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Market Watch
Sector Report
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e-business
W@tch



ICT & e-Business in the Metal Products Industry

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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 focussed 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 on electronic business, and especially on electronic commerce, from a number of authors and research organisations in different European countries and world-wide, there used to be a lack of reliable empirical information about the extent, scope, nature of and factors affecting the speed of e-business development in Europe at the sectoral level in an internationally comparative framework. It is the objective of this report to provide such information for the metal products industries.

The e-Business W@tch

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

The research presented in these Sector Impact Studies is intended to help to benchmark progress and to assess how electronic business development can be further enhanced at the European level or at Member State level with the objective to strengthen the competitiveness of European businesses. Special attention is paid to the SME dimension of e-business.

All reports, as well as an extensive collection of statistics on electronic business, can be downloaded from the website of the market observatory at www.ebusiness-watch.org.

Methodological note

Most of the data presented in this report are based on the European e-Business Survey (2002), a cornerstone of the monitoring activities of the *e-Business W@tch*. The fieldwork 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. In total, 9,264 interviews with decision makers in European enterprises were conducted. The survey included all sectors and all Member States, but only in the four largest states (Germany, France, Italy and UK) were all sectors covered. The survey for the metal products industries was carried out in the following seven countries: Germany, Finland, France, Greece, Italy, Luxembourg, and the UK. More detailed information about the survey methodology is provided in the methodological annex to this report.

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

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

The Metal Products Industries: Sector Profile & e-Business

1 Economic profile

This chapter is based on the (more detailed) introductory chapter to the first report of the *e-Business W@tch* on the metal products manufacturing industry, published in October 2002. It summarises the most important economic data and current challenges. Readers who are interested in a more comprehensive macro-economic portrait of the sector are asked to look up the respective chapter in the first report, which is available at

<http://www.ebusiness-watch.org/marketwatch/ressources/ressources.htm>.

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:

NACE Rev.1		Activity
division	group	
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 of 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 whole¹ 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 which accounts for 9.3% of the employment in total manufacturing.

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

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 ¹⁾ (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, 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

¹ EU11: all enterprises: EU excluding Greece, Luxembourg, Ireland and Denmark.

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

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 Economic profile

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.

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.

*Table 1-2: 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 ¹	331,328.0	100.0	134,524.3	100.0	6.6	8.6

¹ EU13: all enterprises: EU excluding Greece and Luxembourg = 100.

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

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. 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.

*Table 1-3: 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 ¹	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 ¹	412,355	9.8	44.9	83.4	30.0	90.3
EU12 ²	2,774,134	11.5	41.4	75.6	31.0	89.5
EU15	3,197,400	11.2				

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

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

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.

The metal products sector shows a relatively low degree of concentration. 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.

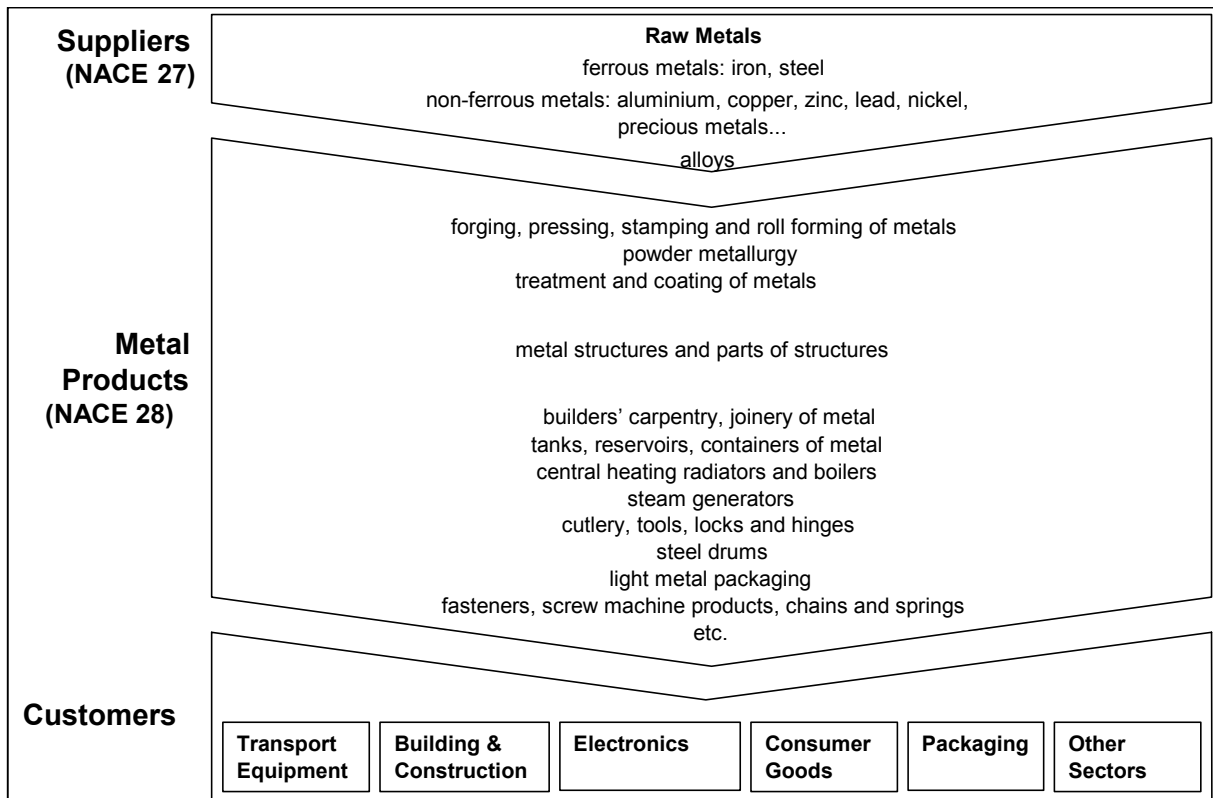
1.3 Sector-specific issues and challenges

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.

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 intermediate 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. The following illustrates the main suppliers, products, and customers in this sector.

Figure 1-1: 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). 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.

2 Usage of ICT & e-business

2.1 The role of ICT and e-business

2.1.1 General trends

The potentials of e-business suggest that 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 intermediate 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.

2.1.2 E-business opportunities

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.
- Offering product information and sales services online can be an efficient way to improve customer service and satisfaction, and thus customer loyalty.

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).

2.1.3 Limits to e-business opportunities

Many of the e-business opportunities commonly listed do not apply to many firms in 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 not very likely.

2.1.4 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.

2.1.5 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.

2.2 ICT infrastructure and skills development in the sector

2.2.1 ICT 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.

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.

Table 2-1: Metal products industry: Availability of IT infrastructure across countries

Available IT infrastructure	D	EL	F	I	L	FIN	UK	EU-7
Computers	99	90	100	100	100	96	94	98
Internet access	93	86	97	92	96	80	84	91
E-mail	91	84	90	91	96	76	82	87
WWW	88	64	84	82	94	76	80	84
Intranet	43	46	38	44	46	31	33	41
Extranet	13	8	14	6	68	19	4	10
LAN	68	65	69	51	83	51	59	62
WAN	23	25	19	9	67	27	13	17
EDI	28	21	31	8	6	16	23	22

Base: EU-7 (D, EL, F, I, L, FIN, UK), all enterprises. N=580. Note: figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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 2-2: Metal products industry: Availability of IT infrastructure by size class

Available IT infrastructure	All sectors	Metal products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Computers	97	97	97	100	100
Internet access	91	84	84	100	100
E-mail	87	81	80	98	100
WWW usage	84	75	75	92	99
Intranet	51	28	27	50	67
Extranet	20	3	3	11	27
LAN	67	40	39	84	97
WAN	34	5	5	22	45
EDI	23	8	7	25	57

Base: EU-4 (D, F, I, UK), all enterprises. N=436 (for metal product sector), N=5917 (for all sectors). In % of enterprises using... Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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.

Overall, more advanced IT infrastructures, such as Intranet, Extranet etc., are less common in the metal products sector than on average among all sectors. Again, this can partially be attributed to the dominance of small firms in this sector, but it also shows that the e-business affinity of the metal products sector is lower than in other sectors.

Table 2-3: Metal products industry: Type of Internet connection by country

Connection type	D	EL	F	I	L	FIN	UK	EU-7
Analogue dial up modem	5	22	43	28	5	17	34	23
ISDN	53	74	35	32	27	19	50	44
DSL	22	0	20	27	3	35	7	20
Other fixed connection	20	0	10	12	65	26	5	14
Other connection	5	7	1	0	0	1	0	2

Base: EU-7 (D, EL, F, I, L, FIN, UK), enterprises with Internet. N=521. Note figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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 position². 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 2-4 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. Obviously, the Internet connections offered by the prevailing telecommunication companies in each country have an influence of the technologies used by firm customers. This is why firms in Finland, e.g., can profit from the highly developed IT infrastructure in Finland in terms of bandwidth, whereas equivalent offers seem to be limited in Luxembourg and France.

Table 2-4: Metal products industry: Bandwidth available to companies with internet access (by country)

Bandwidth	D	EL	F	I	L	FIN	UK	EU-7*
<2 Mbit/s	75	91	84	67	93	43	87	77
2-10 Mbit/s	11	7	5	9	3	31	5	9
>10 Mbit/s	1	2	4	4	1	13	0	2

Base: EU-7 (D, EL, F, I, L, FIN, UK), enterprises with Internet. N=521. Note figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: June/July 2002. * figures do not add up to 100, because firms could also answer "do not know".

Source: e-Business W@tch (2003)

² 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.

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 2-5: Metal products industry: Companies with a website (by country)

	D	EL	F	I	L	FIN	UK	EU-7
Company has a website*	43	44	54	64	53	48	52	55
Plans to have a website within next 12 months*	33	30	19	12	22	7	21	20
Web hosting by external service provider	62	58	66	74	56	68	30	74
Web design by external service provider	64	65	68	70	51	57	77	70
Website maintenance/ updating by external service provider	64	71	58	74	63	84	77	71
Usage of content Management System	8	14	3	15	0	1	0	9
Information about products on the website	88	87	94	90	89	100	97	91

Base: EU-7 (D, EL, F, I, L, FIN, UK), enterprises having a website, N=370, except *: all enterprises, N=580. In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

Only slightly more than 50% of firms in the sector have a website. This ratio is only higher for medium and large companies. This means that almost half of the companies in the sector do currently not have the basic infrastructures yet to participate in e-business. Differentiation by country shows Italy at the high and Germany at the low end. However, an additional 20% of firms in the sector plan to have a website within the next 12 months, so there is a process of catching up in this regard.

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.

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. 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. 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 2-7 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 2-6: Metal products industry: Size of IT department (average number of employees per 1000)

Available IT infrastructure	All sectors	Metal products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Employees mainly occupied with maintenance of company website (1)	69	32	33	8	2
Employees mainly occupied with maintenance of IT and networks (2)	123	62	63	21	9

Base: EU-4 (D, F, I, UK), (1) enterprises having a website, N=370 (for metal products), N=6187 (for all sectors); (2) all enterprises N=580 (for metal product sector), N=5417 (for all sectors). In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

2.2.2 IT skills development

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 2-7: Metal products industry: IT learning offers

	D	EL	F	I	L	FIN	UK	EU-7
Support of IT and networking skills development	75	78	90	68	93	88	78	77
In-house computer/IT training	41	58	55	42	79	51	51	46
Computer/IT training by third parties	54	58	60	52	44	89	73	61
Use of working time for learning activities	48	63	78	57	91	79	63	59

Base: EU-7 (D, EL, F, I, L, FIN, UK), all enterprises, N=580. Note figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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 interesting to see 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 2-8: Metal products industry: Importance of learning schemes for IT skills development

	D	EL	F	I	L	FIN	UK	EU-7
learning "on the job" is "very important"	43	53	45	64	63	47	69	53
learning "on the job" is "fairly important"	49	39	43	33	35	44	24	40
formal training schemes are "very important"	26	45	11	32	45	8	20	24
formal training schemes are "fairly important"	57	45	45	48	44	66	44	50
self-learning activities of employees is "very important"	40	29	37	63	19	46	37	45
independent study activities of employees are "fairly important"	48	60	55	28	45	44	47	44

Base: EU-7 (D, EL, F, I, L, FIN, UK), enterprises using computers, N=563. Note figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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 (cf. table below).

Table 2-9: Metal products industry: IT skills gap

	Size class	Total	D	EL	F	I	L	FIN	UK
Companies having recruited or tried to recruit IT specialists (1)	Total	9	6	14	9	12	24	14	4
	0-49	8	5	12	10	12	23	13	3
	50-249	17	23	36	3	14	14	20	19
	250+	41	40	67	9	44	100	45	71
Companies with great difficulties in recruiting IT specialists (2)	Total	27	2	55	49	33	56	1	1
Companies with some difficulties in recruiting IT specialists (2)	Total	16	7	21	0	23	0	49	2

Base: EU-7 (D, EL, F, I, L, FIN, UK), (1) all enterprises, N=580; (2) enterprises having recruited or tried to recruit IT specialists, N=94. In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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%: 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% of firms reported they had “great difficulties”, in comparison to 22% 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 is least pronounced in Germany and the UK, where hardly any firm had great difficulties recruiting IT specialists. On the other hand, there seem to be severe problems in Greece, Luxembourg and France where approximately 50% experienced great difficulties hiring appropriate personnel. Italy and Finland rank in between. Wage levels paid in the industry and availability of qualified IT specialists 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% of the employees in the metal product sector work in companies that have computers, only 33% of the employees actually use the computers themselves (compared to 57% as the all sector average). This confirms the view that IT in general does not play a dominant role for the business routine in the metal products sector. Consequently, more advanced IT infrastructure like remote or wireless access to the company's computer system are less frequent in the metal products sector than on average. However, the industry is not at a disadvantage to other sectors concerning the access of office workers to basic technologies like email, WWW, and Internet. Here, metal product firms are comparable to the all sector average. Again, there is greater usage of IT infrastructures in larger firms than in smaller ones. This is true for all the technologies listed in table 2-10.

Table 2-10: Metal products industry: Office workers using IT (in %)

The majority of office workers has access to	All sectors	Metal Products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
E-mail for internal communication (1)	67	62	44	80	89
E-mail for external communication (1)	74	73	64	83	88
WWW (1)	63	62	58	68	65
Intranet (1)	44	34	19	46	63
Remote access to company's computer system (2)	40	29	14	36	61
Wireless access to the company's computer system (2)	13	9	3	11	24

Base: EU-4 (D, F, I, UK), (1) all enterprises. N=436 (for metal products sector), N=5917 (for all sectors); (2) enterprises using computers. N=427 (for metal products sector), N=5741 (for all sectors) Note: figures weighted by employment ("enterprises comprising ...% of employment"). Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

2.3 E-business activities

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

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

The discussion follows this structure.

2.3.1 Internal processes

Compared to the sector average, firms in the metal products industry are less frequently equipped with a number of online technologies to support internal processes. Customer Relationship Management (CRM) applications and the usage of Application Service Providers (ASP) is three times more frequent on average than in the metal products sector. Furthermore, using the Internet to share documents and to perform collaborative work with colleagues is only used by companies representing 33% of

employees in the metal products industry, compared to 46% on average. We find similar results for the usage of e-learning (12% in metal products, 19% on average) and online tools to support human resource management functions (14% in metal products, 23% on average).

The sector exhibits an average diffusion of online technologies for tracking working hours and automating travel cost reimbursements. In two applications, however, the sector outperforms the average: This is in the usage of ERP systems (25% in metal products, 20% on average) and in Internet-based Knowledge Management solutions (12% in metal products, 10% on average).

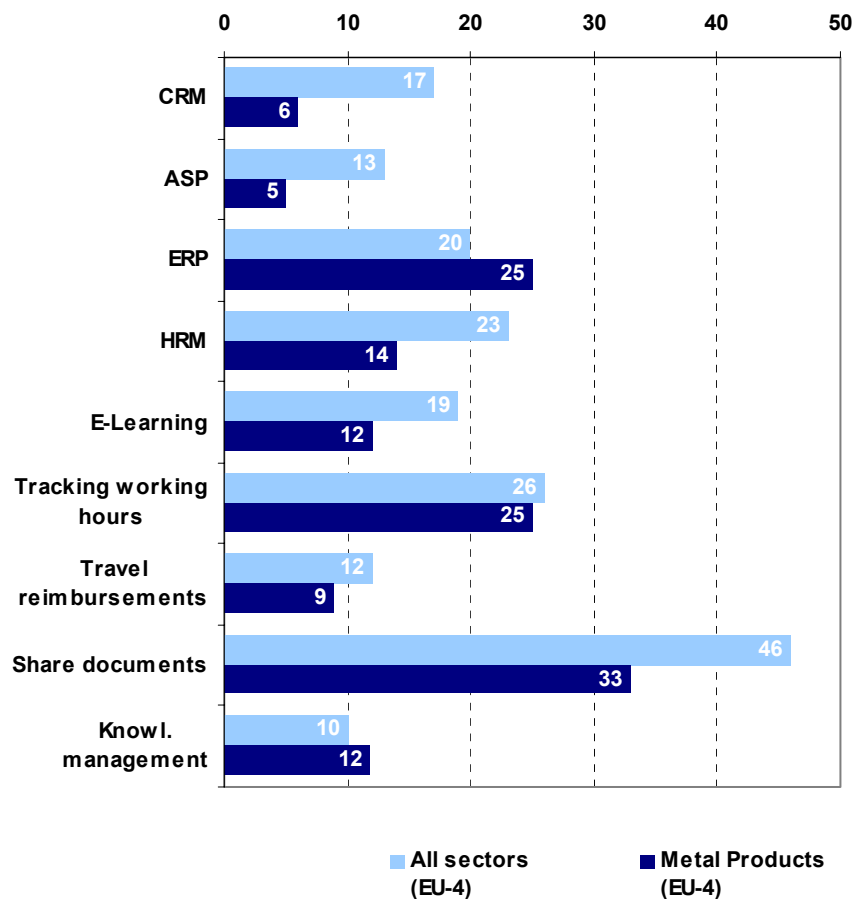
It is not entirely clear why firms in the metal products sector make comparatively frequent use of some rather advanced solutions (such as knowledge management), and under perform in other solutions (such as ASP and sharing documents). This could be an indicator for a catching up process within the sector. Obviously, already a large share of companies is using Internet technologies to support various internal processes. Eventually, positive experiences made with these technologies will lead to the adoption of other e-business tools for internal processes as well in the future.

Figure 2-1: Metal products industry: Usage of online technology for internal processes – sector comparison

Base: EU-4 (D, F, I, UK), all enterprises (N=436 for metal products, N=5917 for all sectors).

Figures weighted by employment ("enterprises comprising ...% of employees say that they use...").
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



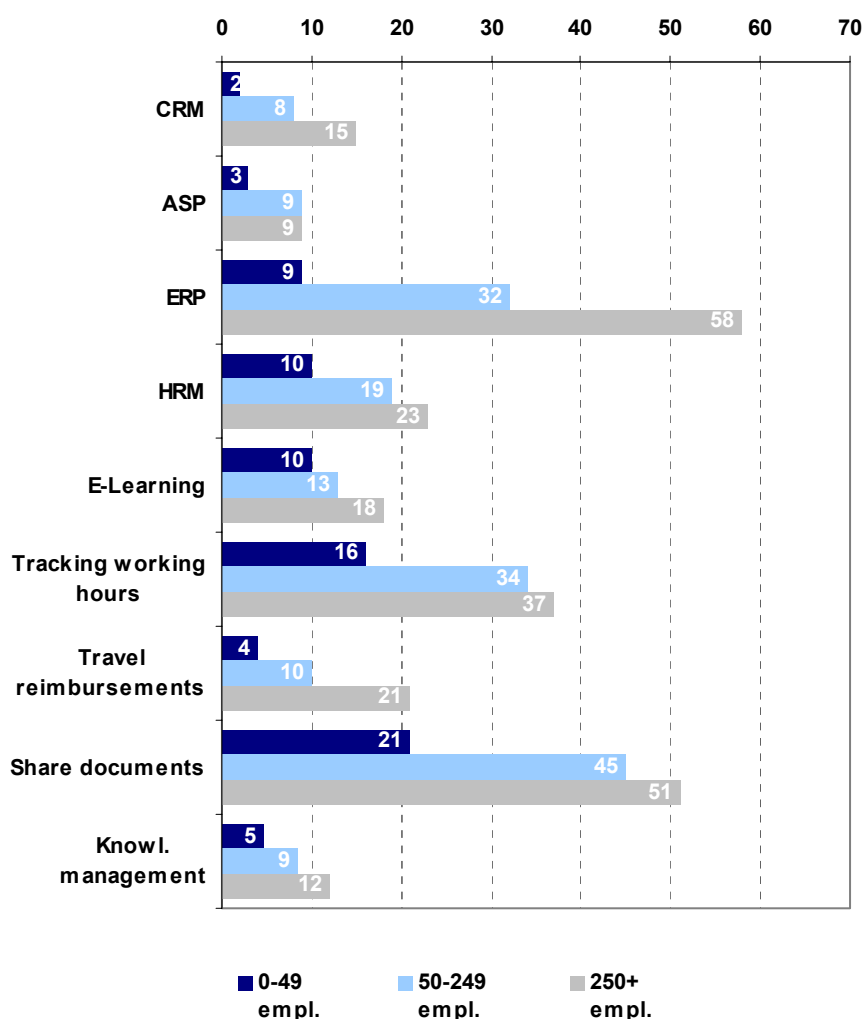
With respect to the distribution of technology usage across size classes, we get the usual picture: Large firms are much more frequently users of these Internet tools than small firms. The differences in usage frequencies between large and very small firms are most prevailing for CRM systems (factor 7), ERP (factor 6.5), and travel cost reimbursement (factor 5). This is consistent with the argument that these application exhibit significant economies of scale, which make them less attractive to smaller firms.

Figure 2-2: Metal products industry: Usage of online technologies for internal processes – by size class

Base: EU-4 (D, F, I, UK), all enterprises (N=436 for metal products, N=5917 for all sectors).

In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



2.3.2 Processes of the extended enterprises

With “processes of the extended enterprise” we mean all activities that are neither purchasing or selling, but still involve interaction, collaboration and exchange of information with people or organisations outside of the company itself. Firms often engage in frequent and intense collaborations with suppliers and customers, negotiating contracts, designing products, and jointly managing production capacities and inventory. Various Internet technologies are available to support these processes. E-marketplaces can also be counted towards this category because they enable firms not only to negotiate contracts and trigger transactions, but also to share information with industry partners.

Table 2-11: Metal products industry: Participation in e-marketplaces

	Total Metal Sector (All Sector Avg)
Participation in e-marketplaces (1)	2 (5)
Catalogue-based offering on e-marketplaces (2)	77 (41)
Catalogue-based purchasing on e-marketplaces (2)	80 (36)
Auctions on e-marketplaces: selling (2)	15 (16)
Auctions on e-marketplaces: bidding (2)	11 (18)

Base: EU-4 (D, F, I, UK), (1) all enterprises. N=436 (for metal products sector), N=5917 (for all sectors); (2) enterprises participating in e-marketplaces. N=8 (for metal products sector), N=497 (for all sectors) In % of enterprises.
Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

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. This is not surprising, given the fact that hardly any online marketplace exists that is tailored to metal product companies in particular. Against this background, the figures on usage categories have to be interpreted with care, since they are based on only eight 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.

In the usage of other online technologies for the extended enterprise, firms in the metal products sector do not clearly lag behind average. In fact, using the Internet to exchange documents with suppliers and customers has become an almost standard procedure, just like in other sectors as well. A quarter of the employees works in companies that have access to extranets of their business partners, or use EDI solutions. Also, negotiating contracts online and using Supply Chain Management solutions (SCM) is not less common in the metal products sector than on average. The industry only slightly falls behind in online collaboration with partners to develop new products and to forecast demand.

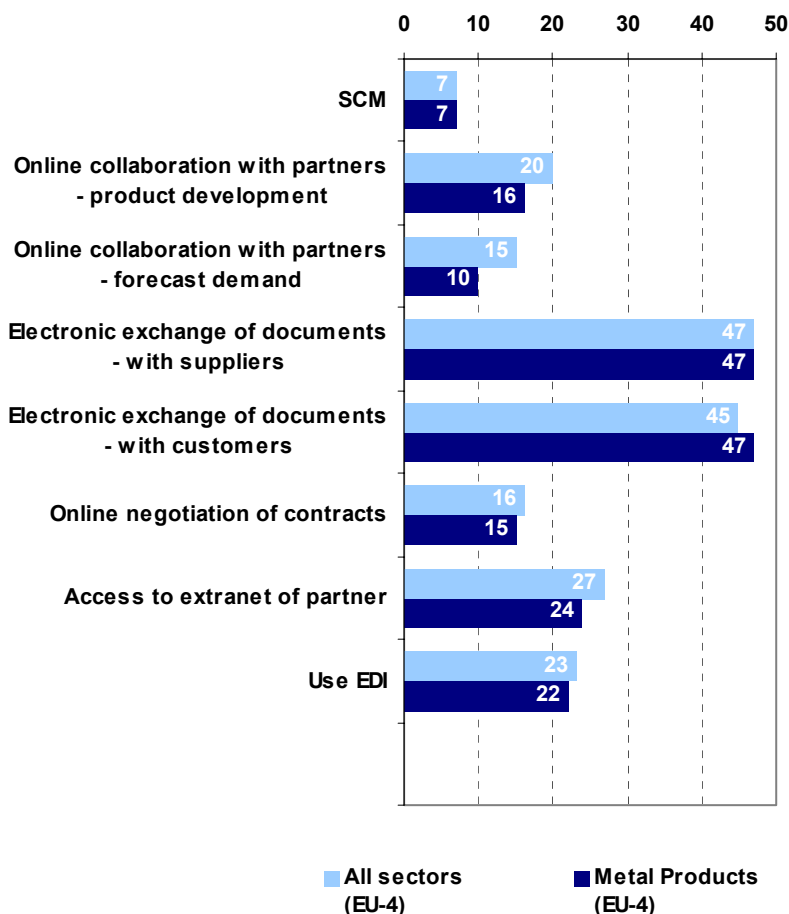
Figure 2-3: Metal products industry: Usage of online technologies for the extended enterprise – sector comparison

Base: EU-4 (D, F, I, UK), all enterprises (N=436 for metal products, N=5917 for all sectors).

Figures weighted by employment ("enterprises comprising ...% of employees say that they use...").

Reporting period: June/July 2002

Source: e-Business W@tch (2003)

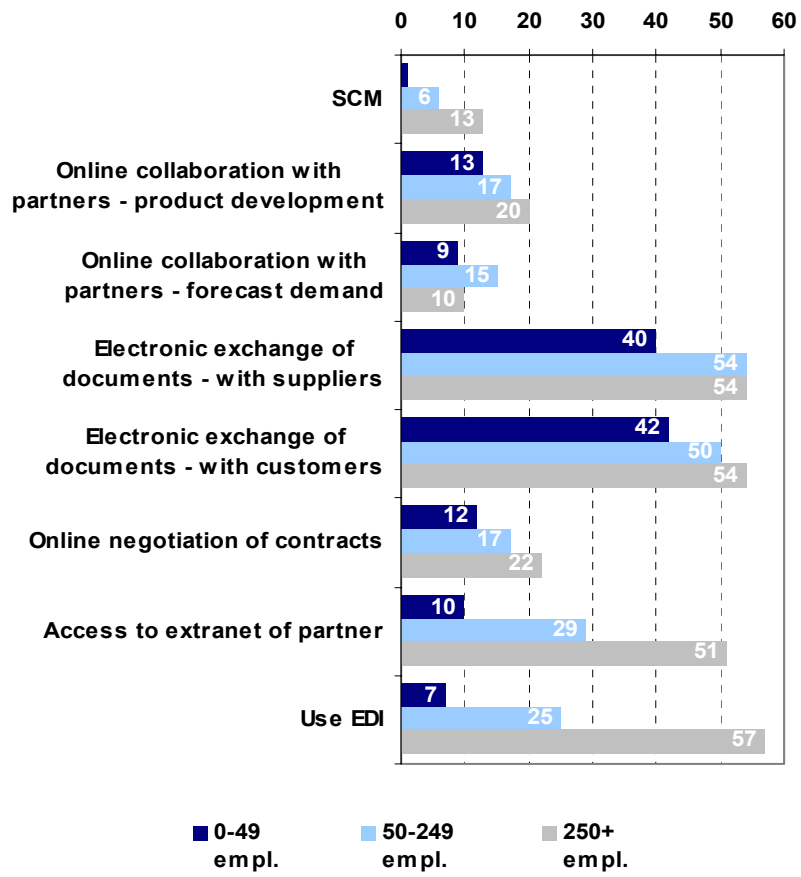


With respect to the size class distribution, large firms are much more frequent users of EDI, SCM, and Extranets of partners. This is the same picture that we find in most manufacturing sectors. The implementation of these rather complex solutions obviously requires a certain minimum of transactions and a rather highly developed IT infrastructure in firms to realize advantages compared to traditional ways of coordinating intra-firm activities. Smaller firms, however, make frequent use of less advanced and complex solutions. For example, they are quite active in using the Internet to exchange documents with customers and suppliers.

Figure 2-4: Metal products industry: Usage of online technologies for the extended enterprise – by size class

Base: EU-4 (D, F, I, UK), all enterprises (N=436 for metal products, N=5917 for all sectors).
In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



Overall, firms in the metal products sector are less frequently users of Internet technologies for intra-firm collaboration than on average. However, they do not dramatically fall behind the other sectors. At least some applications have already convinced a high number of companies, although no spectacular success stories or case studies are publicly communicated. The sector seems to take a rather down-to-earth, conservative approach to IT in general, but there is no sign for resistance against Internet technologies in general.

2.3.3 Purchasing

Using the Internet to purchase goods or services is one of the more common applications of e-business. 24% of all enterprises in the metal products sector make use of this procurement channel, 35% of the employees in the sector work in companies that purchase online. Compared to online sales, purchasing online is much more frequently used. Obviously, companies do not follow an integrated strategy. However, there are considerable differences between countries. German metal manufacturers engage more than three times more often in online purchases than their Italian counterparts.

Figure 2-5: Metal products industry:
Companies purchasing online

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).
Figures weighted by employment ("enterprises comprising ...% of employees say that they purchase online"). Reporting period: June/July 2002.
Source: e-Business W@tch (2003)

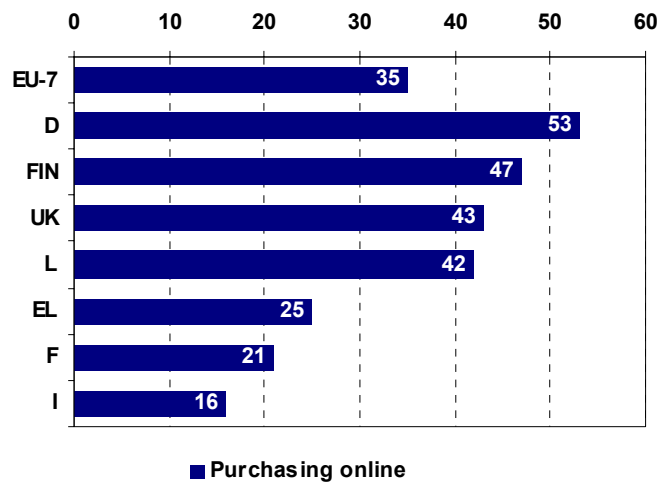
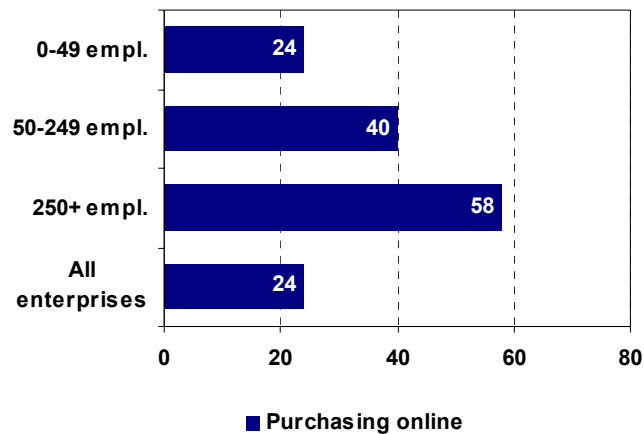


Figure 2-6: Metal products industry:
Companies purchasing online – by size class

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).
In % of enterprises.
Reporting period: June/July 2002
Source: e-Business W@tch (2003)



The size class distribution of companies purchasing online reflects the “normal” or expected situation of e-business diffusion. Almost two thirds of the large enterprises use the Internet as a procurement channel, whereas only one quarter of the small firms do so. However, it can hardly be argued that small firms are more reluctant to adopt online purchases due to information deficits. On the contrary, there is a larger share of small and medium-sized firms with more than one year of online purchasing experience than among large firms (see table 2-12). Overall, 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 e-commerce.

Table 2-12: Metal products industry: Buy-side e-commerce activity

Activity	Metal Products				
	All sectors	All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Currently purchasing online	36	24	24	40	58
• > 2 years	42	33	33	42	6
• 1-2 years	40	49	49	37	80
• < 1 year	15	17	18	19	3
Plan to purchase online	7	9	9	6	0

Base: EU-4 (D, F, I, UK), all enterprises for the first and last row, enterprises purchasing online (incl. NA/DK) for lines 2-4. N=580 (for metal products sector), N=5417 (for all sectors). In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

Although procurement is much more often done via e-commerce than sales, the metal products sector still remains significantly below the online purchasing average of all industries (see table 2-12). Whereas only 24% of metal product firms purchase online, 36% firms of all sectors do so. However, compared to the other sectors, metal manufacturers seem to be catching up – they express plans to introduce e-procurement slightly more often than firms in other industries. Especially small firms (9% of them) in the sector still have plans to purchase online within the next 12 months, which would reduce the e-procurement gap between small and large enterprises.

Table 2-13: Metal products industry: Type of goods purchased online

	All sectors	Metal Products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Online procurement of MRO ¹⁾ goods	64	65	64	74	70
Online procurement of direct production goods	49	56	57	46	22

Base: EU-4 (D, F, I, UK). Enterprises purchasing online. N=191 (for metal products sector), N=3786 (for all sectors). In % of enterprises. Reporting period: June/July 2002. 1) Maintenance, repair and operations.

Source: e-Business W@tch (2003)

Online procurement is used to buy MRO goods by the majority of companies in all size classes. Direct production inputs, however, are only bought 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: Metal products industry: Online share of total purchases

	All sectors	Metal Products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
> 50%	9	2	3	0	0
26-50%	10	3	3	7	0
11-25%	19	10	10	5	0
5-10%	25	36	37	23	35
< 5%	37	49	49	65	65

Base: EU-4 (D, F, I, UK). Enterprises purchasing online. N=191 (for metal products sector), N=3786 (for all sectors). In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

The figures on the share of purchases made 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 overall smaller procurement volumes, 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.

Summing up, purchasing online has gained acceptance in about one quarter of the firms in the sector. Enterprises in Germany are much more active in online purchases than firms in Greece, France, or Italy. Online procurement volumes are still rather low. In addition, there are currently clear signs for a slowing down of e-procurement adoption, with the exception of small firms in the sector.

Barriers to purchasing online

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. Table 2-13 lists the percentage of firms that “completely agree” 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. Surprisingly, the cost of technology is much more often considered a significant barrier by large firms than by smaller ones. It could be that large firms consider the implementation of a complex e-procurement software solution (which is indeed expensive), whereas smaller firms think about simply using available online offers for purchases, without implementing a special software system.

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*". Table 2-15 shows that for almost all barriers, a relatively large number of companies have given this answer.

Table 2-15: Metal products industry: Barriers to purchasing online

Barrier	Metal Products				
	All sectors	All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Requires face-to-face interaction					
• Completely agree	38	49	49	42	37
• Somewhat agree	22	19	19	24	24
Suppliers do not sell online					
• Completely agree	32	41	41	44	52
• Somewhat agree	22	27	27	24	36
Concerns about data protection & security					
• Completely agree	31	27	27	24	22
• Somewhat agree	24	29	29	31	23
Technology is too expensive					
• Completely agree	24	23	23	23	48
• Somewhat agree	23	23	23	31	17
Suppliers' technical systems incompatible					
• Completely agree	13	16	16	14	15
• Somewhat agree	17	20	20	27	22
Cost advantage insignificant					
• Completely agree	22	23	24	16	23
• Somewhat agree	24	28	28	33	32
Base: EU-4 (D, F, I, UK), all enterprises. N=436 (for metal products sector), N=5417 (for all sectors). In % of enterprises. Reporting period: June/July 2002.					

Source: e-Business W@tch (2003)

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 significant barrier to adoption 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.

2.3.4 Marketing and sales

Although the procedures are similar, the patterns of introduction of online *sales* differ considerably from those of online *procurement*. Only 6% 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%). Again, we also find strong regional differences in online sales. Finland and Germany are most advanced in this category, with 10% respectively 9% of firms using the Internet to sell their products. Online sales play hardly any role in this sector in France in Luxembourg (2% and 1%).

As could be expected, online sales are less widespread in small than in medium-sized or large companies. However, very large enterprises 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.

Figure 2-7: Metal products industry: Companies selling online – by country

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).

Figures weighted by employment ("enterprises comprising ...% of employees say that they purchase online"). Reporting period: June/July 2002

Source: e-Business W@tch (2003)

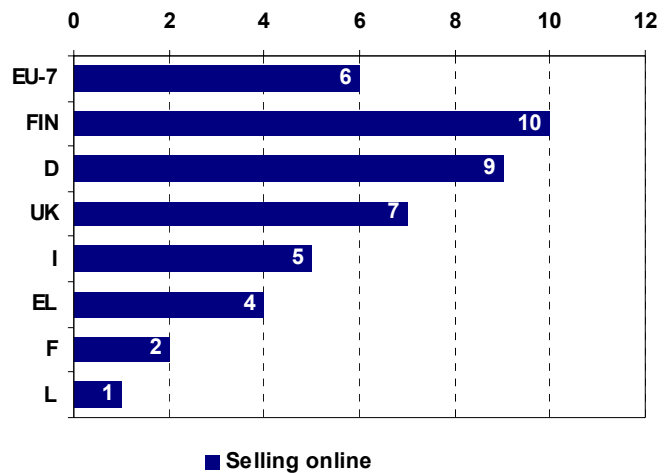
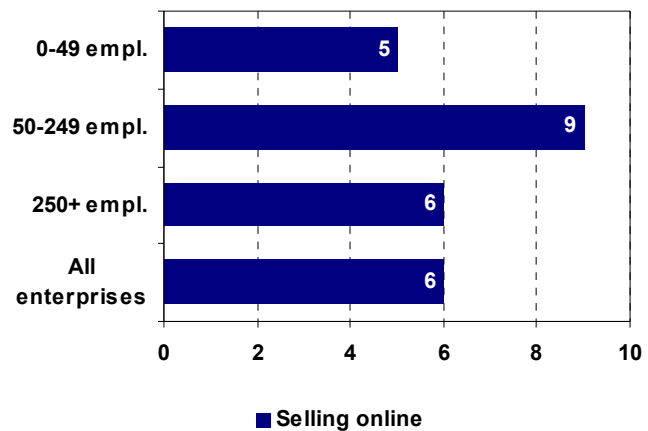


Figure 2-8: Metal products industry: Companies selling online – by size class, enterprise weighted

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).

In % of enterprises. Reporting period: June/July 2002

Source: e-Business W@tch (2003)



Metal manufacturers are latecomers to the online sales market. Whereas 42% of companies in the sample of all industries have more than two years of experience, this is only the case for 24% of firms in the metal products sector experience. A large number of firms in all size categories have less than two years of e-sales experience.

10% of enterprises in the metal products sector said that they plan to sell online within the next 12 months, compared to 9% in all sectors. If these plans are realized, the number of firms selling online in this sector will more than double in the near future. This indicates that the metal products sector will at least not further fall behind the other sectors in terms of e-commerce usage.

Table 2-16: Metal products industry: Sell side e-commerce activities experience

Activity	Metal Products				
	All sectors	All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Currently selling online	12	6	5	9	6
• > 2 years	42	24	24	29	0
• 1-2 years	36	60	56	57	0
• < 1 year	20	18	18	14	10
Plan to sell online	9	10	10	7	9

Base: EU-4 (D, F, I, UK), all enterprises for the first and last row, enterprises selling online (incl. NA/DK) for lines 2-4. N=580 (for metal products sector), N=5417 (for all sectors). In % of enterprises. Reporting period: June/July 2002.

Source: e-Business W@tch (2003)

It is interesting to see via which channels firms conduct their online sales. In the metal products sector, as well as in all other sectors, the company's homepage is the primary e-commerce sales channel. 87% of enterprises that sell online in the metal products sector use their homepage for this purpose. Still a large percentage (of the small number of firms that sell online) use electronic marketplaces, 35% in the metal products sector, compared to 36% on average. Sales via Extranets or mobile e-commerce do not play a role yet in this sector.

Figure 2-9: Metal products industry: E-commerce channels

Base: EU-4 (D, F, I, UK), companies selling online (N=24 for metal products, N=1346 for all sectors).

In % of enterprises. Reporting period: June/July 2002

Source: e-Business W@tch (2003)

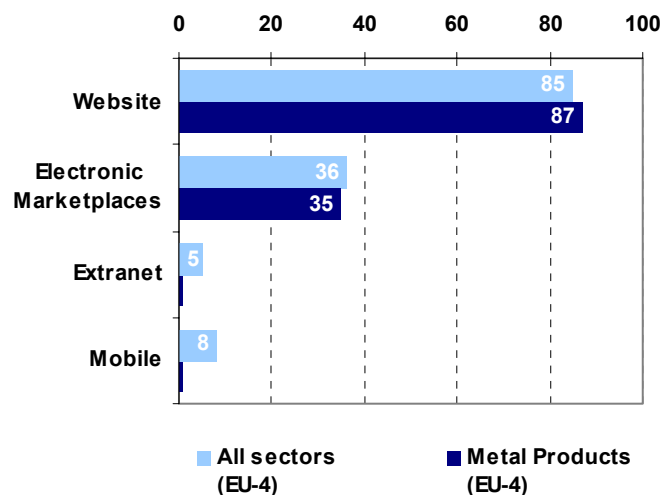


Figure 2-10: Metal products industry:
Online customer structure

Base: EU-4 (D, F, I, UK),
companies selling online (N=24 for metal
products, N=1346 for all sectors).

In % of enterprises
Reporting period: June/July 2002

Source: e-Business W@tch (2003)

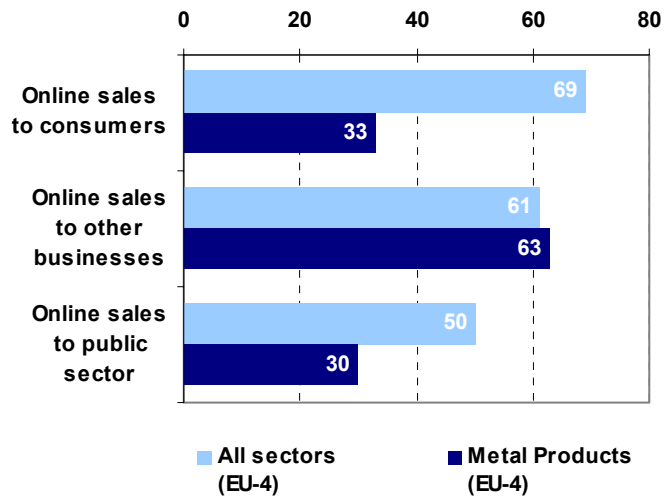
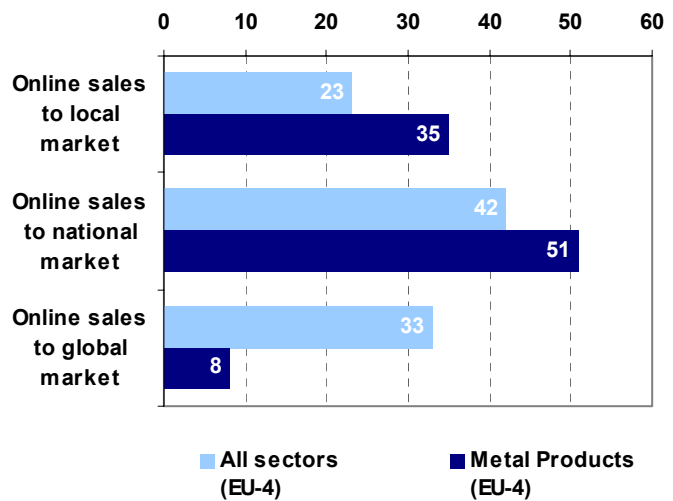


Figure 2-11: Metal products industry:
Target market of online sales

Base: EU-4 (D, F, I, UK),
companies selling online (N=24 for metal
products, N=1346 for all sectors).

In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



Looking at the structure of online customers it becomes obvious that the metal products sector primarily produces intermediate products that go into different kinds of other industries. 63% of those firms that sell online in this industry make online sales primarily to other businesses. Online sales to consumers and to the public sector are less common among metal product firms than on average.

Interestingly, the point made early that metal products are mainly a local, at most national, business are confirmed by the target market evaluation of those firms that actually sell online. On average among all sectors, 33% of enterprises selling online use the properties of the Internet as a global medium to reach a global market. In the metal products sector, only 8% try to reach a global market. Instead, 51% concentrate on their national market (42% for all sectors) and 35% use it simply to automate some aspects of their interaction with local customers (23% on average). Obviously, the potentials of online sales to reach new geographic market regions seem to be somewhat limited in this sector, mainly due to product characteristics and transportation costs.

It is also interesting to observe the degree of online sales integration into business processes. The more integrated online sales are into a company's IT infrastructure and processes, the more advanced is the company with respect to e-business usage. The metal products sector clearly lags behind the all sector average in this respect. None of the firms in this sector have fully integrated their online sales into their backend IT systems. In the majority of cases, online orders generate an automatic email (60%) or fax (28%) that then need to be processed manually in some way. The remaining 12% that did

not answer to any of these categories might contain firms that have no clear process for dealing with online orders. In this case, there is a high chance of online orders “getting lost” – surely not a sign of high e-business competence.

The figures below provide further information about the degree of online sales sophistication. The metal products sector clearly falls behind the sector average in all relevant categories. Online sales trigger business processes in only 11% of enterprises in the metal products industry, compared to 29% on average. Furthermore, online sales via secure connections (SSL) are very rare (17% in metal products, 46% on average), and customer service is only provided online in one third of all cases (49% on average). Online payment is only made possible by 30% of the firms offering online sales.

Figure 2-12: Metal products industry: Degree of online sales integration into business processes

Base: EU-4 (D, F, I, UK), companies selling online (N=24 for metal products, N=1346 for all sectors).

In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)

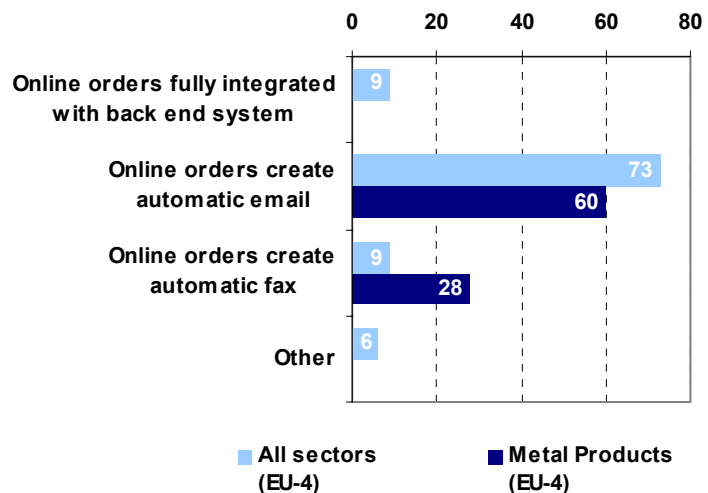
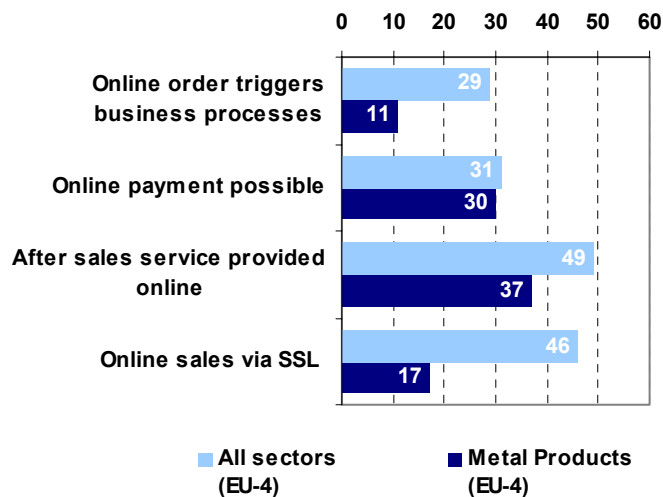


Figure 2-13: Metal products industry: Sophistication of online sales

Base: EU-4 (D, F, I, UK), companies selling online (N=24 for metal products, N=1346 for all sectors).

In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



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 to online sales 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.

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 never become a prime example for e-commerce. 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: Metal products industry: Barriers to selling online

Barrier	All sectors	Metal Products			
		All enterpr.	0-49 empl.	50-249 empl.	250+ empl.
Few customers online					
• Completely agree	20	25	25	16	27
• Somewhat agree	25	27	28	21	23
Customers hesitant to buy online					
• Completely agree	31	31	31	30	25
• Somewhat agree	29	24	24	29	29
Goods / services do not lend themselves to selling online					
• Completely agree	47	55	55	64	57
• Somewhat agree	17	18	18	15	18
Processing of payments for online orders is a problem					
• Completely agree	22	15	14	23	20
• Somewhat agree	19	17	17	21	29
Technology too expensive					
• Completely agree	26	20	20	25	37
• Somewhat agree	25	25	25	31	35
Revenue of online sales is still low					
• Completely agree	34	37	37	27	53
• Somewhat agree	26	24	24	39	32
Delivery process causes problems					
• Completely agree	15	19	19	9	3
• Somewhat agree	18	16	15	30	23
Adapting corporate culture to e-commerce is difficult					
• Completely agree	24	29	29	27	34
• Somewhat agree	24	26	26	26	30
Base: EU-4 (D, F, I, UK), all enterprises. N=436 (for metal products sector), N=5417 (for all sectors). In % of enterprises. Reporting period: June/July 2002.					

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

2.4 Impact of e-business

It is generally argued 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. The following chapter provides empirical evidence from the metal products sector that shows to what extent these hypotheses already fit reality.

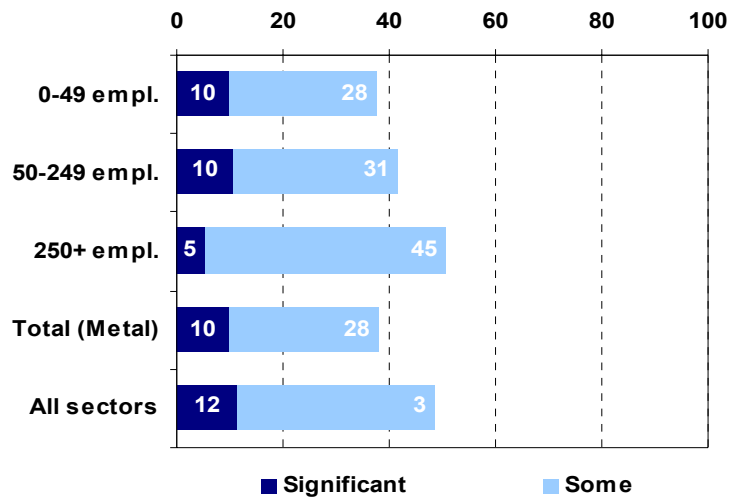
Figure 2-14 shows the percentages of firms in the sector where e-business already constitutes some or an important part of the way the company operates today. Overall, 38% of firms in the metal products industry see e-business as a part of their daily business, compared to 45% on average. So, despite the industry not being an early adopter of e-business, the Internet and the associated possibilities for conducting business have not been ignored. 10% of all firms, and surprisingly also 10% of the small and medium-sized firms, made the statement that e-business already constitutes a significant part of their operations today. Keeping in mind the large total number of firms that these figures represent, we can indeed assume that the Internet will have and already has an important impact on business processes, cost structures, performance, and market dynamics.

Figure 2-14: Metal products industry: Perceived importance of e-business in general

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).

In % of enterprises. "E-business constitutes a ... part of the way company operates today."
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



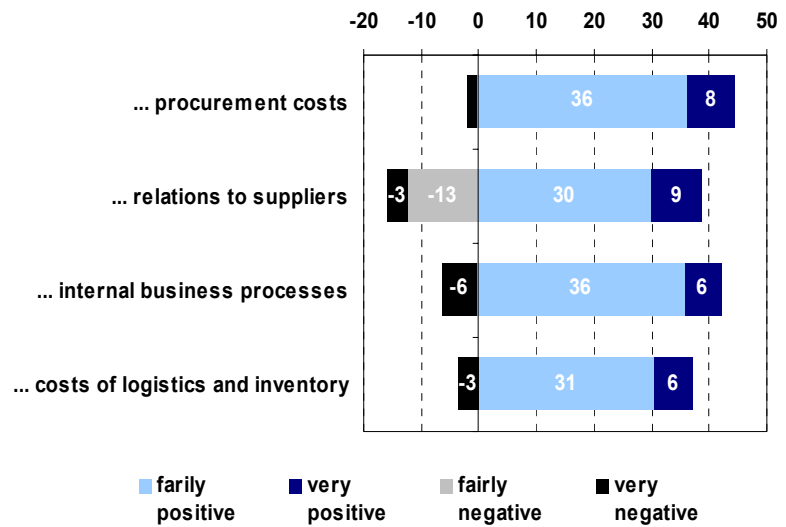
Generally, firms that purchase online are satisfied with the results of doing so. Roughly 40% of those firms reported positive experiences with respect to procurement costs, internal business processes, costs of logistics and inventory, and relations to suppliers. However, some companies also made negative experiences with respect to supplier relations (16%) and internal business processes (6%). This shows that e-business activities are not completely risk-free. The remaining percent did not report any significant impact of e-procurement on these categories. So, overall, the effect of purchasing online is positive, or at least neutral for most companies in this sector.

Figure 2-15: Metal products industry: Impact of procuring online

Base: EU-7 (D, E, EL, F, I, L, UK), companies procuring online (N=176).

In % of enterprises.
Reporting period: June/July 2002

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



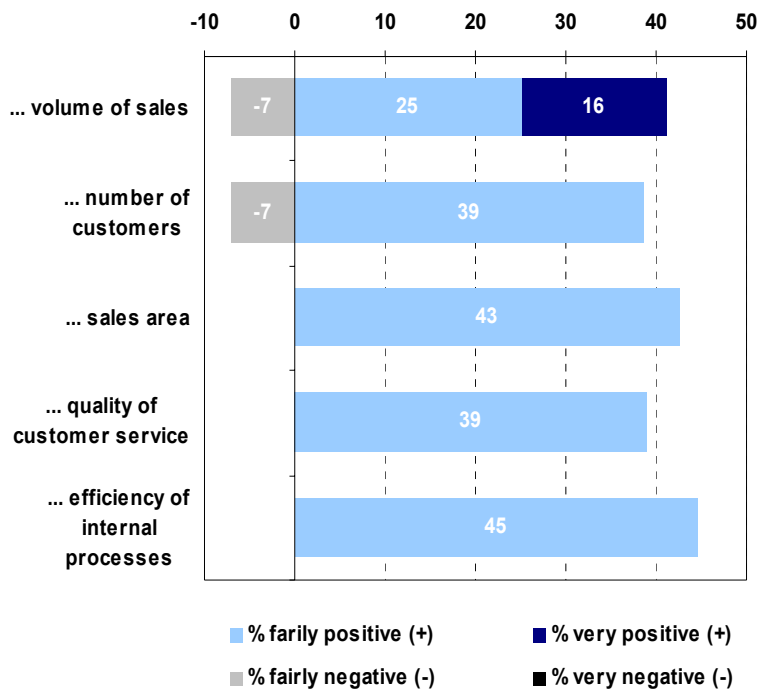
The experiences of metal product firms selling online are quite similar. Roughly 40% report positive impacts on sales volume, number of customers, sales area, quality of customer service, and the efficiency of internal processes. However, hardly anyone reported *very* positive experiences. Looking at these figures, one should keep in mind the low number of firms actually selling online (31), and the fact that most of these firms have less than two years of online sales experience. Eventually, positive effects will only become fully visible after some time has passed and companies collected experiences of how to use this sales channel to their best advantage.

Figure 2-16: Metal products industry: Impact of selling online

Base: EU-7 (D, E, EL, F, I, L, UK), companies selling online (N=31).

In % of enterprises.
Reporting period: June/July 2002

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



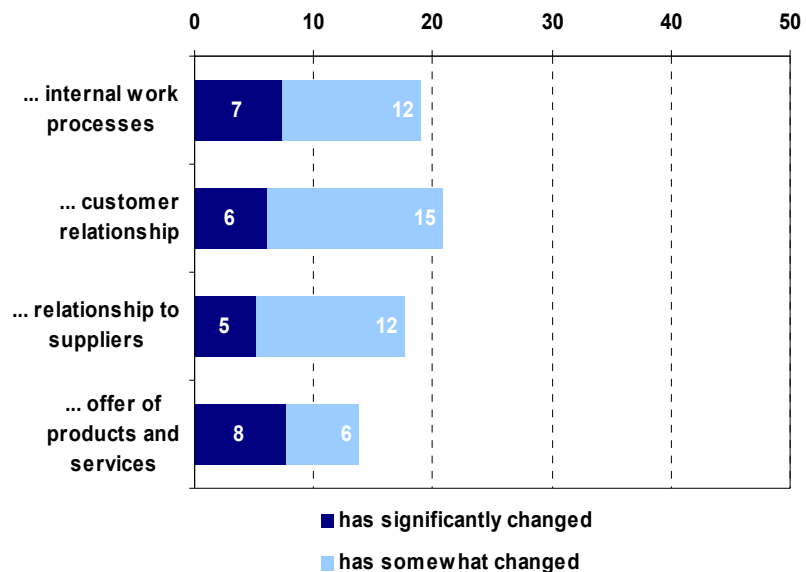
In general, the percentage of firms in the sector reporting that e-business has already had an influence on their internal work processes, relations to customers and suppliers, and their product offers is still pretty low. This is mainly because of the low number of firms that actively and seriously engage in e-business activities in the metal products industry. The most obvious impact is perceived with respect to customer relations – probably not only because of the firms that sell online, but also because of those enterprises that produce intermediate products that are sold to other industries / companies, where e-business already constitutes a more significant part of operation. Thus, we might expect to see an e-business pull-effect from the customer side on firms in the metal products industry.

Figure 2-17: Metal products industry: Perceived impacts of e-business in general

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).

In % of enterprises.
Reporting period: June/July 2002

Source: e-Business W@tch (2003)



The willingness of firms to invest in e-business will also depend on what they think who will be the main beneficiaries of the new systems. The figures in table 2-18 support the view 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 2-18: Who will benefit most from e-business?

	Total	0-49 employees	50-249 employees	250+ employees
SMEs	8.5	8.4	14.3	2.2
Large enterprises	54.1	54.6	36.7	36.2
Equal	30.1	29.8	39.5	48.3
No one	2.1	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 (2003)

22% of companies in the metal products industry said in 2002 that e-business did not yet play a significant role for them yet, but probably would in two years (compared to 25% on average). This share of firms are likely adopters of e-business technologies in the near future. However, the majority of enterprises in the sector are explicitly e-business skeptics, saying that e-business does currently not

a play a role for them, and will not be important in two years from now either. 58% of firms in this industry made this statement, compared to 55% on average. Surprisingly, the share of e-business skeptics is even higher among large firms (72%). Compared to the other industries, the share of e-business skeptics is significantly higher in the metal products sector. This confirms the statement made earlier that this sector exhibits a number of factors that limit possible e-business opportunities.

Figure 2-18: Metal products industry: Expected future importance of e-business

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).
 In % of enterprises.
 Reporting period: June/July 2002
 Source: *e-Business W@tch* (2003)

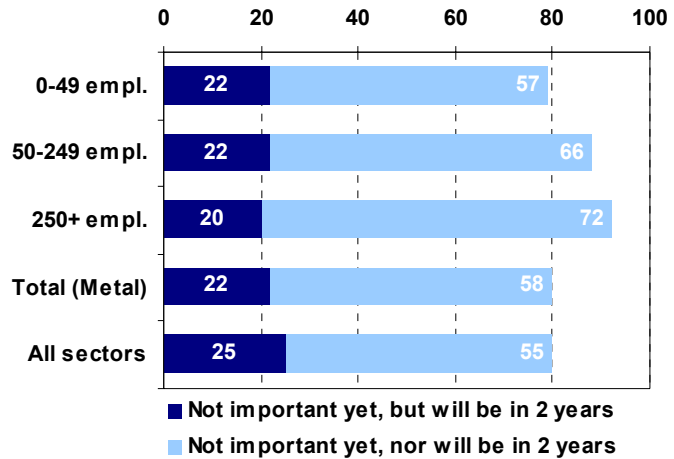
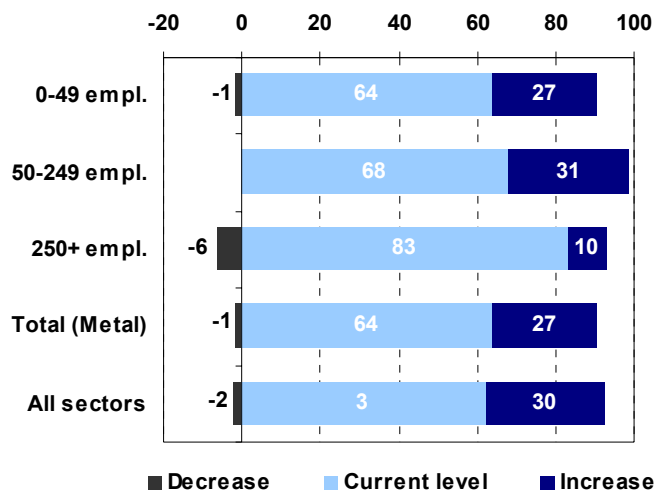


Figure 2-19 provides further evidence that we may not expect to see a dramatic “catching up” of the metal products sector compared to other industries in the near future. 64% of firms in the metal products sector will remain their expenditure on e-business on the current (comparably lower) level in the next 12 months (63% for all sectors). 27% of metal products enterprises plan to increase their spending on e-business technologies, compared to 30% average. This is still a rather high number of firms that will intensify their e-business activities in the near future. However, it also suggest a growing “digital divide” between this sector and the all-sector average.

Figure 2-19: Metal products industry: Planned expenditures on e-business within the 12 month period ahead

Base: EU-7 (D, E, EL, F, I, L, UK), all companies (N=580).
 In % of enterprises.
 Reporting period: June/July 2002
 Source: *e-Business W@tch* (2003)



2.5 Case study mywilka.com³

Company profile

Wilka Schliesstechnik GmbH is a family – owned company located in Velbert, Germany. Founded in 1865 as a local manufacturer of locks and cylinders it has become an internationally active company. At the moment Wilka Schliesstechnik is present in a number of mostly European countries. The company employs around 300 people, primarily in its home country. The product range of the company has been gradually extended and nowadays, besides production of basic locking articles, the core activities of the company are development, installation, and production of locking products and security systems. The company's motto "Wilka – Advantage Through Quality" defines its corporate identity as a supplier of high – quality locking and security systems. Efforts to apply quality management principles were rewarded with an ISO 9001 certificate.

Project description

Compliance with market demand requires flexibility in fulfilling individual customers' needs. Hence, apart from adopting a quality strategy, the management of Wilka Schliesstechnik undertakes other steps in order to better serve its customers and to build a competitive advantage over its competitors. The company took the role of a sector pioneer in e-business adoption by launching an Internet – based service platform for its customers (mywilka.com) at the Metal Product Fair in 2001. The main aim of the introduction of mywilka.com was to improve customer service and to increase customer satisfaction.

mywilka.com – Online shop for dealers

Originally, before the introduction of mywilka.com, customers' orders were received by post or fax. Only then the system specifications could be entered into the internal database. Any customer inquiries about the blue prints of ordered systems had to be processed manually and could be presented only in a paper form. The traditional process was time-consuming and costly. The introduction of the Internet based platform enabled to change the conventional ways of processing and fulfilling customers' orders. Nowadays, apart from being able to place orders online, customers registered on the platform benefit from such features as online locking systems development or around the clock access to the archived product plans. At the end of 2001, mywilka.com was extended by a large online shop module. New features allow authorized customers to cancel orders online, to check the availability of products in the company's storehouse and to download up-to-date technical drawings, pictures and specifications of the products. mywilka.com gives the company a clearer picture of its customers' behaviour and buying patterns. This information allows the firm to manage its inventory more efficiently and to book its customers' orders with higher certainty.

mywilka.com resembles a B2B exchange but it offers advantages superior to a simple marketplace. Besides reducing the time and cost of interaction, it also enables partners to share documents, drawings, and system designs in standard formats and in real time, thereby facilitating closer collaboration. Unlike many open B2B marketplaces, mywilka.com offers a secure communication channel. The one-to-one communication system allows to keep control over the platform and the content in the hands of Wilka Schliesstechnik. Such arrangements help to focus activities on processes and service rather than on price.

Evaluation and outlook

Considering the company's size and its fields of activity, the step into e-business can be viewed as a success. mywilka.com has achieved broad acceptance among customers. So far, around 500 companies have registered on the platform and Wilka management hopes that this number will continue to grow further in the future. The company does not expect a positive return on investment in terms of "hard cash" from the project. Rather, soft benefits (e.g. better service and thus customer loyalty) are the main objective. The company stresses that these soft benefits have been achieved. Encouraged by satisfactory results of this project, Wilka Schliesstechnik plans to extend the services offered on the mywilka.com platform. In the future it will be possible to check online the availability of products, to access information about negotiated prices, and overdue invoices. These efforts should contribute to higher customer satisfaction and create a platform for up to date communication between Wilka Schliesstechnik and its customers.

³ Research by DIW Berlin, in cooperation with Wilka Schliesstechnik GmbH

3 Summary and conclusions

3.1 Summary of main findings

Sector structure

Every sixth enterprise in the manufacturing industries belongs to the metal products sector. In 2000, about 270,000 metal product enterprises were counted in Europe. The production value of these enterprises amounted to 331 billion Euro, which is equivalent to 6.3% of total manufacturing. The sector employs 3.2 million people, or 11.2% of total manufacturing employment. Output development in 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. However, there is more cyclical movement in the development of output and employment in the metal products industry than in total manufacturing. This is due to the fact that the main customers of the sector (the automotive industry, the producers of machinery and equipment, and the construction industries) are vulnerable to a changing business climate. The sector is furthermore characterised by a predominance of smaller enterprises. Also, the industry shows a relatively low degree of concentration.

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 manufacturing sectors (for example, oxygen steel or automobile production).

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. Companies often specialise in one specific product line (e.g. metal chains, beverage cans, or locks) or customer group. Most of the companies are deeply rooted in regional structures and operate only in national or local markets. All these factors contribute to the predominance of SMEs in the sector.

E-business technologies promise potentials for expansion into new markets, cost savings, outsourcing, and better customer service. These potentials suggest that 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 sector. 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.

Limits to e-business opportunities compared to other sectors

We found that e-business opportunities are limited in the metal products sector compared to other industries. Main reasons are the predominance of small enterprises, the heterogeneity of products, and the local focus of business activities. E-business potentials often involve cost reductions due to automating high frequency routine tasks. Small enterprises often do not have complex and high frequency routine tasks, and thus potentials for improvement are limited from the beginning. The heterogeneity of products makes necessary standardisation and product description activities costly and difficult. However, since these standards are one of the prerequisites for a well functioning e-market, the potentials of e-markets for metal products are limited. Also, the advantages of the Internet of being a global medium are not as relevant if firm's business activities are focused on regional markets (this does not have to be a strategic disadvantage – the relatively good performance of the metal products industry compared to other manufacturing sectors does not suggest that there is a structural problem).

Furthermore, metal product firms are confronted with the usual e-business risks. Most important are opportunity costs (capital can often be spent on other investment projects than e-business that

promise greater profits to the firm), risks of eroding profit margins and increased price competition in electronic markets, and general implementation risks of e-business solutions.

Given these preconditions, it is not surprising that e-business adoption statistics are generally lower in the metal products sector than on average.

Evidence for an IT skills gap

Basic Internet technologies (like computer, email, and access to the WWW) are widely available in firms in the metal products sector, whereas more advanced IT infrastructures (like extranets, remote or mobile access) are less frequently found than on average. The percentage of workers using computers in their daily routines is clearly lower in this sector than on average. Furthermore, only 9% of firms tried to recruit IT specialists during the last twelve months. Companies in Luxembourg, France, Greece, and Italy that tried to find IT specialists experienced great difficulties, which suggests a significant IT skills gap for metal product firms in these countries. Figures indicate that firms tried to close this gap by offering IT training, preferably offered by external third parties. Only slightly more than 50% of firms in the sector have a website. This ratio is only higher for medium and large companies. This means that almost half of the companies in the sector do currently not yet have the basic infrastructures yet to participate in e-business. However, an additional 20% of firms in the sector plan to have a website within the next 12 months, so there is a process of catching up in this regard.

E-Business usage figures

Compared to the sector average, firms in the metal products industry are less frequently equipped with online technologies to support internal processes, such as CRM, sharing documents online, or e-learning. In two applications, however, the sector outperforms the average: This is in the usage of ERP systems (25% in metal products, 20% on average) and in Internet-based Knowledge Management solutions (12% in metal, 10% on average). Eventually, positive experiences made with these technologies will lead to the adoption of other e-business tools for internal processes as well in the future.

The participation of metal product firms in e-marketplaces is only marginal. At less than 1% it reaches hardly one-fifth of the average penetration of e-marketplaces in European industries in general. This is not surprising, given the fact that hardly any online marketplace exists that is tailored to metal product companies in particular. In the usage of other online technologies for the extended enterprise, firms in the metal products sector do not clearly lag behind the average. In fact, using the Internet to exchange documents with suppliers and customers has become an almost standard procedure, just like in other sectors as well. A quarter of the employees works in companies that have access to extranets of their business partners, or use EDI solutions. Also, negotiating contracts online and using Supply Chain Management solutions (SCM) is not less common in the metal products sector than on average. The industry only slightly falls behind in online collaboration with partners to develop new products and to forecast demand.

Purchasing online has gained acceptance in about one quarter of the firms in the sector. Roughly 40% of those firms that purchase online report positive or very positive experiences. Enterprises in Germany are much more active in online purchases than firms in Greece, France, or Italy. Online procurement volumes are still rather low. In addition, there are currently clear signs for a slowing down of e-procurement adoption, with the exception of small firms in the sector. The most dominating reasons for not purchasing online are (1) that procurement requires face-to-face interaction, and (2) that suppliers do not sell online.

Online sales are much less common than online purchases in this sector. Only 6% of employees work in companies that have already engaged in online sales. This is far below the average of all industries (17%), although 40% of firms that actually sell online report positive experiences. Metal product manufacturers are clearly latecomers to the online sales market. However, 10% of enterprises in the sector said that they plan to sell online within the next 12 month, compared to 9% on average. If these plans are realized, the number of firms selling online in this sector will more than double in the near future. This indicates that the metal products sector will at least not further fall behind other sectors in

terms of online sales usage. The most important barrier to the adoption is that products do not lend themselves to selling online.

E-business impact positive, but limited

Overall, 38% of firms in the metal products industry see e-business as a part of their daily business, compared to 45% on average. So, despite the industry not being an early adopter of e-business, the Internet and the associated possibilities for conducting business have not been ignored. 10% of all firms, and surprisingly also 10% of the small and medium-sized firms, made the statement that e-business already constitutes a significant part of their operations today. Keeping in mind the large total number of firms that these figures represent, we can indeed assume that the Internet will have and already has an important impact on business processes, cost structures, performance, and market dynamics. The most obvious impact is perceived with respect to customer relations – probably not only because of the firms that sell online, but also because of those enterprises that produce intermediate products that are sold to other industries / companies, where e-business already constitutes a more significant part of operation. Thus, we might expect to see an e-business pull-effect from the customer side on firms in the metal products industry.

However, a dramatic “e-revolution” in the sector remains an unlikely scenario for the near future. 58% of companies said that e-business does currently not play a role for them, and will not play a role in two years from now either. In addition, less firms in this industry plan to increase their e-business budgets in the coming 12 months (27%) than on average (30%). This suggests a growing “digital divide” between this sector and the all-sector average, despite the growing usage of some Internet technologies in a number of fields.

So, overall, our qualitative and quantitative research results suggest that e-business potentials exist in the metal products sector, but they are limited compared to other sectors, mostly due to sector-specific structural reasons. In the long run, we will likely witness a growing number of firms in this industry making use of online technologies for selected tasks, but the metal products sector in general will remain behind the e-business usage rates of other sectors.

3.2 Economic implications

E-business technologies offer a range of possibilities to reduce costs, reach new markets, and improve customer satisfaction and loyalty. Many firms in the metal products sector have not yet utilised all chances that these new ways of doing business offer. However, costs and benefits have to be carefully weighted in each individual case. Investments into e-business technology do not necessarily have to be the best decision under opportunity cost consideration.

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 currently be expected in the metal products sector as a consequence of e-business. In the long run, however, e-business will not fail to impact the metal products sector as well. Growing usage rates in a number of fields suggest that we have not yet seen the entire scope of changes that e-business will bring to this industry. Changes will most likely not be as dramatic as in other sectors, but we expect a measurable and overall positive effect in the long run.

An important question is whether small firms will also be able to take advantage of the new opportunities, especially given the predominance of SMEs in this sector. Small firms have generally less chances to participate in e-business solutions, but where they have started to introduce e-solutions, they do seem to profit from them. 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. Also, small firms show clear signs of an IT skills gap in this sector. This, combined with great difficulties of finding appropriate IT specialists in some countries, is a serious barrier to e-business adoption.

3.3 Policy issues

A need for policy intervention would be indicated if there were signs of market failure in the adoption of e-business and if the overall investment into e-business diverged from the efficiency level in this industry. Market failure would exist if individually rational behaviour lead to inefficiencies at the aggregate level. Our analysis highlighted a number of sector-specific structures that limit the potential positive effects of e-business for the individual firm and justify non-investment into a number of solutions. Whether this results in inefficiencies at the aggregate level cannot be finally concluded from this research. We do not want to make policy recommendations based on the speculative assumption that an inefficient under-investment into e-business technologies exists. However, rational decision about investments into e-business require a high level of IT competence and understanding of e-business in each individual firm. Our analysis does not suggest that such competencies exist in the majority of enterprises in this industry. Metal product manufacturers are overall less involved in the usage of IT in daily business than other sectors, and they appear to have more trouble finding appropriate IT specialists, suggesting the existence of an IT skills gap, which could result in sub optimal investment decisions.

This could be a field for policy action. A possible policy measure could be subsidies for IT consultancy and IT training for firms in the metal products sector. However, no measures should be taken to push firms into the adoption of particular technologies or e-business solutions. The results would be disappointing and the activities would be considered costly failures. This conclusion should be discussed with industry representatives to confirm its appropriateness.

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Annex: Methodology of the e-Business Survey 2002

Background

Most of the data presented in this report are derived from the European e-Business Survey 2002, a cornerstone of the monitoring activities of the *e-Business W@tch*. In total, 9264 telephone interviews with decision makers in European enterprises in all EU Member States were conducted during June and July 2002. For the construction of the questionnaire and for underlying definitions, OECD recommendations were taken into account.

Field work

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

Country	Organisation	Country	Organisation
Austria	Spectra Marktforschung: Brucknerstr. 3-5/4, 4020 Linz	Italy	INRA Demoskopea S.p.A., Via Rubicone 41, 00199 Roma
Belgium	INRA Belgium, Avenue de la Couronne 159-165, 1050 Brussels	Luxembourg	ILReS Market Research, 46, Rue di Cimentière, L-1338 Luxemburg
Denmark	Gallup TNS Denmark, Masnedogade 22-26, 2100 Copenhagen	Netherlands	Blauw Contactcenter, Conradstraat 18, 3013 AP Rotterdam
Germany	INRA Deutschland GmbH, Papenkamp 2-6, 23879 Mölln	Portugal	Metris GfK, Av. Eng. Arantes e Oliveira 3-2, 1900-221 Lisboa
Finland	Taloustutkimus Oy, Lemuntie 9, 00510 Helsinki	Spain	INRA España S.A., C. Alberto Aguilera, 7-5, 28015 Madrid
France	CSA TMO, 22 rue du 4 Septembre, 75065 Paris Cedex 02	Sweden	GfK Sverige, Box 401, 221 00 Lund
Greece	MEMRB – K.E.M.E., 24 Ippodamou St., 11635 Athens	UK	Continental Research, 132-140 Goswell Road, EC1V 7DY London
Ireland	Lansdowne Market Research, 49 St., Stephens Green, Dublin 2		

Interview method

The field work was carried out in June and July 2002 using computer-aided telephone interview (CATI) technology. The decision maker in the enterprise targeted by the survey was normally the person responsible for ICT within the company, typically the IT manager. Alternatively, particularly in small enterprises which may not have a separate IT unit, the managing director or owner was interviewed.

Population coverage and sampling

The highest level of the population for the e-Business Survey was the set of all enterprises which are active at the national territory of one of the EU Member States and which have their primary business activity in one of the 15 sectors specified by NACE Rev. 1 codes. The most important used viewpoints for breakdown of the population in the survey were (i) the economic activity, (ii) the national territory of the enterprise and (iii) the size in terms of employees. The survey was carried out as an enterprise survey, i.e. data collection and reporting focuses on the enterprise (rather than on the establishment), defined as a business organisation of one or more establishments comprised as one legal unit.

The sample included enterprises from 15 sectors of the economy, defined by NACE Rev. 1 business activities (see table next page). The composition of sectors took into account their economic importance, homogeneity with respect to the analysis of e-business, and the relevance of e-business activities.

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

Samples were drawn locally by the INRA partner organisations based on the acknowledged business directories and databases (cf. table next page).

Population coverage of the e-Business Survey (2002)

No.	NACE Rev. 1 Codes (Section – Division/Group)		Sector Name
01	D	15, 16	Manufacture of food products, beverages and tobacco
02	D / O	22, 92.1, 92.2	Publishing, printing, reproduction of recorded media, audiovisual services
03	D	24, 25	Manufacture of chemicals and chemical products
04	D	28	Manufacture of metal products
05	D	29 (except 29.6, 29.7)	Manufacture of machinery and equipment
06	D	30, 31 (except 31.3 - 31.6), 32	Manufacture of Electrical machinery and electronics
07	D	34, 35	Manufacture of transport equipment
08	G	52.11, 52.12, 52.4	Retail
09	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
10	J	65.12, 65.2	Credit institutions, investment firms and leasing enterprises
11	J	66	Insurance and pension funding services
12	K	70	Real estate activities
13	K	74	Business services
14	I / K	64.2, 72	Telecommunications and computer-related services
15	N	85.11, 85.12, 85.3	Health and social services

Country	Directory / Database	Country	Directory / Database
Austria	Herold BUSINESS MARKETING database	Italy	Dun & Bradstreet
Belgium	SPECTRON database by Vicindo	Luxembourg	Rèpertoire des entreprises luxembourgeoises by STATEC (the official list of the National Statistic Administration).
Denmark	KOB (Købmandsstandens Oplysnings Bureau)	Netherlands	MarktSelect
Germany	Heins und Partner Business Pool	Portugal	Business directory by INE (the National Statistics Institute)
Finland	Blue Book - Salesleads database by the Helsinki Media Company Oy (Sanoma Magazines Finland)	Spain	Dun & Bradstreet
France	IDATA, based on "INSEE Siren file" (the National Institute of Statistics) and other directories	Sweden	Swedish Post Adress Register (PAR)
Greece	ICAP directory (the major database for Greece)	UK	Dun & Bradstreet
Ireland	Bill Moss / Dun & Bradstreet		

In total, 9264 interviews were carried out. The following table shows the breakdown by country and the average interview length:

Country	No. of interviews	Average length	Country	No. of interviews	Average length
Austria	308	17.0 min.	Italy	1517	22.5 min.
Belgium	300	18.2 min.	Luxembourg	102	17.4 min.
Denmark	304	20.2 min.	Netherlands	500	17.2 min.
Germany	1500	18.8 min.	Portugal	300	23.0 min.
Finland	308	20.6 min.	Spain	502	18.4 min.
France	1362	17.2 min.	Sweden	260	19.8 min.
Greece	308	16.5 min.	UK	1538	16.5 min.
Ireland	155	20.1 min.	TOTAL	9264	~ 18 min.

Problems encountered

No major problems were reported by the fieldwork organisations with respect to interviewing (e.g. comprehensibility of the questionnaire, logical structure). A statement from the institute that carried out the survey in the UK summarises this general assessment very well: "On the whole, the fieldwork went relatively smoothly. The questionnaire was logically structured and flowed naturally. Most problems stemmed from the difficulties of conducting research projects among ICT decision makers in general rather than from any specific flaws in design of this project itself. Dedicated ICT professionals are heavily researched and therefore securing their participation can be difficult. This is a particular problem in larger companies."

In some countries, it was not possible to accomplish the number of interviews envisaged, mainly in those cases where the total population of enterprises was relatively small (e.g. in the insurance sector in smaller countries). In some cases, the objective of including a share of 10% of large companies could not be accomplished; if possible, these were then replaced by interviews with SMEs.

An issue – which was known in advance but is unavoidable in telephone interviews – is that it is not always easy to find the right target person. Field work organizations reported that sometimes a data processing manager is not very aware of the consequences of e-business on the whole of the company, on the personnel level and on the financial level. On the other hand, the general manager may not always be aware of the implementation status and technical consequences.

Tabulations

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

1. An activity breakdown of the population of enterprises into 15 sectors. This breakdown is based on the aggregate of four countries (D, F, I, UK), as in these countries all 15 sectors were included in the survey and therefore comparability of the sample is given. These four countries represent more than 60% of the market volume in any of the 15 sectors and in most sectors actually more than 70%.
2. A size-class breakdown of the population of enterprises into three categories: small enterprises (including micro-enterprises, i.e. enterprises with 0-49 employees), medium sized enterprises (50-249 employees) and large enterprises (250+ employees).

A breakdown of the population by EU Member States is also available, but it is restricted to four countries (D, F, I, UK) for the same reason as explained in (1.) above. This implies that two different kinds of totals were calculated: (i) an EU-4 total consisting of the results from Germany, France, Italy and the UK and (ii) a sector total consisting of all countries included in the survey of a particular sector. For reasons of comparability and consistency, tables comparing sectors build on the EU-4 totals. Sector totals are composed of 6-8 countries per sector.

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

Weighting principles

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

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

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

Variables - indicators

The set of ICT and e-business indicators for which data were collected in this survey can be structured into five main modules:

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

The choice of indicators includes a basic set of widely accepted measures for e-commerce and e-business (as used in related surveys on e-commerce and e-business e.g. by Eurostat), but also introduces a few innovative indicators which have a pilot character and are not yet widely tested. The full list of variables which was the basis for preparing the questionnaire can be downloaded (as a spreadsheet) from the *e-Business W@tch* website at its "database" section (http://www.ebusiness-watch.org/marketwatch/database/survey_info.htm).