



The European  
e-Business  
Market Watch  
Sector Report  
No. 2 III/July 2003

2 III

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



## ICT & e-Business in the Chemical Industries

**eEurope**  
Go Digital



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

## *Disclaimer*

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information. The views expressed in this report are those of the authors and do not necessarily reflect those of the European Commission. Nothing in this report implies or expresses a warranty of any kind. Results from this report should only be used as guidelines as part of an overall strategy. For detailed advice on corporate planning, business processes and management, technology integration and legal or tax issues, the services of a professional should be obtained.

## *Acknowledgements*

This report was prepared by *Berlecon Research GmbH* (Berlin) on behalf of the European Commission, Enterprise Directorate General. It is part of a deliverable in the context of the European e-Business Market W@tch (short name: *e-Business W@tch*), which is implemented by *empirica GmbH* in co-operation with *DIW Berlin* and *Databank Consulting* and with support of *Berlecon Research* (Berlin) on behalf of the European Commission based on a service contract running from January 2002 until June 2003.

## *Contact*



empirica GmbH  
Oxfordstr. 2  
D-53111 Bonn  
[info@empirica.com](mailto:info@empirica.com)



DIW Berlin  
Königin-Luise-Str. 5  
D-14195 Berlin  
[pkoeffinger@diw.de](mailto:pkoeffinger@diw.de)



Databank Consulting spa  
Corso Italia 8  
I-20122 Milan  
[dbcons@dbcons.it](mailto:dbcons@dbcons.it)

## *Rights Restrictions*

Any reproduction or republication of this report as a whole or in parts without prior authorisation is strictly prohibited.

Bonn / Brussels, July 2003

## Table of Content

Introduction .....	5
The Chemical Industries: Sector Profile & e-Business .....	7
1 Economic profile .....	7
1.1 <i>Definition and focus</i> .....	7
1.2 <i>Industry statistics</i> .....	9
1.3 <i>General economic trends and challenges</i> .....	14
2 Usage of ICT & e-business .....	16
2.1 <i>The role of ICT and e-business</i> .....	16
2.1.1 E-business drivers .....	16
2.1.2 Importance of e-business .....	18
2.2 <i>ICT infrastructure and skills development in the sector</i> .....	19
2.2.1 ICT infrastructure .....	19
2.2.2 IT skills development .....	21
2.3 <i>E-business activities and impacts</i> .....	22
2.3.1 Internal processes .....	22
2.3.2 Processes of the extended enterprises .....	25
2.3.3 Purchasing .....	29
2.3.4 Marketing and sales .....	32
2.4 <i>E-business development 2002 – 2003: main trends</i> .....	35
3 Summary and conclusions .....	39
3.1 <i>Summary of main findings</i> .....	39
3.2 <i>Economic implications</i> .....	40
3.2.1 Implications for the individual enterprise .....	40
3.2.2 Implications for the industry structure .....	42
3.3 <i>Policy issues</i> .....	43
References .....	45
Annex: Methodology of the e-Business Survey 2003 .....	46

## Index of tables and figures

### Tables

Table 1-1: Structure of the Chemical industries in the EU-13 (2001) by kind of activity .....	10
Table 1-2: Production of chemicals, rubber, and plastics in EU countries 2001 * .....	11
Table 1-3: Number of enterprises in the chemical industries in the EU-13 (2001) by subsectors .....	11
Table 1-4: Employment, productivity and labour costs in the chemical industries in EU countries 2001.....	13
Table 1-5: Size class distribution in the chemical industries in EU-15.....	14
Table 2-1: Chemical industries: Availability of IT infrastructure .....	20
Table 2-2: Chemical industries: Availability of IT infrastructure across countries .....	20
Table 2-3: Chemical industries: Usage of online technologies .....	23
Table 2-4: Chemical industries: Usage of online technologies within the value chain.....	26
Table 2-5: EDI usage .....	26
Table 2-6: Chemical industries: Channels used for purchasing online.....	30
Table 2-7: Chemical industries: Enterprises with a website .....	32
Table 2-8: Chemical industries: Platforms used for selling online .....	34

### Figures

Figure 1-1: Sectoral breakdown of EU chemical industry sales 2001 .....	9
Figure 1-2: Development of production in EU15's chemical industries and overall manufacturing, 1991-2002. ....	12
Figure 1-3: Development of employment in EU15's chemical industries and overall manufacturing, 1991-2002...	13
Figure 2-1: Chemical industries: Importance of e-business in 2003 as perceived by companies.....	19
Figure 2-2: Chemical industries: Companies supporting any kind of networking and IT skills development.....	21
Figure 2-3: Chemical industries: IT training offered to employees .....	21
Figure 2-4: Chemical industries: IT recruitment intensity and difficulties* .....	22
Figure 2-5: Chemical industries: Usage of e-learning and knowledge management systems .....	23
Figure 2-6: Chemical industries: Current and planned usage of CRM systems .....	24
Figure 2-7: Chemical industries: Current and planned usage of ERP systems.....	25
Figure 2-8: Chemical industries: Current and planned usage of SCM systems .....	27
Figure 2-9: Chemical industries: Participation in B2B e-marketplaces .....	28
Figure 2-10: Chemical industries: Companies making online purchases .....	29
Figure 2-11: Chemical Industries: Share of online purchases in total procurement (2003).....	30
Figure 2-12: Chemical industries: Impact of purchasing online on ... ..	31
Figure 2-13: Chemical industries: Impact of purchasing online on ... ..	32
Figure 2-14: Chemical industries: Companies selling online .....	33
Figure 2-15: Chemical industries: Share of online sales in total sales (2003).....	33
Figure 2-16: Chemical industries: Impact of selling online on ... ..	35
Figure 2-17: Importance of e-business in 2002 and 2003.....	36
Figure 2-18: Investment climate for e-business technologies.....	37
Figure 2-19: Online purchasing in 2002 and 2003 .....	38

## Introduction

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

Despite the increasing number of studies and market research on electronic business, and especially on electronic commerce, there used to be a lack of reliable empirical information about the extent, scope, nature of and factors affecting the speed of e-business development in Europe at the sectoral level in an internationally comparative framework. This report aims to provide such information for the chemical 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](http://www.ebusiness-watch.org).

### The e-business decision-maker surveys 2002 and 2003

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

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

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

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

## The Chemical Industries: Sector Profile & e-Business

### 1 Economic profile

#### 1.1 Definition and focus

This chapter is based on the (more detailed) introductory chapter to the first Sector Impact Study of the *e-Business W@tch* on the chemical industries, published in July 2002. It summarises and updates key economic statistics about the sector and current trends and 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 can be downloaded from the document archive of the *e-Business W@tch* website at

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

The chemical industries, as defined in this report, consist of two sectors in the sense of the NACE Rev. 1<sup>1</sup> Code: Manufacture of chemicals, chemical products and man-made fibres (NACE 24) and manufacture of rubber and plastic products (NACE 25). As this report discusses both sectors, we will use the terms “the combined chemical industries” or in short “the chemical industries” for the combination of NACE 24 and 25. In the official statistics, this combined sector is divided into nine sub-sectors:

NACE Rev. 1	Activity
24	Manufacture of chemicals, chemical products and man-made fibres
24.1	Manufacture of basic chemicals
24.2	Manufacture of pesticides and other agro-chemical products
24.3	Manufacture of paints, varnishes and similar coatings, printing inks and mastics
24.4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
24.5	Manufacture of soap, detergents, cleaning, polishing
24.6	Manufacture of other chemical products
24.7	Manufacture of chemical fibres
25	Manufacture of rubber and plastic products
25.1	Manufacture of rubber products
25.2	Manufacture of plastic products

While this classification according to NACE (especially on the three-digit level) is the most used in official publications, especially participants from the chemical industry usually split their sector in sub-sectors that differ from the three-digit NACE level. While the NACE classification is product-centred, the industry classification better reflects the peculiarities of value chains and business relationships in the different sub-sectors.

Since the use as well as the impact of e-business depends more on the structure of the value chain and the business relationships than on product characteristics, it is useful to look closer at the chemical industry's convention of defining three sub-sectors, to which we add the plastic products industry. The resulting four main areas of the combined chemical industries are:

- Basic chemicals;
- Fine and speciality chemicals;
- Formulated chemicals; and
- Rubber and plastic products.

<sup>1</sup> For simplicity, we will simply write NACE in the remainder of this report.

As we will often refer to these areas in the analysis of e-business in the combined chemical industries, they are more closely defined in the following section. A detailed definition can be found in the first *Business W@tch* sector report on the chemical industries.

### Basic chemicals

Basic chemicals form the foundation of the chemical industry. Its manufacturers produce inputs for the remainder of the chemical industry from raw minerals, crude oil, gas and energy, typically in large-scale plants. Much of the produced output remains in the chemical industry itself, where it is refined to downstream products. Some examples for output are petrochemicals, basic inorganics, basic organics, and industrial gases.

The production is characterised by large output volumes as well as by high capital and energy intensity. R&D intensity is comparatively low. Raw materials (so-called feedstock) are basic commodities and the main input besides capital. Production costs therefore depend considerably on the prices for feedstock, which are typically commodity prices. Outputs are also commodities, i.e., standardised products that are bought in huge amounts with price being the major decision criterion for the buyer. Typically, the output markets are highly transparent. Due to the high market transparency and standardised product characteristics the switching costs for buyers are low and the markets are very competitive, implying comparatively low profit margins.

### Fine and speciality chemicals

Fine and speciality chemicals are the next element in the chemical industry's value chain. The companies in this segment use basic chemicals as a major input to produce a large variety of special substances, often in relatively small volumes. One part of the output is used by other sub-sectors of the combined chemical industries (e.g. plastics as input for plastic products, soaps as input for toiletries). Another part is sold to outside the combined chemical industries. For example, food additives serve as inputs for the food processing industry or man-made fibres as input for the textile industry.

Production differs considerably from the basic chemicals industry. Much of the output is custom-manufactured for the specific customer, imposing specific requirements onto production plants. Frequently, the product must be developed according to specification before it can be produced – typically in co-operation with the customer. This is one reason why the R&D intensity is comparatively high in this sector. It also implies high switching-costs for the customer. Overall, the manufacture of fine and speciality chemicals is an industry with comparatively high profit margins, where price is not the determining factor for establishing a business relationship. Most but not all products of this sector show these characteristics to full extent. A variety of products, sometimes called “bulk specialities”, are easier to substitute. Pricing for these products is highly competitive and became even more so in recent years due to increased market transparency.

### Formulated chemicals

Formulated chemicals are another step further along the value chain. This sub-sector typically uses basic chemicals as well as speciality chemicals as inputs. The formulated chemicals sector differs from the other two chemical industries in that its products are mostly produced for end use by individuals, government institutions or other companies and not as inputs for other parts of the chemical industry. The most important part of formulated chemicals is the production of pharmaceuticals, medical chemicals and botanical products. Often it is aggregated together with the production of agrochemicals to form a major part of the life-sciences industry.<sup>2</sup> Coatings, inks and adhesives also constitute an important output of this sector, and are used in a variety of industries.

The formulated chemicals sector is characterised by a high R&D intensity. The pharmaceutical and the agrochemical industries in particular conduct significant amounts of research. Those parts of the

---

<sup>2</sup> There is no clear definition of the life-sciences industry. Some consider agrochemicals to be part of it, others do not. In some cases medical equipment is also added to the life-sciences industry, as are food chemicals, etc.

sector that produce chemicals for human consumption are also strictly regulated, posing high demands on the skills of companies to handle such regulations.

The products are typically only partially substitutable, either due to patent protection (e.g. in the pharmaceutical industry) or due to brand name. Therefore brand or monopoly premiums are possible, leading to relatively high margins. However, competition by non-branded products exists and forms the foundation for a low-price segment of the market.

### Rubber and plastic products

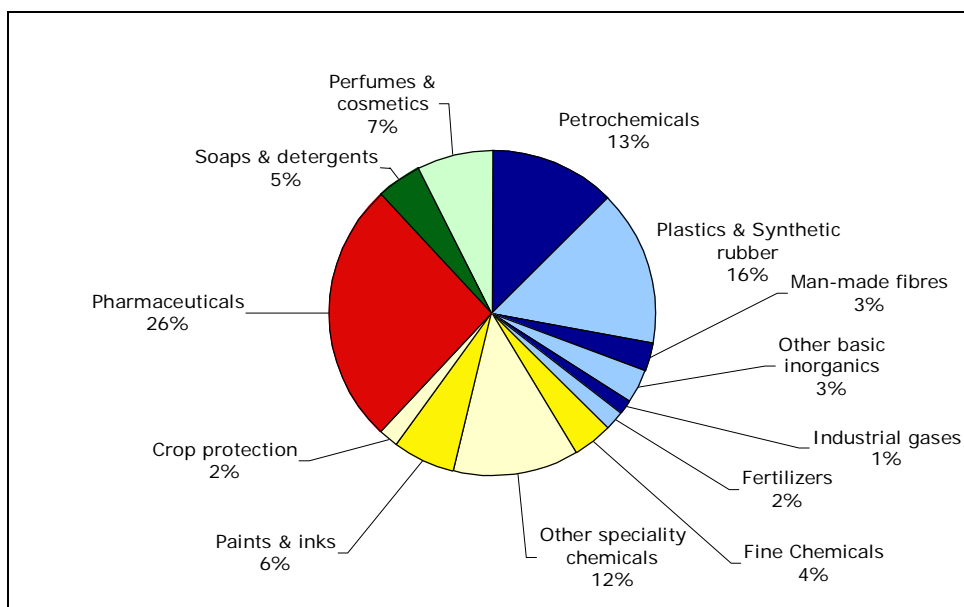
The manufacture of rubber and plastic products is similar to the formulated chemicals sector in that it uses considerable amounts of speciality chemicals as inputs. While synthetic rubbers and rubber chemicals are important inputs for the rubber products industry, the plastic product industry's major input are resins. The rubber products industry and the plastic products industry differ very much in market structure as well as in output markets. Within rubber, the manufacture of tyres accounts for almost half of production value, the most important single part. The industry's most important customer is the automotive industry, not only for tyres but also for non-tyre products, e.g. for wiper blades, belts, weather stripping or windows and door seals. The tyre industry is dominated by the three large companies Goodyear (USA), Michelin (France), and Bridgestone/Firestone (Japan).

Quite contrastingly, the plastics industry is characterised by a high number of SMEs, which produce all sorts of plastic products. The major production process is extrusion, where the heated plastic is made into its intended form. While many companies concentrate solely on extrusion, others are integrated forward into the production of fabricated products, such as complete windows and patio doors, thermoformed containers or printed signs.

### Production value by sub-sector

Figure 1-1 shows in more detail the output structure of the chemical industry (excluding rubber and plastics) in Europe, using industry sales data. The blue items from petrochemicals to fertilisers are basic chemicals, accounting for almost 38% of total sales. The next four (in yellow) belong to fine and speciality chemicals (24%). The formulated chemicals defined above are here divided into pharmaceuticals (red, 26%) and consumer chemicals (green, 12%).

Figure 1-1: Sectoral breakdown of EU chemical industry sales 2001



Source: CEFIC ([www.cefic.org/factsandfigures](http://www.cefic.org/factsandfigures)). Shares based on data from A, D, E, F, I, NL, FIN, UK.

## 1.2 Industry statistics

This section briefly summarizes the main economic indicators of the combined chemical industries. The analysis of e-business in chapter 2 can thus be interpreted with the size, importance and structure of the sector in mind. A more detailed presentation of the sector's economic situation can be found in the first *e-Business W@tch* report on the chemical industries as well as in the literature mentioned therein.

### Production value and value added

Altogether, the combined chemical industries produced output worth 675 billion Euro in 2001, the last year for which data is available (see table 1-1). Within the combined chemical industries, the chemical industry alone (NACE 24) accounts for about 73% of aggregated production volume. Together, the combined chemical industries account for 14% of the production value of EU manufacturing (see table 1-2). Thus, they are of considerable weight in Europe's economy.

Value added at factor cost was roughly one third of the production value, reflecting the large importance of direct production inputs. Much of this input comes from the chemical industry; energy and commodities are other important inputs.

In the chemical industries production value as well as value added in the EU are dominated by the four largest EU member countries Germany, France, UK, and Italy. Together, these four countries account for 74% of total production value in the EU-13 as well as for 74% of value added. Germany alone, the largest producer, accounts for 25% of production value and for 28% of value added in this sector.

Table 1-1: Structure of the Chemical industries in the EU-13 (2001) by kind of activity

NACE Rev. 1		Production value		Value added at factor cost (est.)	
		EUR (m)*	%	EUR (m)*	%
24.1	Manufacture of basic chemicals <sup>1)</sup>	192,312.7	39.6	49,309.7	34.0
24.2	Manufacture of pesticides and other agro-chemical products <sup>2)</sup>	8,302.5	1.7	2,306.5	1.6
24.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics <sup>1)</sup>	34,584.6	7.1	10,614.3	7.3
24.4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products <sup>1)</sup>	139,077.8	28.6	50,710.1	35.0
24.5	Manufacture of soap, detergents, cleaning, polishing <sup>3)</sup>	55,755.1	11.5	15,687.6	10.8
24.6	Manufacture of other chemical products <sup>4)</sup>	40,188.1	8.3	12,399.8	8.6
24.7	Manufacture of man-made fibres <sup>5)</sup>	9,886.2	2.0	2,831.6	2.0
	unassigned (see footnotes 1 to 5)	5,748.8	1.2	1,033.2	0.7
<b>24</b>	<b>Manufacture of chemicals and chemical products</b>	<b>485,855.8</b>	<b>100.0</b>	<b>144,892.8</b>	<b>100.0</b>
25.1	Manufacture of rubber products	39,428.5	20.8	15,281.3	22.9
25.2	Manufacture of plastic products	150,097.5	79.2	51,514.3	77.1
<b>25</b>	<b>Manufacture of rubber and plastic products</b>	<b>189,525.9</b>	<b>100.0</b>	<b>66,795.6</b>	<b>100.0</b>

\* EU-13 = EU-15 excluding Greece and Ireland.  
1) EU-12 = EU-13 excluding Luxembourg.  
2) EU-10 = EU-13 excluding Belgium, Denmark, and Austria.  
3) EU-11 = EU-13 excluding Luxembourg and Finland.  
4) EU-11 = EU-13 excluding Belgium and Sweden.  
5) EU-8 = EU-13 excluding Denmark, Luxembourg, Austria, Finland, and Sweden.

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

Table 1-2: Production of chemicals, rubber, and plastics in EU countries 2001 \*

	Production value		Value added at factor cost		Share in total manufacturing	
	Mill. EUR	%	Mill. EUR	%	Prod. value	Value added
B	34,317.5	5.1	10,782.2	5.1	19.9	24.4
DK	11,655.7	1.7	4,716.1	2.2	15.5	18.1
D	170,217.3	25.2	58,407.7	27.6	13.1	14.2
E	49,759.6	7.4	15,272.0	7.2	13.1	14.4
F	138,348.4	20.5	37,352.3	17.6	16.1	17.6
I	92,810.1	13.7	25,638.3	12.1	11.6	12.2
L	1,397.4	0.2	490.9	0.2	19.0	21.0
NL	40,971.7	6.1	9,582.1	4.5	19.5	17.1
A	11,000.9	1.6	4,038.5	1.9	10.8	11.0
P	5,488.8	0.8	1,584.9	0.7	8.1	8.4
FIN	7,437.1	1.1	2,608.7	1.2	6.7	7.3
S	16,169.8	2.4	5,914.7	2.8	10.6	12.6
UK	95,807.4	14.2	35,300.0	16.7	13.9	15.2
EU-13*	675,381.7	100.0	211,688.4	100.0	13.7	14.7

\* EU-13 = EU-15 excluding Greece and Ireland.

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

Comparing the chemical sectors across countries reveals considerable differences in structure, not only in the sector's absolute size. As table 1-2 shows, for example, the combined chemical industries are responsible for almost a quarter of the value added in Belgium's manufacturing sector while this number is 7% for Finland. Thus, the chemical industries are significantly more important in some countries than in others.

Table 1-3: Number of enterprises in the chemical industries in the EU-13 (2001) by subsectors

Nace Rev. 1	24	24.1	24.2	24.3	24.4	24.5	24.6	24.7	25	25.1	25.2
Country	No. of enterprises	% of sector total (NACE 24)							No. of enterprises	% of sector total (NACE 25)	
EU-11*	18,422	24.7	2.0	14.1	13.6	24.8	19.8	1.0	30,791	12.1	87.9
DK	371	18.3	1.9	16.2	21.0	25.3	16.2	1.1	721	12.2	87.8
D	2,858	19.2	1.3	18.1	17.0	22.7	20.6	1.2	7,046	9.4	90.5
E	4,303	23.4	2.0	15.0	9.4	28.8	20.2	1.2	5,969	17.1	82.9
F	3,912	22.7	3.4	8.9	15.7	31.6	17.0	0.6	5,059	11.1	88.9
L	19	15.8	0.0	21.1	5.3	31.6	21.1	5.3	25	36.0	64.0
NL	770	31.8	1.9	15.6	14.9	18.2	15.6	1.9	1,215	8.6	91.4
A	360	25.3	0.8	11.4	21.9	25.0	14.2	1.4	524	5.9	94.1
P	827	20.0	0.4	18.3	12.5	21.6	25.6	1.7	980	16.0	84.0
FIN	298	36.9	0.0	13.8	10.1	21.8	16.8	0.7	675	11.1	88.9
S	833	22.9	1.4	13.8	14.6	23.8	22.7	0.7	1,542	16.1	83.9
UK	3,871	31.9	1.6	14.3	12.4	17.3	21.6	0.9	7,035	10.8	89.2
B <sup>1)</sup>	787	29.1	1.0	16.0	12.6	22.0	15.6	3.7	800	11.3	88.8
IRL <sup>2)</sup>	207	29.0	2.9	8.2	29.0	14.5	14.5	1.9	279	11.5	88.5
I <sup>1)</sup>	6,348	17.5	1.2	16.5	11.8	26.0	25.6	1.4	13,592	12.5	87.5
EU-14 <sup>3)</sup>	25,764	23.1	1.8	14.7	13.3	24.9	21.0	1.2	45,462	12.2	87.8

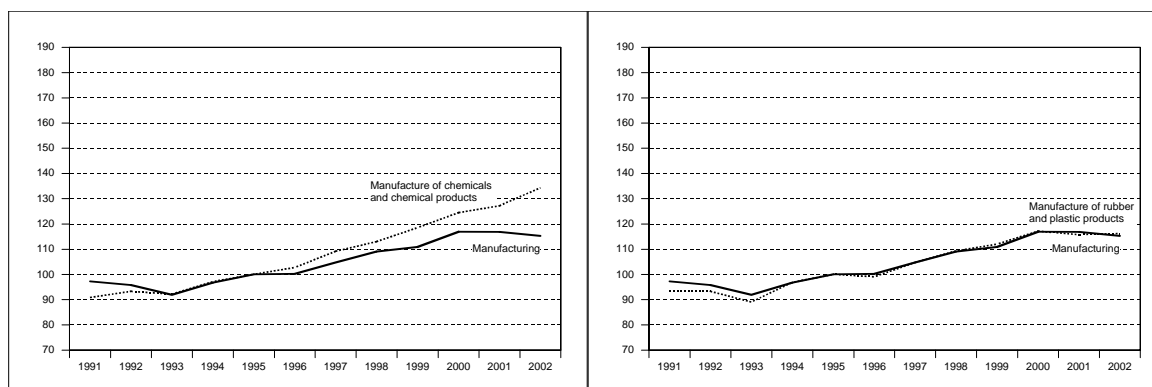
\* EU-11 = EU-15 excluding Belgium, Greece, Ireland, and Italy.

1) Belgium and Italy from 2000- 2) Ireland from 1999- 3) EU-14 = EU-15 excluding Greece.

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

As a comparison of tables 1-1 and 1-3 further shows, the size of companies also differs significantly. In Spain, for example, there are more than 4,000 companies in the chemical sector (NACE 24) alone, producing almost 50 billion Euro of output. In Germany, however, less than 3,000 companies produce more than 170 billion Euro of output. German chemical companies are accordingly much larger.

Figure 1-2: Development of production in EU15's chemical industries and overall manufacturing, 1991-2002.



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

Growth in the chemical industry was comparatively strong since the mid-90s, as figure 1-2 shows. Compared to the manufacturing sector as a total (1.4% per year during 1991-2002), production in the chemical industries grew significantly stronger (3.3%). Growth in the manufacturing of rubber and plastics was very much in line with total manufacturing growth (1.8%).

However, not all parts of the chemical industry grew equally strongly: The most powerful driver during the 1990s was the pharmaceutical industry. Its European production value grew on average by 5.2% each year in the period 1990-2001 (CEFIC 2002b). Basic chemicals (3.9%) also grew faster than industry average (3.2%).

In 2001 this effect was especially pronounced. According to CEFIC (2002) estimates, production of pharmaceuticals grew by 9.9% in this year. However, growth of the remaining chemical industry was negative (-0.5%). The beginning world recession and the US events of September 11 in particular were responsible for this outcome.

### Employment, productivity and labour costs

Overall, the European enterprises in the combined chemical industries had more than 3 million employees in 2001 (see table 1-4). This constitutes a share of 11% in total manufacturing employment. This value is smaller than the sector's share in total manufacturing production, which is at least partly due to the high capital intensity in the chemical industry.

The two sub-sectors, chemical production and production of rubber and plastics products, are both responsible for a significant share in employment. The chemical industry has almost 1.7 million employees, and the rubber and plastic products industry has nearly 1.3 million. Thus, while the output and value added for the chemical industry are much larger than for the rubber and plastic products industry, the employment contribution of the latter is more significant.

As figure 1-3 shows, the employment contribution has increased over the last decade, as employment in the rubber and plastics industry developed more positively than in the chemical industry and in total manufacturing. This can also be seen from absolute numbers. While the chemical industry shows a picture of continuous job losses – 234,000 during the 1990s – in the same time span, the manufacturing of plastic and rubber products has created 74,000 jobs in Europe – mainly since the mid-1990s.<sup>3</sup>

<sup>3</sup> See the first *e-Business W@tch* report on chemical industries.

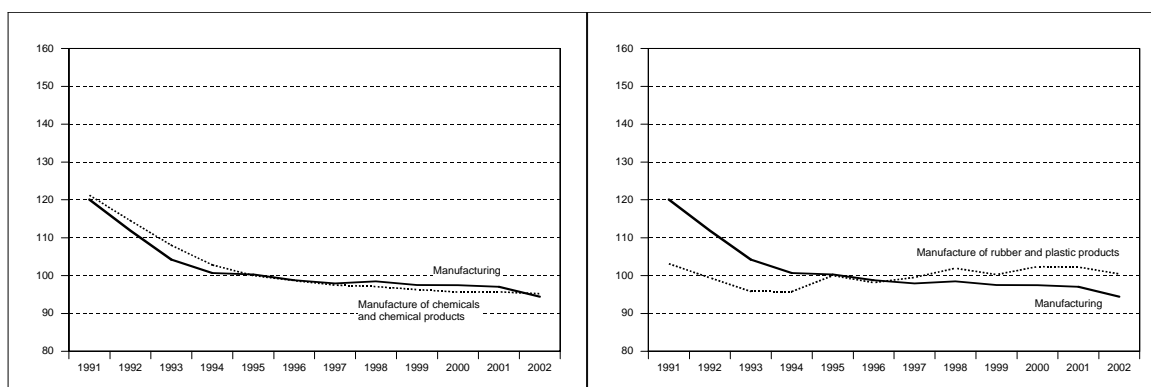
Table 1-4: Employment, productivity and labour costs in the chemical industries in EU countries 2001

	Employment		Productivity		Labour Costs	
	Persons	in % of total	value added per	in % of total	per employee <sup>1)</sup>	in % of total
	employed	manufacturing	person employed <sup>1)</sup>	manufacturing		manufacturing
B	103,429	15.3	104.2	160.0	57.6	129.4
DK	48,430	10.0	97.4	180.2	44.7	123.5
D	876,200	11.8	66.7	119.5	47.0	114.2
E	262,353	9.9	58.2	145.4	34.0	130.9
F	522,034	16.2	71.6	109.1	43.8	93.6
I	428,031	8.6	59.9	142.6	36.3	126.6
L	5,495	16.3	89.3	128.7	50.6	119.0
NL	107,032	12.1	89.5	141.4	47.2	115.9
A	58,631	9.3	68.9	118.4	43.4	110.5
P	47,527	5.0	33.3	168.4	19.5	156.9
FIN	36,586	8.2	71.3	89.0	37.9	96.2
S	69,203	8.6	85.5	146.3	44.6	112.8
UK	491,277	12.4	71.9	122.8	42.1	113.8
EU-13*	3,056,228	11.3	69.3	130.7	42.8	117.0

\* EU-13 = EU-15 excluding Greece and Ireland. 1) in 1000 Euro.

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

Figure 1-3: Development of employment in EU15's chemical industries and overall manufacturing, 1991-2002.



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

According to Eurostat (2001), the share of highly educated employees in the EU chemical industry is quite high, at 27% on average. Highly educated employees are here defined as those with more than second-level education. In comparison, only 12% of the employees in rubber and plastic product manufacturing were highly educated. On average over the combined chemical industries, the high share of well-qualified workers shows in above-average labour costs (table 1-4). In EU-13 labour costs in the chemical industries are about 17% higher than in overall manufacturing.

As Eurostat (2001) further shows, the share of highly educated employees not only differs by sub-sector, but also by country. The different countries show shares between 10-50% within the chemical sector and between 5-28% within the rubber and plastics industry. This is in accordance with large fluctuations of the relative labour costs, which in the different member countries are between 6% lower and 57% higher than in overall manufacturing.

The relatively high wages are earned by above-average productivity. Value added per person employed in the combined chemical industries was at 69,300 Euro in 2001, 16,300 Euro (roughly 31%) more than the EU manufacturing average. A closer look at the three different sub-sectors of the chemical industry shows that productivity is especially high in the basic chemical industry. Data from the late 1990s shows that value added per employee in basic chemicals is almost twice as high as in

fine and speciality chemicals and around 50% higher than in the formulated chemicals industry. Compared to the manufacture of plastic and rubber products, value added per employee in the basic chemical industry is almost three times higher. This shows that overall productivity in the combined chemicals industry depends very much on the relative importance of the respective sub-sectors in the industry.

### Industry structure by size-class distribution

The size class distribution shows a comparatively high percentage of small enterprises (97% are SMEs) for the chemical industries. These, however, have a comparatively small importance for employment and turnover in this sector. More than half of all employees are working in large companies, which sell output worth about two thirds of the sector's turnover (see table 1-5).

Table 1-5: Size class distribution in the chemical industries in EU-15

Variable	Enterprises with ... persons employed (share in % of total)			
	1 to 9	10 to 49	50 to 249	250 and more
Persons employed	4.6%	14.7%	25.7%	54.9%
Total turnover	2.7%	9.8%	21.7%	65.7%
Number of enterprises	58.0%	28.5%	10.4%	3.0%

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

Due to the different production structure there exist considerable differences between the chemical industry on the one hand and the rubber and plastics products industry on the other hand. Large enterprises have a significantly higher importance in the chemical industry than in the plastic products industry, where SMEs are more frequent. While more than two thirds of turnover is generated by large enterprises in the chemical industry, this value is significantly less than one half in the plastic products industry. The difference is even more pronounced for employment: While more than two thirds of employees in the chemical industry work in large companies, less than 40% do so in the plastic products industry. Here almost a third of all jobs are in enterprises with less than 50 employees.

## 1.3 General economic trends and challenges

Several industry-specific issues and challenges exist for the combined chemical industries, some stemming from their worldwide operations, others from the special business relationships between their players and a third group from the special characteristics of their products. Current major issues are:

- Effects of the current state of the world economy
- Planned regulatory changes
- Structural changes and regional shifts

### Effects of the current state of the world economy

As the chemical industries are dependent on raw materials as inputs (e.g. oil and energy), fluctuations in the prices of these goods heavily influence the profitability of its enterprises. Therefore, the fluctuations in oil and energy prices in the wake of the Iraq conflict also affected this sector, especially the producers of basic chemicals.

Closely related to this issue are exchange rate fluctuations. The recent weakening of the dollar and strengthening of the Euro had two contrary effects on chemical companies in Europe: On the one hand, oil and other raw materials, which are largely billed in dollars, became cheaper. This helped to offset price increases. But on the other hand, the weak dollar put pressure on profitability: Many chemical companies bill a considerable fraction of their output in dollars. Those companies that have to pay a large part of costs in Euro and cannot raise dollar prices for their output in the short run – due

to contractual obligations or competitive pressure – experience a fall in profits. The actual effect thus depends very much on the product and currency mix of each individual company.

Finally, the current weak world economic climate also had its effects on the chemical industries. After a good start, the chemical industry's output fell during 2001, according to CEFIC (2002), due to the September 11 events as well as the sharp reduction in raw material stocks from end-use sectors. Chemical companies serving other industrial sectors were much more strongly affected than, for example, pharmaceuticals. The year 2002 looked better for the chemical industry by showing again moderate economic growth (CEFIC 2002a). Whether the hoped-for recovery in 2003 actually will take place is too early to say, as the total effects of major world-wide issues such as the Iraq conflict or SARS on the world economy remain to be seen.

### **Planned regulatory changes**

In Europe the planned new regulatory environment for the chemical industry is intensely debated (European Commission, 2001). A major aim of these changes is to harmonize different treatment of so-called existing chemicals (introduced into the market before September 1981) and new substances. Existing substances represent by far the largest share of output and it is felt by policy-makers that not enough information about the properties of these substances is available. The most important substances are planned to be registered in a central database together with their basic properties. Suspected dangerous substances shall be tested for their physical, chemical, toxicological and ecotoxicological properties and the results be made public.

A key feature of the new regulatory system proposed by the European Commission is that the industry should become more pro-active in providing information and assuming responsibility for their products. Apart from this shift in responsibility, an important topic in the ongoing discussion concerns the costs of this new regulatory environment for the chemical industry and its effect on innovation and competitiveness. While the European Commission regards costs and benefits as balanced, the chemical industry itself fears detrimental effects for jobs, output and international competitiveness.

### **Structural changes and regional shifts**

During the last several years, exports and imports of chemical and plastic products have increased, making the industry more global. The Internet and other ICTs have helped in realising a global market for these products by increasing transparency. This, however, reinforces the pressure on output prices. It puts mergers and consolidation on the agenda also for those parts of the industry that could formerly live comfortably within their special niche, for example in speciality chemicals. Companies in Asia in particular are increasingly competing with European chemical enterprises.

Another factor for an increasing globalisation has been the economic development of emerging markets. The proceeding industrialisation in both Asia and Latin America, combined with a higher standard of living, led to a demand for sophisticated chemical and pharmaceutical products. For European companies this development is a threat in the form of increasingly sophisticated competitors in these countries on the one hand, and an opportunity to enter new markets on the other hand.

## 2 Usage of ICT & e-business

### 2.1 The role of ICT and e-business

#### 2.1.1 E-business drivers

The main driving forces for using e-business in the combined chemical industries differ quite substantially from sub-sector to sub-sector, as the chemical industries are very diverse. Commodity-producing companies in the basic chemicals industry, for example, place different hopes in e-business than R&D-intensive pharmaceutical companies do. Overall, four major drivers for e-business in the chemical industries can be identified:

- Decreasing processing costs
- Speeding up information flows
- Improving information about the market
- Extending the market

#### Decreasing processing costs

Using e-business to decrease the costs related to commercial transactions, e.g. processing and changing orders, and at the same time reducing error rates, is a major driver of e-business in this sector. Due to the usually large number of transactions, even fractional improvements in these processes can aggregate to quite substantial savings. For example, procurement of input materials – and the costs associated with this process – are an important element in the chemical industries.

The basic chemicals industry in particular, relying heavily on commodity inputs and active on rather competitive output markets, has an incentive to advance e-business for this purpose. As this industry is producing commodities with rather thin margins and also uses commodities as input, its major potential to increase profit margins lies in the reduction of internal costs. The basic chemicals industry also provides ideal preconditions for the rapid dissemination of e-commerce. As its outputs are commodities traded under almost perfect competition, all companies have to follow with process improvements once one company has achieved savings from its e-commerce activities.

This setting explains the focus on ERP-to-ERP connectivity as one of the aims of e-business activities in the chemical industries. It also explains the existence of e-marketplaces and interconnection hubs, which help to realise this connectivity. Compared to other industries, in the chemical industry the preconditions for realising ERP-to-ERP connectivity and thus fully automatic electronic business are very good. Chemicals are easy to describe and easy to classify. Furthermore, only a few accepted classifications of chemicals (e.g. CAS, see section 2.3.2) exist, which increases the probability that companies can settle on a common classification. This is probably one reason why product catalogues – either on single websites or on catalogue marketplaces – have gained acceptance rather quickly.

In other parts of the chemical industry, for example in speciality chemicals, the potential cost savings from electronic order processing are mostly relevant on the procurement side, where direct materials are an important input. On the customer side other e-business activities, e.g. e-collaboration in product design, can reduce costs in product development. Making these processes more efficient and thereby generating cost savings is of special importance in this industry.

#### Speeding up information flows

Speeding up information flows and thereby accelerating processes is the primary driver in other sub-sectors, particularly the formulated chemicals industry, among them the pharmaceutical industry. In the pharmaceutical industry, research and development, as well as clinical trials constitute a major part of business activity. Companies that are able to make the corresponding processes as efficient as possible by speeding up information flows enjoy a longer period of monopoly with their product, and thus higher profits.

In the pharmaceutical industry four areas of e-business are of special importance:

- **Knowledge management solutions** that can help researchers and product developers to find the information they need more quickly, be it scientific information, patent information or information about specific regulations. As R&D depends very much on information flow and information sharing, an improvement of these activities can have a major impact on the bottom line.
- **The use of Internet and mobile devices in the clinical trial phase** can help to speed up the information gathering process. At the same time information transfer errors can be avoided and the trial results can be stored in a way that corresponds to compliance regulation.
- **Electronic collaboration** is another important area of e-business in the R&D-intensive chemical industries. Using appropriate e-business tools, the process of designing drugs or specific chemicals can be speeded up, leading to corresponding cost savings. This driver is not only important in the pharmaceutical industry but also in the speciality chemical industry. The chemicals are often developed by the speciality chemical company in tight collaboration with its customer.
- **Remote access to the company's IT systems** is of particular importance for pharmaceutical companies, which have large numbers of sales and customer care people, who are typically spending most of their time with customers. Connecting these fieldworkers to the information in the company's ERP and CRM systems can improve their ability to sell the right products considerably. Wireless devices and connections using mobile phones and PDAs provide means to realise these improvements.

"This (*the chemical industry*) is an industry in transition, defined by its complex global supply chain, multi-organization product-development process, and economic environment where access to information is now rivalling the ownership of physical assets as the source of sustainable competitive advantage."

Rosie Hartman, Computer Sciences Corporation ([www.e-chemerce.com](http://www.e-chemerce.com))

### Improving information about the market

Besides improving the access to scientific, product-related information, the Internet considerably enhances the ability to gather information about the market. As a survey of Italian chemical companies shows, 54% of those companies surveyed use the Internet for obtaining information about potential suppliers. It is therefore only reasonable that almost 70% also offered detailed information about their products or services on their website (Federchimica, 2001).

A number of industry-wide Internet services exist in this sector, i.e. portals and related websites that are devoted to the chemical and plastics industry. A first group, industry information services, are sites with information about the industry, chemicals, chemical processes, legislation and similar issues. They speed up the flow of information within the industry and thereby improve the knowledge within chemical companies. A second group, sourcing sites, provide information or services that are of use in a pre-transaction state. They are more closely related to e-commerce, as they provide information about suppliers, their products and prices. These sites make the matching process in the market more efficient and can therefore increase competition in those areas of the combined chemical industries where lack of product and pricing information is responsible for a higher price level.

Particularly in basic chemicals, which are well suited for being traded on exchanges, Internet platforms provide up-to date information about the current prices of these commodities. Buyers can use the information from the platforms to renegotiate their current contracts or let the prices be connected in some way to the spot prices on exchanges. The most important result of this additional information is a greater market transparency. It benefits mostly the buyer of products, making this driver more asymmetric than the previous two.

## Extending the market

Being able to extend one's market is one of the outcomes hoped for from e-business. One has to distinguish two aspects, though: indirect and direct effects. The indirect effects are based on the cost savings and process improvements a company can achieve by conducting e-business. As the company does so, its competitiveness improves, and it will win contracts more easily and thereby extend its market.

The direct effects are based on the idea that on the Internet and on electronic marketplaces the company can be found more easily and thereby conduct business with new partners, which were previously unaware of its existence. The presence on the Internet and activities on e-marketplaces enables less well known companies to reach a larger number of potential clients and to make their products and services known to the world. As will be shown in section 2.3.4 below, many of the companies surveyed by the *e-Business W@tch* were able to increase their number of customers and enlarge their sales area by selling online on the Internet.

### 2.1.2 Importance of e-business

The chemical industry is often perceived as one of the forerunners in e-business. Preconditions in the chemical industries for B2B e-commerce are often considered as exceptionally good – this was the case particularly in the early days of the e-business boom. For example, in a study published in 2000, Forrester Research identified the chemical industry as one of the biggest factors in the B2B e-commerce development, and expected it to be the third largest Internet market behind electronics/high tech and the automotive industry in 2003<sup>4</sup>. They estimated that 35% of sales by chemical firms would be conducted online by 2002<sup>5</sup>. Other studies and the media paint a similar picture of an industry that quickly adopts e-business.<sup>6</sup>

Results of the *e-Business W@tch* survey, however, paint a different picture at first sight: survey results depicted in figure 2-1, for example, show that only 8% of the enterprises in the combined chemical industries of the EU-5 say that e-business constitutes a significant part of the way their company operates today. This is clearly below the average of 14% over all 7 sectors surveyed. Even more surprising is that almost half of the chemical enterprises do not ascribe *any* role to e-business. Data presented in the following chapters of this report, e.g. on the use of e-marketplaces or online purchasing and online selling also show that the level of e-business activities in the combined chemical industries is more or less in line with other sectors rather than being exceptionally high.

Two explanations for these different views on the importance of e-business for the chemical industries exist. Firstly, "the chemical industries" is not always defined in the same way. Often, the pharmaceutical industry (NACE 24.4) is not included in market surveys and analyses but discussed as a different industry. In addition, the plastic and rubber product industry (NACE 25) is frequently not explicitly included, as it is in this survey. Secondly, many studies, press articles and best practice examples focus very much on e-business activities by large, globally active chemical companies. These constitute the major customer group of e-business software providers as well as consultants and are therefore primarily addressed in the respective reports and studies. However, while global giants account for a large share in turnover and employment in this sector, they only make up a fraction of the number of enterprises (see table 1-5 above).

---

<sup>4</sup> Forrester (2000)

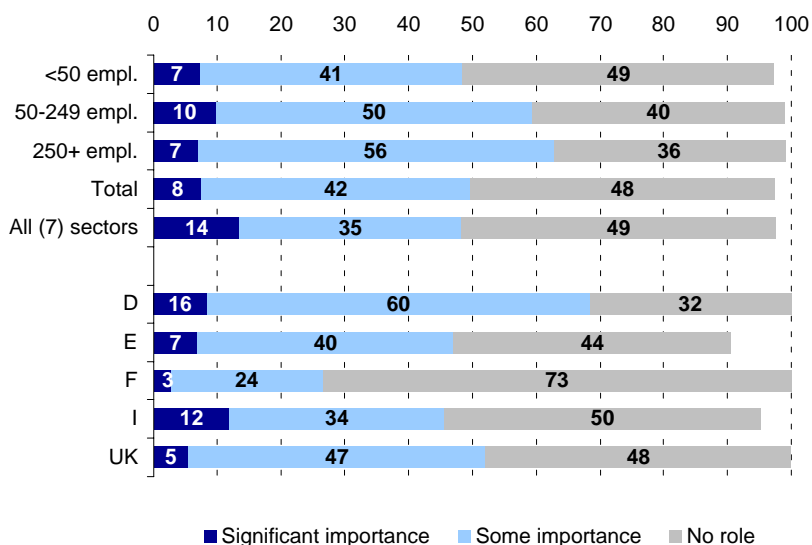
<sup>5</sup> Forrester (2001)

<sup>6</sup> E.g.: Julia King: "Chemical sector leads e-business", Computerworld, October 2000. Rob Spiegel: "B2B E-Commerce Transforms Chemical Industry", E-Commerce Times, January 2000. See also: studies presented in the first *e-Business W@tch* sector report on the chemical industries.

Figure 2-1: Chemical industries: Importance of e-business in 2003 as perceived by companies

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

Source: e-Business W@tch (2003)



## 2.2 ICT infrastructure and skills development in the sector

### 2.2.1 ICT infrastructure

#### General ICT infrastructure

On the ICT infrastructure side, the prerequisites for using e-business can be considered as rather good in the combined chemical industries. Due to the comparatively high importance of large companies – particularly in NACE 24 – a large number of employees in the sector work in companies that are equipped with an above average IT infrastructure. This assessment holds true for all 5 surveyed countries (see table 2-2).

97% of all employees in the sector work in companies that have Internet access, compared to an average of 87% in all sectors. An above average share of employees also works in companies that use e-mail, the World Wide Web, and have an intra- or extranet implemented (see table 2-1).

Significant differences can be observed between company size classes, however. Large enterprises are clearly better equipped than small ones. For example, only 69% of small companies use the WWW while 94% of the medium-sized and 97% of the large companies do. Large gaps can also be observed in the use of intra- and extranets. While the stronger use of the Internet, the WWW and e-mail clearly puts large companies at a better starting position for e-business, intra- and extranets often are simply less applicable in small companies. For instance many smaller companies do not have an internal network of connected computers that they consider to be an intranet.

#### Physical IT infrastructure

The physical IT infrastructure in the chemical industries is above average as well. More than 80% of employees in the sector work in companies that have a LAN (local area network), and almost half of all employees work in companies with a WAN (wide area network). Both numbers are significantly higher than on average over all sectors in the EU-5. This is again due to the high share of large companies in the chemical industries. For small companies with a small number of computers the implementation of a LAN is often not necessary or does not make economic sense. The same is true for the implementation of WANs, which primarily connect different offices of regionally spread companies.

Table 2-1: Chemical industries: Availability of IT infrastructure

Available ICT infrastructure	All (7) sectors	Chemical industries			
		Total	<50 empl.	50-249 empl.	250+ empl.
Computer usage	93	99	96	100	100
Internet access	87	97	87	99	99
E-Mail usage	83	94	81	99	97
WWW usage	77	91	69	94	97
Intranet	49	62	19	59	77
Extranet	17	27	4	18	38
LAN	61	81	37	89	94
WAN	34	49	6	32	69
Remote access *	43	59	22	51	73
Wireless access *	14	13	6	11	16

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total), except\*: enterprises using computers (N=489 for sector total). Figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March 2003.

Source: e-Business W@tch (2003)

### Remote access solutions

Remote access solutions are significantly more prevalent in the chemical industries than in other sectors: almost 60% of the employees in this sector work in enterprises that offer their staff remote access to the company's computer system; an additional 9% plans to enable remote access within the next year (see table 2-1). This outcome is, however, again strongly influenced by the dominance of large enterprises in the chemical industries. On an enterprise-weighted basis, the percentage of enterprises with remote access solutions is at only 27% (4% planned). As stated above (see section 2.1.1), remote access solutions play an important role particularly in large pharmaceutical companies, which have high numbers of customer care employees and fieldworkers.

Quite substantial differences between the remote access possibilities in different countries can be observed: While Germany and the UK are very advanced in this respect, Italy and France lag behind rather (see table 2-2).

Table 2-2: Chemical industries: Availability of IT infrastructure across countries

	D	E	F	I	UK	EU-5
Computer usage	99	99	99	99	98	99
Internet access	99	94	96	93	96	97
E-Mail usage	99	92	88	90	95	94
WWW usage	97	72	94	80	96	91
Intranet	60	65	65	57	64	62
Extranet	17	34	42	14	38	27
LAN	91	66	75	73	85	81
WAN	56	41	57	18	57	49
Remote access *	70	46	42	40	74	59
Wireless access *	11	19	2	10	28	13

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total), except\*: enterprises using computers (N=489 for sector total). Figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March 2003.

Source: e-Business W@tch (2003)

## 2.2.2 IT skills development

### Support of IT skills development

Figure 2-2 shows how employees in the chemical industries are supported by their companies to develop their IT skills. Almost 90% of the employees in the sector work in companies that offer at least some support of IT and networking skills development. This is above the average in other sectors, which underlines the importance of general IT in the chemical industries. However, the high level of IT support in the chemical industries is again determined by the strong dominance of large companies, which offer a considerably better support of IT skills development than small companies.<sup>7</sup>

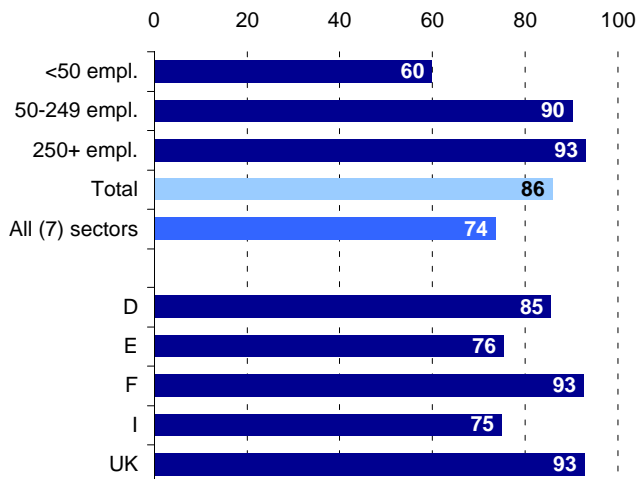
This difference between large and small companies is further aggravated if the form of IT skills development support is considered (see figure 2-3). In small and medium-sized companies, the usage of working time for learning activities is by far the most important form of support. More effective formal training schemes, either in-house or by third parties, are offered only to a relatively small percentage of employees in the small company segment.

*Figure 2-2: Chemical industries: Companies supporting any kind of networking and IT skills development*

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

Figures weighted by employment ("enterprises comprising ...% of employment").  
Reporting period: March 2003.

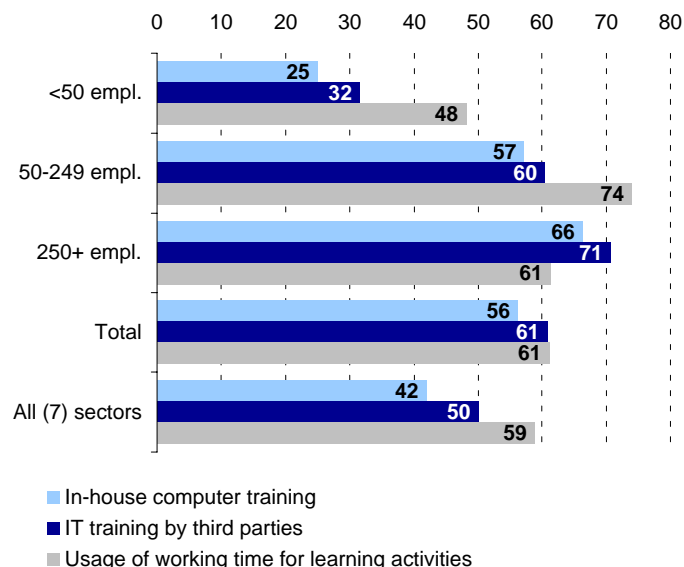
Source: *e-Business W@tch (2003)*



*Figure 2-3: Chemical industries: IT training offered to employees*

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total). Figures weighted by employment ("enterprises comprising ...% of employment offer ..."). Reporting period: March 2003.

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



<sup>7</sup> On an enterprise-weighted basis "only" 64% of the enterprises in the chemical industries offer IT skills support, compared to 54% on average over the 7 surveyed sectors.

## IT recruitment

10% of the companies in the chemical industries have recruited or tried to recruit staff with special IT skills in 2002/2003 (see figure 2-4). This is broadly in line with the IT recruitment activities in other sectors. Large and medium-sized companies, though, have been considerably more active in recruiting IT professionals than small companies. This indicates that small enterprises tend to try to use existing employees for IT support. Only 2% of the chemical companies reported some or great difficulties in recruiting skilled IT staff -particularly medium-sized companies. The highest demand for dedicated IT specialists is observed in the Italian chemical industries, where 14% of the companies searched for IT specialists.

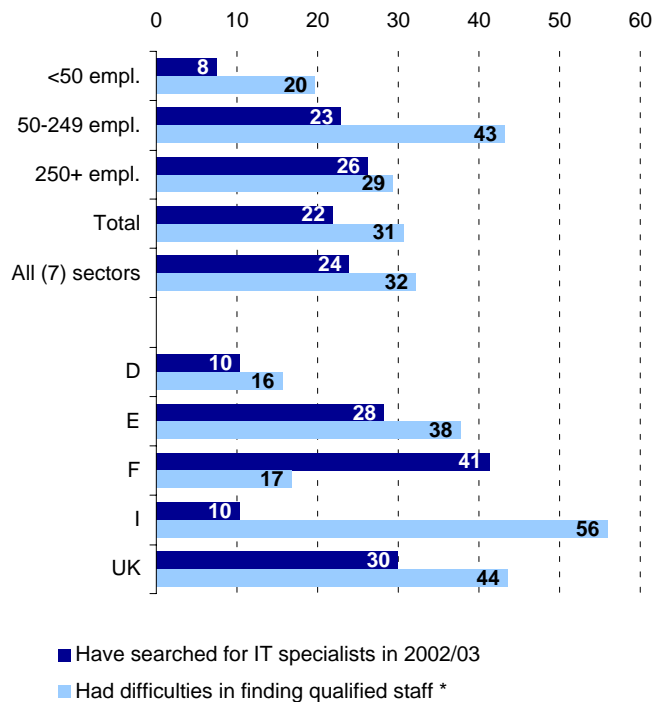
Figure 2-4: Chemical industries: IT recruitment intensity and difficulties\*

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

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total). In % of enterprises.

Reporting period: March 2003.

Source: e-Business W@tch (2003)



## 2.3 E-business activities and impacts

### 2.3.1 Internal processes

#### Internal collaboration

While e-business is often related to the exchange of information or goods and services with external business partners, the use of e-business solutions and ICTs can, first of all, significantly enhance the efficiencies of the internal processes of an enterprise.

As table 2-3 shows, companies in the chemical industries are comparatively advanced in the use of online technologies to support internal processes. This can partly be explained by the high share of large companies in the sector. Human resource management systems in particular can improve the efficiencies in companies with many employees. As a result large companies apply them significantly more often than small ones. For example, 45% of the large but only 9% of the small companies track their employees' working hours and production time with the help of online technologies.

Nevertheless, compared to the average in other sectors, small companies also use online technologies to support internal processes comparatively often.

Table 2-3: Chemical industries: Usage of online technologies

Online technologies used	All (7) sectors	Chemical industries			
		Total	0-49 empl.	50-249 empl.	250+ empl.
To share documents/ to perform collaborative work	19	26	22	53	67
To automate travel reimbursement of employees	3	5	4	8	26
To track working hours and production time	6	12	9	26	45
To support the human resources management	6	8	5	22	40

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total). Figures in % of companies. Reporting period: March 2003.

Source: e-Business W@tch (2003)

### E-Learning and knowledge management

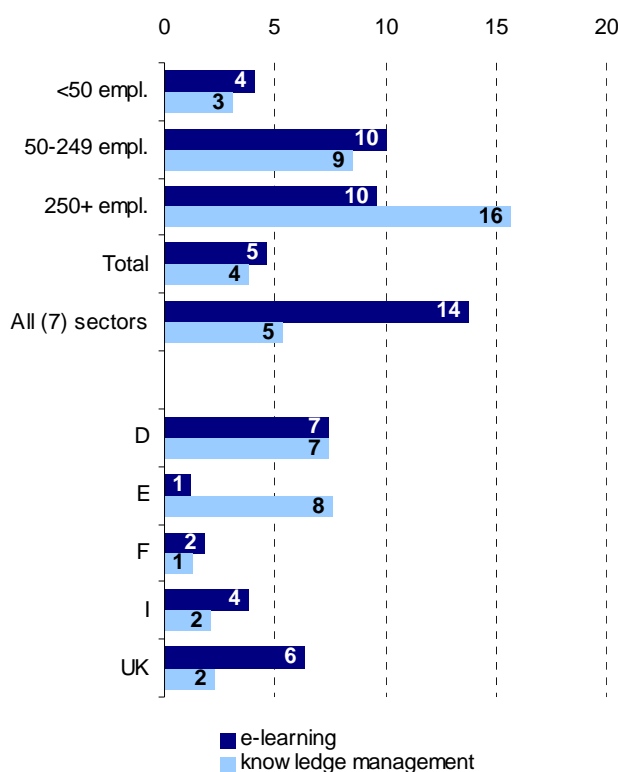
As has been stated in section 2.1, the access to information and knowledge plays an important role in certain sub-sectors of the chemical industries. This is true particularly for large R&D intensive companies, e.g. in the speciality or formulated chemicals industries. Knowledge management solutions can help researchers and product developers to improve the information flow and information sharing.

Survey results depicted in figure 2-5 show that knowledge management systems are particularly used by large companies with many employees, where access to and sharing of knowledge is often a complex and critical task. Knowledge management systems are used by an above average share of enterprises in Germany and Spain.

Figure 2-5: Chemical industries: Usage of e-learning and knowledge management systems

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

Source: e-Business W@tch (2003)



Contrary to knowledge management systems, the use of e-learning tools is significantly below average in the chemical industries. Even large enterprises do not make intensive use of such systems: only 10% of the large and medium-sized enterprises use e-learning tools, compared to 14% over all surveyed sectors. This might be explained by the very specific knowledge required in many sub-

sectors of the combined chemical industries such as pharmaceuticals or speciality chemicals and the high costs of creating specific e-learning content.

### Customer relationship management

Customer relationship management (CRM) systems are used by 7% of the enterprises in the combined chemical industries, which is largely in line with the average over all 7 sectors surveyed (see figure 2-6). Again, such systems can particularly improve the efficiency of customer related processes in companies with a large customer base and large sales forces. Accordingly, medium-sized and large companies use CRM systems three times as often as small companies. The difference in usage of CRM systems between company size classes will widen further in the future, since a large share of medium and large enterprises plan to implement those systems within the next 12 months. These plans point to the fact that companies in the chemical industry will follow a strategy of stronger customer focus than in previous years.

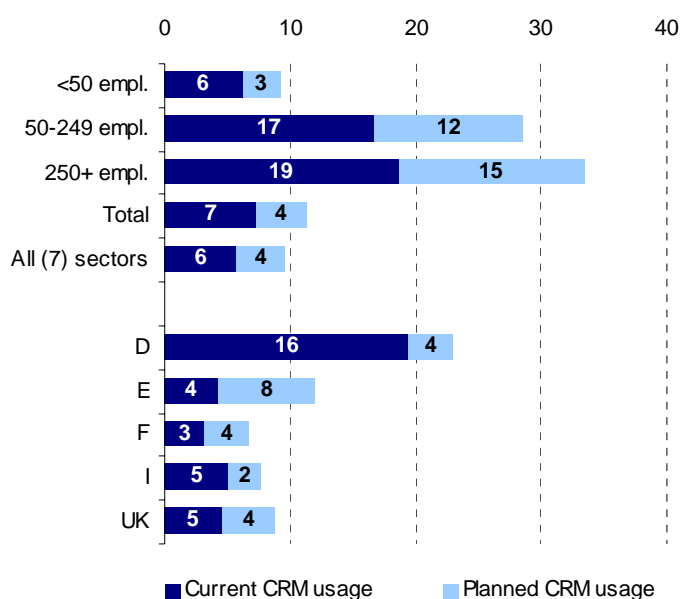
Figure 2-6: Chemical industries:  
Current and planned usage of  
CRM systems

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

Figures in % of enterprises.

Reporting period: March 2003.

Source: e-Business W@tch (2003)



Comparing usage rates of CRM systems among the 5 EU countries surveyed shows that Germany's chemical industry is a forerunner in the use of CRM systems. This is partly explained by the dominance of large chemical companies in Germany (compare tables 1-1 and 1-3).

### Enterprise resource planning

Overall, companies in the combined chemical industries make above average use of enterprise resource planning (ERP) systems. In general, production processes in the chemical industries are very well suited for ERP: a large number of inputs is used to produce a wide variety of outputs. In particular companies with many employees use ERP systems to optimise their production processes: More than 60% of all large but only 43% of the medium-sized and 9% of the small enterprises do so (see figure 2-7). In addition, a higher share of large enterprises plans to further implement ERP systems within the next 12 months, which will lead to a widening gap between company size classes if those plans materialise. ERP systems are often not only too complex and expensive for small companies but usually also require a far-reaching restructuring of organisational processes as well as complete integration of data into a central database. The fixed costs are accordingly high, while the resulting marginal savings are comparatively low and therefore often profitable mainly for large enterprises.

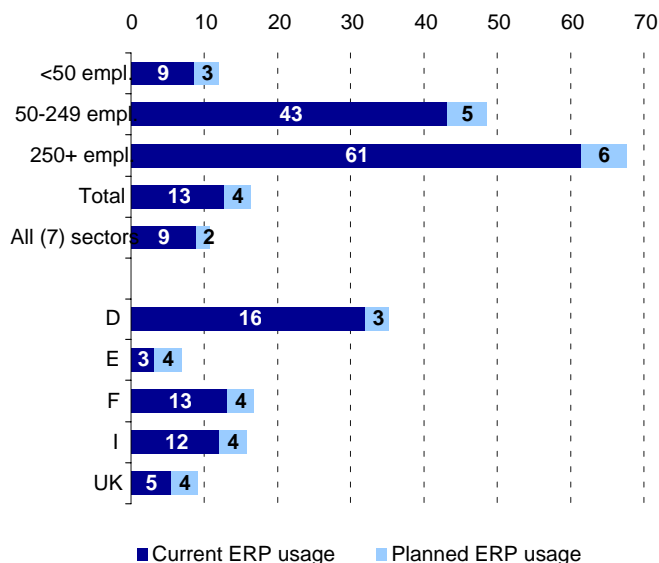
While the low usage of ERP systems in the small company segment often makes economical sense from a single company perspective, it might put small chemical enterprises in a backward position for acquiring new customers that expect their suppliers to implement, e.g. ERP-to-ERP connectivity. This could pose a barrier to small enterprises for participating in and profiting from B2B e-commerce in the chemical industries.

Figure 2-7: Chemical industries: Current and planned usage of ERP systems

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

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

Source: e-Business W@tch (2003)



### 2.3.2 Processes of the extended enterprises

#### Standards for the extended enterprise

The main idea behind the concept of an “extended enterprise” is that a company not only consists of its employees – from assembly hall to management board – but also of a network of business partners such as its suppliers and also its customers. Enterprises that want to be successful must not only look at their internal processes but also need to manage this network efficiently and provide all members of the network with exactly the information they need. Several rather sophisticated e-business solutions and concepts such as EDI networks, supply chain management (SCM), and many e-marketplaces address these issues of an extended enterprise.

A prerequisite for online collaboration with external business partners, and specifically for e-commerce, is the digitisation of information to be exchanged between trading partners. To allow for automatic processing, the information has to be digitised in structured, consistent form rather than being unstructured digital information. Standards help in organising and exchanging information in a way that is consistent across enterprises and IT systems.

The chemical industry has a widely used identification scheme for chemical substances, the CAS registry numbers. As such schemes are a prerequisite for employing industry-wide e-business, the chemical industry has already laid a good foundation.

A major industry effort in the chemical industry to standardise electronic documents for e-business are the Chem eStandards developed by the Chemical Industry Data Exchange CIDX, a non-profit industry-backed organisation. Currently more than 50 companies are members of CIDX, among them chemical companies as well as software companies, trading platforms and systems integrators. Chem eStandards are supposed to become the uniform standards of data exchange developed specifically for the buying, selling and delivery of chemicals. They are based on XML, the Extended Markup Language. To help companies use the standards, CIDX also has been developing business process guidelines. These define frequently used e-business scenarios, such as order-to-cash transactions and collaborative planning, forecasting and replenishment ([www.cidx.org](http://www.cidx.org)).

**Online collaboration**

Table 2-4 shows that chemical and plastics companies cooperate online with external business partners to a comparably large extent. This is first of all an indication of the strong interconnection in the chemical supply chain. But it also points to a reasonable use of information technology to support cooperation. Online technologies are used more often than on average for collaboration in the product design phase. Recalling the different sub-sectors of the chemical industries, these numbers are most likely driven by the formulated and speciality chemicals, where the design process is of larger importance.

*Table 2-4: Chemical industries: Usage of online technologies within the value chain*

Value chain activities	All (7) sectors	Chemical industries			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Online collaboration with business partners for designing products	12	16	15	21	16
Online collaborating with business partners to forecast product demands	10	9	8	14	17
Online management of capacity / inventory	10	10	9	15	27
Electronic exchange of documents with suppliers	37	41	40	46	45
Electronic exchange of documents with customers	28	40	40	44	47
Online negotiation of contracts	12	13	13	12	14

Base: EU-5 (D, E, F, I, UK), enterprises with internet access (N=456 for sector total). Figures in % of companies. Reporting period: March 2003.

Source: e-Business W@tch (2003)

Interestingly, there are only comparatively small differences between small and large companies in online collaboration. However, small and large companies will most likely follow different procedures and use different technologies for exchanging documents. While small companies often exchange unstructured documents (e.g. PDF or text files) via e-mail, large companies are more often integrated with suppliers and customers and automatically exchange EDI documents.

**EDI usage**

Table 2-5 shows this very clearly. While more than half of the large companies employ EDI solutions, only one tenth of the small companies do so. Reasons for this strong difference are first of all that large companies started e-business some time ago, when EDI was the prevalent technology. And secondly, traditional EDI systems based on proprietary value added networks (VANs) are relatively expensive to install and use. Thus, investment in this technology was most useful for large companies, which handled a considerable number of transactions and could achieve significant savings in processing costs from installing such systems. As we will see below (see sections 2.3.3 and 2.3.4) large and small companies also use EDI for different purposes: while small companies seem to use EDI primarily for procurement purposes, large companies use EDI mostly for selling.

*Table 2-5: Chemical industries: EDI usage*

EDI usage	All (7) sectors	Chemical industries			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Use EDI	25	12	9	27	55
Plan to use EDI	3	2	2	8	4
Standard EDI usage	71	63	60	68	73
Internet-based EDI usage	41	44	46	40	37

Base: EU-5 (D, E, F, I, UK), all enterprises for lines 1 and 2 (N=502 for sector total), enterprises using EDI for lines 3 and 4 (N=104). Figures in % of companies. Reporting period: March 2003.

Source: e-Business W@tch (2003)

Of those companies using EDI, almost two thirds use standard EDI solutions, while 44% use Internet-based EDI. New, Internet-based EDI solutions that require less investment than the traditional systems are more prevalent in small companies.

### Supply chain management

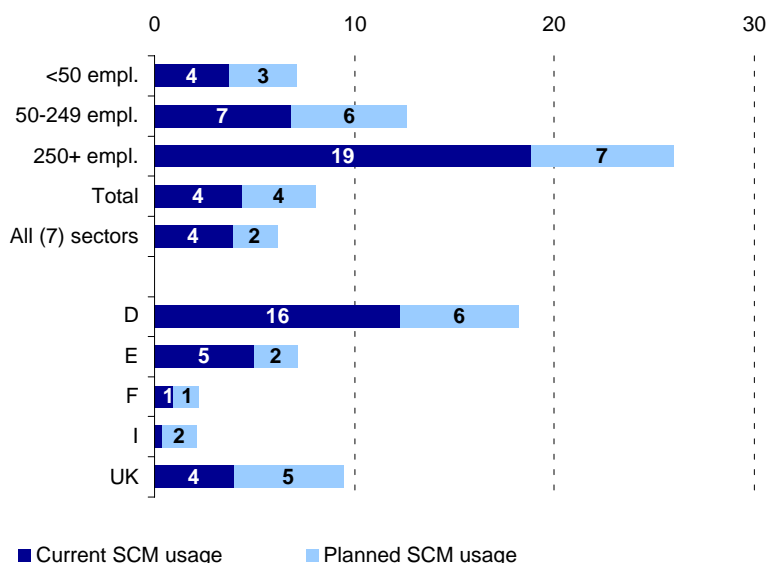
Despite the often cited integrated supply chain in the chemical industry, supply chain management (SCM) systems are used by only 4% of the companies in the combined chemical industries (see figure 2-8). Large companies currently use such systems much more often than small and medium-sized companies. A considerable share also plans to increase SCM use within the next 12 months. This is partly due to SCM networks being very beneficial to those at the top of the value chain that can use them to manage several layers of suppliers. They can typically also handle the complexity of such systems better as well as the problems involved with installing them.

Figure 2-8: Chemical industries: Current and planned usage of SCM systems

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

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

Source: e-Business W@tch (2003)



However, the difference between small and large companies does not necessarily have to be due to deliberate decisions to initiate SCM systems. As large companies tend to be suppliers to many other companies, the probability of being part of some supply chain management network initiated by other companies is simply much higher for them than it is for small companies that have a more limited number of customers. A major barrier to implementing SCM systems for small companies is an insignificant cost advantage. As long as such solutions remain complex and expensive, the typically resultant savings on each transaction are not large enough to justify an investment.

### B2B e-marketplaces

The chemical industry used to be a prime example for the usefulness of electronic marketplaces. Because a significant part of chemical companies' output is sold to companies within the chemical industry itself, the industry is rather fragmented and the products can be well-described, it was considered a good example of an industry well-suited for B2B marketplaces.

However, the overall share of companies in the combined chemical industries that use e-marketplaces is at only 2%, which is in line with the average in other sectors. This low number, however, might partly be due to different definitions of "participation in e-marketplaces". Results from table 2-6 below show that 23% of the companies that purchase online do so via e-marketplaces. This equals 8.5% of all companies in the combined chemical industries and is in contrast to the results in figure 2-9. The contrast between the intensive discussion about e-marketplaces in the chemical industries and the low overall usage of e-marketplaces revealed by the e-business-watch survey reflects that e-marketplaces are used intensively only in limited parts of the chemical industries. In the plastics industry, for

example, they play only a neglectable role. In the chemical industry, they are most important for the few global giants and less so for the large number of small and medium-sized enterprises.

This assessment is also supported by the fact that currently there exist about 40 e-marketplaces worldwide in the chemical industry and 27 in the rubber and plastics industry ([www.emarketservices.com](http://www.emarketservices.com)), of which only very few are well-known and established sites. Most marketplaces are either niche players (e.g. for recycled plastics) or are not very frequented, as one can see from the number of posted trade requests. Some portals also have small noticeboards for products added to their site. In addition to these marketplaces, though, many of the larger companies have set up sophisticated enterprise portals, which offer to some extent a similar functionality as marketplaces. They are, however, restricted to one seller.

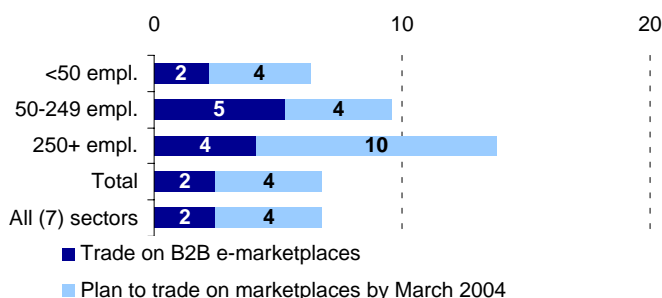
Figure 2-9: Chemical industries: Participation in B2B e-marketplaces

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

In % of enterprises.

Reporting period: March 2003.

Source: e-Business W@tch (2003)



Overall, most of the substantial B2B platforms active in Europe that are targeted at the chemical and plastics industry are sites supported by major chemical companies. These can be either their own enterprise portals or industry-sponsored marketplaces. Most of the smaller services that started in previous years have not survived as a marketplace.<sup>8</sup>

Nevertheless, Internet platforms seem to have become a fixed element of B2B trading in the combined chemical industries. The larger and well-known ones are covered in the trade press in the same way and with the same emphasis as e-business efforts by traditional companies – even after the dotcom meltdown. However, the scope of the active e-marketplaces has changed significantly over the past few years. At the end of the 1990s e-markets were often considered to be something like the B2B equivalent to eBay. They promised to a) bring together supply and demand on a single platform, b) support their users in finding business partners, c) make the price finding process faster and more efficient and d) provide a platform for electronic settlement of each transaction. Over and above this, they promised to connect the marketplace to each company's ERP system.

By now it has turned out that this promise was not realistic. Offering all possibilities on one platform requires a rather complex IT infrastructure, which is difficult to build. What is more important is that it does not reflect the division of labour within companies. Negotiating new delivery contracts is done at other times by other people within the companies than actually placing an order within an existing contract. Thus, the additional benefit of providing all functionality in one place is limited. This explains to some extent the ongoing specialisation of B2B platforms on the Internet and it also explains why many companies in the chemical sector conduct B2B e-commerce through a combination of own e-commerce sites and a variety of marketplaces.

B2B platforms will continue to change scope, especially as the current economic climate forces them to focus even harder on those aspects of e-business that still have priority (and a budget) in companies. This is an ongoing trial-and-error process. For smaller companies in particular, that do not have the resources to follow this process in all its facets, as well as for other casual observers, this leads to an information problem: Often they cannot decide whether negative news about marketplaces concern one dead-end among many different options offered or whether it is a sign of a more

<sup>8</sup> For a more detailed description of the various e-marketplaces that exist in the chemical industries see "Report I: Economic background / e-business issues in the chemical industries" by the e-Business W@tch.

fundamental failure of the underlying idea of e-business and Internet platforms in general. The complex technical nature of the technology makes this problem even more pronounced.

It is therefore important that these parties are provided with an ongoing and neutral assessment of the state of Internet platforms and the issues involved. It is also important that these assessments are up-to-date and do not reflect ideas that are by now defunct. There could be a role for policy in providing this information, first of all because it should be neutral and unbiased and secondly because smaller companies in particular suffer from information gaps.

### 2.3.3 Purchasing

Online procurement is closely related to the concept of the extended enterprise, as the relationship to suppliers forms one element of the extended enterprise. However, companies can also engage in online procurement without the additional step of really collaborating with their suppliers. Therefore, online procurement is generally more often observed than SCM or other forms of supply chain collaboration.

36% of all companies in the combined chemical industries already purchase online and an additional 6% plans to do so over the next 12 months. This is only slightly above the cross-industry average. At 57% the share of large companies procuring online is significantly higher than the share of small (35%) and somewhat higher than the share of medium-sized companies (49%).

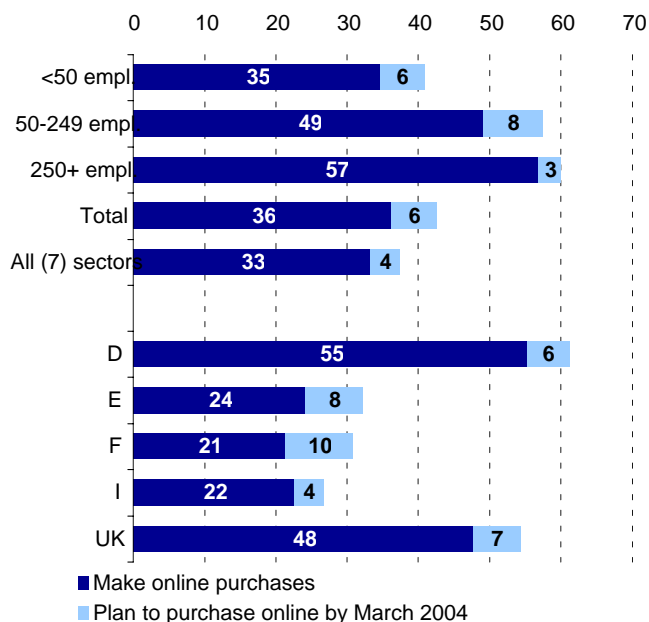
Significant differences in the share of companies making online purchases exist between the 5 EU countries surveyed: At 55%, Germany has the largest share of companies purchasing online, followed by the UK at 48%. In Spain, France and Italy only between one fifth and one quarter of the companies in the chemical industries purchase online.

Figure 2-10: Chemical industries: Companies making online purchases

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

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

Source: e-Business W@tch (2003)



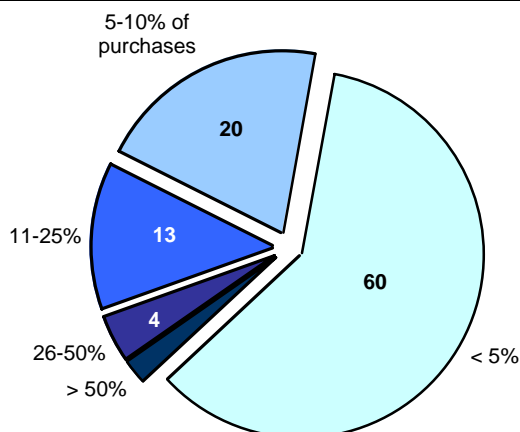
If the share of online purchases in total purchases is considered, the importance of online transactions in the overall procurement process of the chemical industries is further diminished. The fraction of companies for which the share of online purchases in total procurement is below 10% is considerably higher (80%) than on average (63%) (see figure 2-11).

Figure 2-11: Chemical Industries: Share of online purchases in total procurement (2003)

Base: EU-5 (D, E, F, I, UK), companies purchasing online, excl. DK's (N=185).

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

Source: e-Business W@tch (2003)



### Online purchasing channels

The largest share of online purchasing (83%) in the chemical industries is still conducted via a supplier's website (see table 2-6). E-marketplaces are the second most important purchasing channel. However, their usage in the procurement process of chemical companies is still below the average in other sectors. Surprisingly, only 13% of the companies surveyed in this sector have integrated their IT system with that of their suppliers for placing orders. This is significantly below the average share of integrated enterprises in other sectors and holds true even for large companies. Also surprising is that only 21% of the companies in this sector that purchase online use EDI systems – half as many as on cross-industry average. These findings underline that despite the often cited need for IT integration as a prerequisite for reaping all the benefits from B2B e-business in the chemical industries, the largest share of companies in this sector is still well behind in this respect.

And this is not only true for small and medium-sized companies, but also for the large ones. While we have seen above that large companies are much more advanced than small ones in the use of sophisticated e-business solutions (see section 2.3.1 and 2.3.2), the channels used for purchasing online do not differ significantly between size classes. For example, even in the large company segment, only 12% have integrated their IT for placing orders. One exception is that EDI is used for procurement purposes by a higher share of small than medium-sized and large companies. Large companies predominantly use EDI for selling online, as will be shown in section 2.3.4 below.

Table 2-6: Chemical industries: Channels used for purchasing online

Channel used for selling online	All (7) sectors	Chemical industries			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Supplier's website	83	83	83	86	80
E-Marketplace	28	23	23	23	24
Extranet of a supplier	27	15	14	21	19
EDI	42	21	23	14	12
IT system integrated with that of a supplier for placing orders	24	13	13	12	12

Base: EU-5 (D, E, F, I, UK), enterprises purchasing online (N=193 for sector total). Figures in % of enterprises. Reporting period: March 2003.

Source: e-Business W@tch (2003)

### Impact of online purchasing on the company

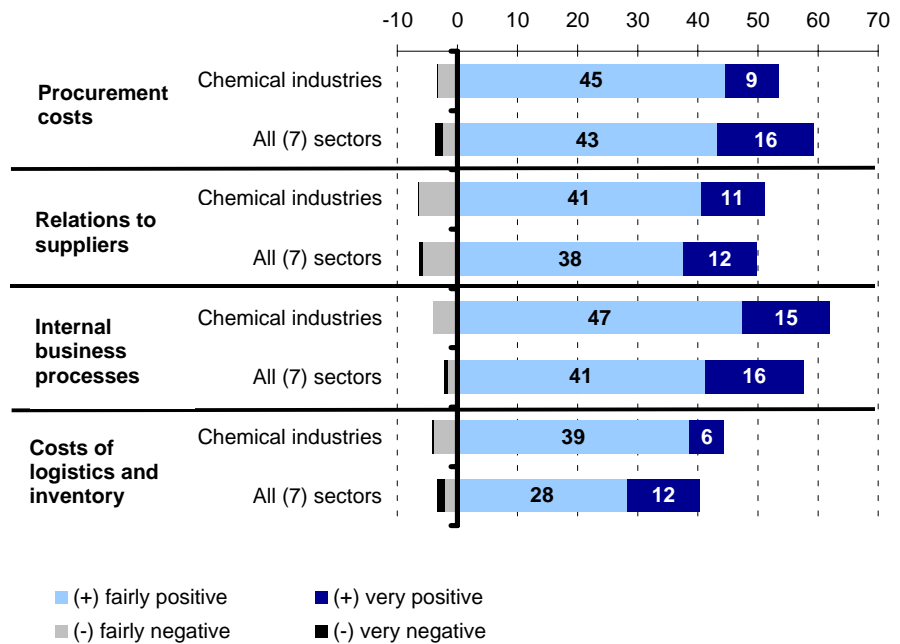
As we have stated in section 2.1 of this report, decreasing internal processing costs for commodity inputs is a great motivation for e-business in the chemical industry. This is supported by the results depicted in figure 2-12: enterprises in the chemical industries experience the strongest positive impact of online procurement on internal processes and procurement cost. In sub-sectors that rely heavily on

commodity inputs with a large number of transactions and that are active on rather competitive output markets, improving the efficiency of internal procurement processes is of particular importance.

Figure 2-12: Chemical industries: Impact of purchasing online on ...

Base: EU-5 (D, E, F, I, UK), enterprises purchasing online (N=185 for sector total). % of enterprises reporting positive or negative impacts. Reporting period: March 2003.

Source: e-Business W@tch (2003)



In some cases, however, the relations to suppliers seem to have suffered from online procurement: 7% of the companies surveyed in the chemical industries report fairly or very negative impacts on their supplier relationships. As figure 2-13 shows, this negative assessment does not equally hold true for small companies. 55% of the small companies note that their supplier relationships have improved, compared to only about one quarter in the medium and large enterprise segment.

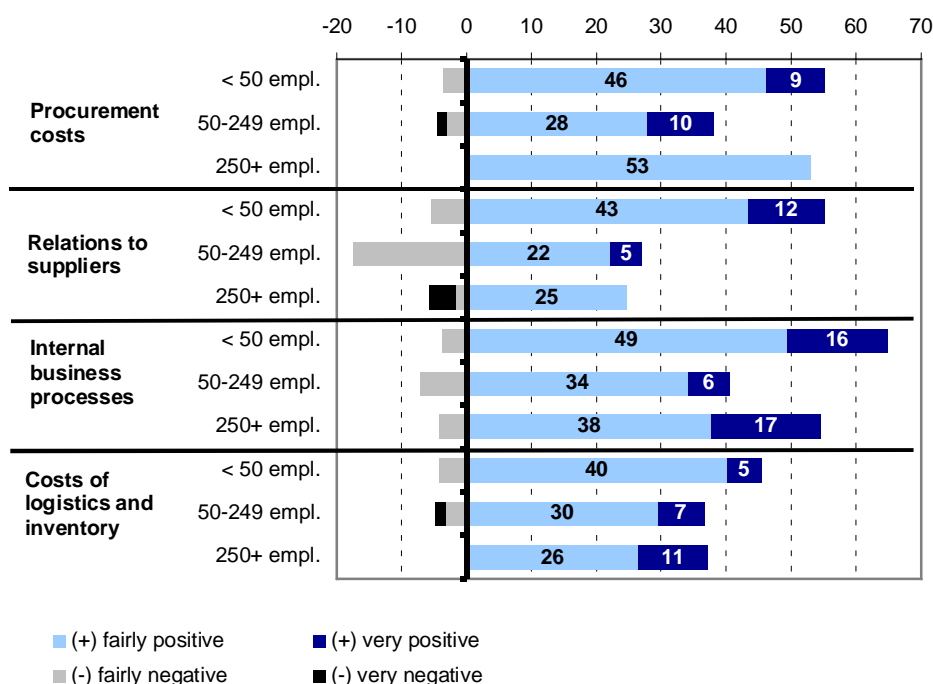
It may come as a surprise that small companies generally judge the impacts of online purchasing more positively than medium-sized and large companies. Besides the relations to suppliers, the efficiency of internal business process has been particularly positively impacted in small companies. One explanation for this outcome might be that small companies usually apply less complex procurement solutions than large companies. Simply using an online purchasing system on a supplier's website can already significantly enhance the purchasing process without requiring large IT investments, employment training or the reorganisation of business processes.

The most negative assessment of the impact of online purchasing comes from the medium-sized enterprises. They are probably often caught between two alternatives: either using very simple online technologies as small companies or implementing complex and costly procurement solutions as large companies. While the first alternative might be undersized for the number of transactions conducted in medium-sized enterprises, the second alternative might be somewhat oversized and too costly.

Figure 2-13:  
Chemical industries:  
Impact of purchasing  
online on ...

Base: EU-5 (D, E, F, I, UK), enterprises purchasing online (N=185 for sector total). % of enterprises reporting positive or negative impacts. Reporting period: March 2003.

Source: e-Business W@tch (2003)



### 2.3.4 Marketing and sales

#### Marketing

ICTs and the Internet can be used in various ways to support marketing and sales activities of chemical and plastics companies. A simple but very effective way for companies to address current and potential clients is to provide information on products and services on a website on the Internet. For SMEs in particular, the Internet is a comparatively inexpensive way to reach a large audience of potential clients.

Table 2-7 shows that chemical and plastics companies are more often present on the Internet than companies from other sectors. Currently, almost all of the large, about 80% of the medium-sized and about half of the small enterprises in the combined chemical industries have their own website on the Internet. However, the share of enterprises with a website in different size classes will probably equal out over the next year, since 16% of the small and 10% of the medium-sized companies in the sector plan to implement a website within the next 12 months.

Table 2-7: Chemical industries: Enterprises with a website

Website	All (7) sectors	Chemical industries			
		Total	0-49 empl.	50-249 empl.	250+ empl.
Have a website	45	55	51	82	96
Plan to have a website	13	15	16	10	0

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total). Figures in % of companies. Reporting period: March 2003.

Source: e-Business W@tch (2003)

#### Selling online

Only 11% of all companies in the combined chemical industries currently sell their products online. This is below the current cross-industry average of 16%. However, if the companies' plans to sell online within the next 12 months materialise, the chemical industries will almost catch up with the average in 2004. Surprisingly, the differences in online selling between company size classes are not

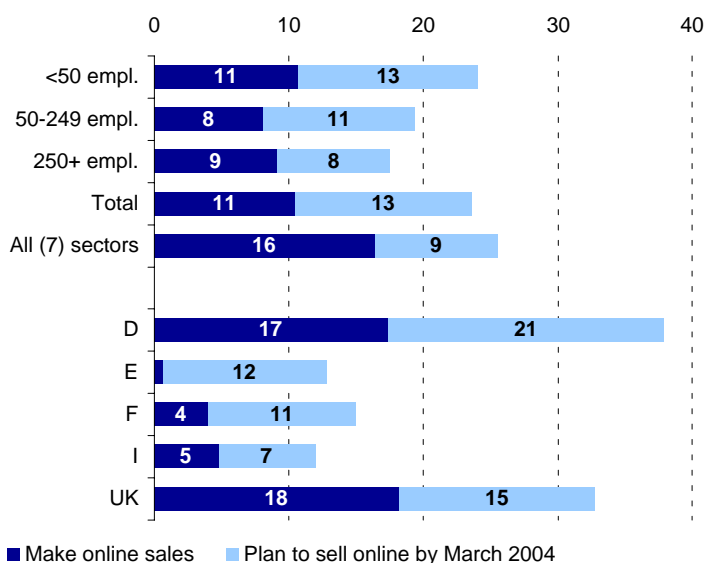
significant, nor are the differences in online selling plans. Small companies seem to have realised that they can particularly profit from selling online

Figure 2-14: Chemical industries: Companies selling online

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

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

Source: e-Business W@tch (2003)



Similarly to the online purchasing activities, companies in Germany and the UK are the most active online sellers in the combined chemical industries. Companies from both countries also plan to significantly increase their respective activities. Italy, France and Spain on the other hand clearly fall back behind their competitors from Germany and the UK, regarding current online sales as well as their plans to make online sales within the next 12 months.

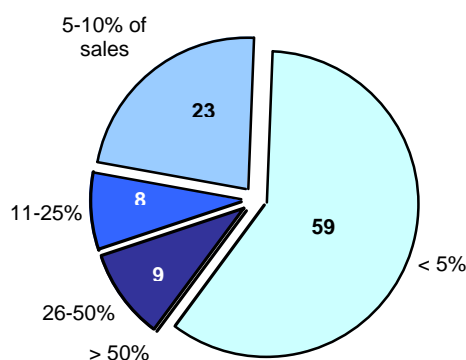
At 11% the share of enterprises selling online is also clearly lower than the share of enterprises purchasing online (36%) (see figure 2-15). Obviously there is a better business case for purchasing online in the chemical industries than for selling online. However, as with online purchasing, the importance of online sales in overall sales is still very low. For more than 80% of those companies that sell online, the share of online sales in total sales is below 10%.

Figure 2-15: Chemical industries: Share of online sales in total sales (2003)

Base: EU-5 (D, E, F, I, UK), companies selling online, excl. DK's (N=42).

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

Source: e-Business W@tch (2003)



### Channels for online selling

The most common channel for selling online in the chemical industries is still the company website (see table 2-8). 81% of the companies that actually sell online use this as the primary channel. 30% sell their products on e-marketplaces, which is below cross-industry average. A comparatively high share of companies (30%), however, has its IT systems integrated with that of a customer for receiving

orders. This is not only above cross-industry average, but also considerably higher than the share of companies with integrated IT systems for purchasing online (13%, compare table 2-6). This result could be due to the fact that a number of chemical companies might be forced by their customers to participate in some forms of supply chain integration.

Table 2-8: Chemical industries: Platforms used for selling online

Platforms used for selling online	All (7) sectors	Chemical industries			
		Total	0-49 empl.*	50-249 empl.*	250+ empl.*
Company website	83	81	83	75	32
E-Marketplace	40	30	29	39	32
Extranet	5	2	0	21	22
EDI	3	8	4	33	77
Mobile	4	5	4	16	0
IT system integrated with that of a customer for receiving orders	24	30	28	58	46

Base: EU-5 (D, E, F, I, UK), enterprises selling online (N=45 for sector total). Figures in % of enterprises. \*Results have to be interpreted with care due to low number of observations. Reporting period: March 2003.

Source: e-Business W@tch (2003)

Even though the results in table 2-8 for different company size classes have to be interpreted with care due to the low number of observations, they give at least an indication about the different online sales channels used by small and large companies: While the company website is the most commonly used channel for small enterprises, EDI systems are most important for large companies. Thus, large companies make strong use of EDI for selling online, while small companies predominantly use EDI for purchasing purposes.

### Impact of online selling on companies

Selling online generally has positive impacts for most of the companies in the combined chemical industries. About half of all enterprises in the sector report very or fairly positive impacts on the volume of sales, the number of customers, the sales area, the quality of customer service and the efficiency of internal business processes (see figure 2-16). However, in most categories, the assessment is less positive than on cross-industry average. Only the impacts on internal business processes and on the costs of logistics and inventory are judged more positively by the chemical industries than on average.

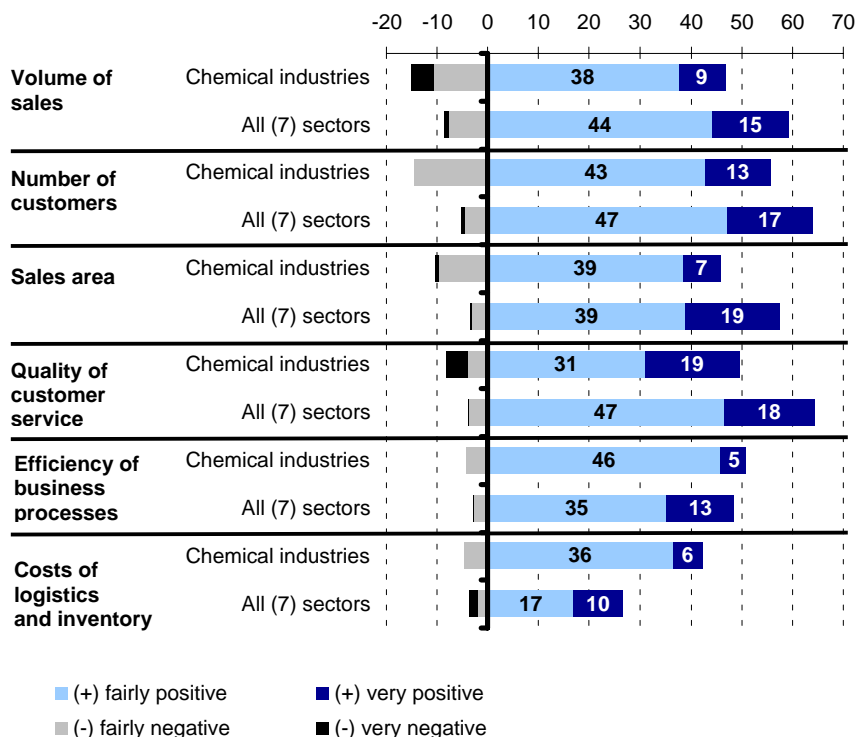
In addition, there is a significant share of companies in the chemical industries for which sell-side e-commerce has brought about negative impacts. A certain polarisation can be observed: positive impacts for a majority of companies but negative impacts for a not negligible share of others. This polarisation is specific to the chemical and plastics sector. A particularly high share of companies feels negative impacts of selling online on the volume of sales and on the number of customers.

The presence on the Internet has enabled many less known companies to reach a larger number of potential clients and to make their products and services known to the world. By contrast, other companies seem to have lost market shares through stronger competition and higher market transparency resulting from enhanced information on prices, new products, patents, etc. over the Internet.

Figure 2-16: Chemical industries: Impact of selling online on ...

Base: EU-5 (D, E, F, I, UK), enterprises selling online (N=43 for sector total). % of enterprises reporting positive or negative impacts. Reporting period: March 2003.

Source: e-Business W@tch (2003)



## 2.4 E-business development 2002 – 2003: main trends

The data presented in the previous sections of this report was based on the *e-Business W@tch* survey conducted in March 2003. The aim of the following section is to identify whether significant changes from the first survey, carried out in June/July 2002, have occurred, which allow an assessment of some major trends in e-business developments in the combined chemical industries.<sup>9</sup>

A comparison of the main e-business indicators of the 2002 and the 2003 survey results reveals that statistically significant changes can mainly be identified in indicators concerning the attitude towards e-business, which are based on the personal judgement of the respondents, rather than in objective usage indicators. For example, no significant changes in the use of e-business applications such as ERP, CRM, SCM or knowledge management could be observed.

One explanation for this result is that changes in the usage of main e-business technologies are dependent on long-term investment decisions and within the time span of one year changes probably range between only a few percentage points. Such changes are too small to be identified at a statistically valid level. Expectations and attitudes towards e-business, on the contrary, change much faster and more strongly and can therefore be better identified in shorter observation periods.

### Attitude towards e-business has improved, particularly in medium and smaller companies

One major trend that can be identified when comparing survey results from 2002 and 2003 is that the importance of e-business in the combined chemical industries has increased from a comparatively low level. While in 2002 only 40% of all enterprises in the sector stated that e-business constitutes a significant or some part of the way their company operates, this share has increased to 50% in 2003

<sup>9</sup> For comparability of the 2002 and 2003 data, the analysis of e-business developments in this section is based on enterprise-weighted data in the EU-4 (Germany, France, Italy, UK).

\*\*\*<sup>10</sup> (see figure 2-17) Even though the share of e-business sceptics<sup>11</sup> in the combined chemical industries is still high, it has at least decreased from 57% to 49%\*\* during the course of last year.

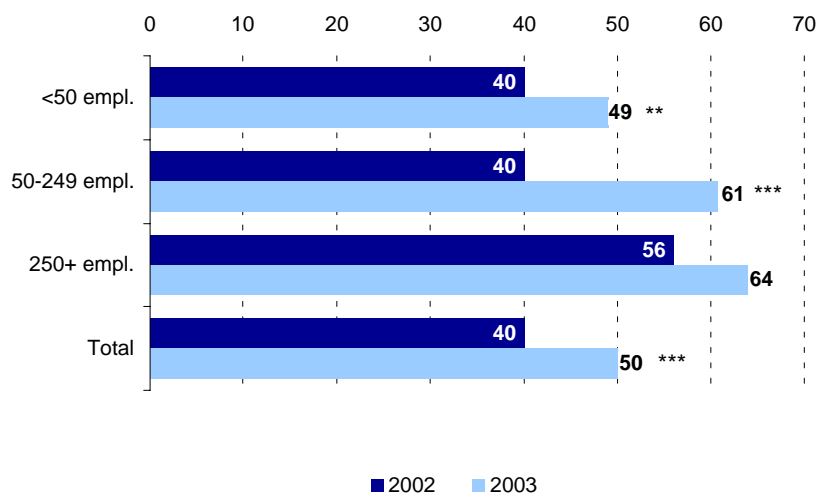
This positive change in the attitude towards e-business is particularly driven by medium-sized and small companies. The share of medium-sized companies that ascribes some or a significant role to e-business has risen from 40% to over 60%\*\*\* in 2003, while the share of small companies has increased from 40% to almost 50%\*\*. A significant drop of e-business sceptics from 58% in 2002 to 49%\* in 2003 has also occurred in the small company segment.

This development shows that while e-business usage in the chemical industries was first initiated by larger companies, for which e-business has become a fixed element by now, it has triggered into the small and medium-sized company segment as well. This trend is probably also related to the fact that small companies have started to realise that they can profit from e-business as well. Survey results reflect this development: the common perception that large companies are the main beneficiaries of e-business has somewhat changed over the past year. While 36% of all respondents still believe that large enterprises are most likely to benefit from e-business, the share of those that see SME's as the main beneficiaries has increased from 11% to 17%\*\*.

Figure 2-17: Importance of e-business in 2002 and 2003

Base: EU-4 (D, F, I, UK), all enterprises (N=350 for 2002, N=402 for 2003).  
Reporting period: June/July 2002 and March 2003.

Source: e-Business W@tch (2003)



### Large companies have increased their e-business investment plans

The overall investment climate for e-business has also improved in the combined chemical industries over the past year. In 2003, 33% of all enterprises in the EU-4 plan to increase their e-business budgets within the next 12 months, compared to only 27%\* in 2002. However, this change is mainly due to higher e-business investment plans of large chemical companies. In this segment, the share of companies that plan to increase the expenditures for e-business technologies has risen from 30% in 2002 to 55%\*\* 2003.

Even though small and medium-sized companies plan to increase their e-business expenditures as well, their investment plans are more moderate and the increase from 2002 is statistically not significant. The more positive attitude of small and medium-sized companies towards e-business has accordingly not yet translated into an equally large increase of e-business budgets.

<sup>10</sup> In the following analysis, \*\*\* will indicate a confidence level of 99% for the statistical validity of a difference between both samples, \*\* indicates a confidence level of 95%, and \* indicates a confidence level of 90%.

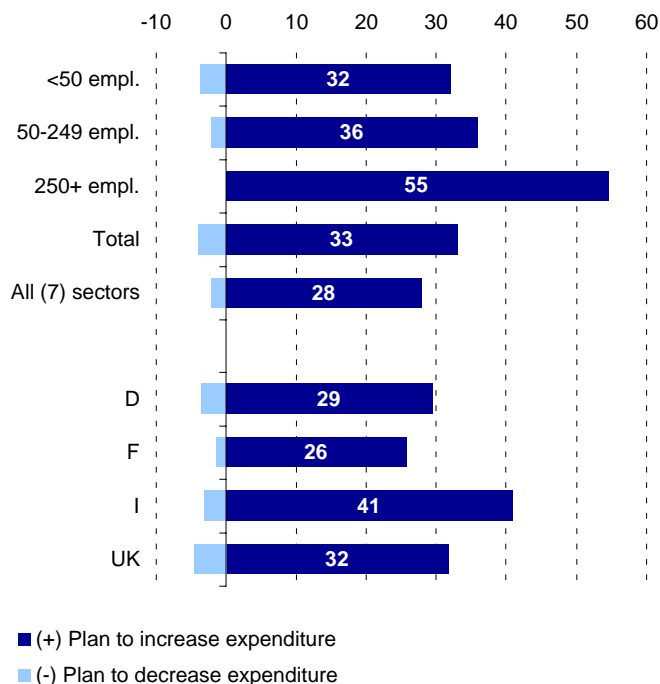
<sup>11</sup> Defined as those companies that do not ascribe a significant role of e-business today nor in the future.

Figure 2-18: Investment climate for e-business technologies

Base: EU-5 (D, F, I, UK), all enterprises (N=402 for sector total).

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

Source: e-Business W@tch (2003)



### Online purchasing activities have increased

Some significant changes between 2002 and 2003 can also be observed in the area of e-commerce in the combined chemical industries.

In particular, the share of companies in the EU-4 that are purchasing online has increased from 30% to 38%\*\*. This result shows that the companies' plans to increasingly purchase online, stated by 9% of all enterprises in 2002, have indeed materialised. Large and medium-sized companies in particular have significantly increased their e-purchasing activities. In 2002, 40% of the large and 34% of the medium-sized enterprises were purchasing online. In 2003, the shares have risen to 59%\* and 51%\*\* respectively (see figure 2-19).

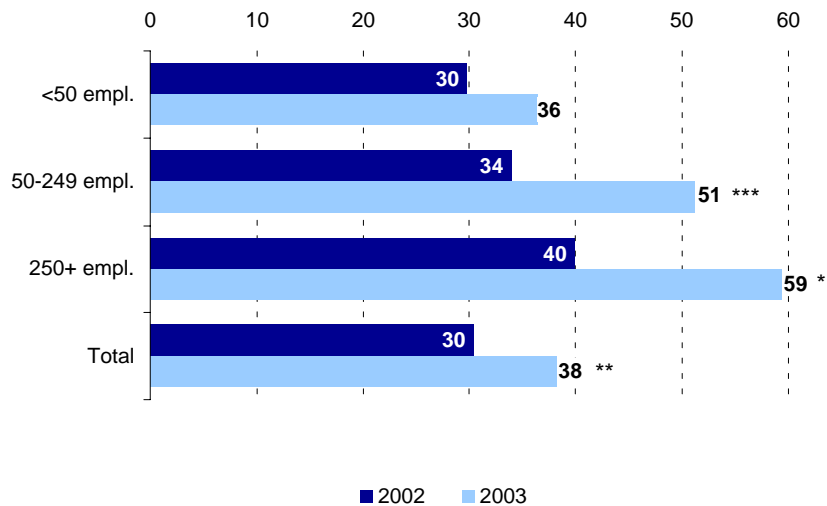
This trend again underlines the importance of efficiency gains in the procurement process of chemical companies – particularly in those companies and sub-sectors that rely heavily on commodity inputs, that have to manage a large number of procurement transactions and that sell on rather competitive output markets.

The fact that smaller companies usually have to deal with a much lower number of procurement transactions and, therefore, profit less from complex procurement solutions is also reflected in the 2002 - 2003 comparison: in small companies, the change in online purchasing activities is smaller and statistically not significant. If this trend continues, the gap in online purchasing activities of small and large companies will continue to widen.

Figure 2-19: Online purchasing in 2002 and 2003

Base: EU-4 (D, F, I, UK), all enterprises (N=350 for 2002, N=402 for 2003).  
Reporting period: June/July 2002 and March 2003.

Source: e-Business W@tch (2003)



### No significant change in online selling, but increased plans

In contrast to online purchasing, online selling activities of chemical companies have not significantly increased between 2002 and 2003. What has changed at a statistically valid level, though, are the companies' plans to engage in online selling activities within the next 12 months: the share of companies in the combined chemical industries that plan to sell online has risen from 8% to 13%\*\*.

This change is mainly due to the future plans of small companies. The share of small companies that plan to sell online within the next 12 months has increased from 8% in 2002 to 14%\* in 2003. This points to the fact that the chances of e-commerce for small companies are apparently seen more on the sell-side than on the buy-side of e-commerce.

## 3 Summary and conclusions

### 3.1 Summary of main findings

The state of e-business in the combined chemical industries (and this is a major result of the *e-Business W@tch* survey for the chemical industries) is still below expectations and also below its potential. At the beginning of the e-business boom the chemical industry (not so much the manufacture of rubber and plastics) was perceived as having ideal conditions for e-business, specifically B2B e-commerce. Many chemical products are easy to classify, many are commodities rather than manufactured to spec, large amounts of chemicals are traded within the chemical industry, and with the envisaged reductions in processing costs there seems to be a good business case for conducting business transactions electronically.

In addition, the technical preconditions are comparatively good, as the survey results have confirmed. Traditional measures such as Internet usage, WWW usage or the support of networking and IT skills development are all higher in the chemical industries than on average over all sectors analysed in this wave of the *e-Business W@tch* survey.

Despite these good prerequisites, our survey results for the combined chemical industries do not paint a very impressive picture of e-business use. For example, the usage of supply chain management or e-marketplaces is only in line with the average in other sectors. And only a small and below average share of companies in this sector has integrated their IT systems with customers or suppliers for placing or receiving orders.<sup>12</sup>

Nevertheless, several companies in the chemical industries use e-business extensively. These companies – large and established household names – make up the largest share of media coverage about e-business in the chemical industries. As they do not constitute the majority of enterprises in the sector, though, their dominance in the media might bias perception of the state of e-business in the chemical industries.

Despite this rather bleak assessment of the current state of e-business in the survey, there are also several encouraging findings. More companies than a year ago consider e-business a part of the way their company operates. In particular small and medium-sized companies consider e-business to be more important than a year ago. This is also reflected in the e-business investment climate, which seems to have improved during the last year. About one third of companies surveyed plan to increase their e-business expenditures within the next 12 months, whereas this number was only slightly more than one quarter a year ago. Finally, the share of companies that are purchasing online also increased. Thus, the importance of e-business in the chemical industries is slowly rising.

However, compared to the initial expectations, the pace of change is comparatively slow. This might be due to the changed nature of e-business activities. The initial “B2B e-commerce” focus was to a large extent on finding new business partners, saving product costs and buying and selling products on the Internet. The focus of many current e-business projects in the chemical industry, though, is on improving the efficiency of business processes. As this involves the restructuring of processes, complex changes in the IT infrastructure as well as changes in the way employees work, rather than simply a substitution of phone calls by e-mail, these changes take some time.

---

<sup>12</sup> Work by others confirms this assessment. Cf. Thayer (2003)

## 3.2 Economic implications

### 3.2.1 Implications for the individual enterprise

The analysis of survey results in this reported has revealed some interesting implications of e-business usage for the individual enterprises in the combined chemical industries. The implications can be sub-divided into e-business opportunities, risks, enablers and barriers:

#### E-business opportunities

- **Improve the efficiency of internal work processes and decrease processing cost.**

As figure 3-1 shows, the improvement in internal work processes is the most important overall impact of e-business on companies in the combined chemical industries. Work processes that can be improved through the use of e-business include internal organisational processes such as collaboration and human resource management as well as procurement and sales processes. As we have seen in chapter 2, decreasing internal processing costs related to procurement is one of the most important opportunities of e-business in the chemical industries. Due to the usually large number of transactions, even fractional improvements in these processes can aggregate to quite substantial savings. In sub-sectors that rely heavily on commodity inputs with a large number of transactions and that are active on rather competitive output markets, improving the efficiency of internal procurement processes is of particular importance.

- **Extend market reach**

While the improvement in internal work processes has recently become the major focus of e-business usage, extending market reach, which was one of the major hopes placed in e-business at the beginning of the Internet hype, is still an important opportunity of e-business usage. The Internet has enabled many less well known companies to reach a larger number of potential clients and to make their products and services known to the world. Survey results in chapter 2 have shown that about half of all enterprises in the sector that sell online report very or fairly positive impacts on the volume of sales, the number of customers, the sales area, and the quality of customer service. Figure 3-1 below backs this view, as customer relationship is the second most important area that is impacted by e-business.

- **Improve information flows**

Speeding up information flows and thereby accelerating processes is an important opportunity for certain sub-sectors in the chemical industries, particularly the formulated chemicals industry. Companies that are able to make processes related to research and development as well as clinical trials as efficient as possible enjoy a longer period of monopoly with their product and thus higher profits. Information available on the Internet as well as knowledge management solutions can help researchers and product developers to improve the process of finding and sharing relevant information.

Besides improving access to scientific, product-related information, the Internet considerably enhances the ability to gather information about the market, thus increasing market transparency.

#### E-business risks

- **Increasing market transparency and competition**

The enhanced access to information on the market can pose an opportunity as well as a risk to companies in the combined chemical industries. On the one hand it can be an opportunity to those companies that can use increased market transparency to extend their markets or to attain better conditions from suppliers. On the other hand, it can pose a risk if competitive pressures threaten a company's market position – particularly if international competition increases through increased market transparency. Survey results on the impacts of online selling have shown that some

companies actually seem to have lost market shares through stronger competition resulting from enhanced information on prices, new products and patents over the Internet.

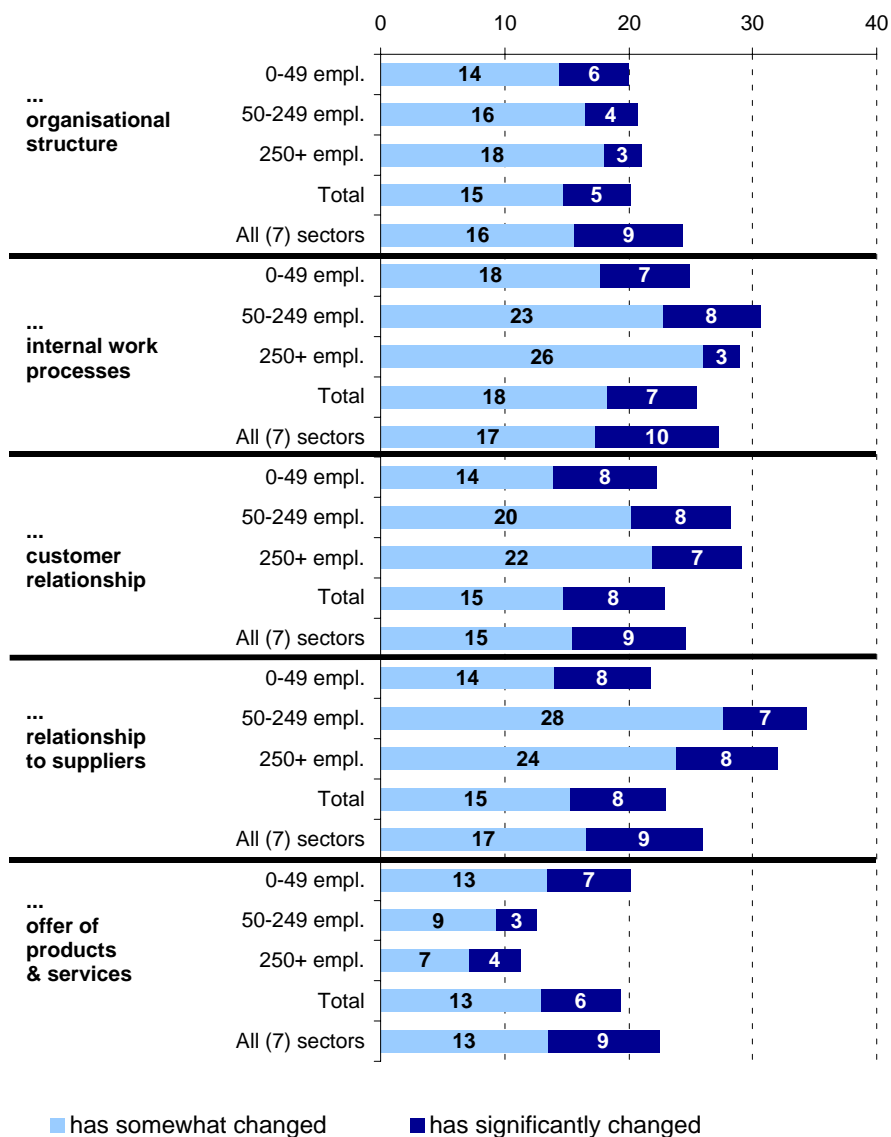
- **Investment in complex e-business projects with insecure ROI**

Another risk that can accompany e-business is an insecure return on investment (ROI). The ROI of complex e-business projects is often difficult to measure and even harder to estimate in advance. During the Internet hype in particular many companies engaged in large and costly e-business projects to gain early competitive advantage that did not result in the expected efficiencies.

Figure 3-1: Chemical industries: Impact of e-business on companies

Base: EU-5 (D, E, F, I, UK), all enterprises (N=502 for sector total). Figures in % of companies. Reporting period: March 2003.

Source: e-Business W@tch (2003)



### E-business enablers

- **Comparatively good IT infrastructure**

As we have seen in the analysis above, the prerequisites for using e-business on the ICT infrastructure side can be considered as rather good in the combined chemical industries. While this is partly due to the high importance of large companies – particularly in the chemical sub-sectors – smaller companies are also equipped with a comparatively good IT infrastructure. This assessment holds true for all 5 surveyed countries.

- **Strong competition and supply chain integration force companies to adapt e-business**

Some sub-sectors of the combined chemical industries also provide good preconditions for the quick dissemination of e-business due to its strong supply chain integration. In particular those at the top of the supply chain can force their business partners to adapt e-business as a prerequisite for long-term contracts. In addition, especially in the basic chemicals industry, outputs are commodities traded under almost perfect competition, so that all companies have to follow with process improvements once one company has achieved savings from its e-commerce activities.

- **Positive change in the attitude towards e-business and in the investment climate**

The positive change in the attitude towards e-business that could be observed when comparing the 2002 and 2003 surveys also builds a good prerequisite for e-business development in this sector. In addition, a larger share of companies now plans to increase e-business expenditure compared to last year. In the large company segment in particular e-business budgets have been increased.

### E-business barriers

- **Internal readiness of chemical companies and their partners**

The most important barrier for e-business is that many companies in this sector do not yet fulfil the necessary internal technical and organisational preconditions for applying e-business. They often have various disparate systems implemented that first have to be integrated internally before they can be integrated with external business partners. This not only requires technical integration but often also a redesign of internal business processes.

Survey results have shown that only one tenth of the companies in this sector have integrated their IT system with that of their suppliers for placing orders – and this holds true even for large companies. This underlines that despite the often cited need for IT integration as a prerequisite for reaping all the benefits from B2B e-business in the chemical industries, the largest share of companies in this sector is still well behind in this respect.

"The next wave of activities calls for business process automation where individual companies integrate internal applications and connect externally to their immediate business partners, customers, and suppliers to enable seamless business integration.

Christina Chung, Loraine McLellan: "B2B Insights for the Chemical Industry", in: [www.e-chemmerce.com](http://www.e-chemmerce.com)

### 3.2.2 Implications for the industry structure

From aggregating the implications for individual companies in the chemical industries one can draw conclusions on the implications for the whole sector:

#### Increasing market transparency implies stronger competition

A major impact of the Internet is the increasing international transparency for products and conditions of chemicals. While e-marketplaces are the most obvious platforms aiming at increasing transparency, individual websites, portals and catalogues are probably even more important. In particular some companies – e.g. so-called "bulk speciality chemicals", which are produced by a large number of manufacturers and sold to a variety of buyers – are increasingly facing international competition, whereas they had previously occupied a niche and been the most obvious suppliers, due to their local proximity and the high search costs for finding other suppliers. Although these effects will not be equally strong in all sub-sectors of the chemical industries, the improved information flow will most likely lead to an increase in competition in most sub-sectors.

Obviously this increasing transparency is a two-edged sword. It not only increases competitive pressure on former niche players but also offers new opportunities for active enterprises, as it enables companies to become easier to find and thus to increase their market reach.

### **Closer integration of companies increases mutual dependencies**

The increasing use of e-business for procurement in the chemical industries often not only aims at reducing processing costs for each individual transaction. A second aim is to obtain better and more accurate information about internal buying behaviour within the company. Buying outside of framework contracts, so-called “maverick buying” frequently occurs in large companies and is often seen as cost-increasing. By using information about who buys what within the company under which conditions, companies can apply a greater degree of centralisation to procurement, which enables them to achieve savings by concentrating on fewer suppliers and obtaining better terms from these suppliers. Together with the costs involved in integrating the IT systems of several companies, this factor works towards a reduction of the number of suppliers.

At the same time, the resulting e-business infrastructure can be used to intensify collaboration with these suppliers. Figure 3-1 above shows that the second most important impact of e-business in the chemical industries is on relations to suppliers. In short, the closer integration implies that enterprises should eventually have fewer but more intensive business relationships. This, however, should also have consequences for the speed and intensity at which external shocks propagate through the value chain. As both increase, external shocks to the sector or single companies may lead to higher fluctuations in output production, profitability or even jobs.

### **E-business accelerates globalisation of chemical industries**

The chemical industries are already a global industry, as has been set out in the first chapter of this report. With new markets such as Asia developing further, globalisation of the chemical industries will increase further. This development is accelerated by e-business. As the Internet increases transparency and the awareness of potential competitors, customers or suppliers, the probability that a company in a different country is the optimal party with which to conduct business, rises.

E-business standards that are international right from the start, like the Chem eStandards, facilitate international electronic data exchange. Since enterprises can exchange data internationally without the need to adapt their IT systems to foreign conventions, the barriers to international trade are lower than they would otherwise be. The same effect is seen on international Internet trading platforms as they allow a company connected to the hub to exchange data with all other companies also connected, irrespective of their location.

## **3.3 Policy issues**

### **Acknowledge changing role of e-business**

A few years ago, the assessment of the implications of ICT usage for enterprises was focused on e-commerce, i.e. on buying and selling over the Internet. Companies were said to be able to decrease their costs for inputs by finding cheaper suppliers and to extend their markets by finding new customers in previously uncovered markets.

As the *e-Business W@tch* survey results have shown, however, companies in the chemical industries see the most positive impact of buying online in improved internal processes. This applies especially to small companies. These results are in accordance with anecdotal evidence about the early e-business motivations of many large companies that aimed to streamline processes and decrease process costs.

This shift in enterprises' motivation for e-business is due to considerable experience gained from early Internet and e-business projects. It thus reflects a better understanding of the potential benefits of e-business than enterprises had a few years ago. This change has to be acknowledged by policy-

makers. They have to make sure that their policy measures are in accordance with the benefits from e-business as they are seen now and not as they were perceived a few years ago. In the very dynamic area of e-business, policy measures constantly have to be adapted to the changing environment. This also has consequences for the gathering of data for e-business indicators, which should reflect the change of focus from pure e-commerce to a more holistic e-business approach, focusing on internal business processes.

### **Educate SMEs about necessary preconditions for realising the full e-business potential**

Reaping the full benefits of e-business is not something that can be done by simply setting up a website or by browsing the Internet for new business occasions. While such activities provide some benefits to enterprises, the full potential of e-business comes from improving internal as well as B2B processes. This, however, first requires that some technical and organisational preconditions are met. And second, it is a process that typically takes time.

In smaller companies in particular, many of these preconditions are not yet met. For example, improving business processes first requires a clear definition of which business processes exist in the company and which factors determine their efficiency. This is often not sufficiently done in SMEs. In addition, several technical preconditions for successful e-business, such as the existence of an ERP system that forms the heart of internal business processes, are often not met in smaller enterprises in the chemical industries. SMEs also lag behind in basic IT infrastructure and in the IT skills development of their employees.

While the decision of SMEs not to invest large amounts in such technologies might be justified by short-run business calculations, there is the danger that such a decision will have serious long-term consequences. If the use of e-business continues to gain in importance in many larger companies, without proper preparation for e-business SMEs might be unable at some point of time to meet technical requirements (e.g., providing all business documents electronically) of doing business with larger customers. As the introduction of e-business takes time, since it requires the modification of business processes and the mastering of a learning process, those companies lagging behind will suffer competitive disadvantages.

Thus there is a role for policy to educate SMEs about the future potential of e-business and to make clear to those companies that foundations for successful e-business in the future have to be laid now. Particularly as the current economic climate favours short-term business decisions delivering an immediate return on investment, such long-run considerations might be undervalued.

### **Educate about the changing role of e-marketplaces**

B2B trading platforms have become a fixed element in the combined chemical industries. However, the *e-Business W@tch* survey for the combined chemical industries reveals some conflicting numbers on the usage of e-markets, depending on the context of the question. This can be interpreted as a sign that it is very much unclear to many enterprises what exactly can be considered an e-marketplace today.

And indeed, e-marketplaces have changed considerably since their invention in the late 1990s. Then they were basically Internet platforms, where several buyers and sellers came together to conduct business transactions. Now there exists a variety of different platforms. Some provide support for negotiations, others are aggregated catalogues, while other groups provides integration support. Some of these are independent and others belong to single companies or to a consortia of companies. This state of e-markets is rather confusing.

It is therefore important that all market players are provided with an ongoing and neutral assessment of the current state of Internet trading platforms and the issues involved. It is also important that these assessments are up-to-date and do not reflect ideas that are by now defunct. There could be a role for policy in providing this information, first of all because it should be neutral and unbiased and secondly because smaller companies in particular suffer from information gaps.

## References

CEFIC (2002): Economic Bulletin June 2002.

CEFIC (2002a): EU Chemical Industry: Modest Growth in 2002 with some Improvement for 2003, News Release, 28.11.2002

CEFIC (2002b): Facts and Figures – The European Chemical Industry in a Worldwide Perspective, June.

Chung, Christina, McLellan, Loraine (2003): B2B Insights for the Chemical Industry, [www.e-chemmerce.com](http://www.e-chemmerce.com)

European Commission (2001): White Paper: Strategy for a Future Chemicals Policy, COM (2001) 88 final

Eurostat (2001): Panorama of European Enterprises 2000.

Eurostat New Cronos (2003):

Forrester (2000): eMarketplaces Boost B2B Trade, February 2000

Federchimica (2001): Indagine sull'e-commerce nell'industria chimica.

Forrester (2001): Custom Chemicals Materialize, January 2001

Keppler, David E. (2002): e-Business: Redefining Business Process in the Chemical Industry, [www.dow.com](http://www.dow.com)

Thayer, Ann M. (2003): Chemical E-Business: Are We There Yet? In: CENEAR 81, 6.

## Annex: Methodology of the e-Business Survey 2003

### Background

Most of the data presented in this report are derived from the recent European e-Business Survey 2003, which constitutes – together with the previous survey carried out in June/July 2002 – a cornerstone of the monitoring activities of the *e-Business W@tch*. In total, 3515 telephone interviews with decision-makers in European enterprises in all EU Member States were conducted between 24<sup>th</sup> February and 20<sup>th</sup> March 2003. The questionnaire was largely based on the questionnaire used in the 2002 e-Business Survey.

### Fieldwork

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

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

### Interview method

The fieldwork was carried out in June and July 2002 using computer-aided telephone interview (CATI) technology. The decision-maker in the enterprise targeted by the survey was normally the person responsible for ICT within the company, typically the IT manager. Alternatively, particularly in small enterprises without a separate IT unit, the managing director or owner was interviewed.

### Population coverage and sampling

The highest level of the population for the e-Business Survey was the set of all enterprises which are active at the national territory of one of the EU Member States and which have their primary business activity in one of the 7 sectors specified by NACE Rev. 1 codes. The most important viewpoints used for breakdown of the population in the survey were (i) the economic activity, (ii) the national territory of the enterprise and (iii) the size in terms of employees. The survey was carried out as an enterprise survey, i.e. data collection and reporting focuses on the enterprise (rather than on the establishment), defined as a business organisation of one or more establishments comprised as one legal unit.

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

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

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

Population coverage of the e-Business Survey (2003)

No.	NACE Rev. 1 Codes (Section – Division/Group)		Sector Name
01	D	15, 16	Manufacture of food products, beverages and tobacco
02	D	24, 25	Manufacture of chemicals and chemical products
03	D	30, 31 ( <i>except 31.3 - 31.6</i> ), 32	Manufacture of electrical machinery and electronics
04	D	34, 35	Manufacture of transport equipment
05	G	52.11, 52.12, 52.4	Retail
06	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
07	I / K	64.2, 72	Telecommunications and computer-related services

Country	Directory / Database	No. of interviews	Average length
Germany	Heins und Partner Business Pool	701	12.1 min.
Spain	Schober	700	11.1 min.
France	IDATA, based on "INSEE Siren file" (the National Institute of Statistics) and other directories	701	12.4 min.
Italy	Dun & Bradstreet	709	15.3 min.
UK	Dun & Bradstreet	704	13.0 min.
<b>TOTAL</b>		<b>3515</b>	<b>12.8 min.</b>

### Problems encountered

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

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

### Tabulations

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

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

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

### Weighting principles

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

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

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

**Variables - indicators**

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

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

The choice of indicators is largely based on those used in the previous survey in 2002. It includes a basic set of widely accepted measures for e-commerce and e-business (as used in related surveys on e-commerce and e-business, e.g. by Eurostat), but also introduces a few innovative indicators which have a pilot character and are not yet widely tested. The full list of variables which was the basis for preparing the questionnaire can be downloaded (as a spreadsheet) from the *e-Business W@tch* website at its "database" section ([http://www.ebusiness-watch.org/marketwatch/database/survey\\_info.htm](http://www.ebusiness-watch.org/marketwatch/database/survey_info.htm)).