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e-Business  
Market Watch

Sector Report  
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9

*e-business*  
**W@tch**



## ICT & e-Business in the Metal Products Industry

**eEurope**  
Go Digital



European Commission  
Enterprise Directorate General  
e-Business, ICT Industries  
and Services

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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 are lacking 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 projects from numerous international authors and research organisations on electronic business and especially on electronic commerce, there is still a lack of reliable empirical information on the factors affecting and the extent, scope, nature of 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 metal products sector.

This report has been published in the framework of the "European e-Business Market Watch" (or, in short, the "*e-Business W@tch*"). 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 will be published on each sector during the 18-month life-time of the *e-Business W@tch*. The sectors and the publication schedule for these reports are as follows:

	Sector	1 <sup>st</sup> Issue Report	2 <sup>nd</sup> Issue Report
1	Food, beverages, tobacco	August 2002	January 2003
2	Publishing, printing and audio-visual services	October 2002	April 2003
3	Manufacture of chemicals and chemical products	August 2002	January 2003
4	Manufacture of Metal products	October 2002	April 2003
5	Manufacture of machinery and equipment	October 2002	April 2003
6	Manufacture of electrical machinery and electronics	October 2002	April 2003
7	Manufacture of transport equipment	August 2002	January 2003
8	Retail	October 2002	April 2003
9	Tourism	October 2002	April 2003
10	Credit institutions, investment firms, leasing enterprises	August 2002	January 2003
11	Insurance and pension funding services	August 2002	January 2003
12	Real estate activities	October 2002	April 2003
13	Business Services	October 2002	April 2003
14	Telecommunications and computer related services	August 2002	January 2003
15	Health and social work	August 2002	January 2003

The research presented in these Sector Reports 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 aim of strengthening the competitiveness of European businesses. Special attention is paid to the SME dimension of e-business. More information about the *e-Business W@tch* is available at [www.ebusiness-watch.org](http://www.ebusiness-watch.org).

This sector report presents research results and work in progress. The second issue (first update) of this sector report will be published in April 2003.

## Methodological note

The data presented in this report are based on the European e-Business Survey, a cornerstone of the monitoring activities of the *e-Business W@tch*. The field work of this enterprise survey was carried out by INRA Germany GmbH in co-operation with its international partner organisations 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, especially in small enterprises which do not have a separate IT unit, the managing director or owner was interviewed. In total, about 10,000 interviews with decision makers in European enterprises were conducted. If not indicated otherwise, figures are presented as employment-weighted data. This means that figures should be read as "enterprises comprising ... % of employees". The reason for using employment weighting is that there are many more micro enterprises than non-micro enterprises. Therefore enterprise-weighted (but also unweighted) figures would effectively represent mainly the smallest firms and blur the economic importance in terms of market volume or number of employees.

The survey included all sectors and all Member States, but only in the four largest states (Germany, France, Italy and UK) all sectors were covered. The survey for the metal products manufacturing sector was carried out in the following seven countries: Germany, Greece, France, Italy, Luxembourg, Finland and the UK. A cross-sector comparison of key e-business figures (based on the EU4 which represent more than 60% of the market volume in any of the 15 sectors and in most sectors actually more than 70%) is available in a special annex to this report, the "Scoreboard of e-Business Indicators". The Scoreboard can be downloaded from the website ([www.ebusiness-watch.org](http://www.ebusiness-watch.org)).

## Manufacture of Metal Products: Sector Profile & e-Business

### 1 Economic profile

#### 1.1 Definition and structure of the sector

The broad range of activities covered by the metal product sector as defined according the NACE Rev.1 code 28 is shown in the following overview:

Code	Activity
28	Manufacture of metal products
28.1	Manufacture of structural metal products
28.2	Manufacture of tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers
28.3	Manufacture of steam generators, except central heating, hot water boilers
28.4	Forging, pressing, stamping and roll forming of metal, powder metallurgy
28.5	Treatment and coating of metals; general mechanical engineering
28.6	Manufacture of cutlery, tools and general hardware
28.7	Manufacture of other fabricated metal products

In 2000, about 270,000 enterprises were counted as belonging to the sector “manufacture of fabricated metal products except machinery and equipment” according to NACE Rev.1 28. They employ a wide range of production processes and produce a large variety of metal products of such diverse types as structural steel constructions, central heating radiators and boilers, steam generators, as well as containers and packaging for food and drinks, cutlery and tools.

Information about the quantitative magnitude of economic activity in this sector within the European Union and its member countries can be drawn from structural business statistics provided by Eurostat. Annual figures on output, input and cost structures of enterprises grouped according to the NACE Rev. 1 two-digit code, which cover the time span from 1985 to 2000 for the European Union as a whole<sup>1</sup> are available for enterprises employing more than 20 persons. Nominal production values, turnover, value added, and personnel costs as well as employment figures are reported for the year 2001.

The value of production amounted to 260 billion Euro or 5.3% of total manufacturing, which was created by some 2.2 million persons employed – 9.3% of the employment in total manufacturing. With respect to details of the sector as output and input data for the three-digit-level aggregates and for the single member countries, the last year for which figures are available is 1999. In many other cases, however, data are available only up to 1998 or 1997. With respect to the European Union as a whole and on the two-digit-level of aggregation, this data collection is quite up to date and will be used to shed light on some characteristics of the development of output and employment in this sector compared with total manufacturing.

The details of the sector structure in terms of the three-digit sub-sectors and the regional structure by member countries of the EU will be discussed on the basis of a second set of structural business statistics including enterprises employing fewer than 20 persons. The data are

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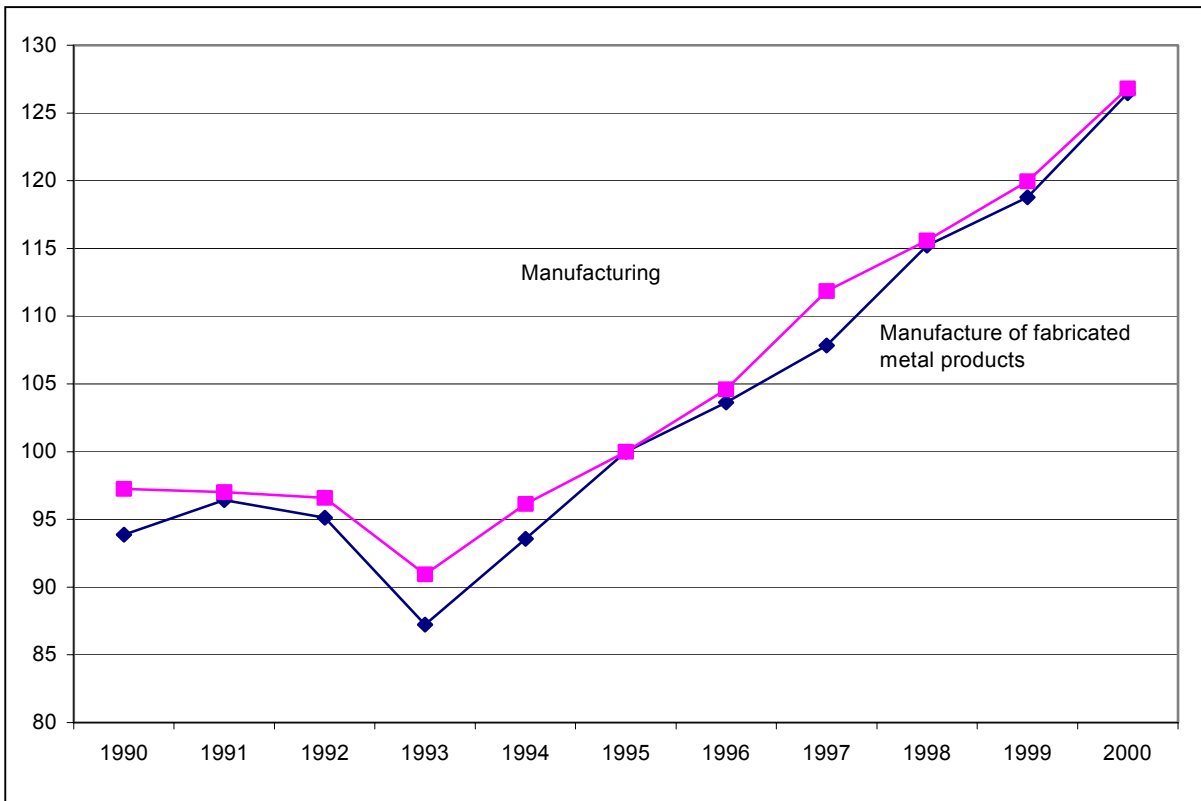
<sup>1</sup> For Belgium, Greece, Spain, Ireland, Luxembourg, Portugal and Finland, data were transmitted from national statistical offices on enterprises employing fewer than 20 persons.

provided by Eurostat from the year 1995 onwards. This database is used because it offers more up-to-date information for the single member countries and on the three-digit-aggregation level of NACE. However, these data are usually unavailable for the EU as a whole, since no observations exist yet for Greece, and in some cases gaps exist in the data with respect to individual – especially small – countries like Ireland or Luxembourg.

Regarding the European Union as a whole, the development pattern of output in constant prices (base year: 1995) in the manufacture of fabricated metal products is quite similar to that of total manufacturing. The annual growth rate of real production value in the period from 1991 to 2001 amounted to 3.6% compared with 3.5% for total manufacturing. But there is more cyclical movement in the development of output of fabricated metal products than in total manufacturing (Figure 1-1). This is due to the fact that the most important customers of that sector, like the automotive industry, the producers of machinery and equipment, or the construction industries are vulnerable to changing business climate.

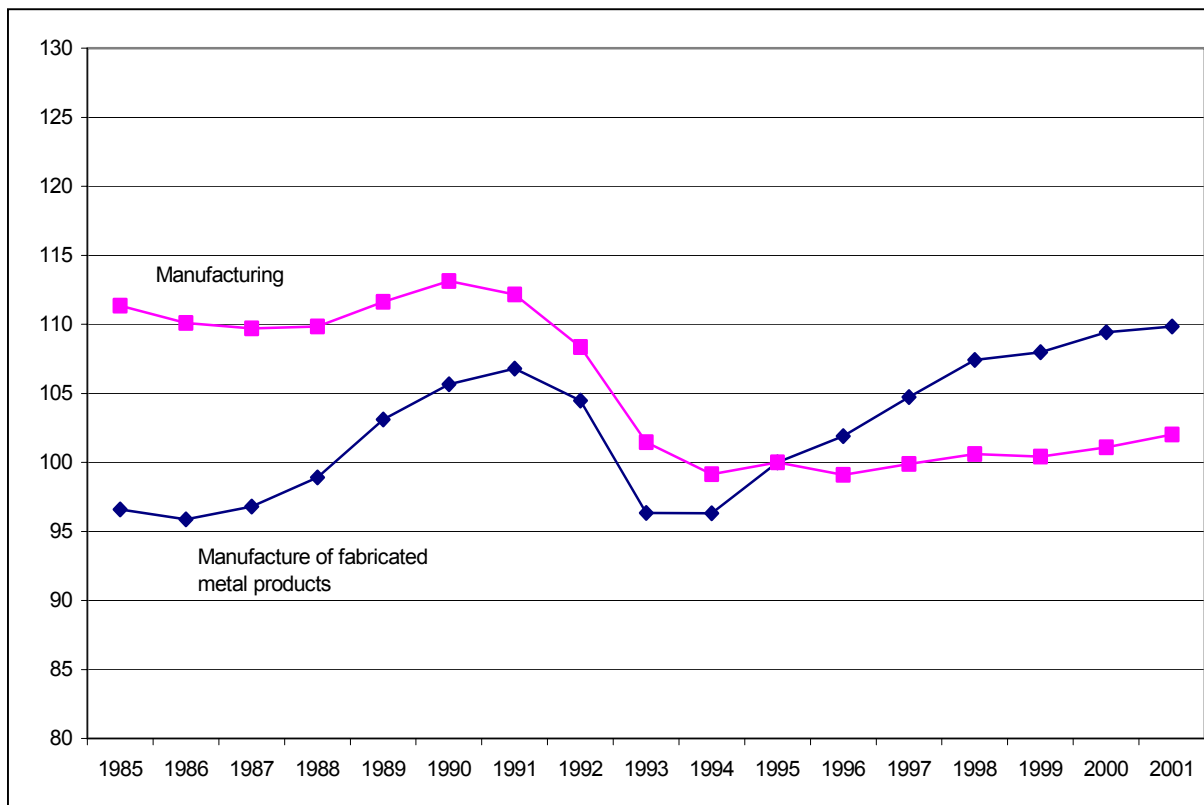
Figure 1-1: Production Value at constant prices in Manufacture of fabricated metal products (NACE Rev.1 28) and in Manufacturing (NACE Rev.1D) in the European Union – Index (1995=100) in %

Source: Eurostat NewCronos 2002, calculations and estimates by DIW Berlin.



Employment in the metal product sector shows some remarkable differences to that of total manufacturing. The cyclical movements are more pronounced, and from the bottom in 1993, employment in the metal products sector expanded at an annual rate of 2.1% compared with stagnating employment (+0.1% p.a. from 1994 to 2001) in total manufacturing (Figure 1-2).

Figure 1-2: Number of persons employed in Manufacture of fabricated metal products (NACE Rev.1 28) and in Manufacturing (NACE REV.1D) in the European Union – Index (1995=100) in %



Source: Eurostat NewCronos 2002, calculations and estimate by DIW Berlin.

As mentioned above, the magnitudes of the different kinds of activities in the sector are documented in more complete and up-to-date form by structural enterprise statistics on all enterprises. This is especially meaningful in this sector with its above-average share of very small enterprises. In 2000, the production value of fabricated metal products of all enterprises amounted to 331 billion Euro or 6.6% of total manufacturing in the thirteen countries for which data are available (EU 15 excluding Greece and Luxembourg). The number of persons employed in all enterprises is the only figure reported by Eurostat for the region of the EU 15 as a whole. There were 3.2 million employed in the metal product sector in 2000, or 11.2% of employment in total manufacturing. Data on value added are not reported by Eurostat for 2000. Value added, a frequently used figure for calculating partial labour productivity, can only be estimated on the assumption that the shares of value added in the production values of the previous year have not changed. The estimated value added – representing the incomes created in this sector – amounted to 134,5 billion Euro in 2000 (EU 13) or 8.6% of total manufacturing. The income share compared with that of employment indicates that income per person employed is less than average.

The structure of production by kind of activity can be derived for 11 member countries only, since on the three-digit level the production values for Denmark in the manufacture of steam generators, except central heating hot water boilers (NACE Rev.1 28.3) and in forging, pressing, stamping and roll forming of metal and powder metallurgy (28.4) are not reported, and for Ireland the values in the manufacture of tanks etc. (28.2) and the manufacture of steam generators etc. (28.3) are missing.

Table 1-1: Structure of the sector "Manufacture of fabricated metal products" (NACE Rev.1 28) in the EU11 <sup>1)</sup> (2000) by kind of activity

NACE Rev.1 28	Production value		Value added at factor cost	
	Mill. EUR	%	Mill. EUR	%
28.1 manufacture of structural metal products	84,427.2	26.0	30,950.2	23.4
28.2 manufacture of tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers	15,263.6	4.7	5,647.6	4.3
28.3 manufacture of steam generators except central heating hot water boilers	15,893.2	4.9	6,052.6	4.6
28.4 forging, pressing, stamping and roll forming of metal; powder metallurgy	35,124.3	10.8	13,016.1	9.8
28.5 treatment and coating of metals; general mechanical engineering	71,385.4	22.0	34,564.2	26.1
28.6 manufacture of cutlery, tools and general hardware	34,808.0	10.7	16,461.9	12.4
28.7 manufacture of other fabricated metal products	68,083.9	20.9	25,478.1	19.2
TOTAL 28 manufacture of fabricated metal products except machinery and equipment	324,985.6	98.0	132,506.3	97.9

<sup>1</sup> EU11: all enterprises: EU excluding Greece, Luxembourg, Ireland and Denmark.

Source: Eurostat New Cronos 2002, calculations by DIW Berlin.

As can be seen from Table 1-1, the production of structural metal products has the largest weight in the production value of the metal products sector as a whole. In terms of value added, the treatment and coating of metals and general mechanical engineering (28.5) contributes the greatest part of income generated in the sector. The third group of enterprises in the ranking according to the weights of production value as well as to the value added share is the manufacture of other fabricated metal products.

About two thirds of production is sold to enterprises of the different sectors of the economy. The most important of these are enterprises in the metal products sector itself, indicating that the enterprises in this sector are highly specialised and use the output of others as intermediary input to be further processed. The next customers in order of importance are the building industries, the machinery and equipment manufacturers, and the transport equipment sector. An important share of production is delivered to the investment demand. Only a small share of output is delivered to private households (less than 5%). The most important suppliers besides enterprises in their own sector are energy suppliers (especially coal), manufacturers of machinery and equipment, transport equipment manufacturers and building industries.

## 1.2 Regional distribution of production

Every sixth enterprise in the manufacturing sector of the EU belongs to the metal products sector. In Germany and Sweden this sector's share in the number of manufacturing enterprises is higher (both around 19%), in Ireland and Austria it is lower (around 12% each). Most enterprises of the metal products sector are located in Italy, followed by Germany, United Kingdom, Spain, and France.

Table 1-2: Manufacture of fabricated metal products in the EU: Number of enterprises (2000)

Nace	28	28.1	28.2	28.3	28.4	28.5	28.6	28.7
Country	No.	Structure by kind of activity in %						
EU13 <sup>1</sup>	175,387	27.3		3.7				12.9
BE	6,026	32.0	3.2	2.7	8.3	37.9	6.4	9.5
DK	3,652	11.4	1.8	0.0	1.5	57.4	8.1	19.7
DE	43,923	34.9	1.0	1.1	3.3	40.8	9.8	9.1
E	27,483	49.5	2.4	0.4	5.8	20.3	8.3	13.3
F	27,427	13.3	1.1	19.6	6.3	43.8	7.6	8.3
IRL	591	48.6	5.4	0.3	2.0	13.2	9.1	21.3
I <sup>2</sup>	93,739	33.9	1.1	0.1	2.7	31.9	3.6	26.7
L <sup>3</sup>	180	35.0		7.8				7.2
NL	7,170	28.5	2.7	0.2	5.3	47.9	4.8	10.5
A	3,185	32.2	1.8	0.4	16.6	13.6	18.7	16.6
P	11,044	31.0	0.8	0.1	4.1	33.6	17.1	13.3
FIN	4,123	30.3	2.5	0.6	2.1	33.7	8.7	22.1
S	9,998	9.9	1.5	0.1	9.1	56.0	8.5	14.8
UK	30,585	12.6	1.4	0.7	5.0	51.8	8.4	20.1
EU12 <sup>4</sup>	175,207	27.3	1.6	3.7	5.3	40.2	9.1	12.9

<sup>1</sup>EU13: excluding Greece and Italy. - <sup>2</sup> Italy: number of enterprises in 1999. - <sup>3</sup> Luxembourg: number of enterprises in 28.2, 28.4, 28.5, 28.6 from 1999. - <sup>4</sup> EU12: exclusive Greece, Italy and Luxembourg.

Source: Eurostat New Cronos 2002, calculations of DIW Berlin.

With respect to the kind of activity, most enterprises in the EU are found in NACE Rev.1 28.5 – treatment and coating of metals; general mechanical engineering –products which have a broad spectrum of customers within the manufacturing sector that use them as intermediary input. In Denmark, Sweden, and the United Kingdom more than 50% of the enterprises in the metal products sector are engaged in these activities. This holds for most countries within the EU, except Spain, Ireland and Austria, where the majority of enterprises are to be found in the manufacture of structural metal products, containers of metal etc (NACE Rev.1 28.1).

The three largest producers of fabricated metal products are Germany, Italy, and France with a total share of 62.5% of the sector's production value in thirteen EU countries. When the shares of the next largest producers – UK and Spain – are added, 83% of European production is covered. The weight of this industry in total manufacturing lies at 6.6% of the EU average, but it varies considerably between countries - from 8.5% in Italy to 1.5% in Ireland.

Production value measures the output of an industry including the inputs needed to produce this output. When the performance of an industry or its contribution to national income is considered, the relevant indicator is value added. The relationship between these two indicators varies between industries and within the same industry between countries according to the degree of vertical integration in the industry. If an industry is highly integrated, it is likely to produce high value added on the basis of low value inputs of raw material and semi-final products. The value added rate, i.e., the share of value added in production value is thus an indicator for the integration of industries. However, it can also vary, owing to differences in the remuneration of factors of production, i.e., in wages and profits. If an industry is able to generate higher value added, this may be due to a higher degree of sophistication or higher productivity, which allows higher factor compensation to be paid. A third reason for differences in an industry's value added rates between countries is a structural one. Comparing one country where types of activities with high value added rates predominate with another country where types of activities with low value added rates predominate, the two countries will show different value added rates in the sector as a whole, even if they both show the same value added rates for each individual kind of activity.

On average the share of the metal product sector's value added in total manufacturing is higher than that of production value; this sector is therefore fairly highly integrated. Its share of value added in production (40.6%) significantly exceeds the corresponding value of total manufacturing in the European Union (30.5%). The highest shares of value added are to be registered in the treatment and coating of metals; general mechanical engineering (48.4%) and in the manufacture of cutlery, tools and general hardware (47.3%). The lowest value added rate is found in the manufacture of structural metal products (36.7%). The value added rates in the metal product sector vary between countries from 34.7% in Portugal to 46.8% in the UK.

Table 1-3: Production of the sector "Manufacture of fabricated metal products" (NACE Rev.1 28) in the EU countries (2000)

NACE Rev.1 Country	Production Value		Value added at factor cost		Share in total Manufacturing in %	
	Mill. EUR	%	Mill. EUR	%	Prod. Value	Value added
B	9,148.2	2.8	3,318.6	2.5	5.3	6.9
DK	4,844.9	1.5	2,257.9	1.7	6.9	8.9
D	88,077.6	26.6	38,109.5	28.3	6.9	8.2
E	26,448.5	8.0	9,656.8	7.2	7.4	9.4
F	49,760.4	15.0	19,445.4	14.5	5.5	8.9
IRL	1,497.4	0.5	573.1	0.4	1.5	1.6
I	69,861.4	21.1	25,699.8	19.1	8.5	11.4
L						
NL	13,332.7	4.0	5,061.8	3.8	6.6	8.7
A	7,405.9	2.2	3,199.7	2.4	7.5	8.6
P	4,161.2	1.3	1,443.6	1.1	5.8	7.1
FIN	4,400.8	1.3	1,787.9	1.3	4.5	5.6
S	10,194.4	3.1	4,229.2	3.1	5.8	7.4
UK	42,194.6	12.7	19,741.1	14.7	5.9	8.0
EU13 <sup>1</sup>	331,328.0	100.0	134,524.3	100.0	6.6	8.6

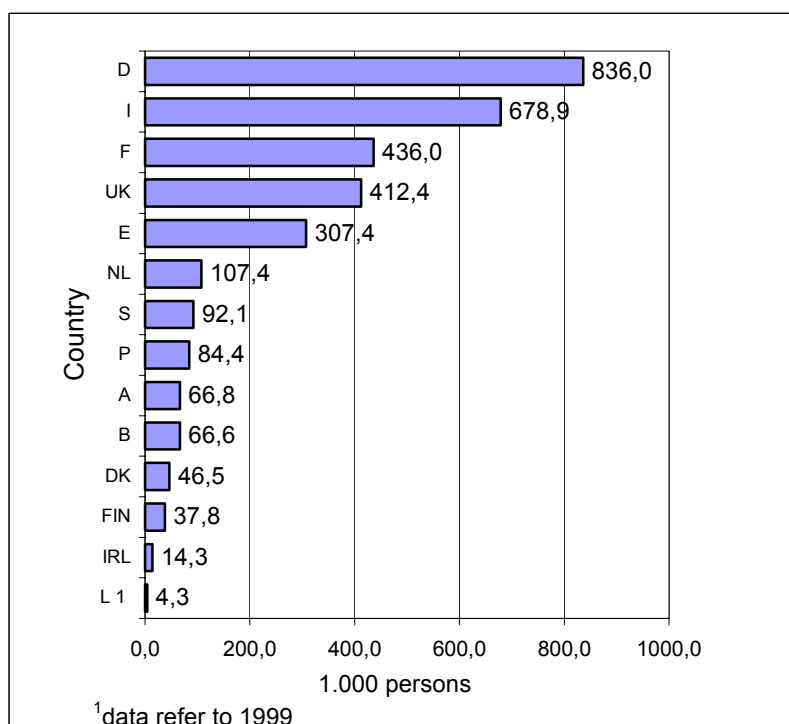
<sup>1</sup> EU13: all enterprises: EU excluding Greece and Luxembourg = 100.

Source: Eurostat New Cronos 2002, calculations by DIW Berlin.

### 1.3 Employment, productivity, and labour costs

Nearly half of the employment in the EU metal product sector can be attributed to Germany and Italy. Together with France and the UK, these four countries account for about three quarters of employment in this sector in the EU. Figure 1-3 shows the regional distribution of employment.

Figure 1-3: Manufacture of metal products (NACE Rev.1 28): number of persons employed in the EU countries (2000)



Source: Eurostat NewCronos 2002.

A closer look at the employment, productivity and labour cost figures reveals that most countries share some common features. Indicators for productivity and labour costs are lower in the metal products sector than the average of total manufacturing. The difference between labour costs per employee in the metal products sector and the average of total manufacturing is smaller than the difference in productivity; i.e. unit labour costs are relatively high in all countries compared to the average of manufacturing.

The levels of productivity and labour costs differ considerably between countries in the metal products sector. The average productivity of the 12 countries in 2000 amounts to a value added of 41,376 Euro per person employed. Apparent labour productivity was lowest in Portugal and highest in Belgium, where it was nearly three times as high as in Portugal. The same holds for labour costs per employee, the average of which amounted to 30,988 Euro per employee.

Table 1-4: Employment, Productivity and Labour Costs in the sector "Manufacture of fabricated metal products" (2000)

Country	Employment		Productivity		Labour Costs	
	Persons employed	Share in manufacturing total	value added per person employed (1000 Euro)	in % of manufacturing total	per employee (1000 Euro)	in % of manufacturing total
B	66,553	9.9	49.9	70.0	36.2	84.3
DK	46,500	9.8	48.6	91.0	35.3	99.4
D	836,016	11.1	45.6	73.6	35.9	88.8
E	307,416	12.2	31.4	76.9	23.3	92.2
F	435,970	11.2	44.6	79.4	33.5	88.8
IRL	14,278	5.5	40.1	30.0	26.3	88.0
I	678,864	13.4	37.9	85.3	25.4	88.5
L <sup>1</sup>	4,294	12.9	59.5	92.5		
NL	107,426	12.0	47.1	72.3	33.8	91.8
A	66,842	10.7	47.9	80.1	34.8	91.4
P	84,372	8.3	17.1	85.0	12.3	104.1
FIN	37,761	8.7	47.3	65.2	30.7	86.8
S	92,136	11.3	45.9	65.8	35.0	86.8
UK <sup>1</sup>	412,355	9.8	44.9	83.4	30.0	90.3
EU12 <sup>2</sup>	2,774,134	11.5	41.4	75.6	31.0	89.5
EU15	3,197,400	11.2				

<sup>2</sup> Luxembourg, United Kingdom: data refer to 1999. <sup>3</sup> EU15 excluding Greece, Luxembourg and UK.

Source: Eurostat New Cronos 2002, calculations and estimates by DIW Berlin.

## 1.4 Size class distribution

The manufacture of metal products is characterised by a predominance of smaller enterprises. The distribution of the number of firms to size classes of employment in this sector does not differ very much from the average in total manufacturing. But the importance of small enterprises for the sector's employment (57%) is considerably higher than in total manufacturing, where a share of 36% has been recorded. The lower employment weight of large enterprises in this sector – 18% compared with 41% in total manufacturing – is a reflection of the low average number of employed persons per enterprise – 560 – compared with 844 in total manufacturing. The large enterprises in the metal products sector are considerably smaller on average than in total manufacturing. This result holds for all the 11 EU member countries for which size class distributions are recorded.

The pattern of size class distribution differs between countries. In Germany, France, Austria, and Sweden the employment shares of large firms are higher than the average, whereas in Spain, Italy, and Portugal the shares of small enterprises are above average.

Table 1-5: Size class distribution of employment (NACE Rev. 1 28)

NACE 28		Enterprises with ... persons employed		
	Total	1 to 49	50 to 249	250 and more
Country	Number of persons employed	Structure in % of total		
B	64,921	55.9	26.3	17.8
DK	46,044	50.1	35.0	14.9
D	798,412	38.8	30.9	30.2
E	299,342	72.9	18.0	9.0
F	442,830	52.7	26.5	20.7
IRL	13,095	50.0	43.2	6.8
I	651,841	76.5	18.0	5.5
A	67,162	39.1	35.8	25.1
P	85,661	72.4	23.4	4.2
FIN	35,066	57.1	28.1	14.8
S	91,578	50.0	23.7	26.3
EU11 <sup>1</sup>	2,197,405	57.0	25.0	17.9

<sup>1</sup> EU excluding Greece, Luxembourg, Netherlands and United Kingdom.

Source: Eurostat New Cronos 2002, calculations by DIW Berlin.

The metal products sector shows a relatively low degree of concentration. Table 1-6 lists the distribution of turnover across size classes of employment. Small enterprises accounted for nearly half of turnover. There is a high degree of specialisation in the sector; firms are often engaged in niche markets. Many small firms are suppliers of intermediary inputs to large companies of the automotive and the machinery equipment industries with only limited market power. The distribution of turnover on size classes of employment differs across countries. In Germany, France and Austria the share of large firms is above the average of 25%. In Spain, Ireland, Italy and Portugal it is significantly lower. These countries show distinctively higher shares of small enterprises (<50 employees) in turnover than other countries.

Table 1-6: Size class distribution of turnover (NACE Rev.1 28)

NACE 28		Enterprises with ... persons employed		
	Total	1 to 49	50 to 249	250 and more
Country	Turnover in million Euro	Structure in % of total		
B	8,554.3	49.1	31.5	19.4
DK	4,402.0	45.5	39.0	15.5
D	87,751.4	28.9	32.1	39.0
E	24,595.9	57.2	29.4	13.5
F	48,327.5	44.6	27.5	27.9
IRL	1,314.8	40.5	48.9	10.5
I	61,631.7	65.4	24.7	9.8
A	7,474.7	31.0	41.1	27.9
P	3,574.8	64.2	29.0	6.8
FIN	3,790.7	48.7	28.8	22.5
S	8,910.6	48.0	30.3	21.7
EU11 <sup>1</sup>	260,328.4	45.6	29.5	24.9

<sup>1</sup> EU excluding Greece, Luxembourg, Netherlands and United Kingdom.

Source: Eurostat NewCronos 2002, calculations by DIW Berlin.

## 1.5 Trade balance

The manufacture of metal products shows a rather low degree of integration in international trade. The majority of trade is still conducted within the EU. Nine countries showed a negative balance of total trade in fabricated metal products; however, if trade with non-EU countries is considered, only four balances remained negative. The countries with the highest export surplus were those with the highest production values, with the exception of the UK, where imports exceed exports in spite of its rank of fourth with respect to production. Germany, Sweden and the United Kingdom had the largest share of extra-EU trade in both directions, Greece and Finland on the export side only.

For the EU as a whole, the trade balance was positive. Denmark, France, Austria and Portugal are countries where total imports exceeded total exports, and in trade with countries outside the EU they managed to achieve an export surplus.

*Table 1-7: Exports, Imports and Trade Balance for the sector "Manufacture of fabricated metal products" of the EU in Mill. Euro (2000)*

Country	Total Exports	Exports to Extra-EU in % of total exports	Total Imports	Imports from Extra-EU in % of total imports	Trade Balance	Trade Balance to Extra-EU
B-L	3,792.6	17.6	4,159.8	22.2	-367.1	-255.1
DK	1,485.8	29.8	1,526.7	25.1	-40.9	59.7
D	16,641.4	44.0	11,229.9	56.4	5,411.6	992.5
EL	191.9	74.7	716.4	33.6	-524.5	-97.5
S	3,532.2	37.6	3,413.8	21.4	118.4	597.5
F	7,091.0	35.7	7,368.6	25.3	-277.5	667.2
IRL	388.2	21.9	917.9	22.9	-529.7	-125.6
I	9,250.7	37.2	3,743.0	35.2	5,507.7	2,126.7
NL	3,397.5	24.3	3,757.6	28.6	-360.1	-251.2
A	2,848.2	39.2	2,973.7	29.0	-125.4	255.4
P	706.9	23.8	967.9	8.9	-261.0	82.5
FIN	883.8	51.0	797.4	28.6	86.4	223.0
S	2,733.4	48.4	1,983.6	33.6	749.8	655.0
UK	5,490.6	43.0	6,661.1	49.2	-1,170.5	-915.0
EU15	22,212.4	100.0	18,197.5	100.0	4,014.9	4,014.9

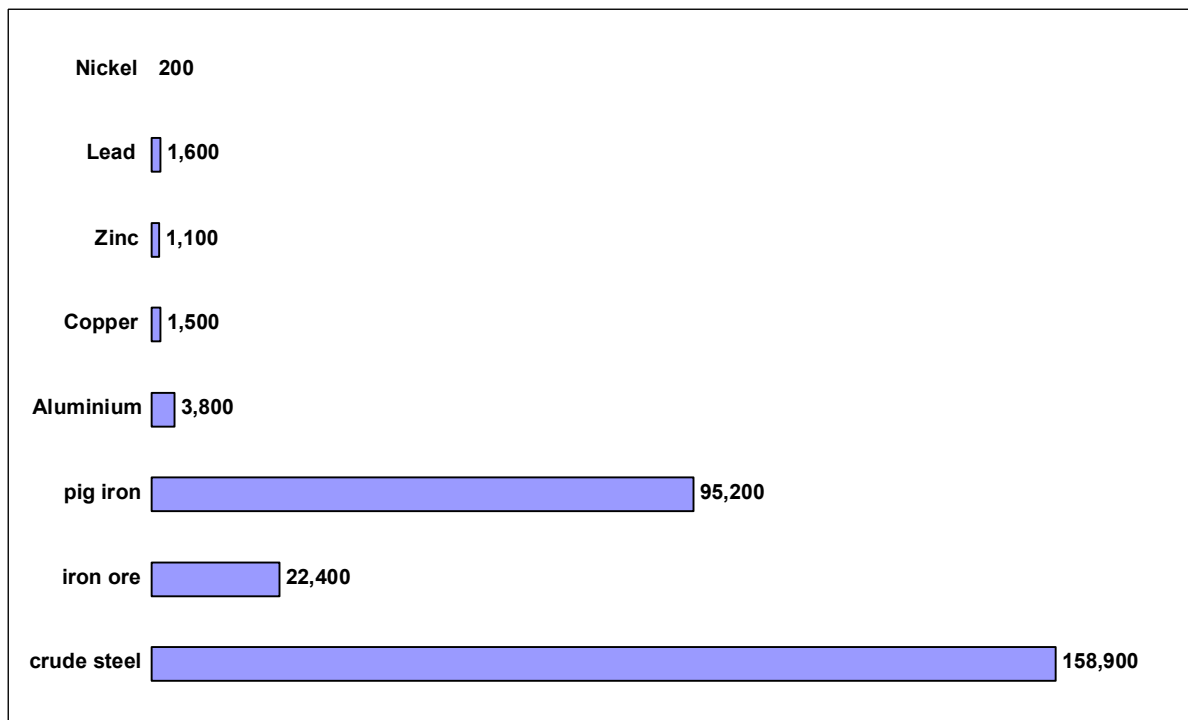
Source: DIW-Foreign Trade Data 2002, OECD, Eurostat.

Since Eurostat has ceased to update the data collection SBS Plus, which contains data on foreign trade of the EU countries and for the EU as a whole, the trade balances for the year 2000 were derived from another source, the DIW Foreign Trade Data. These data are based on OECD Foreign Trade statistics by SITC commodity groups. The trade values of SITC commodity groups were transposed using a concordance scheme from SITC to groups corresponding to the ISIC-code, which is identical to the NACE Rev.1 code on the two digit level. The DIW Foreign Trade Data are given in USD. For the purpose of the [ebiz-W@tch](#) the DIW converted these figures to Euro using average annual exchange rates published by Eurostat. Of course, foreign trade data from these two sources differ, but nevertheless show the same main tendencies.

## 1.6 Sector-specific issues and challenges

The sector comprises a vast variety of products that are sold on different kinds of markets. The production of metal products generally requires substantial input of raw metals. Most of the firms use steel as their main input. In addition, aluminium, nickel, zinc, copper and a variety of alloys and other materials are processed. Figure 1-1 illustrates the relative importance of basic raw metals in Europe by showing the production volume in metric tonnes.

Figure 1-4: EU production of ferrous and non-ferrous metals in 2000 (thousand metric tonnes)

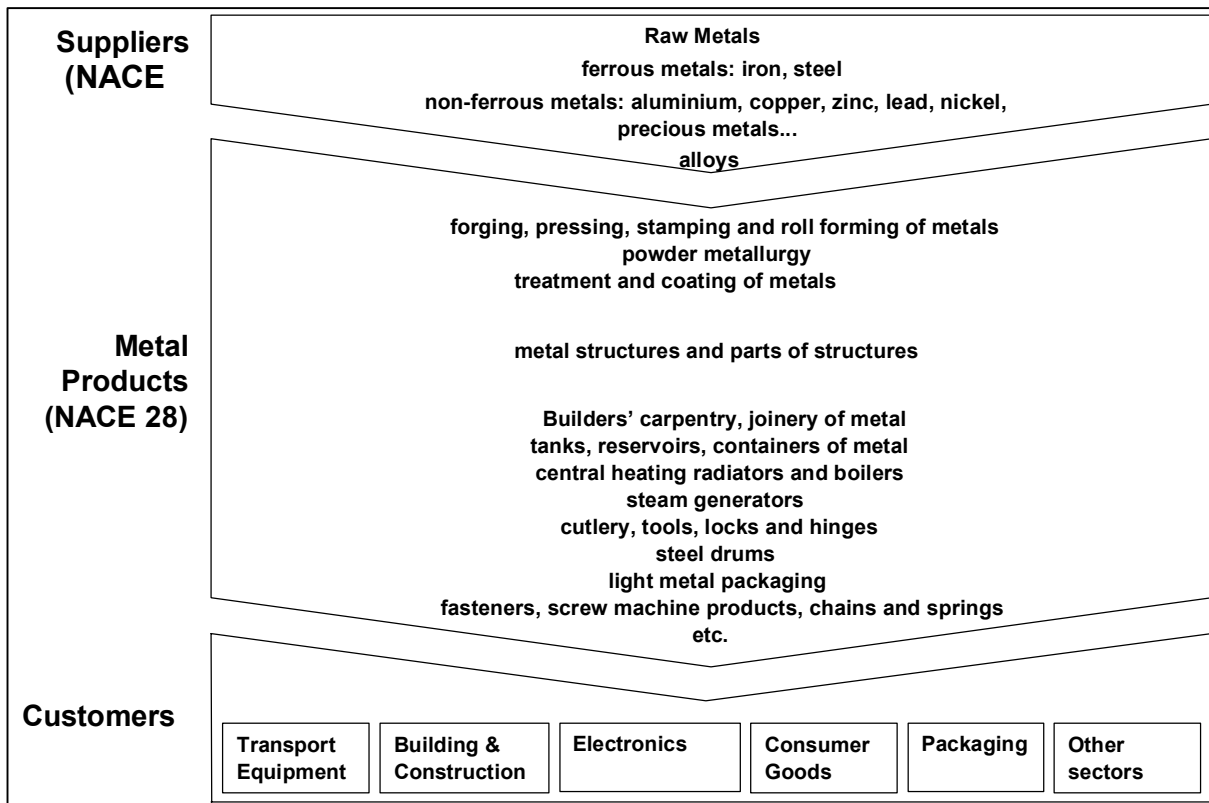


Source: Eurometaux 2001 (estimated figures); IISI 2002; DIW 2002.

Basic raw metals are available in different shapes and qualities, but the majority is of standard quality and sufficiently defined to be suitable for trade on spot markets. For example, the London Metal Exchange (<http://www.lme.co.uk/>) offers highly liquid futures and option contracts for non-ferrous metals. The metal products industry is, however, not the largest buyer of raw metals – the majority of raw material purchases goes to the automotive and construction industries (Eurometaux 2000, p. 25ff).

These sectors are also the most important customers of the metal products sector. Many firms in the metal products sector fabricate interim products from raw metal that are then sold to the automotive or construction industries. Structural metals, rods, bearings, locks, bells, screws, nails, fittings, hinges and tools are examples of products in this value chain. Hot water boilers, central heating systems, hinges, builders' carpentry and fittings for doors and windows primarily go to the construction industry. Some firms in the sector have specialised in the manufacture of metal packaging, for instance aluminium beverage cans. Others produce tanks, reservoirs, or steel drums for different purposes and market segments. Only a small fraction of the sector produces products for the private consumer market – cutlery or tools and metal parts that are sold in DIY and department stores, for example. Figure 1-2 illustrates the main suppliers, products, and customers in this sector.

Figure 1-5: Suppliers, products, and main customers of NACE 28



Source: DIW 2002.

In a nutshell, the sector is extremely heterogeneous in its product output and customer structure. Firms often specialise in one specific product line (metal chains or cutlery, for example) or in one customer group (e.g. automotive or construction), trying to become leaders in narrowly defined market niches.

The production of metal products is a traditional handcraft business. Many firms in the sector have a long history and are often family-owned or private partnerships. In recent decades, automation of production has become more common. It often requires substantial investments into machinery and production lines. However, the sunk costs for setting up a metal products business are still rather low compared to other sectors (for example, oxygen steel or automobile production). All these factors contribute to the predominance of SMEs in the sector.

A number of general economic trends have posed a challenge to manufacturers of metal products in the EU recently:

**Dismantling of trade barriers:** As a consequence of ongoing efforts to liberalise trade, competition has increased around the globe. On the one hand, this implies new opportunities for expanding international sales and gaining access to lower cost suppliers from abroad. On the other hand, many European companies in the metal products sector find it hard to compete against firms from low cost countries that are able to produce the same products more cheaply. This development has been aided by the increasing affordability of technology which once was available to only the developed world. However, the effects of globalisation in the metal products industry are still limited. The sector is deeply rooted in regional infrastructures. Many firms prefer to purchase inputs from local suppliers, and sell to local customers. These traditional business relationships are only marginally affected by globalisation trends. Of course, international trade does take place, but only a very small number of firms from the metal products sector are truly international.

**Price pressure:** Along with increased international competition, low core inflation, sluggish domestic demand during the 90s and the rise of the Internet have removed some of the price-setting power from companies. Producers of commodity metal products have witnessed the most intensive increase in price pressure and frequently complain about “ruinous competition” (see for example [www.fmwi.at](http://www.fmwi.at)). Against this backdrop, successful companies apply one or more of the following strategies (see PWC 2001, p. 25-27):

**Development of niche products:** By developing products that are focused on small markets, it is possible to secure dominant positions and achieve economies of scale which can deter competitors. This strategy is most effective for products which have high technology content. Another advantage of this strategy from a company point of view is that the focus on small markets should make it easier for companies to achieve dominant positions via acquisitions.

**Expansion into new markets:** The markets for metal products are mostly mature throughout Europe. A re-orientation towards young markets therefore makes it possible to benefit from greater demand. Geographic expansion into new regions often enables companies to take advantage of higher growth rates in foreign countries which can increase sales. Asia has been one of the most popular destinations for this, but some companies have also achieved this through expansion within Europe.

**Innovation:** Almost without exception all companies that show high levels of performance have made product innovation a major focus. Underlying this strategy is the idea of increasing sales volumes by moving up the value chain and by refining and differentiating products. Innovations, furthermore, create first-mover advantages and high profits. In addition to this, the know-how acquired via this process can also act as a barrier to entry.

**Cost control:** For some companies, however, narrowing the focus to a smaller number of operations is on the agenda because it allows them to increase operating efficiency in the remaining (core) areas. Besides the standard trimming of personnel and material costs, a number of companies cut costs by outsourcing. The theory behind this is that companies benefit from focusing all efforts on those activities that they do best, in which they do not have to maintain high production and service capacity in times of fluctuating demand.

**Branding:** If successful, branding can provide some protection against price pressures, as it uses quality as the main competitive weapon.

In addition to these mostly offensive strategies, many firms in the sector simply try to hold their market position by making defensive moves. A frequently adopted strategy is that of focusing on key customers. Building and maintaining long-term business relationships with a small number of key customers is considered by many to be an efficient way to survive on the market. (The discussion in 2.3. will highlight some of the opportunities the Internet offers to implement and support these strategies.)

### Environmental issues

Apart from economic challenges linked with market dynamics, metal product manufacturers face technological problems deriving from growing concerns about the impact of their activities on the environment. Ecological awareness has increased during the last decade. The international dialogue on climate change and sustainable development has gained in importance, and policy measures concerning environmental protection have become more and more widespread since the 1970s. More and more, sectors such as the metal processing industry are faced with environmental issues and challenges.

Problems exist in relation to the use of scarce resources as well as to dangerous substances that emerge from the industrial production processes. European policy is deeply concerned with environment protection. In pursuing the goals of the Kyoto Protocol, air emissions in particular have been subject to regulatory control. In some sectors, the range of instruments for reducing pollution already include taxes and other measures to directly internalise environmental costs.

Specific directives have been implemented to introduce different environmental measures and to observe their impact on the different industry sectors.

The EU waste strategy calls for increased recycling of any waste that cannot be reduced and energy recovery to prevent disposal. The related measures not only impose the burden of more careful use of resources and handling of waste on companies, they also offer new opportunities to diversify product and service strategies. European directives require companies to improve their production methods using the Best Available Techniques (BAT) in an ecological sense.

The industry is interested in environmental protection measures, as they are usually accompanied by a reduction in costs and legal liabilities associated with waste treatment and disposal as well as reduced production costs through efficient usage of raw materials and energy.

In the course of technological progress, new production processes and environmentally friendly techniques are being developed. Research is taking place on how to use raw materials more efficiently, e.g. by generating useful by-products, and on processes to recover energy e.g. by incineration of waste.

Recycling in particular is a growing market in the metal industry as most ferrous and non-ferrous metals are highly recyclable, and recycled material is usually still high in quality. Benefits can therefore be achieved by creating products of higher quality, lower price or better functionality.

E-business and environmental issues are linked in two ways. On the one hand, available information technologies provide potentials to reduce waste, over-capacity and inefficiencies in production. Furthermore, software tools like environmental information systems (EIS) can be used to assist in fulfilling legal requirements and achieving environmental goals. On the other hand, investments into environmental protection (as well as other investment projects that have high priority for the sector) limit the budgets available for alternative investment projects, such as e-business.

## 2 ICT and e-business

### 2.1 E-business opportunities

#### 2.1.1 Improving processes and market functionality

Internet-based solutions for the organisation of internal communication and external transactions can be used to support strategies that enable firms to improve their competitive position and financial performance. Furthermore, they can enhance the efficiency of markets by speeding up the exchange of information and by increasing market transparency. This facilitates the operation of mechanisms of competition in a market.

##### Expansion of markets

Expansion into non-saturated geographic regions (Asia, Eastern Europe) and winning new customers in home markets were mentioned as possible strategies against ruinous price competition and stagnating demand (see 1.6.). The Internet can help to support strategies for accessing new markets. When expanding into new geographic regions, e-business offers a variety of tools to support staff at foreign locations, raise customer awareness and improve customer relations and sales. The Internet and e-business can also help to reach new customers within domestic markets. This can be done by such simple means as a corporate website, and a firm profile placed in relevant industry-specific online catalogues, search engines, or marketplaces. In addition, excess supply can be sold in online auctions, which also offer the possibility to create first-time contacts with new customers.

##### Potentials for costs savings

Many companies in the sector are under pressure to reduce inventory and work in progress, and thus working capital requirements. Sales cycles can in general be accelerated by improving communication with key customers, and by using alternative distribution channels for excess capacities. Significant savings in inventory could eventually be achieved, if industry online marketplaces reached sufficient penetration and liquidity (see survey results below).

Cost savings could also be realised by streamlining procurement activities for indirect goods and raw materials. However, there seem to be increasing returns to scale for this sort of e-business investment, and therefore, most of these applications promise the biggest cost savings when they reach a certain order of magnitude (see E-Business Watch Transport Equipment Report, 06/2002, p. 44-47). This might constitute a limit for the adoption of many e-business initiatives in SMEs in general and in the metal products sector in particular.

##### Outsourcing of administration processes

Administration costs are usually fixed costs that can be a considerable burden, especially during cyclical downturns and for small companies. A variety of Internet-based B2B services help companies to outsource elements of administration processes. For example, web-based services are available for payroll accounting and travel expense management (e.g. Lohndirekt.de). These activities are usually routine tasks that do not belong to the core competencies of a company, but nevertheless require in-depth knowledge of accounting principles, laws, etc. External service providers that specialise in these tasks can often offer them at comparatively low costs and high quality. These outsourcing possibilities have existed for some time, and long before the Internet became an important tool. However, electronic communications offers excellent possibilities to outsource functions without losing control and efficiency. Furthermore, Internet-based systems involve low transaction costs and can therefore be supplied at lower prices. Hence, Internet-based outsourcing solutions are a good example of e-business tools that are affordable even for smaller firms.

## Better collaboration with customers

Firms from the metal products sector that deliver directly to larger customers from the automobile, construction, electrical machinery, or retail sector might sooner or later be approached by these customers and asked to join their supply-chain-management (SCM) initiatives. These initiatives usually hold benefits for both sides – the supplier and the customer. From the supplier's perspective, the following benefits can usually be achieved:

- The automation of sales steps reduces transaction costs. Simple work steps (receiving and entering orders, checking availability, preparing fulfilment, billing etc.) become automated, and thus faster, more reliable and cheaper.
- Placing product catalogues into electronic procurement systems of key customers usually strengthens the business relationship with these customers, which often leads to increased order volumes.
- The seamless flow of information provides up-to-date insight into market demand. With more current and precise information about demand, forecasting becomes more accurate, which helps to reduce inventories and production costs.

## Branding and public relations

One of the most important reasons for implementing e-business solutions and investing in corporate websites is to improve the company's image, brand, and visibility. The Internet has proved to be an efficient means of communicating companies' portfolios of products and services, as well as for sharing information with interest groups, such as employees, shareholders, journalists and so on. For example, a survey of 338 enterprises in Germany shows that most companies expect their e-business and Internet investments to have a strong or very strong positive impact on their image. This holds true regardless of a firm's size or business sector (see TechConsult, 2002, p. 47-49).

### 2.1.2 E-business risks

E-business offers opportunities, but also involves risks. Implementation is accompanied by strategic and financial commitments that have to be carefully weighed against the expected benefits in each individual case.

#### Opportunity costs

The considerable investments required for many e-business solutions have to be considered under opportunity cost principles: they might be better spent on other areas. Firms (regardless of size) have only limited budgets for investment projects. According to the theory of optimal allocation of capital, these limited budgets should be spent on the investment opportunities with the highest positive discounted cash flows (Ross et al 1996). This does not necessarily have to be e-business. For example, a metal producer who aims at increasing his sales might be confronted with the alternatives of either investing in an online shop solution, or hiring an additional local sales representative. The online shop is not always the better decision. We believe that the loss of interest that e-business has experienced in the metal products sector can to a large degree be explained with the opportunity costs argument. After having initially focused their efforts on e-business, many managers in the industry might have realised that they can get better returns from investing in product improvements, new production machinery, or personnel than by spending their money on e-business solutions.

#### Eroding profit margins and increased price competition

Online marketplaces tend to give all companies equal access to suppliers, and gravitate procurement to standardised products, resulting in less differentiation of products. Information costs for customers are reduced, which increases market transparency by making it easier to

compare offers from various competitors. In addition, on anonymous electronic markets it is difficult to promote “soft” benefits, such as trustworthy and reliable business partnerships. All of the above works towards shifting competition to prices. As a consequence, companies with low cost structures gain a competitive advantage (see Porter 2001, p. 67). In many parts of the European metal products industry, enterprises complain about destructive price competition. European firms often cannot follow a cost leadership strategy –competitors from Eastern Europe or Asia are cheaper, as their overall cost levels are lower. Competing entirely on the dimension of price would therefore be an unwise strategy. In fact, many European firms in the metal products sector are very concerned about growing price competition, and instead try to differentiate their products, strongly betting on quality, innovation and building long-term business relationships with their customers. Joining anonymous online marketplaces that would only increase pressure on margins seems like an unwise move under these conditions. The cost savings from more efficient logistics analysed above may be needed to compensate for lower margins due to more transparent and competitive online markets. In this case, efficiency increases for the economy as a whole, but the individual firm does not experience any improvement of profitability.

### Implementation risk

Although e-business technologies have already reached a considerable degree of maturity and robustness, there are still technical and organisational implementation risks. IT and software systems are unique in every individual firm, so compatibility and fluent data exchange cannot be guaranteed. Often, the costs for implementing a new complex software system are underestimated in the beginning, and sometimes specific functions of a new software do not work at all due to technical problems. This increases costs, decreases the effectiveness of e-business systems, and leads to frustration and an overall negative assessment of e-business opportunities. However, technical problems are usually not a major obstacle in e-business initiatives as they can usually be solved. A much greater risk arises from a lack of acceptance by employees of e-business systems. This is very common when the implementation of e-business technologies did not go hand in hand with a thorough analysis of business processes and the needs and attitudes of workers.

#### **What am I missing?**

“Let’s see, you want me to put all my products and prices online so my customers can beat me about the head and shoulders. Then I can commoditize myself even more to take my razor-thin margins down to a microscopic level. Finally, I get to pay transaction fees for this privilege. What am I missing?”

*Supplier in an interview with Morgan Stanley Dean Witter & Co, in Wirtz 2001.*

## 2.2 E-business trends in metal product industries

### 2.2.1 General trends

The potentials of e-business described above suggest that – despite the risks involved – there should be a strong interest in the industry to engage in this new way of doing business. However, e-business is currently not a big issue in the metal products industry. Opportunities were mainly discussed during the hype around 2000, but the topic seems to have lost its appeal for the sector and is not an important issue at the moment. At conferences, fairs, and in industry publications, e-business issues currently play little if any role at all. Most of the available publications, statements, and initiatives date back to 2000 and early 2001. Since then, interest in the topic has

plummeted. Even during the period of more intense interest, firms in the metal products sector did not rank e-commerce as a top priority business issue (see Strategem Limited 2000, p.4).

E-business research and publications have widely ignored the metal products sector. In contrast to other industry sectors (such as automotive or chemicals), high quality secondary literature on e-business issues for metal products is very scarce. Consultants, analysts, researchers and journalists – usually quick at finding new trends and spreading the “news” about it – have focused their interest and their e-business related publications on other sectors, leaving the metal products sector an empty field.

This, combined with the dominance of SMEs and the fact that interest in e-business has vanished again after an initial hype, leads to a central question: **Is the sector simply a late adopter of e-business that will experience its own e-revolution just a little later – or is it not suitable for e-business at all?**

Our interviews and anecdotal evidence indicate that most firms in the metal products sector view e-business with some degree of scepticism. They do not see how e-business could actually help them to cut costs or raise revenues. Instead, many producers simply claim that e-business does not fit their industry. There are numerous reasons for this:

In the metal products sector, business is frequently conducted on the basis of personal and long-standing relationships with suppliers and customers. Firms are often specialised in a number of niche products and serve rather small market segments. The number of suppliers and customers for each individual firm is limited, leaving little room for efficiency gains from e-business tools such as CRM or e-procurement. Large shares of business are often based on fixed lot production for specific customers and thus not freely available for sale to an anonymous marketplace. This limits the potential benefits from online shop solutions or participation in industry marketplaces. Furthermore, for those products that are produced “on stock” and can be sold to an anonymous market because they are useable for different purposes and thus require a certain degree of standardisation, producers often fear pressure on price margins from online competition more than they value the potential for increasing market reach and acquiring new customers.

The need for collaborative engineering or other forms of data-intensive communication with business partners is also limited. Metal products are often interim products that are not very engineering-intensive. Customisation of production and engineering exists, but does not require interactive development to an extent that would justify investing in full-scale Internet-based product development solutions.

Back office management in metal product firms is often limited to the most basic functions (accounting, administration and rudimentary human resource management). Production is not as knowledge-intensive as in other industries (e.g. banking or ICT), and training is mostly done “on the job”, therefore the benefits of e-learning, knowledge management and Internet-based back office functions (such as travel expense management) are limited.

This does not mean, however, that no e-business opportunities exist at all. As many firms in the sector are suppliers of the automotive or other industries where e-business is currently being introduced on a broad scale, these firms will probably be confronted with customer initiatives to enter into web-based supply-chain management (SCM) solutions or e-procurement. This pull from the customer side might increase e-business take-up in the metal products sector in the future, but will also require dealing with the concerns and worries of the metal producers about these initiatives.

### 2.2.2 B2B marketplaces

Among the different e-business applications, online marketplaces clearly show the pull function of customers of the metal products sector during the last three years. This is particularly true for those suppliers who are closely integrated into the automotive or construction value chains.

## **Procurement initiatives from metal product buyers**

The automotive industry in particular has approached its supplier base with online procurement initiatives and large scale Internet marketplaces like Covisint or SupplyOn. However, customers and suppliers of these Internet marketplaces had different expectations and interests. Customers primarily tried to increase market transparency, cut prices and reduce transaction costs. Suppliers, on the other hand, were more sceptical about potential transaction cost savings. Their primary concern was the fear of reduced margins and ruinous price competition. On the positive side, they hoped to strengthen existing customer relationships, and gain access to new customers. Obviously, these different expectations and interests have led to conflicts.

As a result, after an initial phase of euphoria (especially from the customer side), disillusionment set in, and the implementation of industry-wide Internet market places turned out to be a much more complex issue than initially expected. In particular the practice of online auctions has destroyed trust between customers and suppliers. In order to deal with this, a German suppliers' association has formed a working group to issue guidelines for fairness in electronic marketplaces to address some of the issues that have led to conflicts in the past (see box next page).

After an initial phase of trial and error, online auctions are hardly used anymore for customer specific bids. These bids often require engineering efforts and are not entirely assigned on the basis of lowest prices. On the other hand, commodity products and access capacities are considered suitable for online auctions.

Missing data standards are seen both by suppliers and customers as a major obstacle to efficient use of Internet marketplaces. Our interview partners pointed out that existing data standards like EANCOM or BMECAT are only suitable for a limited range of products (food/non-food or e-procurement of indirect goods) and do not go into sufficient depth. This limits the potential range of e-business solutions for the metal products industry.

**Fairness for electronic marketplaces**

## 1 – Transparency and clear rules for auctions

- Before the supplier is called upon to participate in Internet auctions, clear rules of the game must have been agreed upon between the market participants. Sufficient time for preparation is required.
- Auction participants and the criteria needed for participation must be defined clearly and known to all auction participants.
- Auction participants must be relatively equal concerning capacity, quality, logistics and service.
- Costs, such as access and service charges, must not be shifted one-sidedly on to the supplier.
- The duration of the auction should be tightly limited and must not be changed during the auction.
- Auctions must not be misused as a tool for creating further downward pressure on suppliers' prices. Test runs must be announced as such.
- Auctions should not be based on any upper limit prices, which have to be underbid.

## 2 - Specification

- A clear specification of the buyer's requirements must be guaranteed. Otherwise, an auction is not a suitable method for doing business. Conditions and terms must be unequivocally agreed and available to all participants at the same time.

## 3 – Confidentiality and security

- In order to enable the electronic marketplace to become permanently viable, confidentiality, system reliability and fairness among the persons trading are all equally indispensable.

*Excerpt from ArGeZ (2001).*

Experts from the sector also mentioned on various occasions that business processes between suppliers and customers need to be better synchronised to enable efficient execution of sales via online marketplaces. However, this seems to be a problem of "learning" to do e-business rather than a severe obstacle. Furthermore, both sides agree that the focus of future initiatives should be on realising cost savings for both sides (primarily by reducing transaction costs) rather than on increasing price pressure for the sole benefit of customers. On the part of metal products suppliers, e-readiness needs to be further improved and top management needs to take a proactive role in this process in order to enable better use of e-business opportunities (see ArGeZ 2002).

Metal product suppliers also complain about high membership and transaction fees of online marketplaces. These costs are often carried entirely by suppliers and act as a major barrier to adoption, especially if a supplier wishes to conduct business with more than one platform or customer.

**No industry-specific marketplace**

Interestingly, marketplaces exist both for the raw metal industry (steel, aluminium etc.) as well as for sectors that are buyers of metal products (automotive, electrical machinery etc.). It is mostly with these marketplaces that firms from the metal products sector interact - if they use online marketplaces at all. However, successful online marketplaces that are specialised in metal

products themselves, covering at least substantial parts of the sector as it is defined in NACE 28, do not currently exist.

There is no visible online marketplace for the metal products industry that is close to reaching a critical mass of users. Obviously, the current offers do not appear to be an attractive and convincing resource for industry members in terms of offers and services. In other sectors which are more involved with e-business and do possess such industry-specific marketplaces, experience has shown that these intermediaries play an important part in creating an e-enabled value chain. This part of industry-specific Internet infrastructure is still missing for the metal products sector.

### **Raw metal marketplaces**

As mentioned above, the manufacturing of metal products requires substantial inputs of raw metals. Raw metals often have the following three properties (PWC 2002, p.72):

- They are homogenous and standardised (especially non-ferrous metals, secondary steel and excess production materials);
- Their market prices are highly volatile;
- Transporting them is awkward and expensive.

These properties lead to a highly fragmented and regionally focused structure of metal production (NACE 27). The market volume in metals is very high – the world-wide production of crude steel alone accounts for 847 m tons in 2001 (IISI 2002). In many parts of the industry growing competition from Asia, Latin America and Eastern Europe increases pressures on European and American firms. The steel industry seems like an ideal place for a neutral e-market. Unlike non-ferrous aluminium and copper markets, steel is the only major industrial commodity not traded on an exchange. Steel trade is characterised by opaque pricing and opaque availability – an independent online marketplace could considerably improve this situation. However, in reality most of the initiatives did not progress beyond a slow start, or failed entirely at the outset. Market specialists attribute this to the naive business models of marketplace owners, integration problems in user firms, lack of transparency regarding product quality, and lack of support in logistics and financing (see Ericson, Jim 2001). But the model still has its believers.

Despite the variety of mediocre online exchanges, a number of B2B trading activities have emerged that are promising both in terms of their functionality, their competitiveness, their services and their financial backup. Metal product firms (NACE 28) could be interested in purchasing raw materials from one of them. The following table lists some examples of e-markets that specialise in the European economies.

Table 2-1: Metal e-Marketplaces with European Focus

<p><b>Allocation Network</b> Hohenzollernstrasse 81 80797 Munich Germany</p> <p>URL: <a href="http://www.allocation.net">www.allocation.net</a></p>	<p>Allocation Network was founded in 1998. This vertical marketplace connects buyers of the automotive, machine, plant, vehicle and application industries with metal-working, plastic-processing or electrical engineering suppliers. It is especially targeted at SMEs.</p> <p>The system offers a range of procurement and sales tools e.g. reverse auctions and tenders, strategic supplier selection and relationship management, Request-for-Quote systems. The platform also contains external links to company owned online shops or catalogues.</p>
<p><b>metalAUCTIONS</b> Frauenthal 11 20149 Hamburg Germany</p> <p>URL: <a href="http://www.metalauctions.com">www.metalauctions.com</a></p>	<p>In 1999 the trading house macroMetal has launched this auction platform to offer value added service to customers. Its services include both private and public auctions that are easier to participate in and more efficient when conducted online. The company also offers consultation on contracts, information on international quality standards and logistic management.</p> <p>To date 700 members of the metal industry are registered, but only a small proportion is actually active. On average, two auctions are conducted per week handling transaction volumes of at least 150,000 Euro each.</p>
<p><b>Steel 24-7</b> Drogenbos Techno Center Boulevard de l'humanité 237 1620 Drogenbos Belgium</p> <p>URL: <a href="http://www.steel24-7.com">www.steel24-7.com</a></p>	<p>In December 2001, this e-business service provider for the steel industry was founded by Arcelor (formerly Arbed/Aceralia and Usinor), Corus, and ThyssenKrupp Steel. Its focus is on leveraging the commercial relationships between steel buyers and suppliers, through the integration of business processes across the boundaries of existing companies.</p> <p>Its products and features include:</p> <p>A one-stop-shop platform, sales/ procurement solutions, supply chain tools (product development, contract management) as well as logistics and finance management. All operations are based on a common standard. Furthermore Steel 24-7 offers IT consultancy and support and its website also provides general industry and company information.</p>
<p><b>BuyForMetals</b> Kleine Kloosterstraat 6 St-Stevens-Woluwe 1932 Belgium</p> <p>URL: <a href="http://www.buyformetals.com">www.buyformetals.com</a></p>	<p>This Internet-based trading platform, launched in 2000 by Arcelor, Corus and ThyssenKrupp Steel, offers procurement and supply chain management tools for the metals industry, such as reverse auction or bidding events and an online catalogue to browse and search. It furthermore aids exchanging Request for Quote (RFQ) or Request for Information (RFI) and offers related services concerning implementation, security and support.</p> <p>Its current focus is on European markets, with plans to expand business globally.</p>
<p><b>Quadrem</b> 171 Ave Charles de Gaulle 92200 Neuilly sur Seine France</p> <p>URL: <a href="http://www.quadrem.com">www.quadrem.com</a></p>	<p>Backed by 21 of the leading mining, minerals and metals companies (incl. European firms Rio Tinto, Imerys, Pechiney, Glencore), Quadrem has eight global locations and offers services in four languages, despite being US-based. It has been developed as a one-stop solution to specifically meet the needs of the industry. It comprises an e-marketplace, online-auctions and bidding tools, an electronic catalogue including sourcing facilities as well as related value added services.</p>

Online trading platforms for raw metals usually feature reverse auctions that allow customers to take advantage of the high volatility of prices in this segment. Also frequently used are (forward) auctions – a transaction mechanism that is primarily used to sell excess capacities or production of second-rate quality.

Currently, however, most metal product firms do not seem to be very interested in the offers of these online platforms. We suspect that this is primarily because many firms are satisfied with their current suppliers and transaction modes – public e-markets are just not a top priority right now as firms are struggling to optimise production schemes and other issues. Some users might even be turned off by their early experiences with online marketplaces, being confronted with the clumsy and dubious websites of the many start-ups that tried to make their fortune during the 2000 hype.

**What's going on?**

“They say that one is an event, two is a coincidence and three is a trend. It may still be a coincidence that MetalSpectrum, MetalSite and Aluminium.com all suspended operations or closed outright in a week's time, but it begs the question, what's going on here?”

*from Ericson, Jim (21-06-2002)*

Many e-marketplaces have suspended operations (e.g. e-steel is now simply an application provider) or closed outright, for instance [www.aluminiumfirst.com](http://www.aluminiumfirst.com), [www.e-materialcut.co.uk](http://www.e-materialcut.co.uk), [www.ferrousexchange.com](http://www.ferrousexchange.com), [www.metaltradenet.com](http://www.metaltradenet.com), [www.steelsscreen.com](http://www.steelsscreen.com). Reasons for this might be that some of them were just too ambitious and did not understand that metals are a sophisticated and complex product not immediately suitable for online-trading. The global trade in metals requires many product-related services, such as logistics and credit management. And even more importantly, trading in metals requires that there be control over specifications and quality, as standards differ widely from country to country. Therefore, in-depth knowledge of the industry and its requirements seems to be the *sine qua non* when developing an online trading place.

Admittedly, this makes it difficult for independent e-marketplaces to gain ground due to the lack of industry knowledge. Three of the four marketplaces listed in table 2-1 have in fact been launched by companies that were already established in the metals markets and now are trying to add value to their business and tighten customer relationships. However, small and medium sized metal manufacturers refuse to adopt the big players' technology.

It must be added that metal products according to NACE 28 seem to have no independent vertically integrated online marketplace at all. E-Hubs like Allocation.net (see table 2-1) offer their services to all material manufacturing industries.

### 2.2.3 Limits to e-business opportunities

Many of the e-business opportunities commonly listed do not apply to the metal products sector. Some examples:

#### **Simple procedures without a high frequency of repetition do not have much potential for improvement.**

Many e-business applications promise greater speed and efficiency in different areas of operation, such as engineering, manufacturing, logistics, inventory management and forecasting of customer demand. These efficiency gains usually result from making procedures more transparent and simple (process re-engineering) and from automating routine tasks that otherwise require substantial work time (and are thus expensive and slow). However, process re-engineering is not required when procedures are already simple, transparent and efficient. And automating tasks that only occur irregularly does not promise great cost savings either. In the metal products sector, small enterprises dominate, as they usually do not have complicated logistics, manufacturing or engineering processes that would justify the regular and real-time exchange of large amounts of digital information with business partners or within the company. The numbers of suppliers and customers for most firms in the sector are quite limited, and so is the variety of inputs and outputs. In most cases, traditional ways of interacting with customers and suppliers (fax, phone, mail, e-mail) are sufficient for handling the core processes. Communication within SMEs does usually not require large scale e-solutions either. Again, phone, e-mail and face-to-face communication are sufficient in most cases, especially within enterprises that only have one or two branches or plants.

**SMEs in general do not have large overheads**

Back offices are usually only staffed with a few people who are responsible for accounting and administration. Therefore, the effects of reducing overhead and the associated cost reductions are limited.

**The metal products sector is not a truly global business segment**

Although there is some international trade both in raw metals and in metal products, the vast majority of production is sold relatively close to home (see 1.5. sector description at <http://www.wsm-net.de/>, or Worldmetal 01/16/2001). Metal product firms are in general more interested in buying their raw material from local suppliers, and their customers often have a local preference as well. One of the reasons for this is the nature of metal products: they are usually heavy and induce high transportation costs compared to their product value. But shipping relatively simple products around the world at a high cost is economically not feasible. In this scenario, supply and demand have to be matched within relatively small geographic regions (local markets) and the advantages of the Internet as a global communication medium cannot be fully exploited.

Despite the existence of e-business opportunities in the sector, compared to other sectors, these opportunities are limited by the specific nature and structure of the sector. Therefore, it can be concluded that a dramatic or even revolutionary impact of e-business on the metal products industry is it not very likely. The case presented below provides an example of how expectations about the positive impact of e-business have been systematically over-estimated during the 2000 hype.

**Dubious analysis – exaggerated expectations**

EITO (2002) reports potential cost savings of B2B e-commerce for 17 industry sectors. Cost savings for metal products were estimated at 22%, which is a very high rate. If such enormous cost savings can really be achieved, it does not seem plausible that the sector should be as reluctant as it is to adopt e-business. Therefore we searched for the original source of the table, trying to find out how Goldman Sachs had justified this estimation.

**B2B estimated savings by sector**

Sector	Estimated savings
Aerospace machining	11%
Chemicals	10%
Coal	2%
Communications	5-15%
Computing	11-20%
Electronic components	29-39%
Food ingredients	3-5%
Forest products	15-25%
Freight transport	15-20%
Health care	5%
Life science	12-19%
Machining (metals)	22%
Media and advertising	10-15%
Oil and gas	5-15%
Paper	10%
Steel	11%

Source: Goldman Sachs (1999)

After following the tracks through a number of articles and further references, we found the original table in a thick Goldman Sachs (1999) investment research publication that recommended dozens of Internet stocks (many of them have since filed for bankruptcy). However, the potential cost saving estimations were not further explained. The numbers had been quoted from marketing material of Internet firms (like FastParts for Electronic Components or MetalSite for steel), or simply quoted as “our analysis” (e.g. for metals) – without any explanation where these numbers come from or how they can be justified. Needless to say, this is not a proper way of conducting serious analysis.

Nevertheless, the table and the numbers have been frequently quoted in other publications, again just recently in the reputable EITO (2002) report. Goldman Sachs themselves have published a long and sophisticated article that calculated the future growth impact and the downward influence on inflation of B2B e-commerce for the entire economy based on the dubious cost saving estimations in this table (Goldman Sachs 2000).

Such ominous and pseudo-scientific publications have obviously contributed to the systematic over-estimation of e-business opportunities.

## 2.2.4 Barriers and enablers

A variety of (mostly external) factors contribute to the adoption of e-business in the metal products sector (in the following, they are called “enablers”). On the other hand, there are also substantial barriers to adoption.

### Enablers:

- **The request from customers** to connect to their e-procurement or SCM systems drives e-business adoption in the metal products sector. E-business is typically more common in companies focused on supplying a particular market segment, and especially those supplying the automotive sector. In general, larger companies and companies higher up the value chain that have direct business with heavy users of e-business solutions are more likely to adopt e-business (see Beddows, 2000, p.2).
- **Intense competition** creates pressures to experiment with new ways to improve cost structures, production, logistics, customer service and gaining access to new markets and customers. E-business offers a variety of tools to support these objectives and to implement the strategies accordingly.
- **Access to technology** does not appear to be a problem. The communication infrastructures necessary are widely implemented, ranging from high-quality telephone networks, computing hardware, and a range of competing software and network access suppliers that court for business. Presently, many providers of e-business software solutions discover the market and special needs of SME's and offer software and service packages that are tailored to this segment.

### Barriers:

- **Implementation costs** are a major barrier to e-business initiatives, especially for firms with tight budgets. Many e-business solutions require substantial up-front investments (fixed costs) in consulting, network infrastructure, software licences, implementation and process re-engineering before they can get “up and running”. Once implemented, the solutions often require additional and continued expenses for maintaining the system. Up front, costs often arise for user training, access fees, transaction and membership fees. These costs have to be balanced against the potential benefits that an e-business solution delivers and against the budget constraints of each firm.
- **Need to re-engineer business processes.** Although re-engineering of processes is often considered a virtue – it offers an opportunity to save costs and improve overall business performance – in reality it often involves changes to the work routines of many employees and thus can easily lead to conflicts that are hard to overcome.
- **Lack of e-business skills** refers to the need 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.
- **Lack of critical mass in industry portals.** Portals and industry specific online marketplaces are subject to network effects – the more firms use them, the more valuable they become. The downside: if only a few firms participate, the value of portals and marketplaces is very limited. A critical mass of users is required for such solutions to “take off”. This phenomenon is well known, and critical mass is usually reached when during the diffusion process adoption shifts from experimental early adopters to a wider circle of participants which, in turn, attracts more users. However, some portals never reach this point and die. In the metal products sector, at least up to now, there is no sign of an industry marketplace or portal that is close to reaching critical mass (with the exception of marketplaces in the automotive sector that reach into the metal products sector). Consequently, the existing portals do not have much appeal

to new users, and instead of increasing their visibility and reach, they cut back or close down. As a result, an important part of e-business infrastructure in the sector is missing. However, evidence from other sectors shows that industry-specific portals and B2B marketplaces with significant reach play an important part as intermediaries for e-business uptake. This suggests that the lack of such an industry-specific online intermediary will at least not act as an enabler to e-business uptake in the metal products sector – more likely it will be a barrier.

- **Lack of data standards.** Those firms in the sector that have already gained some experience in online trading complain about missing data standards that allow a wide range of products produced by sector to be precisely described and identified. Without common data standards, misunderstandings occur, and communication becomes cumbersome.
- **Lack of fairness and transparency:** Metal product firms that have engaged in auctions and e-procurement initiatives of their (automotive) customers often complain about being treated unfairly and about lacking transparency regarding the “rules of the game”. Much of the resistance of metal products suppliers to engage in online trading stems from premature strategies of their buyers to use e-procurement primarily as a tool to reduce prices, without adequately taking the interests of their supplier base into account.

## 2.3 Survey results

The following section discusses some of the results from the e-Business W@tch survey. The survey was conducted in 15 different industry sectors across Europe between June 6<sup>th</sup> and July 15<sup>th</sup> 2002. For each industry sector, six to seven EU countries with a sample size of 100 interviews per country-sector-cell were included in the survey, adding up to 9,264 valid individual cases in the final data set. The questionnaire was identical for all countries and sectors. It includes more than 200 different indicators about IT infrastructure, IT skills, usage of different technologies and solutions, and the economic impact of e-business.

To allow for cross-sector comparison, the four largest European economies (D, F, UK, I) were included for each sector survey. All interviews were conducted using the CATI technique (computer aided telephone interview) that minimises systematic errors. Furthermore, the survey is representative across three firm size classes for each country-sector-cell. Consequently, the e-Business W@tch survey provides one of the most comprehensive and representative data sets about e-business world-wide.

In the survey for the metal products sector, seven country-sector-cells were included (D, F, UK, I, EL, FIN, L). The data cover the most important metal producing countries in Europe that account for almost 80% of value added of the sector in the EU. The total sample included 580 interviews across three different firm size classes in the seven countries<sup>2</sup>. Data are represented either as “enterprise-weighted” or “employment-weighted”. The two weighting schemes were necessary to take account of the size-class-distributions within the sector for different interpretation purposes. Many sectors exhibit very high absolute numbers of small firms, but employment and total production value are often concentrated in a small number of large firms. This has to be taken into account when statements about e-business usage are being made. Enterprise-weighted results are representative for all firms across all size classes. And employment-weighted results are representative for a sector or country aggregate, correcting survey results to reflect the large share of production activity and employment that is attributable to large firms.

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<sup>2</sup> Sample size N was 100 for Germany, 103 for France, 133 for Italy, 60 for Finland, 53 for Greece, 31 for Luxembourg, and 104 for UK.

For example, when a statement is made about how many firms already have a website, enterprise-weighted survey results are used because the statement requires a firm-by-firm analysis. However, for statements about the overall level of e-procurement usage in an industry sector, employment-weighted data are used to take the large share of production activity into account that has to be attributed to large firms. Thus, the two weighting schemes allow representative statements to be made for different purposes.

## 2.3.1 Diffusion of ICT and e-business applications

### 2.3.1.1 Infrastructure

Infrastructure indicators are used to analyse companies' "readiness" to engage in e-business. They provide information about the penetration of basic technologies in the industry and about the propensity of firms to base their strategies on network technology.

The endowment of firms with computers and Internet access can be considered a standard situation for metal product companies throughout Europe. However, there are some significant differences between countries. While France, Italy, Luxembourg and Germany reach almost complete penetration for computers and high values for Internet access, in Finland, the UK and Greece penetration figures for both applications remain below European averages. E-mail and World Wide Web as well as LANs have also been introduced by a large number of firms in all countries, whereas intra- and extranets, WANs and EDI are far less popular. One has to bear in mind, however, that the figures only tell us whether computers and Internet access exist in a company at all, and not how many of the employees have access to these technologies (see also Table 2-10).

Table 2-2: Network applications (in %)<sup>1)</sup>

	Total	D	EL	F	I	L	FIN	UK
Computers	98.3	98.6	90.3	100.0	100.0	100.0	96.1	93.9
Internet access	91.1	92.8	86.2	95.6	91.5	96.1	80.3	83.5
E-mail	88.6	90.6	83.5	89.5	90.5	96.1	76.4	81.9
WWW	83.9	87.7	63.7	84.2	82.1	94.4	76.4	80.2
Intranet	40.5	43.0	46.3	37.8	44.1	46.4	30.7	33.1
Extranet	10.0	13.2	8.4	14.2	6.0	67.5	19.3	3.9
LAN	62.2	68.0	65.0	69.2	51.2	83.2	51.3	58.9
WAN	17.3	23.3	24.9	18.7	9.4	66.6	26.8	13.4
EDI	22.2	27.8	21.3	30.7	8.0	6.1	15.9	23.0

<sup>1)</sup> Note: employment-weighted, i.e. figures should be read as "enterprises comprising ...% of employees".  
Computational base: all enterprises.

Source: e-Business W@tch, DIW (2002).

The differences between countries are more pronounced for the more sophisticated and more advanced technologies than for the basic ones. There is no convincing evidence, however, for links between the individual applications. In countries where most employees work in firms with Internet access, not all the other applications are also widely used. There seems to be a connection between Internet access and e-mail, but none between Internet access and intranets.

Low penetration rates can be due to a number of factors: they can simply indicate a need to catch up, if firms in a specific country started later to introduce electronic procedures. They can hint at functional equivalents, i.e., other means of communication that serve the same purpose. Even if these are somewhat less efficient, firms might decide that, for the time being, there is no need to implement more advanced forms of network technology. Countries with good penetration of the other network applications tend to show a poor diffusion of EDI. In the UK, however, where metal product manufacturers use network applications to a very low extent, EDI is used quite often. No

such relation exists for France and Germany, where high ranks for the other features do not prevent firms from engaging in EDI.

Apart from the outstanding position of Luxembourg (which is probably the effect of the presence of a few large firms in a small country), three groups can be distinguished: France and Germany show a relatively widespread use of network applications, Italy and Greece are in the middle, and Finland and the UK show significantly lower diffusion rates. Variations can be caused by differences in the composition of the sector in each country: some sub-sectors may be more advanced and offer greater opportunities for network technology than others. Size distribution might be a factor (a high percentage of small firms tends to push down penetration rates). However, differences may also be caused by diverging firm strategies that determine standard procedures in a country.

*Table 2-3: Network applications according to size classes*

	<b>Total<sup>2)</sup></b>	<b>0-49 employees</b>	<b>50-249 employees</b>	<b>250+ employees</b>
Computers	<b>96.8</b>	96.7	100.0	100.0
Internet access	<b>84.0</b>	83.6	100.0	100.0
E-mail	<b>80.9</b>	80.4	98.0	100.0
WWW	<b>75.4</b>	74.9	91.7	99.4
Intranet	<b>27.8</b>	27.1	50.4	66.7
Extranet	<b>3.1</b>	2.8	10.7	27.2
LAN	<b>40.4</b>	39.0	84.1	97.3
WAN	<b>5.5</b>	5.0	21.5	44.9
EDI	<b>7.7</b>	7.1	25.3	56.5

<sup>1)</sup> Note: enterprise-weighted, i.e. figures should be read as "% of enterprises have..." Computational base: all enterprises. Due the different weighting schemes, figures for "totals" differ from those in the previous table.

Source: e-Business W@tch, DIW (2002).

The use of network applications varies significantly between enterprises of different size. Whereas the use of computers is common in all kinds of firms, Internet access, e-mail and World Wide Web usage are already used much less often by small firms. Differences are considerable for more sophisticated applications, such as intranets, LANs, WANs and EDI, although some of these tools are not suitable for small enterprises. For example, it does not make sense for a firm with five employees to create an Extranet. Of greater relevance with respect to exploiting potential benefits of e-business is the falling behind of small firms with respect to usage of the Internet and the World Wide Web.

*Table 2-4: Type of connection*

	<b>Total</b>	<b>D</b>	<b>EL</b>	<b>F</b>	<b>I</b>	<b>L</b>	<b>FIN</b>	<b>UK</b>
Analogue dial up modem	<b>23.3</b>	4.7	22.3	43.2	28.2	4.5	17.4	34.4
ISDN	<b>43.5</b>	53.1	74.3	34.7	32.1	27.1	19.2	50.0
DSL	<b>20.2</b>	21.6	0.0	20.2	27.0	2.7	34.9	6.7
Other fixed connection	<b>13.7</b>	20.2	0.0	10.2	12.4	65.2	26.4	4.6
Other connection	<b>2.3</b>	5.3	7.4	0.9	0.4	0.0	1.4	0.0

Note: employment-weighted, i.e. figures should be read as "enterprises comprising ...% of employees". Computational base: enterprises with Internet.

Source: e-Business W@tch, DIW (2002).

<sup>3</sup> It can be assumed that the result for Greece is biased because of an overwhelming impact of one or a few large firms using ISDN.

The most popular type of connection used in the metal products industries is ISDN. Here, Germany and the UK as well as Greece have a prominent position<sup>4</sup>. Surprisingly, firms in France, a country with intensive use of network applications, still show a large number of firms using analogue connections.

While there is a certain consistency between firms in countries with low diffusion rates and rather standard (analogue and ISDN) connections, Finnish firms combine a small number of employees in firms with advanced network technology with a high share of comparatively powerful network connections.

Bandwidth is an important indicator for the level of e-business sophistication a firm can reach. Table 2-3 shows that most metal product manufacturers work with rather low bandwidth. It is interesting that in Luxembourg, a country with the most advanced diffusion of network technology, firms do not use high bandwidth systems, whereas in Finland, where overall diffusion rates are quite low, firms that do use data communication tools more often use high bandwidth connections than similar firms in other countries.

Table 2-5: Bandwidth

	Total <sup>1)</sup>	D	EL	F	I	L	FIN	UK
<2 Mbit/s	<b>76.5</b>	74.7	91.0	84.2	67.2	92.7	42.9	87.1
2-10 Mbit/s	<b>8.6</b>	11.4	7.4	4.7	9.4	3.2	31.1	4.7
>10 Mbit/s	<b>2.2</b>	0.8	1.6	3.8	4.0	0.9	13.2	0.0

Note: employment-weighted, i.e. figures should be read as "enterprises comprising ...% of employees". Computational base: enterprises with Internet <sup>1)</sup> figures do not add up to 100, because firms could also answer "do not know".

Source: e-Business W@tch, DIW (2002).

A prerequisite for starting E-commerce activities is the existence of a company website. The related indicators can be seen as expressing the potential of e-business activities in the metal products sector of each country. Table 2-4 gives an overview.

Table 2-6: Website

	Total	D	EL	F	I	L	FIN	UK
Company has a website	<b>54.9</b>	43.4	44.1	54.0	63.7	53.0	47.8	51.6
Web hosting by external service provider	<b>61.6</b>	58.0	65.8	74.2	55.6	68.2	30.2	74.1
Web design by external service provider	<b>69.9</b>	64.2	64.6	67.8	70.3	50.7	57.1	77.0
Website maintenance/ updating by external service provider	<b>70.9</b>	63.9	71.0	57.4	74.4	62.6	84.2	76.5
Usage of content Management System	<b>9.2</b>	7.8	13.8	3.2	15.0	0.0	0.6	0.4
Information about products on the website	<b>91.1</b>	87.7	87.0	93.5	89.4	97.9	99.8	96.7

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises with..." Computational base: "Company has a website": all enterprises; other questions: enterprises having a website.

Source: e-Business W@tch, DIW (2002).

<sup>4</sup> It can be assumed that the result for Greece is biased because of an overwhelming impact of one or a few large firms using ISDN.

More than half of the metal product firms in Europe have a website; differentiation by country shows Italy at the high and Germany at the low end. Again, no strong relationship exists between infrastructure indicators and diffusion of websites. A large number of websites are hosted by external service providers; this practice is fairly common in the UK and in France, and much less widespread in Finland. These drastic differences between countries indicate a strong dominance of “national” practices; they may also show the quantity and quality of the supply of web hosting services in a country. Even more widespread is the use of external web designers. Here different countries show less divergence. The high value for the UK corresponds with a well-developed culture of outsourcing and a strong presence of business service firms. Again, Finnish firms tend to opt for internal solutions.

Website maintenance is also often outsourced. Obviously, companies delegate the technical parts of their web presence, because it would be too costly to build up internal competence for these purposes. While maintenance relates to the more technical side of web management, updating is a content-related activity. Maintenance is therefore likely to remain a predominantly outsourced activity. Updating, however, might be “re-sourced” in the course of time, if employees gain more experience with web management or older employees with more traditional qualifications are gradually replaced by staff with more network experience. It might then be decided to keep web-updating within the company, because it is a continuous task which needs close attention and control. For most SMEs it is comparatively expensive to utilise external services of this kind. On the other hand, these competencies are rarely available within small and medium sized firms – appropriate policy action here could help SMEs to overcome this dilemma.

Only in Italy have content management systems attained some significance. Metal product firms in other countries hardly use them. Most companies make information about products available on their websites, and for many this seems to be the main purpose of having an Internet presence. Some, however, mainly use the site to present their company without going into further detail about product and service offers (this is more often the case in Germany and in Greece than in other countries).

Whereas only slightly more than half of the small firms (54.3%) have a website, this is the case for three quarters of the medium-sized and more than four-fifths of the large firms. This result is consistent with the lower access rates to the Internet and WWW usage. Small firms thus have generally less chances to participate in e-business solutions.

The size of IT and web management departments can either indicate that a lot of emphasis is laid on the implementation and operating of the company’s IT system, or that a firm is not very efficient in IT organisation and therefore needs to put a lot of resources into it. It can be assumed, however, that with increasing experience in the use of networked systems, a “best practice” in IT management will emerge that operates with an optimum size of IT and web organisation departments. IT departments in the metal products sector are smaller than in any other sector and only about half as big as the average of all sectors included in the survey (123.5 per 1000 employees – e-Business W@tch 2002). A similar picture emerges for the number of employees occupied with website management: only food, beverages and tobacco show the same low figure; the average for all sectors is more than twice the value for metal products (68.2 per 1000 employees). This supports the statements in the first part of this report which diagnosed a rather low level of e-business activity in the sector.

Apart from generally small IT departments, Table 2-5 shows an interesting phenomenon: the number of employees dedicated to managing websites and IT departments is much larger in small than in medium and large firms. Obviously, there are considerable economies of scale in establishing and maintaining the systems. The implementation of a web presence and IT systems and networks requires a certain minimum effort which even small firms cannot avoid. Therefore, they incur a much higher relative burden to achieve the same results as their larger competitors. This seems to be one of the main reasons for the reluctance of SMEs to do e-business.

Table 2-7: Size of IT department (average number of employees per 1000)

	Total	0-49 employees	50-249 employees	250+ employees
Employees mainly occupied with maintenance of company website (1)	31.9	32.9	7.7	1.6
Employees mainly occupied with maintenance of IT and networks (2)	61.6	62.8	20.9	8.7
Note: enterprise-weighted, i.e. figures should be read as "average ...". Computational base: (1) enterprises having a website, (2) all enterprises.				

Source: e-Business W@tch, DIW (2002).

### 2.3.2 IT skills gap

It is often argued that the development of a networked economy is hindered by a lack of qualified personnel. The rapid technical change induced by subsequent rounds of IT innovations requires continuous learning in the industries adopting them. The measures taken by companies to improve the skill profiles of their personnel are an indicator of their ability to exploit the potential of ICT.

Table 2-8: IT learning offers

	Total	D	EL	F	I	L	FIN	UK
Support of IT and networking skills development	76.7	74.6	78.0	89.5	68.4	92.6	87.1	78.4
In-house computer/IT training	45.8	40.5	57.9	55.0	41.5	78.8	51.3	51.1
Computer/IT training by third parties	53.8	57.5	59.6	51.7	44.0	87.8	73.1	61.0
Use of working time for learning activities	59.1	48.4	62.8	77.8	56.5	90.9	78.8	62.7
Note: employment-weighted, i.e. figures should be read as "enterprises comprising ...% of employees support / offer ...". Computational base: all enterprises.								

Source: e-Business W@tch, DIW (2002).

Metal product firms in Europe consider the support of IT skills an important issue. However, differences between countries are significant. Luxembourg, Finland, and France take the lead, and Italy remains below the average. However, when companies were asked whether working time was used to train IT skills, the percentages drop significantly. Apart from Luxembourg, in-house IT training is seldom provided, and training by third parties is also offered by fewer firms than claim to support IT. This suggests that "support of skills development" is a rather abstract category which companies pretend to engage in without actually taking concrete measures.

It is quite surprising that external IT training is more widespread than internal training programmes. Obviously firms use external courses as a tool to broaden their IT knowledge base and as a necessary supplement to the diffusion of skills that already exist in the company.

*Table 2-9: Importance of learning schemes for IT skills development*

	Total	D	EL	F	I	L	FIN	UK
learning "on the job" is <b>very</b> important"	<b>52.9</b>	42.6	53.3	44.5	63.8	62.8	47.2	68.6
learning "on the job" is <b>fairly</b> important"	<b>39.5</b>	49.3	39.2	43.1	33.1	35.4	43.5	24.1
formal training schemes are <b>very</b> important"	<b>23.6</b>	26.0	45.0	10.7	31.9	44.7	7.8	19.7
formal training schemes are <b>fairly</b> important"	<b>50.0</b>	56.5	45.3	44.7	48.3	44.0	65.7	43.8
self-learning activities of employees is <b>very</b> important"	<b>44.5</b>	39.9	29.0	36.6	62.6	18.7	46.0	36.7
independent study activities of employees are <b>fairly</b> important"	<b>43.8</b>	47.6	60.4	54.5	28.1	44.5	43.9	46.5
Note: employment-weighted, i.e. figures should be read as "enterprises comprising ...% of employees". Computational base: enterprises using computers.								

Source: e-Business W@tch, DIW (2002).

Many companies rely on informal learning methods. This seems to be a logical consequence of the fact that most features of ICT are only developed to their full potential when actually implemented; due to the vast range of options offered by technology, many solutions emerge in the process of usage. Hence, formal training courses can only teach basic configurations, and the real ability to work with specific existing systems requires hands-on experience. Learning on the job and independent study activities are particularly often ranked as "very important" by Italy and the UK.

Nevertheless, formal training is also considered important by a large proportion of metal manufacturers, especially in Luxembourg and Germany, two countries with advanced ICT diffusion, and by Greece. If preferences for formal or informal training are related to the general intensity of use of ICT, no general pattern emerges; companies in the UK have a tendency to prefer informal skills improvement, in Greece, however, a country which is also lagging behind in terms of ICT diffusion, firms express strong support for formal training.

The skills gap becomes evident when companies try to hire IT personnel and cannot find the appropriate qualifications in the market. Companies were therefore asked whether they found it difficult to recruit people with IT skills. The answers are documented in Table 2-10.

*Table 2-10: IT skills gap*

	Size class	Total	D	EL	F	I	L	FIN	UK
Companies having recruited or tried to recruit IT specialists (1)	Total	<b>8.8</b>	6.0	14.1	9.4	12.2	24.2	13.5	3.9
	0-49	<b>8.4</b>	5.0	12.1	9.7	12.2	22.7	13.3	3.3
	50-249	<b>16.6</b>	23.3	35.7	3.3	14.0	14.3	20.0	18.8
	250+	<b>41.1</b>	40.0	66.7	9.1	43.8	100.0	45.0	71.4
Companies with great difficulties in recruiting IT specialists (2)	Total	<b>26.8</b>	1.5	55.2	49.0	33.2	56.1	0.7	1.3
Companies with some difficulties in recruiting IT specialists (2)	Total	<b>15.9</b>	7.4	20.6	0.0	22.5	0.0	48.9	2.0
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises..." Computational base: (1) all enterprises, (2) enterprises having recruited or tried to recruit IT specialists.									

Source: e-Business W@tch, DIW (2002).

The share of firms that have recruited (or tried to recruit) IT specialists in the last twelve months is relatively small. Again, the metal products sector is at the end of the list of sectors considered here (only food production and health services show lower figures). The average of all sectors is 13.3 %: thus, it lies considerably above the value reached in metal product firms (*e-Business W@tch* 2002). Especially SMEs in Germany and the UK have been reluctant to hire IT specialists. Obviously, smaller companies cannot afford to employ specialists on a large scale since this would require too large a proportion of their IT budgets. Firms that did not recruit people in the last twelve months do not necessarily neglect the human resource component in IT: they may have already filled all IT specialist positions in the firm before the period of reference.

However, even for the large companies there is a wide gap between Luxembourg – where all firms gave a positive answer to the question – and France, where this is only the case for 9% of the firms. Even if the exceptional case of Luxembourg (which may be biased due to a small number of very large firms) is left aside, differences remain substantial with Greece and the UK at the higher end, and Germany, Italy and Finland in a middle range. This may have something to do with the fact that in the period observed, expectations about the dynamics of ICT development have been revised. Companies in those countries which have high employment protection standards (and, thus, cannot dismiss people easily, should they be no longer needed) have become more careful about hiring new IT personnel. Apart from the strikingly low levels for France, differences between countries seem to reflect factors which are independent from differences in IT strategies, such as business cycles, or already existing IT specialists in the firm. These results confirm that in the long run, SMEs will find it more difficult to access expert knowledge, unless the (few) IT specialists in the firm concentrate on gaining external knowledge from various sources.

The skills gap phenomenon manifests itself in the difficulties of firms to find appropriately qualified personnel in labour markets. Metal product firms have generally met more difficulties than firms in other sectors. 27.2 % of firms reported they had “great difficulties”, in comparison to 21.7% in the sample of all industries. Difficulties occurred more often in small and large companies than in the medium-sized ones. This may reflect limited access of small companies to relevant qualifications because of competition in labour markets, where larger firms can pay higher wages. Large companies might furthermore require more specialised qualifications and look for greater numbers of specialists at one time and thus find it difficult to obtain them. However, country differences are extreme with respect to this variable. The skills gap seems to be more visible in smaller countries than in the larger ones; but this rule does not hold for France where only 9.7% of small firms went to the market, but half of them found it difficult to hire IT specialists. On the other hand, Finland, as a comparatively small country, does not seem to have great problems with a skills gap. Wage levels paid in the industry in the various countries might account for some of the differences observed.

The figures on infrastructure diffusion presented in Table 2-1 only document whether a company as a whole uses certain tools and technologies. The following table provides information on the number of employees in company offices that use IT. Whereas 98.3 % of the employees in the metal product sector work in companies that have computers, only 32.8% of the employees in office jobs actually use the computers themselves. Here, apart from Luxembourg where companies are highly IT-intensive, variation between countries is relatively small.

Table 2-11: Office workers using IT (in %)

	Total	D	EL	F	I	L	FIN	UK
Working with computers (1)	32.8	31.0	30.8	37.6	30.8	43.0	40.7	33.8
Remote access to company's computer system (1)	29.3	40.6	15.1	15.1	20.2	38.5	44.0	35.0
Wireless access to the business computer system (1)	9.5	16.8	5.3	0.9	6.8	30.7	27.2	7.0
Company is planning to enable remote access (1)	8.6	8.2	20.2	9.8	5.7	3.1	5.7	11.8
Access to e-mail for internal communication (2)	61.7	66.1	39.6	53.5	64.8	83.2	64.6	58.0
Access to e-mail for external communication (2)	73.2	80.6	65.0	60.5	76.8	94.4	68.5	66.9
Access to the www (2)	61.5	62.3	40.2	53.4	69.7	29.1	76.4	57.3
Access to intranet (2)	34.3	40.1	36.7	29.0	34.5	43.3	29.3	28.0

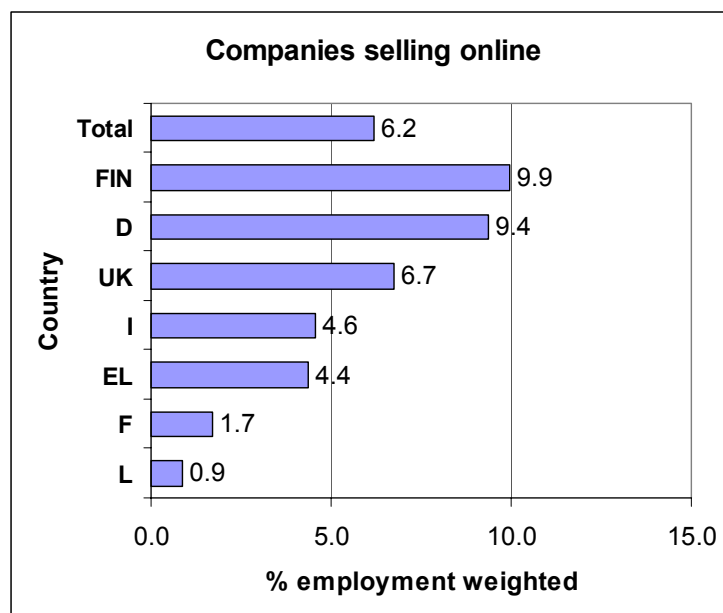
Note: employment-weighted, i.e. figures should be read as "in enterprises comprising ...% of employees the majority of office workers has/is...". Computational base: (1) enterprises using computers, (2) all enterprises.

Source: e-Business W@tch, DIW (2002).

### 2.3.3 Usage indicators for e-business

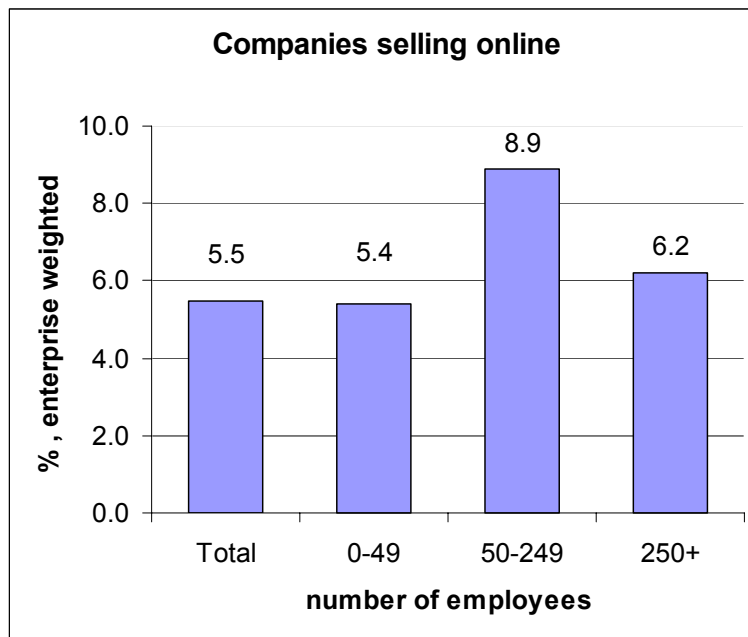
The qualitative research summarised in the first part of this report shows that e-business activities are not very widespread in metal product sectors throughout Europe. The survey results now available provide an opportunity to verify this statement quantitatively. Figures 2-1 and 2-2 report the percentages of companies already selling products online.

Figure 2-1: Selling online (by country)



Source: e-Business W@tch, DIW (2002).

Figure 2-2: Selling online (by size class)



Source: e-Business W@tch, DIW (2002).

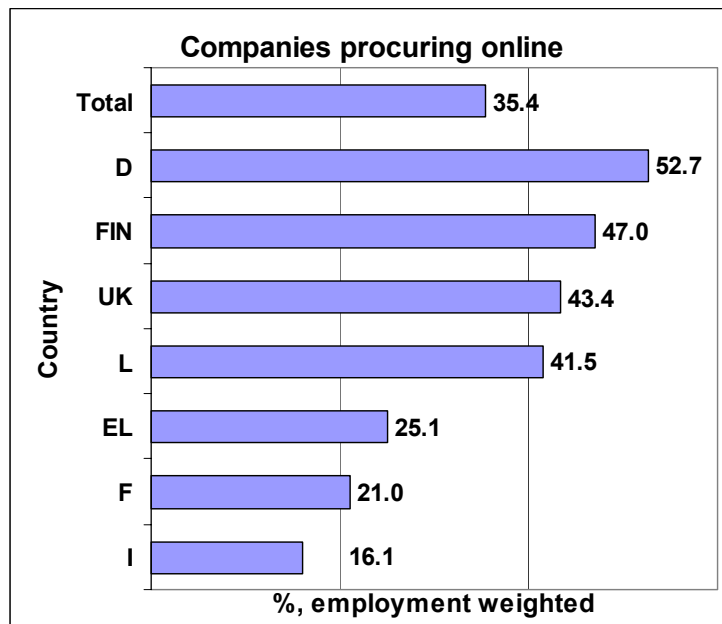
Only 6.2% of employees work in companies that have already engaged in online sales. This is far below the average of all industries in the sample (17.1%). Even if plans to go online are taken into account, metal product firms remain behind other manufacturing companies: only 8.7% of companies intend to sell online in the near future, in contrast to 9.5% for the average of all sectors. Thus, metal manufacturers will hardly succeed in catching up with other industries in the next few years.

As could be expected, online sales are less widespread in small than in medium-sized or large companies. However, the very large enterprises obviously lag further behind than those between 50 and 249 employees. Reasons for this could be that the organisational restructuring required to introduce e-sales efficiently is considerable in a large company, and smaller firms might be more flexible. In addition, there might be less competitive pressure to introduce new sales channels than in other categories.

Metal manufacturers are latecomers to the online sales market. Whereas 44% of companies in the sample of all industries have more than two years of experience, this is only the case for 26% of firms in the metal products sector experience (e-business w@tch 2002, DIW 2002). A large number of firms in all size categories have less than two years of e-sales experience. This has to be kept in mind when interpreting the companies' statements about their online experience.

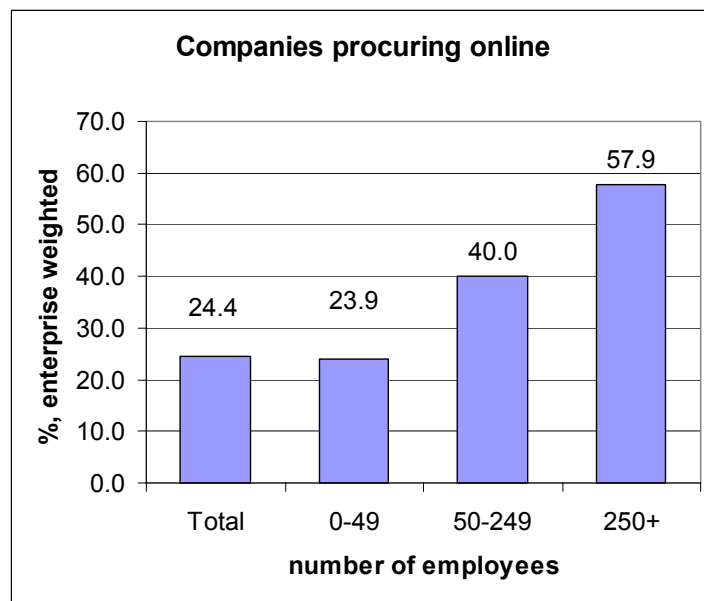
Although the procedures are similar, the patterns of introduction of online *procurement* differ considerably from those of online *sales*. Obviously, companies do not follow an integrated strategy. Online procurement is much more common than online sales: more than 35% of companies procure at least part of their inputs via electronic channels. However, this average hides considerable differences between countries. German metal manufacturers engage more than three times more often in online procurement than their Italian counterparts (see Figure 2-3). Although procurement is much more often done via e-commerce than sales, the metal products sector still remains significantly below the average of all industries (42.7%, e-Business W@tch 2002). However, here, metal manufacturers seem to be catching up – they express plans to introduce e-procurement slightly more often than firms in other industries.

Figure 2-3: Procuring online (by country)



Source: e-Business W@tch, DIW (2002).

Figure 2-4: Procuring online (by size class)



Source: e-Business W@tch, DIW (2002).

Here the size distribution of companies reflects the “normal” or expected situation of e-business diffusion. Large firms take the lead, and the smaller ones are more reluctant. Whereas only 6.2% of the bigger companies sell online, almost 58% buy via electronic channels.

Table 2-12: Online procurement experience

	Total	0-49 employees	50-249 employees	250+ employees
Procuring online for more than 2 years	33.0	32.9	41.6	5.7
Procuring online for 1-2 years	48.6	48.8	36.5	80.0
Procuring online for <1 year	17.4	17.5	19.3	2.8
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises..." Computational base: enterprises procuring online.				

Source: e-Business W@tch, DIW (2002).

Only about one-third of the firms have more than two years' experience with electronic procurement; almost half of those who use the technology have started within the last two years. The fact that the diffusion of online purchase and sales systems has slowed down in the last twelve months corresponds with the previous findings that companies have become more careful as a result of an overall tendency to adopt more sober expectations regarding electronic markets.

Table 2-13: Type of goods procured online

	Total	0-49 employees	50-249 employees	250+ employees
Online procurement of MRO <sup>1)</sup> goods	64.4	64.0	73.1	69.9
Online procurement of direct production goods	56.5	57.3	45.6	22.3
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises..." Computational base: enterprises procuring online. <sup>1)</sup> Maintenance, repairs and operations.				

Source: e-Business W@tch, DIW (2002).

Online procurement is used to buy MRO goods by the majority of companies in all size classes. Direct production inputs, however, are only put online to a large extent by the smaller firms. An explanation for this could be that the production lines and thus the required inputs of the larger firms are less suitable for electronic purchases.

Table 2-14: Online share of total procurement

	Total	0-49 employees	50-249 employees	250+ employees
> 50%	2.3	2.4	0.2	0.0
26-50%	2.5	2.4	6.5	0.1
11-25%	9.5	9.8	5.0	0.6
5-10%	35.5	36.0	23.6	34.8
< 5%	50.2	49.5	64.8	64.5
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises..." Computational base: enterprises procuring online.				

Source: e-Business W@tch, DIW (2002).

The figures on the share of purchases procured online confirm the familiar picture: e-business still plays a rather marginal role in the metal products sector. Although online shares are not very impressive in other industries either (only 9% of companies procure more than 50% of goods online on average), this sector is clearly at the lower end of the list of industries. As a result of the smaller procurement volumes overall, small firms show slightly higher shares in the categories above 5%. For larger firms, on the contrary, online purchases have a very small weight in their general procurement volumes.

Table 2-15: Participation in e-marketplaces

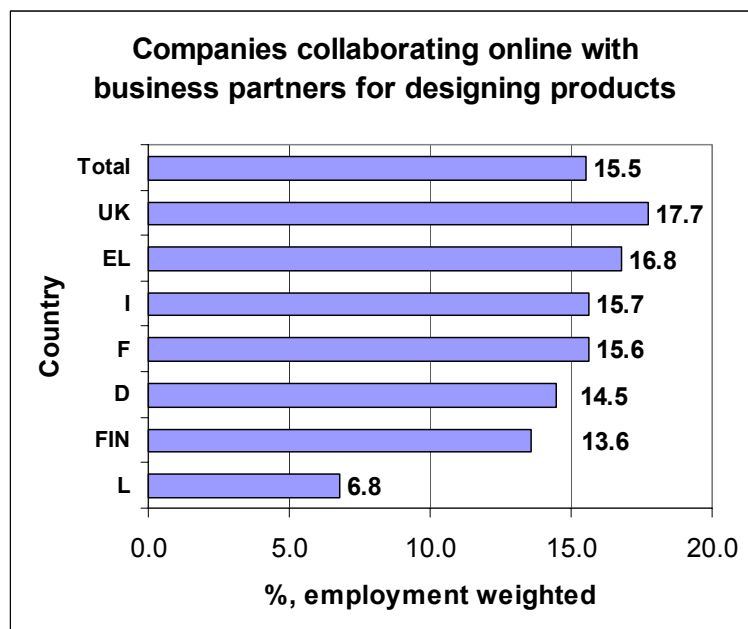
	Total
Participation in e-marketplaces (1)	0.9
Catalogue-based offering on e-marketplaces (2)	80.3
Catalogue-based purchasing on e-marketplaces (2)	68.5
Auctions on e-marketplaces: selling (2)	12.7
Auctions on e-marketplaces: bidding (2)	9.7
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises..." Computational base: (1) all enterprises, (2) enterprises participating in e-marketplaces.	

Source: e-Business W@tch, DIW (2002).

The participation of metal product firms in e-marketplaces is only marginal. At less than 1% it reaches hardly one-fifth of the penetration of marketplaces in European industries in general. Against this background, the figures on usage categories have to be interpreted with care, since they are based on only five cases. However, there seems to be a clear preference of small firms for catalogue-based tools, whereas large firms used the whole range of options and also participate in auctions as sellers and buyers.

It can generally be assumed that the use of the Internet or similar networking technologies in the process of development of new products helps companies to render procedures more efficient and to reduce time-to-market. Companies have therefore been asked about online collaboration with business partners. These techniques are not yet widely used: only between 15-18% of employees work in companies that collaborate electronically. E-collaboration is more common in large firms than in medium-sized and small ones. Apart from Luxembourg with a very low level, the situation is more or less the same in all countries. For the near future it seems that more traditional procedures for product design will prevail, and electronic collaboration will only gradually be used more intensively.

Figure 2-5: Online collaboration with business partners for designing products (by country)



Source: e-Business W@tch, DIW (2002).

### 2.3.4 E-commerce barriers

The results presented above suggest an analysis of the reasons for the reluctance of metal product companies to engage in e-business. In the survey, firms were asked to rank a number of barriers in categories that ranged from “agree completely” to “do not agree”. For all the barriers given in the questionnaire, metal product firms answered slightly more often than others that they “agreed completely”. Obviously, all barriers are felt to be somewhat more important for these firms than for those in other industries. Particularly high percentages of “agreement” have been reached by the barrier “goods do not lend themselves to selling online”. Here metal products are also clearly above the average of all industries. One of the arguments for a low e-business intensity put forward in the first part of this chapter seems therefore to be confirmed by this finding.

Whereas firms in all industries agree to a large extent that revenues from online sales are still too low to justify the investment, the barrier “adopting corporate culture to e-commerce is difficult” seems to find more supporters in this sector than in others. Differences between small and large companies are not very great, and where they become more pronounced, they are counter-intuitive: small firms seem to consider the processing of payments and the cost of technology less of a problem than the larger ones. Large firms, on the other hand, are more concerned about a lack of substantial revenues. This suggests that large firms might have engaged in actual cost-benefit-analysis of e-business in more detail than the smaller ones. An alternative explanation might be that the revenue expectations of large firms are higher than those of the smaller ones.

Table 2-16: Barriers to selling online

	Total		0-49 employees		50-249 employees		250+ employees	
	Com-pletely	Some what	Com-pletely	Some what	Com-pletely	Some what	Com-pletely	Some what
Few customers online	25.4	27.3	25.6	27.4	16.1	21.5	26.9	23.3
Customers hesitant to buy online	30.7	24.7	30.8	24.6	29.7	29.4	24.7	29.5
Goods / services do not lend themselves to selling online	55.1	18.0	54.8	18.1	63.7	15.4	56.1	18.2
Processing of payments for online orders is a problem	14.9	17.2	14.7	17.1	22.8	20.8	19.9	29.2
Technology too expensive	19.7	24.9	19.5	24.7	24.2	30.4	36.9	34.8
Revenue of online sales is still low	36.5	24.3	36.7	23.9	27.2	38.1	52.9	31.4
Delivery process causes problems	18.7	15.7	19.0	15.4	9.0	29.8	4.0	22.7
Adapting corporate culture to e-commerce is difficult	29.1	26.0	29.2	26.0	27.2	25.7	33.8	30.8

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises agreeing completely or somewhat..."  
Computational base: all enterprises.

Source: e-Business W@tch, DIW (2002).

The barriers affect critical mass phenomena: once a sufficient number of customers are ready to buy online, advantages will be visible, and the cost of implementation will be spread over a larger number of transactions. However, the large number of firms that consider goods inappropriate for online sales and of those that blame corporate culture for a lack of online activity, shows that the metal products sector will probably continue to be a slow adopter of online sales channels. Relatively few problems are seen with respect to the more technical aspects such as delivery and payment. Here most companies expect that they will be able to deal with the challenges involved.

Table 2-17: Barriers to procuring online

	Total		0-49 employees		50-249 employees		250+ employees	
	Com-pletely	Some-what	Com-pletely	Somew-hat	Com-pletely	Some-what	Com-pletely	Some-what
requires face-to-face interaction	<b>48.8</b>	<b>19.3</b>	49.1	19.1	41.7	24.9	37.8	23.6
Suppliers do not sell online	<b>41.1</b>	<b>27.0</b>	41.0	27.1	43.0	24.2	52.0	36.1
Concerns about data protection & security	<b>27.4</b>	<b>28.1</b>	27.5	28.1	24.6	31.4	21.9	23.9
Technology is expensive	<b>23.3</b>	<b>22.8</b>	23.2	22.6	22.3	30.3	46.9	17.7
Suppliers' technical systems incompatible	<b>15.6</b>	<b>20.4</b>	15.7	20.2	13.5	27.0	14.6	22.0
Cost advantage insignificant	<b>23.1</b>	<b>28.1</b>	23.3	27.9	16.0	33.0	23.1	31.1
Note: enterprise-weighted, i.e. figures should be read as "% of enterprises agreeing completely or somewhat..." Computational base: all enterprises.								

Source: e-Business W@tch, DIW (2002).

Table 2-16 lists the percentage of firms that “agree completely” that given phenomena are a barrier to online *procurement*. It can be assumed that aspects clearly perceived as barriers might also lead to non-adoption. The peculiarities of the sector determine barriers to online procurement: many enterprises emphasise the importance of personal communication in procurement procedures and a similarly large number do not find appropriate suppliers in online offers. Metal product manufacturers consider these points problematic more often than firms in other industries. Problems with the technical systems of suppliers are consistently mentioned slightly more often than in the average of all industries; and cost advantages are held to be insignificant by a somewhat higher percentage of enterprises, while cost of the technology is mentioned as a barrier just as often as by other firms. On the other hand, safety concerns play a less prominent role than elsewhere, but are still significant for the sector itself.

If barriers are perceived as a problem which might delay implementation, but not as something that prevents it, it can be assumed that the company “agrees somewhat”. The table shows that for almost all barriers, a relatively large number of companies have given this answer.

Taken as a whole, the identification of barriers explains much about the low interest observed in e-business. However, the barriers hint at different problems: whereas face-to-face communication seems to be a traditional and (difficult to change) way to proceed, problems with finding suppliers and connecting to their systems are typical for critical mass phenomena and can be overcome once a certain threshold of online market participants has been reached. Concerns about data protection and security are not specific to the sector and require the development of adequate tools which are currently developed by software houses and negotiated between regulatory bodies for the Internet in general. A more difficult point is the obvious mismatch between costs and benefits perceived by the firms in the sector. The downward trend in prices for hardware and standard software can only partly ease the problem, since implementation is labour intensive and will therefore remain expensive. However, before cost advantages can be realised, substantial investment is needed, and the problem assumes almost circular features.

### 2.3.5 Impact indicators

It is generally assumed that e-business will significantly change the way companies do business and enhance possibilities to improve performance. It is also expected that e-business will have a deep impact on the functioning of markets. However, these assumptions have either been deduced from the technological and organisational characteristics of e-business systems or are based on a few prominent examples. The following chapter provides empirical evidence from the metal products sector that shows to what extent common hypotheses fit reality.

*Table 2-18: Impact of selling online – positive effects*

	Total		0-49 employees		50-249 employees		250+ employees	
	Very	Fairly	Very	Fairly	Very	Fairly	Very	Fairly
Volume of sales	16.1	25.2	16.7	26.0	0.0	7.0	0.0	5.5
Number of customers	0.0	38.6	0.0	40.2	0.0	0.7	0.0	70.9
Sales area	0.1	42.6	0.1	43.3	0.0	28.5	10.9	65.4
Quality of customer service	0.1	38.9	0.0	40.4	0.7	7.7	0.8	13.3
Efficiency of internal business processes	0.1	44.6	0.0	45.5	0.7	27.9	0.0	12.5
Costs of logistics and inventory	0.4	51.6	0.0	53.0	7.7	21.5	0.0	65.4

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises reporting very positive effects or fairly positive effects on ..." Computational base: enterprises selling online.

Source: e-Business W@tch, DIW (2002).

Very few companies consider the impact of online sales on the different parameters as "very positive". Only the volume of sales seems to have grown satisfactorily for about one-sixth of the firms. However, the experience was not altogether negative: many firms saw at least a "fairly positive" impact in various features. Metal product manufacturers differ from firms in other industries, where considerably more firms claimed "very positive" impacts for all features. As many firms in the metal products sector found their experience was "fairly positive", differences become less pronounced if the two categories are taken together. For the variable "costs of logistics and inventory", even more firms in the metal products sector experienced a "fairly positive" impact than in other sectors.

*Table 2-19: Impact of procuring online – positive effects*

	Total		0-49 employees		50-249 employees		250+ employees	
	Very	Fairly	Very	Fairly	Very	Fairly	Very	Fairly
Procurement costs	8.0	36.1	8.2	35.5	5.7	48.8	0.3	45.2
Relations to suppliers	8.7	30.0	9.0	30.1	3.9	26.8	0.2	31.7
Internal business processes	6.2	35.8	6.0	36.2	11.5	27.4	3.2	36.1
Costs of logistics and inventory	6.3	30.6	6.2	31.2	10.6	19.1	0.1	25.1
Number of suppliers	24.3	7.6	24.7	7.7	17.0	7.3	16.5	0.5

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises reporting very positive effects or fairly positive effects on ..." Computational base: enterprises selling online.

Source: e-Business W@tch, DIW (2002).

More firms see the impact of doing e-commerce as "very positive" on the procurement side than on the sales side, but the share of companies with very positive experience remains low (also in relation to other industries). About a quarter of the firms surveyed indicated a positive impact on

the number of suppliers, which probably has to be read as an increase in the number, and thus more choice and less dependency on small groups of suppliers.

Even if companies that have experience with online sales and procurement are not enthusiastic about the impact on costs and procedures, more than 40% of firms considered them “very positive” or “fairly positive”. Some positive demonstration effects might therefore emerge from this, and they might speed up the diffusion of electronic sales and purchasing techniques. However, this effect will be more subdued than in sectors with more companies that report “very positive” impacts.

The willingness of firms to invest in e-business will also depend on what they think about the main beneficiaries of the new systems. The figures support the statement that large firms are likely to derive greater benefits from e-business than their smaller counterparts. The hypothesis that SMEs might be able to use electronic systems to make up for structural disadvantages is not shared by the companies in the metal products sector. Large firms believe less in benefits for SMEs than the SMEs themselves. On the other hand, almost half of the large firms think that benefits are distributed equally. Given the fact that cost structures of e-business systems present considerable economies of scale, it is not surprising that benefits are predominantly attributed to large firms.

*Table 2-20: Who will benefit most from e-business?*

	<b>Total</b>	<b>0-49 employees</b>	<b>50-249 employees</b>	<b>250+ employees</b>
SMEs	<b>8.5</b>	8.4	14.3	2.2
Large enterprises	<b>54.1</b>	54.6	36.7	36.2
Equal	<b>30.1</b>	29.8	39.5	48.3
No one	<b>2.1</b>	2.0	5.6	5.4

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises believing that ...will benefit most from e-business" Computational base: all enterprises.

Source: e-Business W@tch, DIW (2002).

The indicator “satisfaction with e-business” reproduces the results of the impact indicators: most companies are “fairly satisfied”, some are disappointed, and only a few are enthusiastic. However, it is remarkable that the medium-sized and large firms are more often disappointed than the smaller ones. Obviously, expectations were higher here.

*Table 2-21: Satisfaction with e-business*

	<b>Total</b>	<b>0-49 employees</b>	<b>50-249 employees</b>	<b>250+ employees</b>
Very satisfied	<b>8.5</b>	8.6	4.1	11.5
Fairly satisfied	<b>82.5</b>	83.1	70.0	42.9
Fairly disappointed	<b>9.0</b>	8.3	24.9	40.3
Very disappointed	<b>0.1</b>	0.0	1.1	5.3

Note: enterprise-weighted, i.e. figures should be read as "% of enterprises being...satisfied with the effects and success of e-business" Computational base: enterprises expressing that they do e-business.

Source: e-Business W@tch, DIW (2002).

## Future trends in e-business expenditure

An overwhelming majority of firms responded that expenses would neither grow nor shrink. Only a few companies plan to spend less in the future, and some want to invest more than this year. Large firms in particular intend to either reduce spending or freeze it. This can either mean that large firms have gone through a first round of investment and are now trying to exploit the new systems, or that they are disappointed with initial experiences, and – as a consequence – would prefer to wait than to put more money in an insecure initiative. Given the delay of the metal products sector in introducing e-business, one would have expected sharply rising investment sums in order to catch up with other industries. The survey result thus shows that the low level of activity is not only caused by late adoption and a simple time lag or critical mass problem, but seems to have structural causes.

## 2.4 Case Studies

Despite the rather subdued e-business activity in the sector, a few examples will illustrate which e-business solutions are currently being implemented. The cases presented in the following chapter refer to individual companies and practical solutions developed for individual use as well as to industry initiatives that target a set of companies and support electronic information exchange and e-business activities.

### 2.4.1 E-Commerce Initiative for Locks and Hardware: Fachverband Schloss- und Beschlagindustrie (Industry Association for Locks and Metal Fittings)

Although e-business implementation is hardly an issue for SMEs in the metal products sector, some of them are integrated into the supply chain solutions of their customers, especially the automotive industry. This has led to the creation of e-business initiatives both on the sales side of the metal products sector, such as Covisint or Daimler Chrysler's e-doc, and on the procurement side e.g. Steel 24-7 or Buyformetals. Although some metal manufacturers have started to develop their own electronic supplier networks, there is no standard or role model solution for the industry as yet. Nevertheless the issue has been taken up, and some associations are trying to develop sector specific e-business standards, e.g. the German Association for the Locks and Hardware Industry. The following case study will present a project that has been initiated by this association.

#### Initial Situation

Despite the sobering experience of the last eighteen months, the German Association for the Locks and Hardware Industry is still of the opinion that e-business is useful and offers economic potential to the industry, but that standard solutions rarely meet all sector-specific requirements. Therefore, they decided to start an industry-specific e-commerce initiative, a project considered to be of high priority; among other benefits, it enables the association to provide its members with expert advice on software tools, to estimate the effort involved in e-business implementation and to quickly respond to technological progress.

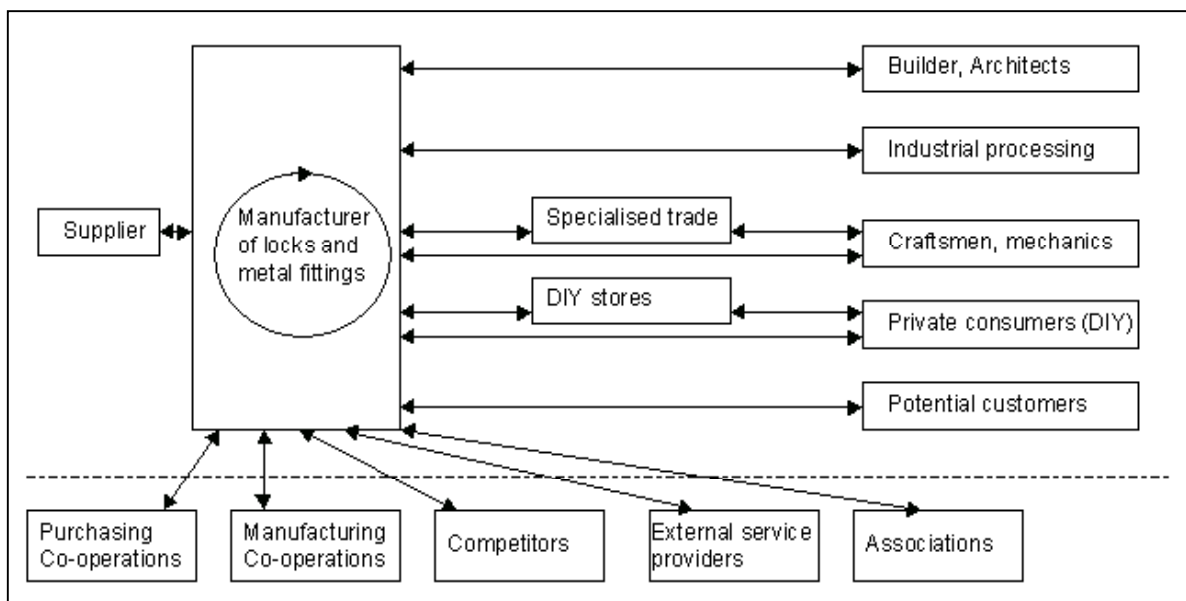
#### Project Description

The project "e-Commerce for Locks and Hardware" offers both an incentive to immediately launch individual e-business solutions, as well as a model for Internet based information exchange and online trading for the whole sector. The e-commerce concept is being developed in a continuous process, and the systems are continuously expanded and improved.

In 2000, the German Association for the Locks and Hardware Industry conducted a survey on the subject "Internet" among its more than 200 member companies. The results formed the basis for the development of the so-called ECIS (Electronic Commerce Information System). The analysis of already existing websites of member companies has been another preparatory activity for the realisation of the concept. During every phase of the project the association co-operates closely with IT experts and software providers and regularly confers with its members as well as with their trading partners. ECIS has been created with the scope of customising standard software packages. It combines different individual modules (Active-Server-Pages) through a flexible connection and aims at compatibility with existing technologies and future functions.

The objective of the initiative is to create a portal for the whole sector which connects all relevant trading parties and – in addition – provides product information and industry news.

Figure 6 Possible Business Connections



Source: FVSB association website.

So far, a data pool and demo versions of an online shop have been finished and are now introduced to members and suppliers. Furthermore, the association is currently involved with the eCI@ss project which develops standardised product classifications that are supposed to facilitate communication. For the near future, the development of a communication platform as well as e-procurement and public bidding trials are scheduled.

**Data pool** – This data bank forms the basis of the whole project. It stores the companies' product details as well as business-related information. German manufacturers and traders of locks and metal fittings have agreed on using a standardised XML-based format ("BMEcat") for exchanging information. The data pool has been developed to transform data into this format and thus facilitate the information exchange between manufacturers and customers. Members can access and update the data on the association's website. Retailers may search the catalogue for products or company details. As electronic communication increases, more and more information has to be stored and made accessible. The data pool is therefore designed to be expandable.

**e-Commerce** – Based on this data bank, an online shop is to be created. So far, retailers may access product information only and then have to contact the company which offers the desired product to place an order. The association has developed a prototype that is demonstrated on the website and gives an example of a proprietary online trading platform. Existing company online

shops may also be accessed through the association's website. The e-Commerce initiative covers only part of the sector's activities, since highly specialised products (e.g. security locks, ornaments) that go right to the end-user according to individual specifications do not seem suitable for being traded online.

**e-Procurement** – Previously this term only comprised the procurement of so called C-products (office materials etc.). Some online catalogues are accessible via the association's website. A concept for the e-procurement of A-products (raw materials) or B-products (manufacturing related tools and materials) is still to be developed. The realisation of such a project requires high transparency as well as in-depth industry knowledge, a fact which raises some difficulties and uncertainties about benefits, realisation problems and risks within the sector.

## Outlook

So far, 30 companies have registered and 50,000 different products are recorded. However, pilot transactions have shown that there is still a call for further action. A task force currently improves the quality of the platform (e.g. design, industry related news) and standardises the information exchange. Project related meetings and presentations for the industry as well as its customers take place regularly. Strategic subjects, such as principles of fairness for electronic marketplaces and the companies' claim to remain independent despite a common platform, are discussed here.

"The strategic importance of the data pool as a basis of an industry related portal for locks and metal fittings is further increasing"

[www.fvsb.de](http://www.fvsb.de)

In fact today, Internet portals seem to be gaining importance for the metal products sector. The e-commerce project will therefore continue and the German Association for the Locks and Hardware Industry will elaborate its concept further.

## References

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## 2.4.2 The Nedschroef Supplier Web

### Company Profile

Koninklijke Nedschroef Holding N.V. is a holding company headquartered in the Netherlands, with 22 subsidiaries in 11 countries (Germany, Denmark, Belgium among others). Together they constitute the Nedschroef Group. The shares of Koninklijke Nedschroef Holding have been traded at the Amsterdam Exchange since 1987.

Originally, the company was a manufacturer of rivets for the shipbuilding industry. The product range has been expanded since the 1960s, and today the core activities of the group are the development, production and distribution of fasteners (primarily for the automotive industry), mainly bolts and nuts, as well as machines and tools for the fastener industry.

Presently the group employs 1700 people world-wide. In the year 2001 a net turnover of 283.5 million Euro was achieved.

## Initial Situation

Nedschroef pursues an ambitious “policy of expansion” to strengthen its position as a world class supplier and to also meet the trend of the automotive industry towards globalisation. For the coming years an average growth of turnover of 10% per annum is envisaged. This strategy is supported by the acquisition of companies and a related increase in the market share that today amounts to approximately 9% in the Western European automotive industry and 14% in the world-wide machine tool market.

Faced with the challenge of successfully sustaining global competition and therefore an increasing requirement for effectiveness, as are many others in the sector, the company is also venturing into fields of potential e-business application. Initially transactions along the supply chain (sales and procurement) offer an approach to increase competitiveness by reducing through-put times and costs.

For example, Nedschroef has joined e-business solutions initiated by the automotive industry, such as Daimler Chrysler’s “e-doc”. In addition, the company has started implementing an Internet based supplier web to connect all suppliers with Nedschroef. The present case study will analyse this initiative.

## Project Description

So far, Nedschroef has been using EDI for business transactions whenever business partners were able to do the same. However, traditional EDI systems did not meet the quickly changing requirements any more, and some suppliers did not even deploy such basic technologies. To address these problems, Nedschroef decided to create its own supplier web and to provide a common platform to electronically link the company with its 50 main products suppliers.

For this purpose Nedschroef procured a standard software package that was then further customised and implemented by internal and external IT experts. The basic functions of this software are similar to EDI offering tools for document and data storage, logistics management and transaction organisation. However, as the application is Internet based it is much easier and less costly to implement than traditional EDI applications. Suppliers can simply access the platform through a special website.

Anticipated benefits of the supplier web application are improved data security (particularly for suppliers not yet using EDI) as well as cost reduction by reducing transaction time and costs. Furthermore the company would be able to reduce stocks and to achieve just-in-time-delivery.

## Implementation Status

At present the software is still being modulated while all relevant data is entered into the system. The warm-up-phase, i.e. the application, is scheduled to be fully implemented at Nedschroef’s at the end of 2002. Thenceforward the company’s suppliers are to be approached. Meanwhile, pilot testing (placing test orders via the Internet) with two suppliers has been carried out. All of the expected benefits were achieved (in so far as they could be tested in a pilot run). Nedschroef’s suppliers remain reluctant however, as they still perceive the implementation of the supplier web as implying high effort and time exposure. In order to push the e-business solution, from the beginning of 2003 Nedschroef it a condition for doing business with the company that either expanded EDI or a link to the supplier web was available.

## Outlook

Many larger companies in the sector that are trying to implement e-business structures face the same difficulties with suppliers refusing to join such initiatives. However, they express the opinion that the industry has to overcome this e-business reluctance itself, and experts at Nedschroef’s do not expect any policy measures to be helpful in this context. Currently the strategy in the firm seems to be keeping an eye on what techniques the customers (particularly in the automotive industry) are launching.

## References

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## 3 Summary and conclusions

### 3.1 Summary of main findings

This report has analysed the use of ICT and e-business technology and their impact in the metal products sector. The sector comprises a set of quite heterogeneous industries that range from the working of raw metal into sheets and blocks to building supplies and household goods such as cutlery and tins. As in many other sectors, metal product manufacturing is characterised by internationalisation trends, pressure on prices and margins, and a strong emphasis on cost control. Companies in the sector respond to these challenges by intensifying innovation activities, focusing on niche products, expansion into new markets and the development of brand identification measures. Environmental issues play a major role, since most processes of production involve the use of detrimental substances, use a lot of water and create large amounts of toxic waste. E-business offers a number of tools to ease environmental problems through more efficient use of resources, avoidance of over-capacity and scrap reduction, and early warning systems. However, it seems that this potential is hardly being used.

Results have been derived from qualitative research on sector performance in general and on e-business activities, as well as from a survey of 580 companies in seven European countries. Thus, anecdotal evidence from interviews and case studies has been supplemented by statistical analysis and a newly generated empirical database. Results should be representative for the sector as a whole, although due to the low level of e-business activity, for some indicators the number of cases is too low to arrive at as detailed an analysis as one might wish.

Theoretically e-business offers the same opportunities to the sector as any other sector of the economy. However, one of the central (and surprising) findings of this report is that metal product manufacturers are very reluctant to implement ICT and e-business systems. This attitude is being confirmed by a whole series of indicators and is shown by firms in all countries and across size classes. Differences between countries and firm types are not significant enough to contradict this general trend.

The risks deriving from an engagement in a new field of technology, new business models and organisational patterns do not seem to be higher than in other industries. Opportunity costs play a significant role, since substantial investment (mainly in software and training) is needed; increased market transparency might erode margins and lead to an intensification of competition. Some applications and systems are still in a pilot phase, which increases the risk of failure in implementation. However, the particularly low involvement of firms in the metal products sector in e-business activities cannot be explained by a lack of opportunities or a particularly problematic constellation of risks alone.

There seems to be a certain cyclical influence: a period of excitement and high-flying hopes with respect to e-business has been followed by a sobering-up period induced by the end of the dot.com boom in the United States and not entirely convincing experiences of companies in Europe. Apart from this, the analysis has revealed more fundamental reservations with respect to

electronic transactions. Companies and industry associations alike emphasise the fact that their products and transaction methods do not lend themselves to doing e-business. In addition a rather conservative atmosphere seems to prevail, making it difficult to implement major changes within firms or between business partners.

Nevertheless, individual companies have begun to implement online procurement and sales systems, and a majority have achieved – if not “very positive”, at least “positive” results. Industry associations are not pushing the issue actively at the moment, but some are continuing activities started during the boom phase of e-commerce. Companies’ plans with respect to future e-business initiatives show that diffusion has not come to a stop, but will continue at a reduced pace.

Hence, it can be concluded that – due to the specific nature of products traded and transaction patterns that have been established, this sector is somewhat less suitable for e-business than others. However, the low level of e-business activity can also partly be seen as resulting from critical mass phenomena as well as from time lags in implementation. The relatively high importance attributed by companies to barriers such as “customers hesitant to buy online” or “suppliers do not sell online” hints at severe problems of critical mass, and a likely quick uptake once a certain threshold has been reached. Currently, however, the lack of dynamism in the business climate and a general attitude of “wait and see” after the abatement of initial e-business enthusiasm do not help to accelerate the catching-up process.

## 3.2 Economic implications

E-business offers opportunities to save costs and streamline procedures in existing transactions and business routines. Furthermore, it generates possibilities to expand markets, introduce new business models and to re-define value chains. The generally low level of adoption of e-business implies that no drastic changes in cost and price structures, in market organisation and innovation activity can be expected in the metal products sector.

Changes will be more visible and will occur earlier on the input side, where more than one-third of companies have gained some experience with online channels, whereas on the sales side, they will be much less pronounced (with only roughly 6% of active enterprises). However, even on the procurement side, online trade volumes are still rather insignificant in relation to overall transaction volumes. Volumes and shares are likely to increase slowly but steadily and reach a threshold where impacts on prices, input quality, supplier constellations and value chain configuration will be noticed and reflected in profits and loss accounts.

The results of the survey with respect to impacts of selling online have to be interpreted with care, since only 33 enterprises have answered the question. However, the results are quite surprising, since small firms have perceived positive effects to a larger extent than medium and large ones for a whole series of variables. Thus, it does not seem that it is particularly difficult for them to gain from e-business. Responses were more balanced for the impact of online procurement, with a considerable number of firms seeing positive effects in doing e-business.

An important question is whether small firms will be able to take advantage of the new opportunities to the same extent as their bigger counterparts. Whereas only slightly more than half of the small firms have a website, three-quarters of the medium-sized and more than four-fifths of the large firms do. The same asymmetry exists for Internet and World Wide Web usage. Small firms have generally less chances to participate in e-business solutions, but where they have started to introduce e-solutions, they do not seem to have more difficulties or benefit less than larger firms. It has to be kept in mind, however, that some of these results are based on a rather small number of observations, and need to be confirmed by more empirical data.

An important finding of this report is that the cost of having an ICT department and of establishing and maintaining a web presence is much higher proportionally for small than for medium and

large enterprises. Hence, it is more difficult and takes longer for these firms to cover sunk costs from the gains to be derived from doing e-business. Nevertheless, small firms mentioned the cost of e-business technology as an important barrier less often than larger firms. At least on the procurement side, small firms seem quite often to be able to compensate for a lack of economies of scale by reducing the costs of logistics and inventory.

The evidence available from the survey supports theoretical considerations on the impact of e-business on firms: indeed, a large share of firms confirm positive impacts on costs, customer and supplier relations, the efficiency of procedures and the scope of markets. However, experience was less often “very positive” than in other sectors. Hence it cannot be expected that demonstration effects will spill over from successful e-business firms and cause a new impulse in still reluctant firms.

Since electronic marketplaces have hardly gone beyond the experimental stage and are only used by a very small number of companies (0.9% of the sample), new ways of operating of market mechanisms, such as auctions that might drastically increase market transparency and reduce producer rents as well as transaction costs are unlikely to have an impact on market performance at this point in time.

### 3.3 Policy issues

Policy issues arise with respect to the integration of SMEs in e-business initiatives and the general lagging behind of the sector and its impact on European competitiveness. These issues lead to a set of conclusions for economic and technology policy that will be presented in the following chapter.

#### **SMEs must improve their readiness to do e-business**

The fact that SMEs often lack the basic prerequisites for e-business, i.e., Internet access and a website, leads to two policy conclusions:

Conclusion 1-1: Awareness of e-business opportunities should be improved. As a result of the public debate following the recent dot.com failures, expectations in relation to the benefits of electronic markets have shrunk considerably. Small firms in particular seem to have severe doubts about the usefulness of electronic forms of doing business. A discussion of features that have lead to failures, mistakes that have been made by early adopters, and the conditions under which they can be avoided, could help to shed new light on the still existing advantages of e-business.

Conclusion 1-2: Obviously the relative cost of building up and maintaining modern ICT solutions is higher in SMEs than elsewhere. Measures that might help SMEs to get access to external resources for establishing e-solutions and to find efficient and cost-effective ways to maintain them in the long run might provide some compensation for this disadvantage. A possible policy measure might be subsidies for ICT consultancy.

Measures presented in conclusions 1-1 and 1-2 are useful where the introduction of e-business could improve the efficiency of procedures in SMEs and where the overall efficiency of markets would benefit from an integration of smaller market participants along with the already connected medium-sized and large ones. It has to be borne in mind, however, that to a certain extent the reluctance of SMEs to adopt certain e-solutions is due to inappropriateness of the tool, or to sound cost considerations (lack of substantial turnover to justify the additional sunk costs).

#### **Enhancing competitiveness via sensible e-solutions**

Conclusion 2-1: The analysis has shown that part of the reluctance of metal product manufacturers to engage in e-business is due to sector-specific peculiarities. Here it would not make sense to push firms into e-business. The results would be disappointing and the activities

would be considered costly failures. The fact that not many firms plan to increase their e-business related expenditure may be the result of a thorough analysis of costs and benefits and a conclusion from experience from other firms in the industry rather than stubborn conservatism or lack of awareness.

Conclusion 2-2: On the other hand, analysis has also revealed a high importance of barriers that seem to be related to critical mass phenomena. Here, diffusion measures, such as credit support for introduction, awareness programmes or publicly supported information and learning schemes might help to reach a threshold beyond which systems develop out of their own dynamics.

Conclusion 2-3: In some markets e-business will become the common standard in procurement and sales systems, even if strict cost considerations would not justify their adoption. Here a new paradigm for doing business has to be accepted by firms that want to remain competitive. Offering electronic transactions might become a pre-requisite for market participation. A close observation of the development of competition in international markets is necessary to monitor the development of the relationship between e-business intensity and competition. Even if at the moment competitiveness seems to rest mainly on different features, such as price and product characteristics and the quality of customer-supplier relationships, the further diffusion of e-business adoption might lead to a higher ranking of this feature in the list of relevant variables in competition.

The appropriateness of the measures presented above should be discussed with industry representatives in order to reach the relevant target groups and to optimise the timing of policy initiatives.

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