procurement still appear to be rather low; the majority of firms purchases less than 5% of their overall volumes over the Internet. In particular e-catalogue based systems often lag initial expectations and make reaching positive ROIs a long-term objective for many firms. To realise all the benefits of e-procurement and online sales, support of senior management and continuous activities to raise utilisation levels remain indispensable.

Rapid uptake expected for corporate websites, e-marketplaces, CRM and SCM

Plans of companies indicate that B2B marketplaces, SCM, CRM, and website usage could gain further momentum in the near future. Despite the already high ratio of firms with a corporate website (currently 67%), another 18% of enterprises plans to start their own website within the coming months. Two other e-commerce applications are expected to show rapid uptake in the near future: B2B e-marketplaces are currently only used by 4% of enterprises in the sector, but another 5% stated that they plan to start using these services until March 2004. A similar development is expected for the rather complex application of supply chain management tools (SCM). Although currently only 2% of firms are engaged in such an application, another 3% plans to do so. It can be expected that the potential saturation level for these tools is much lower than for online purchasing and corporate websites, but it also shows that some of the formerly hyped and now almost concealed application have yet to see their most rapid uptake.

Firms plan to spend significantly more on e-business in 2003 than the year before

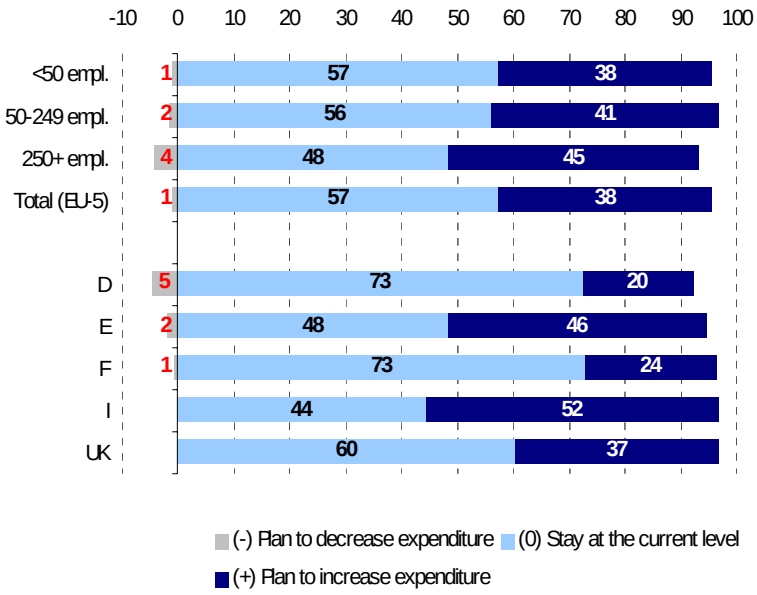
Another indicator for the still intact upward trend in e-business usage are the plans of companies about their e-business expenditure, as illustrated in figure 2-16. 38% of enterprises plan to increase their e-business spending, while only 1% plan a decrease in the next 12 months. The remaining 57% plan to keep their e-business expenditures at the current level. Compared to the last survey round, this is a significant increase in companies reporting that they plan to spend more on e-business in the near future. (This was the other significant change compared to the first survey, in addition to the IT specialists indicator.) In particular, Italy and Spain exhibit a high share of companies planning to increase e-business spending. This amplifies the impression that e-business development is still dynamically progressing and, far from having reached its full potential yet, e-business continues to gain importance and influence in the sector.

Figure 2-16: Electronics and electrical machinery: Future e-business expenditure

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502).

Figures in % of enterprises. Reporting period: March 2003.

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



3 Summary and conclusions

3.1 Summary of main findings

The sector comprises the traditional electrical engineering industry, and the more high-speed ICT-manufacturing industry. The latter experienced dynamic growth in the last decade and has considerably contributed to GDP and productivity growth in Europe. However, with the end of the Internet-hype in late 2000, the ICT-producing industry dived into a deep recession that is not yet over. The electrical machinery industry was more in line with the overall economic development and only experienced a slightly stronger than average recession in 2001.

Sector is an early adopter of e-business

The electronics industry in particular 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. In addition, this sub-sector is naturally IT-savvy and pre-destined to be open to experiment with new technology-driven management solutions. Consequently, the entire sector is among the early adopters and already advanced in the usage of e-business. Within the sector, the electronics industry is clearly more advanced than the electrical engineering industry.

Regional differences in adoption

Survey results indicate that basic Internet infrastructures are widely implemented across Europe and no longer constitute 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, Germany and Spain lead in these measures, while France falls behind.

There are also significant differences in e-business adoption within the countries included in our survey. As a general trend, Germany and the UK lead in e-business adoption, whereas France remains sceptical. Spain exhibits mostly average or above average usage figures, while Italy currently appears to be entering a dynamic catching up process. The falling behind of France cannot be fully explained by a lack of infrastructure, IT-skills, the Minitel history, or lower per-capita income, but rather by the important role played by cultural aspects. The business culture in France displays a marked preference for face-to-face interaction and a tendency towards IT-scepticism.

Online purchasing currently the most widely adopted application

Survey results showed that purchasing online is currently the most widely adopted e-business application. Approximately 55% of enterprises in the sector already purchased online by March 2003, although other applications have not yet reached such a high level of acceptance. For example, only 9% of firms sell goods online, 20% use the Internet for product development, and 7% use Internet-based solutions to support human resource management.

Differences between SMEs and large firms

Surprisingly, SMEs are actually head-to-head in the adoption of a variety of e-business applications with 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. Those SMEs that purchase online procure even larger proportions of their total purchasing volume over the Internet than large firms. Obviously, SMEs (especially in the electronics industry) are convinced of the advantages of e-business.

Adoption rates in SMEs are only significantly lower for applications where a certain minimum size of a company is needed in order to reasonably employ the application, e.g. Intranet, Extranet, or WANs. In addition, 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. Higher usage rates of these technologies among large firms do not reflect an underdevelopment of e-business in small firms, nor do they imply that small firms have a comparative disadvantage. In fact, these solutions deal with problems primarily experienced by large firms. Because of that, we attest 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.

E-business continues to gain influence and importance

The time-series figures available from the new survey (March 2003) reveal an intact and dynamic upward trend for e-business usage in this sector. Companies' plans indicate that online sales, B2B marketplaces, CMS, CRM, and website usage could gain further momentum in the near future, whereas online purchasing is already so common that this application exhibits only small growth rates and begins to approach its saturation level. 38% of enterprises plan to increase their e-business spending, while only 1% plan a decrease in the next 12 months. The remaining 57% plan to keep their e-business expenditures at the current level. Compared to the first survey round (July 2002), this is a significant increase in companies reporting that they plan to spend more on e-business in the near future. In particular, firms in Italy and Spain exhibit a high share of companies planning to increase e-business spending. This reinforces the impression that e-business development is still dynamically progressing and far from having reached its full potential yet.

3.2 Economic implications

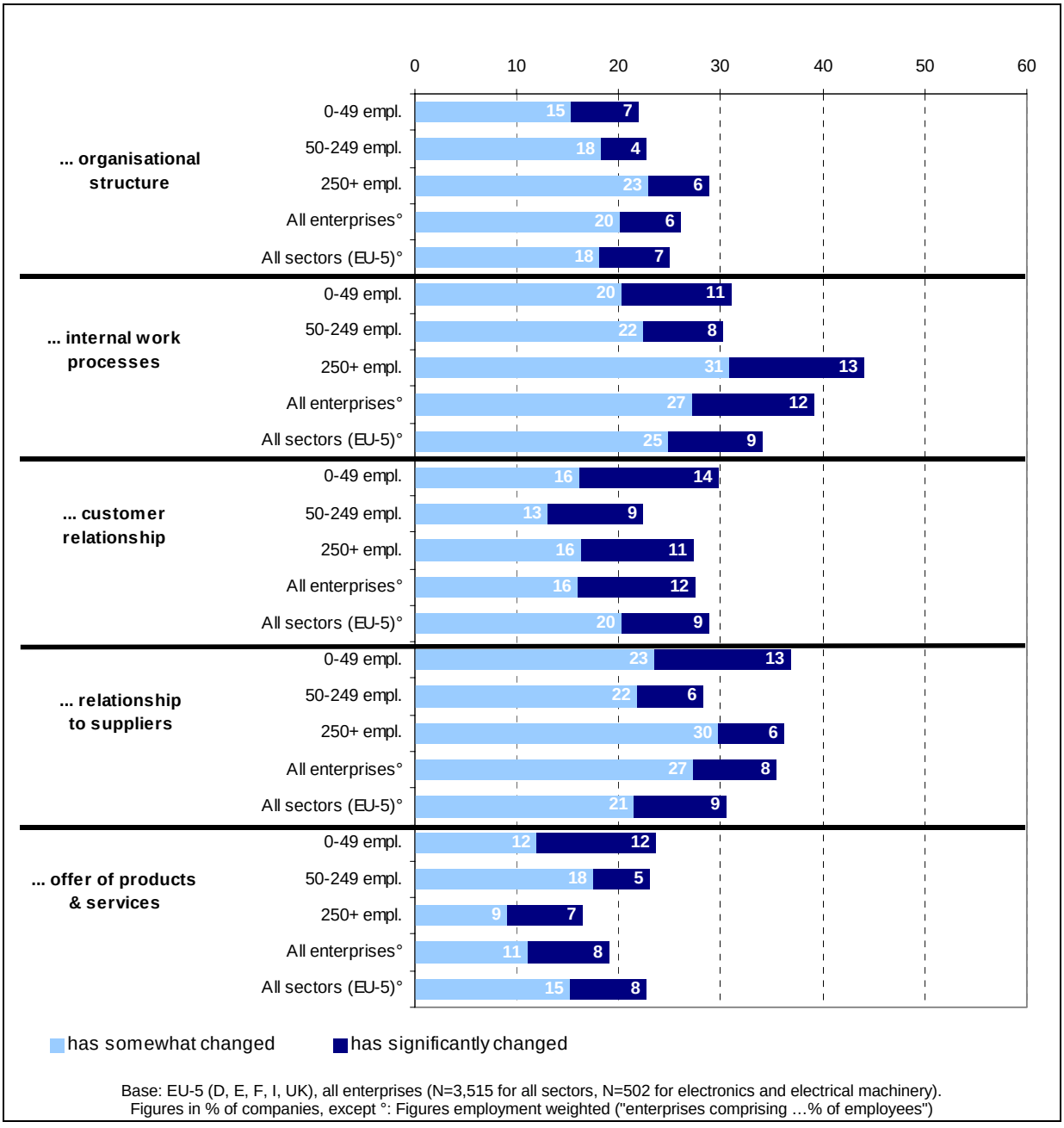
3.2.1 Implications for the individual enterprise

Figure 3-1 summarizes qualitative impressions of firms about the perceived impact of e-business on their own company. The most important changes are perceived with respect to internal work processes and relations to suppliers, where substantial impacts already seem to have occurred. 39% of sector employees work in companies where e-business has already changed internal work processes. This figure is higher for large companies, where e-business tools to support internal processes are more frequently used (see section 2.3.1). 35% of sector employees work in enterprises where relations to suppliers have changed due to e-business. Here, there are no significant differences of perceived impact between large and small companies. Obviously, the continuing industry-wide implementation of e-business is affecting all parts of the value chain, independent from company size classes.

Organisational structures have changed in firms representing 26% of sector employees, with slightly higher impact of e-business on organisational structures in large firms. Customer relationship has changed due to e-business in enterprises comprising 28% of employees in this sector, with no major differences across size classes. The smallest impact of e-business was perceived with respect to offers of products and services. Only 19% of sector employees work in companies where products or services have been changed due to e-business.

These perceived impacts are all within the usual range observed in the average of all sectors. Although e-business has already affected a large number of firms in one way or another, we believe that e-business development is still 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). We expect that firms will continue to experiment with these new technology-driven management tools in their own interest and that, as a consequence, the impact of e-business on individual firms and the entire industry will continue to increase.

Figure 3-1: Electronics and electrical machinery: Impact of e-business on companies



Base: EU-5 (D, E, F, I, UK), all enterprises (N=3,515 for all sectors, N=502 for electronics and electrical machinery).
Figures in % of companies, except °: Figures employment weighted ("enterprises comprising …% of employees")

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

E-business opportunities

- E-technologies can lead to **greater speed and efficiency of procedures**, for example by improving internal information flows, or automating procedures. They therefore create opportunities for cost savings. The potential for cost savings increases when procedures are carried out by a large number of people and with high frequency. Thus, there are economies of scale which make these sort of applications especially attractive to large firms where overheads might be reduced. Examples are online tools to automate travel cost reimbursement or human resource management.
- Bundling of internal orders via an e-procurement system can help to achieve higher bulk-discounts from suppliers, and thus reduce costs.

- E-technologies can also provide access to new resources, channels, and information that would otherwise not be available. Thus, they create opportunities for improving decision-making or expanding business opportunities. Examples are online B2B marketplaces, websites and online shops for reaching customers on a global basis.
- Advantages can be gained from a better collaboration with suppliers and customers. Outsourcing and specialisation are enhanced, and strong strategic partnerships can be built in an industry group. Globally dispersed business units can be connected and integrated in efficient communication platforms. Experience shows that customer satisfaction and loyalty can be increased if e-commerce channels are offered and used.

E-business risks

- Implementation of e-business solutions is not always trivial. Sometimes the system simply does not function as proposed, or the training of employees is insufficient to make it work effectively. The new system may also prove incompatible with other existing systems and processes.
- The considerable investments required for many e-business solutions could eventually be better applied to other areas of operation, such as product development etc. Hence, investments involve opportunity costs.
- Market transparency involves the risk of eroding profit margins. Suppliers often seem to fear that e-business will increase the pressure on prices and margins. This provides lowest cost producers (usually large firms) with an advantage, at the expense of firms competing primarily based on personal service, high quality, or generally higher cost structures.

E-business enablers

- The electronics industry is naturally IT-savvy, has a high degree of IT competence, and is willing to experiment with new technology-driven problem solutions.
- Intense competition creates pressure to experiment with new ways of improving cost structures, production and engineering, products and customer service. E-business provides a set of powerful tools for these objectives and can thus become an important competitive asset.
- Access to technology is not a problem. Necessary IT infrastructures are widely implemented and used.

E-business barriers

- **Implementation costs** are a barrier to e-business initiatives, especially for firms with constrained budgets.
- **Need to re-engineer business processes**: although this is an opportunity to improve overall business performance, it often involves changes to the work routines that can easily lead to conflicts.
- **Return on investment issues**: investments of e-business initiatives have to be justified by positive ROIs. On the other hand, business cases that rely purely on cost saving arguments often underestimate the potential benefits of initiatives that can also consist of soft factors (such as customer satisfaction, or greater ease of doing things) and thus slow down e-business adoption.

3.2.2 Implications for the industry structure

E-business further speeds up globalisation and specialisation

At the sector level, it is likely that the Internet and e-business solutions will further speed up the process of globalisation and specialisation. These trends towards specialisation (both of firms and of economic regions) should exploit comparative advantages and thus improve the overall sector productivity and economic growth.

Exploiting comparative advantages does not lead to equal benefits

However, this does not automatically mean that all regions and all firms will benefit equally. Exploitation of comparative advantages does involve re-allocation of production and development facilities to regions with especially profitable surroundings. The re-allocation of chip and component manufacturing facilities to Asia and the emergence of CEMs during the last decade is such a consequence. In the electronics industry, further specialisation and outsourcing enabled by e-business could eventually contribute to a further disintegration of individual firms, strengthen the position of highly specialised firms, service providers and contract manufacturers. On the other hand, high value-added research, engineering, and development tasks often remain in the high-skill industrialised European countries. The electrical engineering industry in particular is likely to remain a strong presence in Europe.

3.3 Policy issues

Improving the competitiveness of European regions as a prerequisite to increase ICT manufacturing

The ICT-manufacturing sector experienced dynamic growth and contributed considerably towards GDP, productivity growth, and employment. However, ICT production is a global business that exploits comparative advantages of regions. Therefore, in order to maintain or increase ICT-manufacturing in Europe, the competitiveness of European regions needs to be continuously improved.

The production and development of ICT goods is globally mobile. The industry is increasingly taking advantage of specific economic conditions in different regions, forming globally dispersed production and know-how clusters. The implementation of industry-wide e-business will further contribute towards this trend. Competition takes place not only between firms, but also between economic regions. Obviously, Europe will not be able to compete with the rest of the world based entirely on lowest wages. Instead, European policy can focus on providing high quality infrastructures, improving education and schooling schemes, ensuring legal systems that allow for intense but fair competition and trade, supporting regional innovation and production clusters, and contributing towards a stable but not over-regulated legal environment.

Providing the required e-business skills calls for a change in education strategies and schemes

A lack of e-business skills is often said to slow down e-business adoption. The main difficulty for businesses in this respect is the requirement to train users every time their work routines are changed and new software packages – each with unique functions and properties – are implemented. Re-training of staff and re-organisation of business processes are part of the implementation costs for e-business initiatives. Continuous re-qualification requirements throughout the entire employment biography are an essential characteristic of a knowledge-based economy.

However, this calls for a change in education paradigms. A good basic (university or technical) education is still of very high importance, but no longer sufficient for most people to cope with the rapidly changing challenges of modern work life. Part of the responsibility (and incentive) to educate employees lies with the enterprises. In some countries firms seem to be better at this than others (Finland is a best case scenario, see 1st sector report No. 11-I). However, even extensive educational efforts by employers cannot make up for deficits in basic education. In addition, the role of public policy in “life long learning” has still to be defined. Questions of organisation, financial responsibilities, quality regulation and certification as well as models of public/private partnership are issues to be discussed in this context.

Exploring the long-term impact of e-business: the need for continuous research

Continuous research is needed to assess the progress and impact of ICT and e-business to better understand the impact of ICT investments and e-business on sector structures, market dynamics, market failure, and macro-economic indicators, such as productivity and employment. Research

should be based on sound economic theory and high quality empirical data, provided by independent research organisations that do not have a commercial interest in promoting specific trends or solutions. The *e-Business W@tch* provides a good basis for these objectives and should also enable efficient communication of research results to the wider public. The results of the *e-Business W@tch survey* should be further used in scientific research to improve our understanding of the questions outlined above.

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Annex: Methodology of the e-Business Survey 2003

Background

Most of the data presented in this report are derived from the recent European e-Business Survey 2003, which constitutes – together with the previous survey carried out in June/July 2002 – a cornerstone of the monitoring activities of the *e-Business W@tch.* In total, 3,515 telephone interviews with decision-makers in European enterprises in all EU Member States were conducted between 24th February and 20th March 2003. The questionnaire was largely based on the questionnaire used in the 2002 e-Business Survey.

Fieldwork

The fieldwork of the survey was carried out by INRA Germany in co-operation with its partner organisations on behalf of the *e-Business W@tch*:

Country	Organisation
Germany	INRA Deutschland GmbH, Papenkamp 2-6, 23879 Mölln
Spain	INRA España, Grupo IPSOS ECO Consulting, Avda. de Burgos, 12.-8°, 28036 Madrid
France	CSA TMO, 22 rue du 4 Septembre, 75065 Paris Cedex 02
Italy	INRA Demoskopea S.p.A.,Via Rubicone 41, 00199 Roma
UK	Continental Research, 132-140 Goswell Road, EC1V 7DY London

Interview method

The fieldwork was carried out in June and July 2002 using computer-aided telephone interview (CATI) technology. 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 EU Member States and which have their primary business activity in one of the 7 sectors specified by NACE Rev. 1 codes. 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 focuses 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 included enterprises from 15 sectors of the economy, defined by NACE Rev. 1 business activities (see table next page). The composition of sectors took into account their economic importance, homogeneity with respect to the analysis of e-business, and the relevance of e-business activities.

The sample drawn was a random sample of companies from the respective sector population in each Member State where the respective sector was to be surveyed with the objective aim of fulfilling quota with respect to company size class. Target quota were to include a share of at least 10% of large companies (250+ employees) per country-sector cell and at least 30% of medium sized enterprises (50-249 employees).

Samples were drawn locally by the INRA partner organisations based on the acknowledged business directories and databases (cf. table next page). In total, 3,515 interviews were carried out.

Population coverage of the e-Business Survey (2003)

No.	NACE Rev. 1 Codes (Section – Division/Group)		Sector Name
01	D	15, 16	Manufacture of food products, beverages and tobacco
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	G	52.11, 52.12, 52.4	Retail
06	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
07	I / K	64.2, 72	Telecommunications and computer-related services

Country	Directory / Database	No. of interviews	Average length
Germany	Heins und Partner Business Pool	701	12.1 min.
Spain	Schober	700	11.1 min.
France	IDATA, based on "INSEE Siren file" (the National Institute of Statistics) and other directories	701	12.4 min.
Italy	Dun & Bradstreet	709	15.3 min.
UK	Dun & Bradstreet	704	13.0 min.
TOTAL		**3,515**	**12.8 min.**

Problems encountered

No major problems were reported by the fieldwork organisations with respect to interviewing (e.g. comprehensibility of the questionnaire, logical structure). A statement from the institute that carried out the survey in Germany summarises this general assessment very well: "In total fieldwork ran smoothly and the questionnaire was easy to understand for most of respondents."

- Most problems stemmed from the difficulties of conducting research projects among ICT decision-makers in general, rather than from any specific flaws in design of this project itself. 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 not possible to accomplish the objective of including a share of 10% of large companies in a specific sector. These were then replaced by interviews with SMEs.
- The Italian institute remarked that it was difficult to carry out the interviews within businesses/retailers not using or with a basic use of computers, because of the number of questions on related issues. Furthermore, it was reported that few respondents seemed to be aware of the existence of e-marketplaces and/or the meaning of this term.
- An issue – which was known in advance but is unavoidable in telephone interviews – is that it is not always easy to find the right target person. 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 level and on the financial level. On the other hand, the general manager may not always be aware of the implementation status and technical consequences.

Tabulations

Within the coverage specified above, and in line with the special task of the *e-Business W@tch*, results were compiled for mainly two sets of data:

1. An activity breakdown of the population of enterprises into 7 sectors. This breakdown is based on the aggregate of five countries (D, E, F, I, UK). In order to facilitate comparisons to the 2002 survey, an additional breakdown by activity based on the EU-4 aggregate of D, F, I and the UK was computed. The reason is that in 2002 Spain was not covered in all of the 7 sectors.
2. A size-class breakdown of the population of enterprises into three categories: small enterprises (including micro-enterprises, i.e. enterprises with 0-49 employees), medium sized enterprises (50-249 employees) and large enterprises (250+ employees).
3. A breakdown of the population by EU Member States (D, E, F, I, UK).

In addition, the activity breakdown was cross-tabulated with the country as well as with the size-class breakdown. These cross-tabulations are offered in special sector databases. However, depending on the indicator and the filter questions, the number of observations can become very small in many cells of this cross-tabulation. It is therefore recommended to limit the breakdown of data to one dimension (in the case of pre-filtered questions) or two dimensions (if all enterprises were asked).

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 figures 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.

Weighting was based on the latest available universe figures by Eurostat. 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 and allowing 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 three 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 can be structured into four main modules:

- Module A: ICT infrastructure and e-skills development in the company
- Module B: E-commerce and e-business usage
- Module C: Impact of selling and procuring online
- Module D: Impact of and satisfaction with electronic business

The choice of indicators is largely based on those used in the previous survey in 2002. It includes a basic set of widely accepted measures for e-commerce and e-business (as used in related surveys on e-commerce and e-business, e.g. by Eurostat), but also introduces a few 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 questionnaire can be downloaded (as a spreadsheet) from the *e-Business W@tch* website at its "database" section (http://www.ebusiness-watch.org/marketwatch/database/survey_info.htm.