

Sector Report: No. 02-I, May 2004

Electronic Business in the Chemical Industries

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

**e-business
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The e-Business W@tch

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

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

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Contact

For further information about this Sector Study or about the *e-Business W@tch*, please contact:

 <p>empirica Gesellschaft für Kommunikations- und Technologieforschung mbH Oxfordstr. 2, D-53111 Bonn Germany Fax: (49-228) 98530-12 info@empirica.com</p>	 <p>e-Business W@tch c/o empirica GmbH Oxfordstr. 2 D-53111 Bonn Germany Fax: (49-228) 98530-12 info@ebusiness-watch.org</p>	 <p>European Commission Enterprise Directorate-General e-Business, ICT Industries and Services Fax: (32-2) 2967019 entr-ict-e-commerce@cec.eu.int</p>
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Introduction to the *e-Business W@tch*

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

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

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

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

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

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

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

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

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

Over the past 10 years, "electronic business" has increased from a very specific to a very broad topic to be studied. The OECD defines e-business in 2004 concisely as "automated business processes (both intra-and inter-firm) over computer mediated networks". This definition is useful as it makes clear that e-business is more than e-commerce (which focuses on commercial transactions between companies and their customers, be it consumers or other companies) and that e-business includes

internal processes within the company as well as processes between companies. Furthermore, the OECD definition implicitly indicates that the focus and main objective of electronic business is to be found in business process automation and integration and the impacts thereof.

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

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

The role of economic analysis in the Sector Reports

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

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

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

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

The definition of sectors and the adequate level of aggregation

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

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

The 10 sectors analysed in 2003/04

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

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

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

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

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

Primary selection criteria

- (a) The economic importance of the sectors for the EU economy: For the representation of e-business impacts in the economy as a whole, "large" sectors play a major role, since changes in their production models, their purchasing and marketing behaviour as well as their productivity and dynamics of growth have a very major effect on the performance of the entire economy. The assessment of the economic importance was mainly based on two standard economic indicators: the sector's share of employment and the amount of value-added by the sector.
- (b) The relative importance of electronic business within the sector: As the *e-Business W@tch* has demonstrated in the first phase (2002/03), the intensity and nature of ICT and e-business usage differs considerably between sectors. Some sectors, although still small in absolute terms, are growing rapidly and/or illustrate the role which ICT and electronic business may play in other sectors in the future. The statistical proxy for the relative importance of e-business in a sector is the Pilot Index which was computed for 15 sectors (cf. European E-Business Report 2003), based on the eEurope 2005 E-Business Index.

Secondary selection criteria

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

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

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

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

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

The Chemical Industries: The use of ICT and e-business in 2003/04 ¹

1 Economic profile

1.1 Definition

The chemical industries, as defined for the purpose of this study, consist of two sectors in the sense of the NACE Rev. 1 classification of business activities: the manufacture of chemicals, chemical products and man-made fibres (NACE Rev. 1 Division 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:

Exhibit 1-1: Configuration of the chemical industries in terms of NACE Rev. 1

NACE Rev. 1		Activity
Division	Group	
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
- Rubber and plastic products

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

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 *e-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. 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 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.

1.2 Economic profile

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

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

1.2.1 Industry structure

Chemicals production dominated by large firms, plastic production by SMEs

The combined chemical industry comprises roughly 72,000 enterprises, employs more than 3.1 million people and generates a value added of 223 billion Euro. Rubber and plastics (NACE Rev. 1 25) comprise almost twice the amount of enterprises of chemicals (NACE 24), but employ slightly less people and generate less than half the amount of value added. These relations indicate the importance of SMEs in the rubber and plastics products sector compared to the chemical products sector. In NACE 24, the share of firms with more than 50 employees is larger than in NACE 25, more than two thirds of the employees work in large enterprises, and more than three quarters of the value added are generated in large enterprises.

Exhibit 1-2: Structure of the combined chemical industries in the EU in 2000

	Total (EU-15)	Enterprises with ... persons employed			
		1-9	10-49	50-249	250+
NACE	Number of enterprises	Structure in % of total			
Sum	72,187	58.0	28.6	10.4	3.0
24	26,290	59.4	23.8	11.7	5.0
25	45,897	57.2	31.3	9.7	1.8
	Number of persons employed	Structure in % of total			
Sum	3,108,800	4.6	14.7	25.7	55.0
24	1,685,900	2.9	8.5	20.5	68.1
25	1,422,900	6.6	22.0	31.9	39.5
	Value added at factor costs (Million Euro)	Structure in % of total			
Sum	223,011.3	2.6	9.5	21.2	66.7
24	155,940.8	1.5	5.5	16.8	76.2
25	67,070.5	5.1	19.0	31.3	44.5

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

Size-class relations in the new Member States is similar to the EU-15

Data indicate that the structure of the industry in the new Member States in terms of company size-bands is similar to the EU-15. In both sub-sectors the majority of firms are micro enterprises with less than ten employees, but the rubber and plastics industry (NACE 25) has an even larger share of SMEs than the chemical industry (NACE 24). Consequently, in the chemical industries relatively more persons are employed in large firms, and most value added is created there.

Exhibit 1-3: Structure of the chemical industries in selected new Member States in 2000

	Total	Enterprises with ... persons employed			
		1-9	10-49	50-249	250+
NACE	Number of enterprises	Structure in % of total			
24 (1)	4,342	70.6	16.5	9.1	3.8
25 (2)	12,506	80.5	13.4	5.3	0.7
	Number of persons employed	Structure in % of total			
24 (3)	103,713	3.4	7.3	17.6	71.7
25 (4)	71,146	6.4	20.8	28.4	44.4
	Value added at factor costs (Million Euro)	Structure in % of total			
24 (5)	4,567.2	3.5	5.0	15.9	75.6
25 (6)	2,174.1	9.6	17.5	32.6	40.3

(1) CZ, EE, HU, LT, LV, PL, SK; (2) CZ, EE, LT, LV, PL, SK; (3) CZ, HU, LV, PL, SK; (4) CZ, PL, SK;
(5) CZ, HU, LV, SK; (6) CZ, SK

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

Basic chemicals, pharmaceuticals and plastic products production most important

Within the chemical industry (NACE 24), the production of basic chemicals (NACE 24.1) is most important in terms of persons employed (32%) and value added (37%) as well as second most important in terms of number of enterprises (24%). These figures point out that basic chemicals form the foundation of the chemical industry. The second sub-sector that stands out is pharmaceuticals, medical chemicals and botanicals (NACE 24.4) with a 29% share of employees and a value added

share of 34%. The other sub-sectors have an employment and value added share in NACE 24 of around ten percent or below.

In NACE 25, manufacture of plastic products is economically more important than rubber manufacture on the aggregate level. The plastic industry comprises 88% of enterprises, 79% of employees and 78% of value added.

Exhibit 1-4: Chemical industries structure by kind of activity in EU-15 in 2001

Activity (NACE Rev. 1)		Enterprises		Persons employed		Value added at factor costs (Million Euro)	
		Number	%	Number	%	Number	%
24	Manufacture of chemicals and chemical products	26.172	100	1.695.554	100	155.524	100
24.1	Basic chemicals	6,200	24	548,578	32	57,094	37
24.2	Pesticides and agro-chemical products	424	2	25,299	2	2,569	2
24.3	Paints, varnishes, printing ink, mastics	3,731	14	165,950	10	11,168	7
24.4	Pharmaceuticals, medicinal chem., botanicals	3,436	13	490,330	29	53,072	34
24.5	Soap, detergents, cleaning, polishing	6,491	25	224,989	13	15,246	10
24.6	Other chemical products	5,588	21	191,375	11	13,468	9
24.7	Man-made fibres	302	1	49,033	3	2,908	2
25	Manufacture of rubber and plastic products	45,333	100	1,413,272	100	66,927	100
25.1	Rubber products	5,503	12	300,596	21	15,077	22
25.2	Plastic products	39,830	88	1,112,676	79	51,850	78

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

1.2.2 Production value and regional distribution

In both NACE 24 and NACE 25, value added at factor cost is roughly one third of the production value, reflecting the large importance of direct production inputs. Much of this input comes from the chemical industry itself; energy and commodities are other important inputs.

As in most sectors, the four largest EU economies (Germany, France, the UK and Italy) account for a substantial share of the total production. In the combined chemical industries, they account for about 70% of total production value and 67% of value added. Germany is the largest producer, accounting for around one fourth of the EU production.

Among the new EU Member States, Poland, Czech Republic and Hungary are the largest producers of chemical, rubber and plastic products. Together, these three countries account for more than 80% of production and value added in nine new Member States (Lithuania is not included as no data were available). Poland alone accounts for almost half of the production value.

Exhibit 1-5: Value added in the chemical industries in EU Member States (2001)

Country	NACE 24 (chemicals and chemical products)				NACE 25 (rubber and plastic products)			
	Production value		Value added		Production value		Value added	
	Euro (million)	% of EU-15	Euro (million)	% of EU-15	Euro (million)	% of EU-15	Euro (million)	% of EU-15
BE	28,552.6	5.6	8,904.5	5.7	6,868.5	3.6	2,010.8	3.0
DK	6,535.9	1.3	2,557.7	1.6	2,802.9	1.4	1,162.2	1.7
DE	123,026.3	23.9	40,388.7	26.0	51,087.7	26.4	19,284.5	28.8
EL	1,939.2	0.4	634.0	0.4	860.4	0.4	247.0	0.4
ES	34,559.4	6.7	9,703.9	6.2	15,192.3	7.9	5,020.6	7.5
FR	100,498.8	19.5	24,754.4	15.9	34,604.2	17.9	10,631.4	15.9
IE	25,167.2	4.9	12,292.4	7.9	1,333.4	0.7	482.1	0.7
IT	62,823.7	12.2	15,295.8	9.8	32,130.5	16.6	9,523.5	14.2
LU	491.0	0.1	145.2	0.1	799.7	0.4	305.9	0.5
NL	36,347.3	7.1	7,794.0	5.0	5,988.5	3.1	1,905.7	2.8
AT	6,277.7	1.2	1,954.5	1.3	4,163.8	2.2	1,551.6	2.3
PT	3,504.7	0.7	953.8	0.6	2,047.5	1.1	643.4	1.0
FI	5,062.6	1.0	1,648.6	1.1	2,387.7	1.2	980.4	1.5
SE	12,484.9	2.4	4,999.8	3.2	3,302.0	1.7	1,197.0	1.8
UK	66,962.9	13.0	23,496.5	15.1	29,887.3	15.4	11,980.8	17.9
EU-15	514,234.1	100.0	155,523.8	100.0	193,456.3	100.0	66,926.9	100.0

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

Exhibit 1-6: Value added in the chemical industries in the new Member States (2000)

Country	NACE 24 (chemicals and chemical products)				NACE 25 (rubber and plastic products)			
	Production value		Value added		Production value		Value added	
	Euro (million)	% of new Member States	Euro (million)	% of new Member States	Euro (million)	% of new Member States	Euro (million)	% of new Member States
CY	155.7	0.9	61.2	1.2	71.4	0.7	29.6	1.0
CZ	3,429.5	20.2	894.0	17.5	2,376.7	23.7	650.1	22.8
EE	162.8	1.0	35.9	0.7	92.6	0.9	24.1	0.8
HU	2,964.8	17.5	945.1	18.5	1,374.1	13.7	369.8	13.0
LV	116.5	0.7	36.5	0.7	65.5	0.7	17.3	0.6
MT	65.6	0.4	21.3	0.4	94.1	0.9	56.1	2.0
PL	7,619.0	45.0	2,491.6	48.9	4,657.4	46.4	1,395.8	48.9
SI	1,407.0	8.3	409.3	8.0	715.4	7.1	181.2	6.4
SK	1,017.4	6.0	200.2	3.9	594.8	5.9	128.3	4.5
Total	16,938.3	100.0	5,095.1	100.0	10,042.0	100.0	2,852.3	100.0

No data available for LT.

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

1.2.3 Employment, productivity and labour costs

Combined chemical industries account for 11% of total employment in manufacturing sectors

The chemical, rubber and plastic industries provide jobs for about 3.1 million people in the 15 EU Member States of 2003. The relative importance for employment in relation to other manufacturing sectors varies between countries, but is between 8-13% in most cases. It is highest in Belgium and Luxembourg (about 15% of employment in manufacturing). In total, the combined chemical industries account for about 11% of employment in manufacturing sectors in the EU-15.

As no comparable employment data for this sector were available for Poland from the sources used by the *e-Business W@tch* to compile these statistics, the figure for the new Member States can only be estimated. Assuming that Poland's significant share of the total production value in the new Member States (about 45%) is about an equivalent to its share in employment, the *e-Business W@tch* estimates that the chemical, rubber and plastic industries provide jobs for about 400,000 people in the new Member States.² This would mean that the total employment in the combined chemical industries in the enlarged European Union of 2004 amounts to about 3.5 million people.

The relative contribution to employment measured as a share of total employment in manufacturing sectors is slightly lower in most of the new Member States than in the EU-15. In most countries, the combined chemical industries account for about 5-9% of employment in manufacturing.

High productivity in chemical products manufacturing

Productivity in the chemical industries is high compared to other sectors. In 2001, value added per person was 91,724 Euro in NACE 24, 80% more than the manufacturing average. The high productivity is driven by the basic chemical industry which operates in very competitive markets for input and output and keep profit margins high only by producing as efficiently as possible.³ The chemicals and plastics industries differ considerably: In NACE 25, productivity amounted to only 47,356 Euro per person employed which was 7% lower than the manufacturing average.

In the new Member States, productivity is much lower than in the EU Member States in absolute figures. However, these figures do not take into account price differences between the different countries. The productivity gap would considerably narrow if figures were expressed in PPPs (Purchasing Power Parities), which are based on producer price indices for the sectors. Purchasing power parities (PPPs) eliminate the differences in price levels between countries.

Labour costs in the chemical industry is higher than in manufacturing average

In the 15 EU Member States of 2003, labour costs in the chemical industry (NACE 24) are much higher (+40%) than in the manufacturing industries average, while labour costs in the rubber and plastics industry (NACE 25) are slightly lower (-6%). Labour costs tend to be highest in Belgium, Germany and Denmark and lowest in Portugal and Greece.

However, relative to the countries' average labour costs in manufacturing, the picture is different. The Portuguese chemical industry (NACE 24) almost doubles the manufacturing labour cost average. In plastics and rubber (NACE 25), labour costs are smaller than the manufacturing average in most countries, with Luxembourg and Portugal being well above the average.

In the new Member States, labour costs amount to only one fifth of the labour costs in the Member States in both chemicals and plastics production. Compared to the manufacturing average, however,

² The confirmed figure for 7 countries (without Poland, Slovenia and Lithuania, for which no data were available) is about 220,000. Cf. exhibits on following pages.

³ See more details in the *e-Business W@tch* chemicals report of August 2002. The report can be downloaded from the *e-Business W@tch* website.

labour costs are even (relatively) higher than in the EU-15. These data may reflect the relatively high productivity in the chemical industries of the new Member States.

Exhibit 1-7: Employment, productivity and labour costs in the chemicals and chemical products industry (NACE 24) in European countries (2001)

Country	Employment		Productivity		Labour Costs	
	Persons employed	In % of manufacturing total	Value added per person employed	In % of manufacturing average	per employee (1000 Euro)	In % of manufacturing average
BE	70,475	10.5	126,350	193.5	60,128	139.2
DK	23,763	4.9	107,633	214.9	52,174	146.7
DE	488,934	6.5	82,606	150.9	56,133	132.7
EL	14,440	6.5	43,910	110.9	25,258	121.7
ES	139,796	5.3	69,415	177.0	38,983	151.0
FR	291,643	7.2	84,879	166.7	51,578	137.2
IE	23,255	9.1	528,585	402.3	39,569	128.3
IT	207,717	4.3	73,638	175.5	43,592	150.6
LU	1,563	4.6	92,933	137.4	42,953	100.6
NL	72,458	8.0	107,566	174.3	49,639	129.3
AT	25,676	4.1	76,122	133.6	49,062	125.3
PT	22,476	2.5	42,436	215.8	24,503	194.5
FI	18,486	4.2	89,181	125.1	43,129	114.1
SE	43,774	5.5	114,218	218.7	50,581	127.9
UK	251,099	6.5	93,575	158.8	50,859	135.5
EU-15	1,695,554	6.0	91,724	179.1	50,183	140.6
CY	1,623	4.5	37,708	140.9	16,934	109.9
CZ	44,413	3.2	20,129	207.1		
EE	3,181	2.7	11,286	157.8	5,631	123.1
HU	35,445	4.7	26,664	215.8	9,587	166.9
LV	4,222	2.8	8,645	124.2	4,114	115.2
MT	889	2.8	23,960	81.6	12,881	91.5
PL					9,978	144.5
SI					21,321	181.2
SK	19,633	4.8	10,197	137.1	5,488	115.7
EU-10 (new MS)	109,406 (1)	3.8	20,056 (1)	195.4	10,088 (2)	150.9

EU-15 data for 2001, new Member States data for 2000. No data available for LT. n.a. = not available

1) CY, CZ, EE, HU, LV, MT, SK only. 2) CY, EE, HU, LV, MT, PL, SI, SK only.

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

Exhibit 1-8: Employment, productivity and labour costs in the rubber and plastic products industry (NACE 25) in European countries (2001)

Country	Employment		Productivity		Labour Costs	
	Persons employed	In % of manufacturing total	Value added per person employed	In % of manufacturing average	per employee (1000 Euro)	In % of manufacturing average
BE	30,780	4.6	65,328	100.1	43,467	100.6
DK	22,999	4.7	50,532	100.9	35,652	100.2
DE	392,699	5.2	49,108	89.7	37,864	89.5
EL	9,341	4.2	26,444	66.8	17,506	84.4
ES	122,473	4.6	40,994	104.6	27,537	106.7
FR	242,842	6.0	43,779	86.0	33,523	89.2
IE	10,759	4.2	44,807	34.1	26,226	85.0
IT	210,134	4.3	45,321	108.0	28,165	97.3
LU	3,820	11.2	80,075	118.4	54,531	127.7
NL	36,388	4.0	52,371	84.8	35,414	92.2
AT	29,713	4.7	52,220	91.7	36,867	94.2
PT	24,918	2.7	25,821	131.3	14,478	114.9
FI	17,547	4.0	55,873	78.4	34,737	91.9
SE	26,193	3.3	45,699	87.5	35,291	89.2
UK	232,665	6.0	51,494	87.4	34,156	91.0
EU-15	1,413,272	5.0	47,356	92.5	33,565	94.0
CY	1,255	3.4	23,586	88.1	15,304	99.3
CZ	56,349	4.1	11,537	118.7		
EE	2,940	2.5	8,197	114.6	4,731	103.5
HU	31,656	4.2	11,682	94.5	5,758	100.3
LT						
LV	2,167	1.4	7,983	114.7	2,591	72.6
MT	1,822	5.8	30,790	104.9	15,958	113.4
PL					6,901	100.0
SI					12,045	102.4
SK	14,797	3.6	8,671	116.6	5,704	120.3
EU-10 (new MS)	110,986 (1)	3.8	11,491 (1)	112.0	7,001 (2)	104.7

EU-15 data for 2001, new Member States data for 2000. n.a. = not available

(1) CY, CZ, EE, HU, LV, MT, SK only.- (2) CY, EE, HU, LV, MT, PL, SI, SK only.

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

1.3 Trends and challenges

The chemical sector during the economic downturn

The chemical industries are a mature sector with rather stable and predictable demand and supply, but even such a sector was affected by the overall economic downturn of the past few years. Although the various sub-sectors manufacture a broad variety of products which are used in very different contexts and areas of life, supply goods for other industries account for the majority of production, for example for the automotive industry, for packaging and for construction. As a consequence, these sub-sectors of the chemical industries are more susceptible to economic cycles than, for example, the pharmaceutical industries.

Recent economic indicators suggest a revival of the economy in 2004. If this holds true, the European chemical industries should also benefit. During the economic downturn, many companies from the sector have consolidated which should pay off when the upswing gains momentum.

The pressure to consolidate business will remain, through. For example, BASF, a global leader of the chemical industries, forecasts annual growth rates for the sector that are below those of the world economy, in contrast to the situation in the previous 20 years. Annual growth in the world-wide chemical industry until 2015 is estimated at 2.7%, compared to 3.1% for the world economy.⁴ If so, the chemical industries will focus on realising cost saving potentials rather than on growth in the years to come.

Since exports account for a significant percentage of revenues for many European companies in this globalised sector, business will also depend on exchange rate fluctuations. The high valuation of the Euro poses a risk for European companies. Manufacturers of fine and speciality chemicals are probably affected to a higher degree by exchange rate developments than companies producing basic chemicals. These benefit from cheaper prices for supply goods which are traded in US Dollar.

The impact of policy and the legal framework

The development of the chemical and pharmaceutical sectors does not only depend on the economic situation, but also on national and international policy and the resulting legal framework.

Chemical policy: The European REACH Regulation

On 29th October 2003, the European Commission adopted a proposal for a new EU regulatory framework for chemicals. Under the proposed new system called REACH (Registration, Evaluation and Authorisation of CHemicals), enterprises that manufacture or import more than one tonne of a chemical substance per year would be required to register it in a central database. The aims of the proposed new Regulation are to improve the protection of human health and the environment while maintaining the competitiveness and enhancing the innovative capability of the EU chemicals industry. REACH would also give more responsibility to the industry to manage the risks from chemicals and to provide safety information on the substances. This information would be passed down the chain of production. The proposal has been drafted in close consultation with all interested parties, including an Internet consultation.⁵

Only those chemical substances produced or imported in volumes of 1 tonne or more per year (per manufacturer/importer) have to be registered in REACH. This means that around 30,000 marketed substances will need to be registered. Of these 30,000 substances, around 20,000 are produced or imported in volumes of between 1 and 10 tonnes. The number to be evaluated will depend on the concerns of the Member States' authorities, but the White Paper predicted that around 20% of substances would go through this process.

Up to 1500 substances of very high concern will be subject to authorisation. Approximately 40,000 intermediates will also need to be registered although for most of them the registration requirements will be significantly lighter than for other substances.

The Commission's Impact Assessment estimates the direct costs of REACH to the chemicals industry at a total of some €2.3 billion over an 11 year period, including fees to the Agency of €0.3 billion. The costs to downstream users of chemicals are estimated at €2.8 - 3.6 billion if the market behaves as expected with 1 - 2 per cent of substances withdrawn because continued production would not be profitable. Costs could rise to €4.0 - 5.2 billion if industry faces higher supply chain adaptation costs. These estimates include the direct costs passed on from the chemicals sector to downstream users. Consequently, the overall costs to the chemicals industry and its downstream users would then be €2.8 - 5.2 billion.

⁴ "Baustelle Chemie", in: Der Spiegel, No. 52/2003, 20 Dec. 2003, p. 69

⁵ see <http://europa.eu.int/comm/enterprise/chemicals/chempol/whitepaper/reach.htm>

The chemical industry, however, argues that costs implied will be much higher and estimates them at about 15 billion Euro. Special chemicals manufacturer Degussa, for example, estimates that annual costs to comply with the regulations planned by the European Commission would amount to 200 million Euro.

Health policy

European health policies are confronted with huge challenges. The ageing society and the increasing number of patients suffering from chronic diseases make it increasingly difficult to ensure that services can be financed at the level European citizens are used to. To gain control over the cost explosion, Member States try to enforce health policy reforms which in some cases include quite drastic breaks with traditional practices.

This has implications for the pharmaceutical industry. In Germany, for instance, the discounts which pharmaceutical companies have to grant to health insurance schemes was drastically increased from 6% to 16% with the beginning of 2004. It is expected that small and medium-sized companies will react with strict cost saving programmes, co-operations and mergers. The large German pharmaceutical companies also expect reduced revenues due to the health reform, but to a lesser extent, because their main business is in exports.

Online sales in the pharmaceutical industry

In most of the EU Member States, trade with pharmaceuticals is strictly regulated. Opening markets for internet pharmacies that sell online is therefore an important innovation and new development.⁶ In this context, the sector awaited with great excitement the decision of the Court of Justice of the European Communities (Rs-C-322/01) from 11th December 2003. The Court decided that the national prohibition of trading with pharmaceuticals does not comply with European Union law, as far as pharmaceuticals are concerned that are approved on the national market and need not be prescribed. In Germany, the health reform created a more liberal framework for selling pharmaceuticals online than was imposed by this decision, allowing online sales also for prescription-only medicines.

Product innovation – a critical success factor

Product innovation in the pharmaceutical industries, starting with research and development and leading all the way through to market introduction, needs a long time and consumes huge amounts of money. For many pharmaceutical companies it is therefore the single most important critical success factor whether newly developed products, which can be sold with high margins (the so called "blockbusters"), are successful once introduced to the market. Bayer, for example, has great expectations for its new potency medicine Levitra. This product was developed and is marketed in co-operation with Glaxo Smith Kline, the largest European pharmaceutical company. The companies expect revenues of more than one billion Euro per year, 60% of those in the USA.

On the other hand, it can be a critical situation for companies when patent rights for a (successful) pharmaceutical product end and competitors are allowed to produce the same kind of product (generics). The situation is worse when a product is accused of causing the death of more than 100 people, as in the case of Bayer and its Lipobay, a prescription medicine to treat high cholesterol. In the USA, thousands of people have filed suit against Bayer which has spent more than half a billion Euro for out-of-court settlements since. This does not include indirect costs because of reduced sales or damaged image.

Restructuring in the sector

As in other sectors, chemical and pharmaceutical companies are facing increasing competitive pressure in the global economy. One of the reactions is a restructuring of markets. The recent battle about the takeover of Aventis is a spectacular example. The Bayer group tries to reduce its business areas by hiving off its basic chemicals branch. The trends towards specialisation, focusing on core

⁶ See excursus in this report in chapter 2.

competencies and the focus on realising economies of scale have already been observed in the past and are likely to remain in place in the near future.

One of the main problems for the chemical industries is that more and more products are becoming mass commodities which can easily produced by competitors in low-wage countries. To remain competitive, companies need to minimise production costs by exploiting economies of scale or conquer niche markets with specialised products. Against this background, companies tend to narrow their range of products, which drives the ongoing restructuring process in the chemical industries as companies sell or buy branches of other companies.

Mergers and Acquisitions: Aventis as an example

In January 2004 the French pharmaceutical company Sanofi-Synthelabo launched a hostile takeover (worth 48 billion Euro) of its German-French competitor Aventis, a company more than double the size of Sanofi-Synthelabo. Aventis is the result of the merger of Hoechst and Rhone-Poulenc in 1999. A merger of Aventis with Sanofi-Synthelabo would create the world's third largest pharmaceutical company after Pfizer (USA) and Glaxo Smith Kline (UK) with about 100,000 employees and revenues of about 25 billion Euro.

In France, assessment of the envisaged merger is mostly positive, since it is in line with the French policy to create large and strong national companies that play an important role on the world market. In Germany, views are rather critical as it is suspected that the merger will lead to massive lay-offs and that it will be mainly German sites that will be affected. Trade unions warn that the merger would cost 10,000 to 12,000 jobs.

Restructuring of groups: Bayer as an example

Bayer group, the last European chemical conglomerate besides Akzo Nobel which produces nearly everything from artificial fertilizers to plastics, is currently undergoing a restructuring process. In the future, Bayer wants to focus on the production of pharmaceuticals and high-quality agricultural chemicals with the objective to increase profits even at lower total revenues. Other business areas will be split off to a company established for this purpose (NewCo) from 2005 onwards. Thus, Bayer group follows a strategy which was used by Hoechst AG five years ago with their Life Science concept.

Exhibit 1-9: Largest pharmaceutical companies world-wide (2002)

Company	Rank (2002)
Pfizer	1
GlaxoSmithKline	2
Merck & Co.	3
AstraZeneca	4
Bristol-Myers Squibb	5
Johnson & Johnson	6
Novartis	7
Eli Lilly	8
ranked by revenues generated in 2002	

Source: Datamonitor / Pharmaceutical Business review online, 10th Feb. 2004

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

2.1 Introduction

The chemical industries have been a rather conservative sector when it came to using information and communication technologies for linking business processes and interacting with their suppliers and customers. A part of the explanation may be found in the extremely high demand for security in this sector, due to the sensitive nature of the goods produced (toxic potential) and the high level of research and development, at least in sub-sectors such as the pharmaceutical industries, requiring strict measures for protecting the company's knowledge (data, patents). To some extent, this leads to a paradox in the sector: On the one hand, the chemical industries have always been an innovation and RTD intensive sector as far as product development is concerned. On the other hand, due to the high regard for security, the same sector is rather averse towards taking risks in process innovation, in particular as far as exchanges with other companies in the market are concerned.

Will technology fulfil its promise?

"Globally, the chemicals sector is among the most technologically advanced. Yet in one vital area, technology has yet to fulfil its promise: eBusiness."

(from a brochure by CIDX – Chemical Industry Data Exchange)

The portrait of an industry that hesitates first but then quickly starts to adopt e-business once the applications have become more mature, with a lower risk of adoption, has been confirmed by a number of studies investigating e-commerce and e-business use in the sector, including those of the *e-Business W@tch*. However, one has to bear in mind that many of these studies were commissioned or carried out by large software or consulting companies. These tend to focus very much on the rather spectacular e-business activities by large, globally active companies, which constitute their major customer group. It is certainly true that many of the larger companies from the chemical industries have adopted electronic business applications on a high level. Furthermore, the sector as a whole has some characteristics that are quite perfect for e-business. For example, many of its products are very suitable for standardisation and, consequently, to be traded online. This constitutes an essential difference to other manufacturing sectors. In the textile industries, for example, products tend to be much more "unique" with respect to their design and composition and are therefore more difficult to be catalogued electronically.

Within the chemical industries, however, the e-business situation is a different one for many smaller companies which are typically suppliers to larger firms. In its first report on e-business in the chemical industries in August 2002, the *e-Business W@tch* found evidence that "many smaller chemical companies are still in a very early stage of e-business usage. Many have not yet integrated their internal ERP systems and are unable to conduct e-business in the same way as larger companies."⁷ This finding is still valid 18 months later, although the SMEs in the chemical industries are not lagging behind their counterparts from other sectors, including other manufacturing sectors such as the automotive industry.

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.

⁷ Previous e-Business Sector Impact Studies published by the *e-Business W@tch* in 2002/03, which include reports on the chemical industries, can be downloaded from the website (www.ebusiness-watch.org).

The EU enlargement as a potential e-business incentive

When the 10 Acceding Countries have joined the European Union in May 2004, the enlarged Internal Market of the EU will offer new opportunities, but also create increased competition for European companies both in the previous and in the new Member States. The ability and acceptance to trade electronically with business partners, suppliers and customers across borders will rise in importance in an increasingly international business environment. This applies to the chemical industries as well as other sectors.

The size of the new markets in the chemical industries of the new Member States (in terms of production value), however, cannot yet be compared with those of the Member States of 2003. Production value of the chemical industries in Poland, which is by far the largest of the 10 economies, is much smaller than in the respective markets of Sweden, Belgium or Ireland, although Poland has more inhabitants than these three countries together. The following exhibit shows the size of the chemical industries in those countries which were part of the e-Business Survey 2003 in this sector.

Exhibit 2-1: Size of the chemical industries in countries included in the e-Business Survey 2003 in this sector

	NACE 24 (chemicals and chemical products)		NACE 25 (rubber and plastic products)		NACE 24+25	
	Production value	Value added	Production value	Value added	Production value	Value added
BE	28,552.60	8,904.50	6,868.50	2,010.80	35,421.10	10,915.30
DE	123,026.30	40,388.70	51,087.70	19,284.50	174,114.00	59,673.20
ES	34,559.40	9,703.90	15,192.30	5,020.60	49,751.70	14,724.50
FR	100,498.80	24,754.40	34,604.20	10,631.40	135,103.00	35,385.80
IE	25,167.20	12,292.40	1,333.40	482.1	26,500.60	12,774.50
IT	62,823.70	15,295.80	32,130.50	9,523.50	94,954.20	24,819.30
SE	12,484.90	4,999.80	3,302.00	1,197.00	15,786.90	6,196.80
UK	66,962.90	23,496.50	29,887.30	11,980.80	96,850.20	35,477.30
CZ	3,429.50	894	2,376.70	650,1	5,806.20	1,544.10
EE	162.8	35.9	92.6	24.1	255.40	60.00
LV	116.5	36.5	65.5	17.3	182.00	53.80
PL	7,619.00	2,491.60	4,657.40	1,395.80	12,276.40	3,887.40

Source: Eurostat New Cronos / DIW

International trade plays an important role for many companies from the chemical and pharmaceutical industries. Exports can account for more than 50% of revenues. Imports of supply goods from foreign markets are also important, for companies producing basic chemicals in particular. Furthermore, the sector is currently undergoing a consolidation and restructuring process, with many and in some cases rather spectacular mergers and acquisitions taking place. Against this background, the EU enlargement will add another dimension which will have an impact on the sector. Companies from the 2003 EU Member States may, for example, consider to move parts of their production to the new Member States where wages and possibly taxes are lower. Furthermore, trade between chemical companies from the existing and the new Member States of the European Union will be facilitated.

In the chemical industries, Cefic, The European Chemical Industry Council, supports the EU enlargement as an important contribution to the goal of political and economic stability in Europe. The council co-operates with associations from the new Member States already since the early 1990s (see fact box below). Legal work, in particular surveying and comparing the national chemical legislation with relevant EU laws and rules, has been an important aspect of this co-operation. In 1999, Cefic implemented a working group addressing the impact of the enlargement on the Internal Market and regulatory environment with regard to the chemical industry. Conclusions were presented in October 2000 at the Industrial Forum on Enlargement Conference in Paris.













Enlargement in the federation of European chemical associations – a process that started in 1992

Cefic, The European Chemical Industry Council, supports the accession of the Central and Eastern European Countries (CEEC) to the EU as an important contribution to the goal of political and economic stability in Europe.

Since 1992, Cefic has opened its membership to Central European Federations. Today, the Chemical Industry Federations of the Czech Republic, Hungary, Poland, Slovakia, Slovenia and Turkey are full members of Cefic and the Federations of Bulgaria, Estonia and Lithuania are Associate Members of Cefic. Good co-operation and partnership with Federations in Latvia, Romania and Cyprus have been developed. Today, Cefic represents about 40,000 large, medium and small chemical companies which employ about two million people and account for more than 30% of world chemical production. A major task for the chemical industry in the CEEC, as for other sectors, is now to adapt to the requirements of the European Union.

cf. Cefic (www.cefic.org) - EU Enlargement

Exhibit 2-2: Key figures on the countries compared

	Area (km ²)	Population (million)	GDP/capita (PPS)*	Major industries	Main trading partners (export)
BE 	30,528	10.3	25,260	Chemical, metal products, food	France (18%) Germany (17%) Netherlands (13%)
DE 	357,023	82.5	24,000	Machinery, electronics and electrical machinery, automotive, chemical, steel	France (11%) USA (10%) UK (8%), Italy (7%)
ES 	504,782	39.5	19,510	Automotive and shipbuilding, chemical, steel, textile	France (20%) Germany (13%) Portugal (10%)
FR 	543,965	59.2	23,870	Food, transport equipment, machinery, electronics, metal products	Germany (15%) UK (10%) Spain (10%)
IE 	70,273	3.8	27,360	Electronics, metal products, machinery	UK (24%) USA (17%) Germany (13%)
IT 	301,338	57.7	23,860	Automotive, chemical, machinery, textile	Germany (17%) France (13%) USA (10%)
SE 	449,964	8.9	23,700	Metal products, wood, pharmaceutical/chemical, textile, electronics	Germany (11%) UK (10%) USA (9%)
UK 	242,910	59.9	23,530	Chemical, automotive, machinery, food, metal	USA (15%) Germany (13%) France (10%)
CZ 	78,866	10.3	13,700	Textile, automotive, beverages	Germany (41%) Slovakia (8%)
EE 	45,227	1.4	9,240	Machinery, electronics, textile	Finland (34%) Sweden (14%)
LV 	64,589	2.3	7,750	Wood, textile, food, machinery, chemical	UK (17%) Germany (17%) Russia (11%)
PL 	312,685	38.7	9,410	Food, transport equipment, machinery, chemical	Germany (36%) Italy (7%) Netherlands (5%)

* PPS = Purchasing Power Standards

Sources: dtv Jahrbuch 2004 (SPIEGEL-Buchverlag) / * European Union: Key indicators on Member States and Candidate Countries (<http://www.europa.eu.int/comm/enlargement/candidate.htm>)

2.2 E-business indicators – the statistical picture

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

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

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

2.2.1 Infrastructure and skills development

The *e-Business W@tch* concluded already in previous editions of this report⁸ that the infrastructure prerequisites for using e-business can be considered as quite good in the combined chemical industries. This observation is further confirmed by recent results from November 2003. In practically all countries, including the new EU Member States, ICT network connectivity indicators are higher in the chemical sector than on average for all sectors in the EU-5. The relatively high importance of large companies, particularly in NACE 24, explains that a large number of employees in the sector work in companies that are equipped with an above average ICT infrastructure.

On the European E-Business Scoreboard, which benchmarks 10 sectors of the European economy in four dimensions, the chemical industries have an indexed score of +0.43 in the dimension "connectivity of the enterprise". An index of 0 represents the sector average, with +/-1 being the standard deviation from the average. Chemicals are ranking on fourth position.

Local and wide area networks

The relatively high benchmarking score should not obscure some ambivalences that become visible when looking at the figures in more detail. 83% of all employees in the chemical industries work in companies that have connected their computers with a Local Area Network (LAN), which can be regarded as a basic indicator whether the minimum requirements for practising e-business on a significant level are in place. However, these are only 40% of all enterprises. Among the remaining 60% of all firms (legal units) there are many micro-companies that do not connect their few computers internally. 9% of all companies, which represent about half of the employment in the sector, use a Wide Area Network to connect their different remotely located establishments.

These figures already indicate the dichotomy of the sector: There are large enterprises with complex and advanced IT architectures on the one hand, and a lot of small companies equipped with very basic, frugal information technology and networks on the other. High-tech and low-tech exist in parallel, and this clearly determines and characterises the e-business state-of-the-art in the chemical industries. This is a situation which can be found in other manufacturing sectors as well, for example in the automotive industry, where the gap between large players and the small companies is even more pronounced.

⁸ cf. www.ebusiness-watch.org (publications – 2002/03)

Exhibit 2-3: Use of physical network infrastructure in the chemical industries (2003)

	Use computers	Local Area Network	Wide Area Network	Remote Access	Wireless remote access
Sector total (EU-5)					
% of employment	99	83	48	57	12
% of enterprises	96	40	9	23	5
0-9 employees	93	22	2	15	3
10-49 employees	100	53	10	26	6
50-249 employees	100	88	31	51	12
250+ employees	100	92	70	71	17
All (9) Sectors (EU-5)				37	10
% of employment	95	61	29	37	10
% of enterprises	89	32	5	16	4
Sector by country (% of employment)					
BE Belgium	100	92	64	80	31
DE Germany	100	92	53	68	11
ES Spain	99	67	42	46	18
FR France	100	76	58	42	2
IE Ireland	100	89	64	70	10
IT Italy	100	76	19	41	9
SE Sweden	100	90	53	83	40
UK United Kingdom	99	86	55	73	26
CZ Czech Republic	100	62	23	61	30
EE Estonia	100	77	43	40	26
LV Latvia	95	68	8	39	16
PL Poland	97	55	23	42	9

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

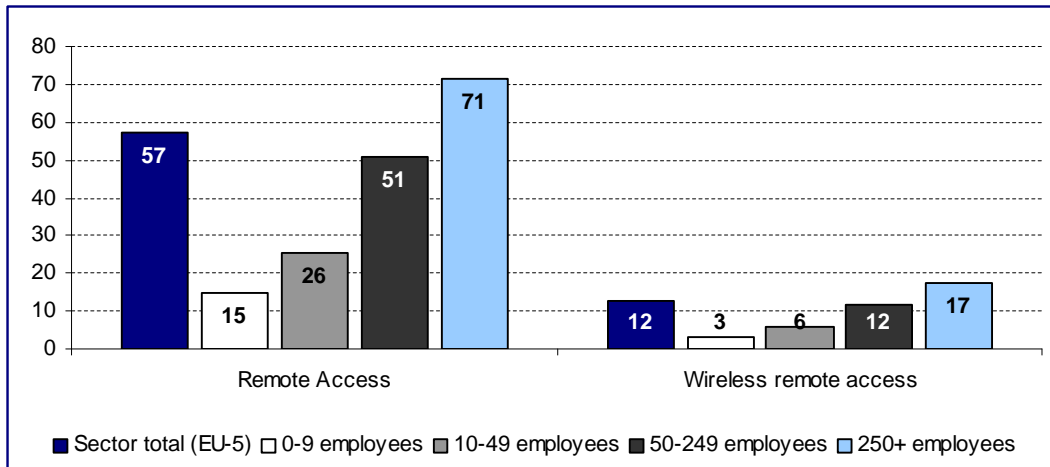
Remote access to the network

Remote access solutions are significantly more prevalent in the chemical industries than in other sectors: 57% of the employees in this sector work in enterprises that offer their staff remote access to the company's computer system. This is the fourth highest figure among the 10 sectors surveyed in 2003. 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 23%.

Remote access solutions play an important role particularly in large pharmaceutical companies, which have high numbers of customer care employees and fieldworkers. Companies representing 12% of employment report that employees can remotely access the computer network through wireless technology. This does of course not mean that all employees in these companies have remote access. This functionality is only relevant for example for teleworkers and mobile workers.

The use of company internal Wireless LANs has already reached a higher level, at least in the EU Member States of 2003 and the technologically more advanced new Member States. It appears that WLAN use could be a good indicator for the e-readiness of companies in general. In Sweden, already 38% of employees work in companies with a WLAN in place. In the Czech Republic, Belgium and Ireland the figure is between 23-29%, while in Poland (8%) and Latvia (4%) WLAN is not yet widely diffused.

Exhibit 2-4: Enterprises enabling remote access to their computer system (2003)

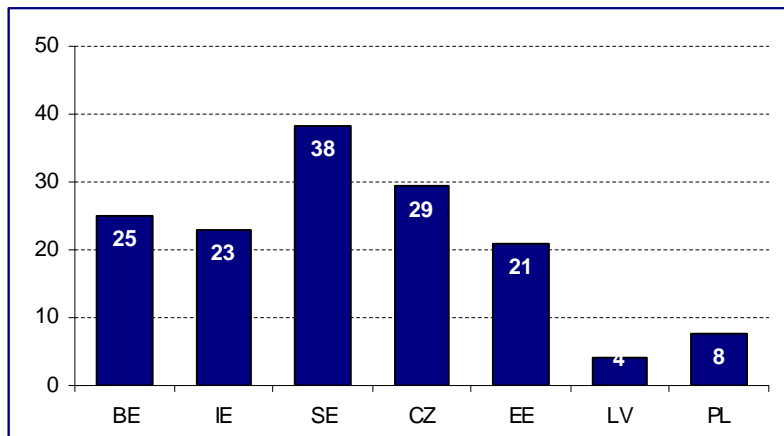


Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Exhibit 2-5: Enterprises from the chemical industries using a WLAN (2003)



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

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

Internet access and use of basic Internet applications

Simple internet access is no longer a useful indicator for the connectivity of a company. In the chemical industries, more than 85% of all firms and more than 95% of all companies with more than 10 employees are connected. Latvia is the only country in the sample where less than 90% of all employees work in companies with internet access.

As a consequence, a vast majority of all enterprises uses e-mail and the WWW, the basic and most important internet applications in the daily work routines of many office workers. While browsing the WWW for business information does not constitute an e-business activity by itself, the impact of having this world-wide source at one's fingertip should not be underestimated. The WWW offers companies access to information in an immediate and cost-efficient way which was unthinkable only 10 years ago and is a major driver for the transparency of markets.

Exhibit 2-6: Internet access and use of basic internet applications (2003)

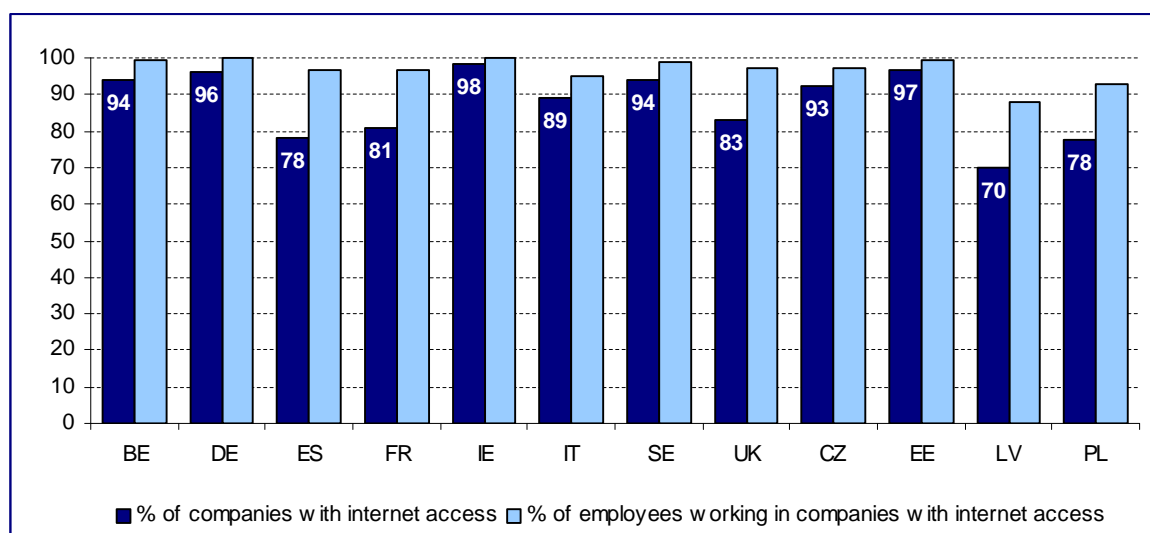
	Have access to the internet	Use e-mail	Use the WWW
Sector total (EU-5)			
% of employment	98	95	92
% of enterprises	86	80	70
0-9 employees	78	69	62
10-49 employees	96	93	74
50-249 employees	99	99	95
250+ employees	99	97	97
All (9) Sectors (EU-5)			
% of employment	88	84	77
% of enterprises	76	68	58
Sector by country (% of employment)			
BE Belgium	100	99	98
DE Germany	100	100	98
ES Spain	97	96	72
FR France	97	89	95
IE Ireland	100	100	100
IT Italy	95	93	80
SE Sweden	99	99	97
UK United Kingdom	97	96	97
CZ Czech Republic	97	96	95
EE Estonia	99	99	99
LV Latvia	88	88	88
PL Poland	93	89	88

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Exhibit 2-7: Companies having Internet access (2003)



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

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

While a vast majority of enterprises is connected to the internet, there are differences in the connection mode and quality between larger and small enterprises and between regions. Close to 40% of all large companies report that the bandwidth of their internet access is 2 Megabit/s or more, compared to 21% of medium-sized companies and less than 10% of the small firms. Among micro-enterprises, still close to 40% say that they use analogue dial-up modems to connect, which indicates that they use the internet for e-mail and occasional web browsing but rather not for more advanced applications. In fact, the percentage of enterprises with a broadband connection (of at least 2 Mbit/s) is slightly below the all sector average (9% compared to 11%). This connectivity gap between the small and large enterprises occurs in other manufacturing sectors as well, for example in the electrical machinery and electronics and the transport equipment manufacturing sectors.

The preferred connections modes in countries depend to some extent on the legacy of the regional telecommunication infrastructure and shows some peculiarities. The share of firms with broadband connection (2 Mbit/s or above) is comparably low in some of the new Member States (Poland, Czech Republic), Italy and – surprisingly – in the UK. In France, 30% of all companies are online but could not answer the question about the available bandwidth of their internet connection.

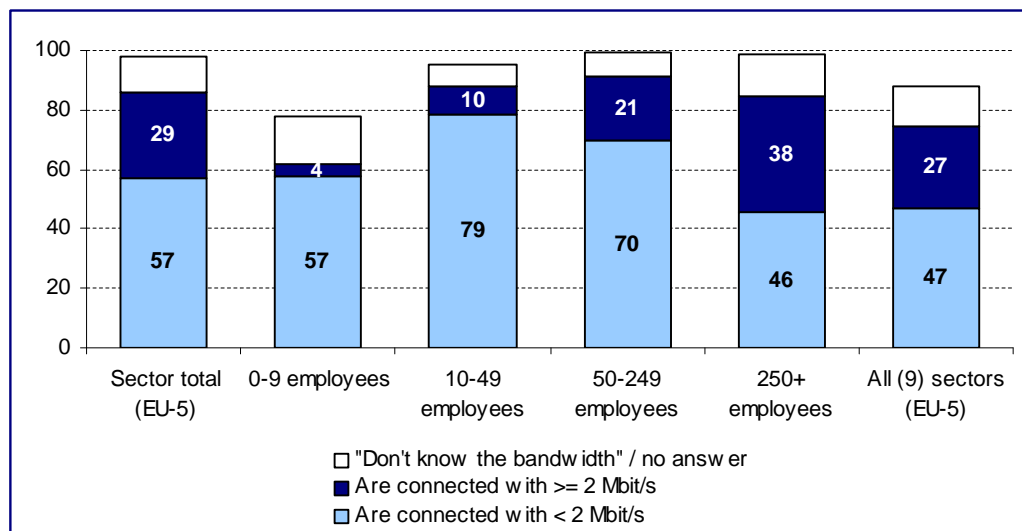
Exhibit 2-8: Quality of internet connection used by companies (2003)

	Still use analogue dial-up modem *	Maximum bandwidth of internet connection		
		Are connected with <2 Mbit/s	Are connected with >= 2 Mbit/s	Don't know their connection bandwidth
	% of enterprises connected	% of all enterprises	% of all enterprises	% of all enterprises
Sector total (EU-5)				
% of employment	13	57	29	12
% of enterprises	31	65	9	13
0-9 employees	39	57	4	17
10-49 employees	26	79	10	7
50-249 employees	15	70	21	8
250+ employees	8	46	38	15
All (9) Sectors (EU-5)				
% of employment	16	47	27	14
% of enterprises	27	49	11	16
Sector by country (% of employment)				
BE Belgium	4	20	68	12
DE Germany	4	59	39	1
ES Spain	10	51	34	12
FR France	17	36	30	30
IE Ireland	12	53	42	5
IT Italy	12	71	19	6
SE Sweden	5	32	46	21
UK United Kingdom	27	67	17	14
CZ Czech Republic	14	77	18	2
EE Estonia	4	43	35	22
LV Latvia	13	38	27	22
PL Poland	28	62	19	11

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

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

Exhibit 2-9: Quality of internet connection by size-band (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

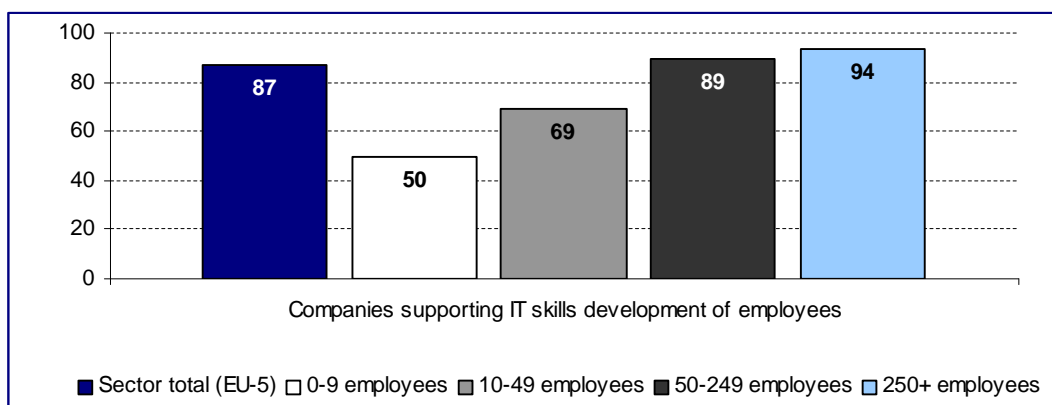
Weighting: Figures for size-bands in % of enterprises. Figures for "Sector total" and "All sectors" are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

ICT skills development in the company

Almost 90% of the employees in the chemical industries work in companies that offer at least some support of IT and networking skills development. This is above the average in other sectors (77%), 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 training schemes on a broader level than small companies. 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.⁹

Exhibit 2-10: Companies supporting any kind of IT skills development (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

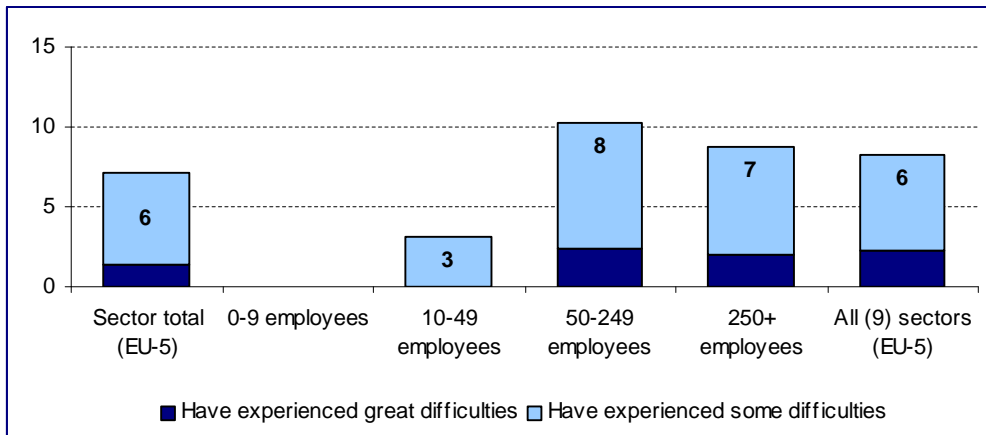
⁹ Cf. previous Sector Report on the Chemical Industry, July 2003, p. 21 (www.ebusiness-watch.org).

ICT skills: demand and supply

9% of all companies in the chemical industries recruited or tried to recruit staff with special IT skills in 2002/2003. This is broadly in line with the IT recruitment activities in other sectors. As can be expected, large and medium-sized companies were considerably more active in recruiting IT professionals than small companies due to their overall demand for staff and staff turnover. Compared to the e-Business Survey 2002, answers suggest that the percentage of companies seeking IT staff in 2002/03 was lower than in 2001/02 when 13% of all enterprises (comprising 31% of employment) said they had made recruitment efforts. This is plausible, since the IT related employment effect of the new economy crash was most severe during the 2002/03 period.

In total, enterprises representing about 7% of employment reported in 2003 that they had "some" or "great" difficulties in finding suitable staff with IT qualifications. Due to their higher demand, it is mainly the medium-sized and large enterprises which complain about a skill gap in the supply of IT specialists on the labour market. Figures are very similar to those for the 2001/02 period, when 5-6% of all companies from the sector had reported difficulties. On the whole, the sector does not seem to suffer from an IT skills gap anymore. The same level of difficulties would probably be reported for any hiring of specialised staff, across departments and job descriptions.

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



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

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

In the second part of the e-Business Survey 2003 (carried out in November), the e-Business W@tch asked companies for the first time which formal qualifications they expected from newly hired IT people and whether they were outsourcing some of their IT operations. Data are therefore only available from those countries which were part of the November survey. The picture is somewhat unclear as it suffers statistically from the low number of observations in each country. However, as a rule of thumb it can be concluded that both kinds of formal qualifications asked – academic degrees, or an IT industry certificate and job experience – are important, and that the latter are rated even higher in most countries. In any country, more than half of all companies which had posted jobs said that they expected "an IT industry certificate and at least a few years experience" from applicants.

Most companies, at least the larger ones, outsource some of their IT operations. Regional differences are striking and range from a fourth of all companies in the Czech Republic, a third in Ireland and Poland, two thirds in Belgium up to 90% in Estonia. It must be considered, though, that companies may include different IT related services in their consideration (or not) when answering the respective question, for example web hosting or contracts with application service providers. Therefore the term "outsourcing" bears some vagueness and inaccuracy which can hardly be prevented in representative

surveys. In any case, the level is high, and particularly large enterprises from the chemical industries are likely to contract service providers to take care of some of their IT related activities.

Exhibit 2-12: Recruitment activities, expected qualifications and outsourcing of IT activities in the chemical industries (2003)

	Recruitment			Outsourcing
	Have made recruitment efforts during past 12 moths period	Of those expected: Academic degree (Master, PhD) *	Of those expected: IT certificate + job experience *	Have outsourced some of their IT activities
Sector total (EU-5)				
% of employment	23	not available	not available	not available
% of enterprises	9	not available	not available	not available
BE Belgium	6	70	54	65
IE Ireland	8	70	94	33
SE Sweden	9	21	91	57
CZ Czech Republic	25	35	63	24
EE Estonia	28	0	73	92
LV Latvia	38	52	78	70
PL Poland	6	50	70	33

Base: all enterprises / *enterprises having made recruitment efforts. N~ 50-100 per country. Weighting: Figures weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

2.2.2 Internal business processes

The *e-Business W@tch* has concluded in 2003 that "the most significant impacts of e-business currently concern the internal work processes."¹⁰ In fact, most enterprises can benefit from using ICTs for making internal work processes more efficient. Process innovations can result from implementing simple applications and do not necessarily require sophisticated and expensive e-business software.

Improving the efficiency of internal business processes is one of the main drivers for e-business in the chemical industries as well. But large enterprises are still most likely to make use of these applications as the efficiency gains from IT-supported internal business processes tend to increase with the company size.

Knowledge management and e-learning

Knowledge management and e-learning have both been buzz-words since the late 1990s, and particularly e-learning¹¹ is still very much on vogue as a concept to support life-long learning. Special knowledge management software should help companies to organise information that is relevant for employees in a way that they can easily retrieve and use it.

Both applications, although frequently overrated in the sense that they have not lived up to exaggerated expectations, can have clear merits for businesses if scaled to the actual need of the enterprises and if adequately used. E-learning in particular goes hand in hand with the use of an intranet, since in many cases the material will be available from there. Knowledge management

¹⁰ The European E-Business Report 2003. p. 24f.

¹¹ In the context of the *e-Business W@tch*, e-learning has been defined as learning material for employees that can be accessed through the intranet of a company or through the internet. Companies were asked whether they use an e-learning application, based on this definition.

software will also have close links to the intranet, and in some cases the intranet *is* the de facto "knowledge management" system of a company.

In the combined chemical industries, 62% of all employees work in enterprises that have implemented an intranet, while only 12% report that they use a special knowledge management solution and 8% use e-learning tools. For all applications, diffusion increase by size-class. Intranets have become a commonplace in large companies, but even a third of all small companies (with 10-49 employees) have one.

Special software for knowledge management is only used at a significant level in large firms (15%). This is common to all sectors surveyed, but the diffusion among small and medium-sized firms is particularly low in the combined chemical industries. The textile and footwear industry is the only other manufacturing sector with an even lower adoption rate among SMEs.

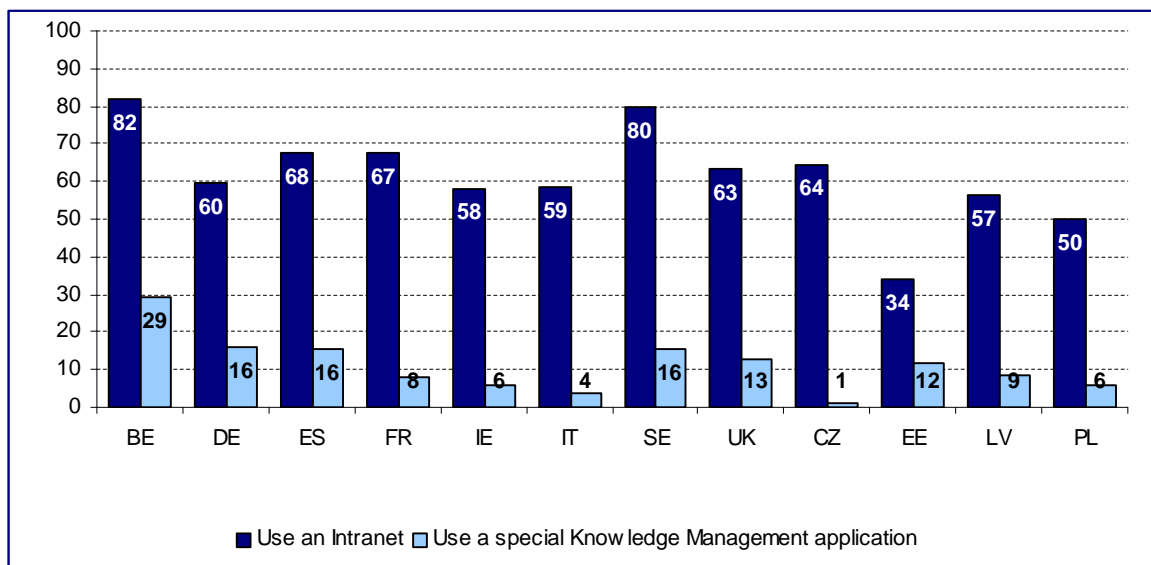
Exhibit 2-13: Knowledge management and e-learning (2003)

	Use an intranet	Use a special knowledge management application	Use an e-learning application
Sector total (EU-5)			
% of employment	62	12	8
% of enterprises	22	4	4
0-9 employees	9	1	3
10-49 employees	32	5	5
50-249 employees	58	8	10
250+ employees	79	15	10
All (9) Sectors (EU-5)			
% of employment	45	10	13
% of enterprises	21	5	5

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

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

Exhibit 2-14: Knowledge management: Use of intranets and special applications in the chemical industries by country (2003)



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

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

Use of online technologies to support internal business processes

Sharing documents to perform collaborative work has become quite common among enterprises from the chemical industries, even among some of the smaller ones. 55% of employees work in companies where document sharing is possible in order to facilitate collaborative work processes, compared to 40% on average across sectors.

The diffusion of IT solutions for other, more specific applications is less advanced in the sector, but still in all cases above industry average. Companies accounting for 33% of employment use online technologies to track working hours and production time (compared to 20% on average), 28% to support the human resources management and 16% to automate the travel reimbursement of employees. Levels are about the same as were reported in 2002.

Considering that the automation of internal work processes is further developed in the chemical industries than in many other sectors, it comes as a surprise that this is not reflected by the companies' perception of this effect. The share of firms saying that "the use of e-business applications has significantly or somewhat changed their internal work processes" is (slightly) lower than on industry average.

Exhibit 2-15: Use of online technologies to support internal business processes in the chemical industries (2003)

	To share documents internally / for collaborative work	To automate travel reimbursement	To track working hours / production time	To support human resources management
Sector total (EU-5)				
% of employment	55	16	33	28
% of enterprises	24	4	11	7
0-9 employees	15	3	7	4
10-49 employees	27	3	13	7
50-249 employees	53	7	26	22
250+ employees	67	25	45	41
All (9) Sectors (EU-5)				
% of employment	40	11	20	21
% of enterprises	22	3	5	5
Sector by country (% of employment)				
BE Belgium	70	13	53	42
DE Germany	56	21	43	24
ES Spain	43	18	32	23
FR France	60		10	23
IE Ireland	62	21	30	27
IT Italy	41	5	33	22
SE Sweden	61	24	51	22
UK United Kingdom	66	32	40	50
CZ Czech Republic	68	3	53	28
EE Estonia	61	6	34	21
LV Latvia	45	9	30	16
PL Poland	33	5	4	5

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

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

Use of ERP systems

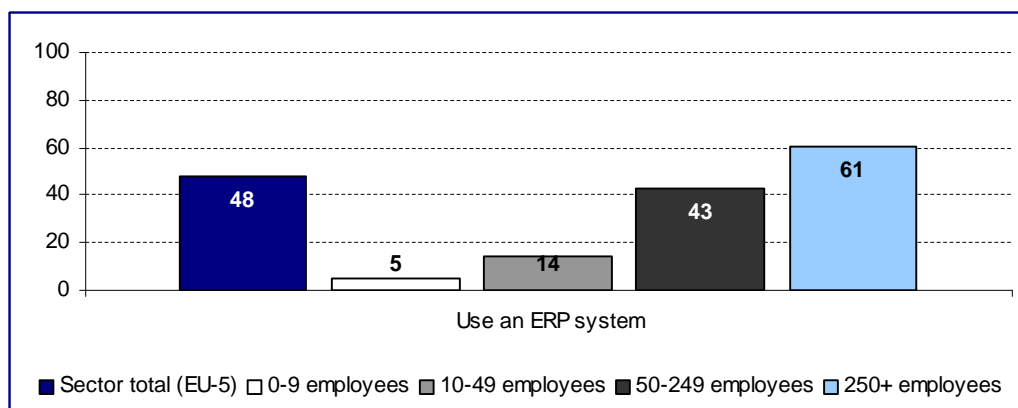
Enterprise Resource Planning (ERP) systems are software systems that help to integrate and cover all major business activities within a company, including product planning, parts purchasing, inventory management, order tracking, human resources, projects management, and finance. Ideally, they link business processes electronically across different business functions and thus help to improve the efficiency in operating those processes.

However, ERP systems also play an important role in supporting the connectivity between enterprises. And in fact, improving the ERP-to-ERP connectivity between enterprises is currently one of the main aims of e-business activities in the chemical industries. Some of the major electronic marketplaces and interconnection hubs of the industry address this issue and 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, and product catalogues – either on single websites or on catalogue marketplaces – have gained acceptance rather quickly.

As can be expected, the use of ERP systems is increasing by company size. For small companies with less than 50 employees, ERP systems are often not economical. In 2003 43% of all medium-sized companies and 61% of the large companies from the chemical industries reported that they use an ERP system. In total, 48% of all employees in the EU chemical industries work in companies with an ERP system in place. This is clearly above the all sector average (19%). The only sector from the 10 industries benchmarked by the *e-Business W@tch* in 2003 where ERP systems are even wider deployed – mainly among large companies – is in transport equipment manufacturing (73%).

The deployment and sophistication of ERP systems is likely to further increase among companies from the chemical industries. This development is encouraged by activities of B2B connectivity enablers such as Elemica.

Exhibit 2-16: Companies using an ERP (enterprise resource planning) system (2003)



Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

2.2.3 Procurement processes and supply chain management

Buy-side electronic commerce activities

Using e-business to decrease the costs related to commercial transactions, for example 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 – is an important element in the chemical industries.

Within the combined chemical industries, the basic chemicals industry in particular is relying heavily on commodity inputs and is a supplier to highly competitive output markets. This is an incentive to advance e-business. As this industry is producing commodities with rather narrow margins and 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.

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.

Exhibit 2-17: Online purchasing activities by companies (2003)

	Make online purchases	Online purchases account for at least 5% of total	Online purchase of MRO* goods	Online purchase of direct production goods
Sector total (EU-5)				
% of employment	51	23	30	25
% of enterprises	32	13	19	19
0-9 employees	23	11	14	14
10-49 employees	39	14	22	24
50-249 employees	50	22	34	24
250+ employees	56	25	30	27
All (9) Sectors (EU-5)				
% of employment	46	23	29	23
% of enterprises	31	18	19	17
Sector by country (% of employment)				
BE Belgium	53	12	27	25
DE Germany	61	29	43	34
ES Spain	30	12	5	12
FR France	36	28	26	19
IE Ireland	32	10	16	16
IT Italy	31	9	13	16
SE Sweden	70	25	35	10
UK United Kingdom	75	22	39	31
CZ Czech Republic	61	32	44	45
EE Estonia	45	18	22	19
LV Latvia	40	16	32	25
PL Poland	14	11	4	10

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

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

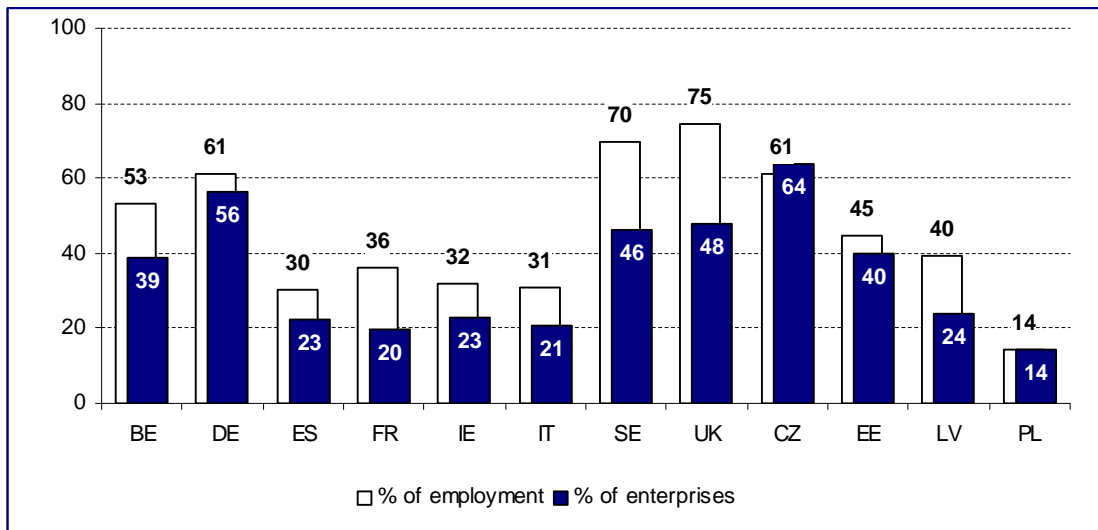
32% of all companies from the sector, which account for more than 50% of employment, say that they order direct supply goods and/or MRO goods online from suppliers. However, when discarding companies that say that online purchases account for less than 5% of their total purchases, figures go down to less than half. Thus, e-procurement is likely to play a significant role in companies that

represent about 20-25% of the sector employment. Regarding size-bands, the critical divide is between the small enterprises and the medium-sized ones which seem to constitute the critical minimum size for using e-procurement at significant levels. There are hardly any differences between medium-sized and large enterprises with respect to online purchasing statistics.

The intensity of online purchasing is about on the average level of all sectors which is rather low for a manufacturing sector. The new E-Business Scoreboard shows an index of 23 for the combined chemical industries in e-procurement intensity, compared to 31 for transport equipment manufacturing and 30 for the electronics sector. ICT services are the benchmark with 54.

The regional breakdown suggests a high level of e-procurement activity among chemical companies from the Czech Republic, particularly when comparing only companies that purchase more than 5% of their supplies online. Figures reported by Czech companies are even higher than those of Germany, Sweden and the UK, which are among the countries with the highest levels of e-procurement in many sectors.

Exhibit 2-18: Companies from the chemical industries making online purchases by country (2003)



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

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

Types and relative importance of online purchases by companies

About four out of five companies that buy supplies online say they order from websites of their suppliers. Thus, suppliers' websites seem to play a far more important role for e-procurement in the sector than special B2B marketplaces, ordering via EDI and through extranets of suppliers. EDI connections in particular are not widely used in the chemical industries. Results are very much in line with findings from other sectors and the all sectors average.

However, these figures do not include information about the actual volumes traded via each of these channels and platforms. Data just show that some channels are used by fewer companies than others. Nevertheless it could be possible that online trade conducted through B2B marketplaces or EDI connections is more intensive, involving larger volumes of goods traded, than orders from single supplier websites, even if used by fewer companies.

Special B2B trading platforms on the internet ("e-marketplaces") are the second most important purchasing channel. About one in four companies that make online purchases buys from e-marketplaces.

Exhibit 2-19: Distribution platforms and protocols used for online purchases in the chemical industries (2003)

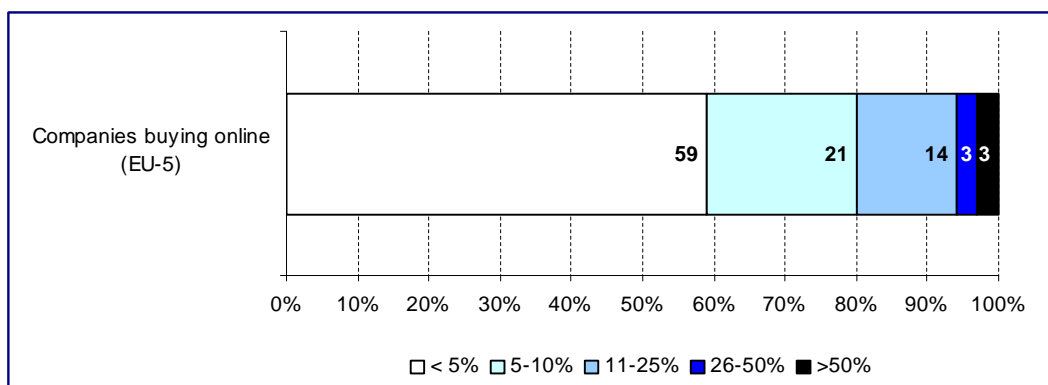
	Website of suppliers	B2B electronic marketplaces	Extranet	EDI
Sector total (EU-5)				
% of employment	82	24	19	6
% of enterprises	80	24	17	3
0-9 employees	73	25	23	1
10-49 employees	86	22	8	5
50-249 employees	86	23	21	4
250+ employees	78	23	20	8
All (9) Sectors (EU-5)				
% of employment	88	24	28	6
% of enterprises	85	21	22	3

Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=185 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

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

As in most sectors, survey results indicate that online orders still account for a rather low percentage of total purchases for most companies, even among those that actually place online orders. In the chemical industries, close to 60% of all companies that order suppliers online estimate that these orders account for less than 5% of total orders. Another 20% say that online purchases are about 5-10% of their total purchases.

Exhibit 2-20: Share of online purchases (all platforms) as % of total purchases in the chemical industries (2003)



Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=185. In % of enterprises. Reporting period: March/November 2003.

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

It is very difficult to assess the actual volumes or even the industry wide total share of online purchases compared to the level of traditional forms of ordering and purchasing goods and services. A simple computation of the answers received from chemical companies, assuming that the average share will rather be towards the lower end in each of the ranges offered as options for their answer, suggests that EU companies from the chemical sectors made about 5% of their total purchases online in 2003. This figure, which includes ordering of MRO goods and direct production goods, is about the same for the all sector average. Notwithstanding the many uncertainties implied by this computation, the figures are very much in line with estimates based on other surveys.¹²

¹² Cf. The European E-Business Report 2003 by the e-Business W@tch, p. 10f.

Business process integration for buying online

It comes as a surprise that only 4% of all companies from the sector say that they have integrated their IT system with that of their suppliers for placing orders. This is below the average share of integrated enterprises in other sectors and holds true even for large companies (8%). The use of EDI based systems for ordering online is just on the cross-industry average level. 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, a large share of companies in this sector still lags behind in this respect.

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

	Use of online technologies* to exchange documents with suppliers	IT system is integrated with that of a supplier for placing orders	Use an SCM (Supply Chain Management) system
Sector total (EU-5)			
% of employment	43	6	13
% of enterprises	34	4	4
0-9 employees	30	3	1
10-49 employees	37	6	7
50-249 employees	45	6	7
250+ employees	47	8	19
All (9) Sectors (EU-5)			
% of employment	37	8	6
% of enterprises	24	6	2
Sector by country (% of employment)			
BE Belgium	57	16	45
DE Germany	31	1	18
ES Spain	49	6	7
FR France	68	15	12
IE Ireland	54	7	37
IT Italy	19	4	2
SE Sweden	52	15	27
UK United Kingdom	55	9	19
CZ Czech Republic	38	4	0
EE Estonia	49	23	5
LV Latvia	38	3	9
PL Poland	30	7	2

* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

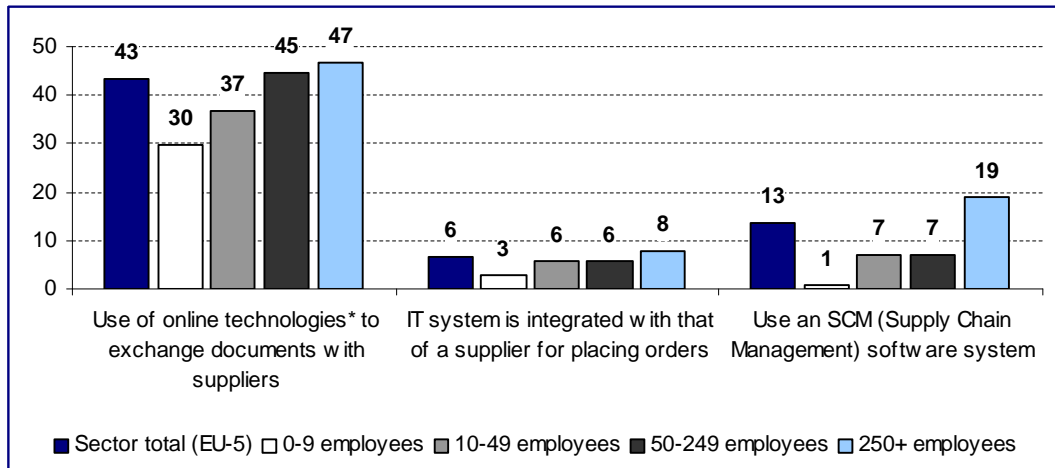
On the other hand, this assessment is somewhat in contrast to the diffusion of Supply Chain Management (SCM) systems. The level of SCM adoption among chemical companies is not only above the all sector average, which can be expected from a manufacturing sector, but is actually one of the highest among the ten sectors analysed by the e-Business W@tch in 2003/04.¹³ However, as in all sectors, SCM systems are mainly installed in large enterprises (19% have one), while only 4% of all

¹³ SCM systems are mainly used by manufacturing companies for managing supply and demand and thus production of physical supply goods through integrated and collaborative planning tools.

enterprises say they use a SCM system. They are more widely diffused among chemical enterprises in the EU Member States of 2003 than in the new ones.

Companies from the chemical industries are also more likely than companies from other sectors (on average) to use online technologies to exchange documents with suppliers. Companies representing 43% of employment say they do so, compared to 37% on average.

Exhibit 2-22: IT integration with suppliers (2003)



* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

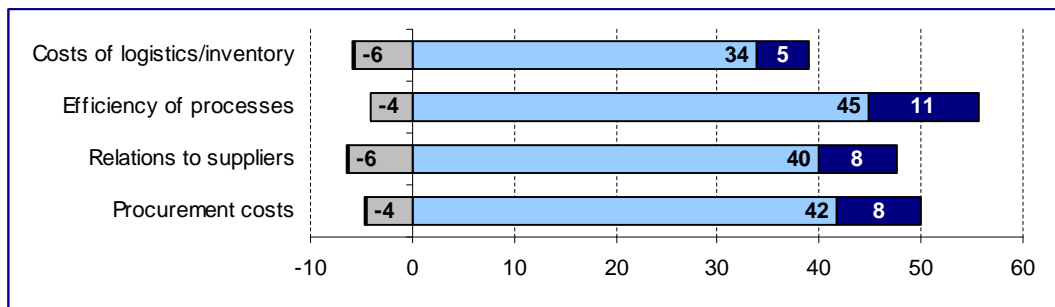
Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Perceived impacts of purchasing online

Companies from the chemical sectors that have experience with e-procurement report mostly positive impacts, if any impact at all. The strongest impact is perceived on the efficiency of business processes. 56% of all companies that order supply goods online say that this has led to an efficiency increase, while only 4% have observed negative effects.

Exhibit 2-23: Perceived effects of purchasing online in the chemical industries (2003)



Legend: very negative >> fairly negative >> fairly positive >> very positive

Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=185. In % of enterprises. Reporting period: March/November 2003.

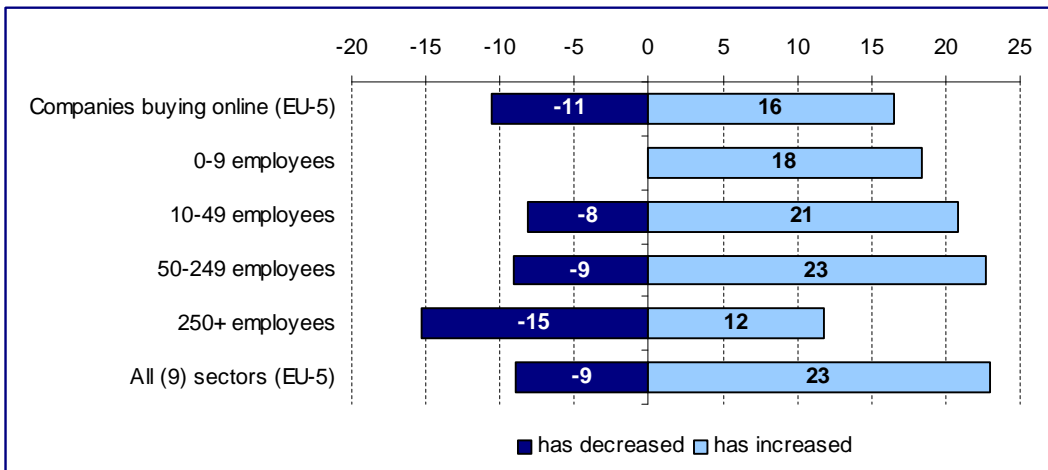
Source: e-Business W@tch (2003/04)

The e-Business W@tch asked enterprises whether their e-procurement activities have led towards an increase or rather to a decrease in the number of their suppliers. Results from the chemical sectors are quite interesting as large companies differ from others in that respect. While even among the large companies a majority has not observed any impact on the number of suppliers, a larger share of

enterprises say that the number has decreased (15% of companies ordering online) than say that it has increased (12%). Among SMEs, it is the other way round.

This can be taken as an indication that – at least in manufacturing sectors – large enterprises in fact use the new opportunities offered by e-procurement to radically streamline their supply chain. E-procurement is particularly attractive for very large companies with different establishments or branches, since the electronic management of supplies enables them to bundle demand across departments, branches and establishments. Small supply companies are at risk to become the victims of this type of rationalisation.

Exhibit 2-24: Reported effect of e-purchasing on the number of suppliers (2003)



Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=185. In % of enterprises.
Reporting period: March/November 2003.

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

2.2.4 Marketing and sales

Information and communication technologies and the Internet can be used in various ways to support marketing and sales activities of companies from the combined chemical industry. In fact, it was shown in the previous chapter that websites of supply companies are the preferred platform for ordering supplies online. Thus, it should be a simple but effective way for companies to address current and potential clients to provide information on products and services on a website and allow them to place online orders.

However, results of the e-Business Survey 2003 indicate that the use of e-business applications for marketing and sales purposes have not yet reached the same level as the use for other business functions. While the chemical sectors rank above average in three out of four categories depicted by the E-Business Scoreboard (see Chapter 2.3), activities are below the all sector average in the e-marketing and sales area.

Since chemical companies seem not to have exploited the full potential of e-marketing and sales, it can be a business opportunity to assist companies in developing these skills with a sector-specific approach. SpecialChem has established itself as a service provider offering this know-how to speciality chemicals producers (see Business Example below).

Business example:***SpecialChem – combining community building, marketing and e-commerce***

Paris-based SpecialChem was founded in April 2000 as a marketing and business development company in the domain of speciality chemicals, using Internet, e-marketing tools and knowledge management systems.

SpecialChem's business model consists of two pillars:

First, to build large communities of technical buyers and specifiers of speciality chemicals. Second, SpecialChem's main revenue comes from selling new sales generation programmes to chemical raw material producers.

1. Online technical assistance for speciality chemicals markets. Currently over 55,000 professionals worldwide use SpecialChem's online services. In September 2003, a new service platform was launched entirely dedicated to paints, coatings and inks markets (www.specialchem4coatings.com). This platform complements its existing ones for adhesives & sealants and polymer additives & colours. The platforms offer information resources, sourcing and technical knowledge (such as raw material finders and application data), technical solutions and expert help for product development, for example guidance for optimising specific performance qualities of coating or ink.

2. Developing new e-enabled programmes & processes to generate new leads & new sales for Speciality Chemicals raw material producers. SpecialChem runs customized e-marketing programmes such as

- introduction of new technologies to specific market segments*
- permanent polling & investigation of needs & trends of end-markets*
- faster penetration growth markets such as China and Russia*

In December 2003 SpecialChem acquired the content and e-marketing assets of Omnexus, extending its penetration into the plastics market (www.omnexus.com).

Currently, 40% of SpecialChem's users (which include those involved in formulating, injecting and extruding) are US/NAFTA region-based, 30% in Europe, 25% in Asia and 5% in the rest of the world.

Sources: www.specialchem.com / Information provided by Mr. Bernard Hasson, co-founder of SpecialChem

Sell-side electronic commerce activities

At first glance, chemical and plastics companies are more often present on the Internet than companies from other sectors. In 2003, almost all of the large, about 80% of the medium-sized and about half of the small enterprises in the combined chemical industries reported to have some kind of website on the Internet. In total, enterprises accounting for more than 80% of employment had a website, compared to 66% on average across sectors.

However, these statistics do not tell us much about the use of this website. Figures include on the one hand most simple, basic websites which may consist of only one or two pages with company information, and, on the other hand, highly developed sites with sophisticated interactive features, including e-commerce functionalities at a high level.

A good indicator as to whether websites consist of more than just a few pages and whether they are regularly updated is the use of content management systems (CMS). In fact, when counting only those websites that are maintained with a CMS, the adoption rate shrinks dramatically from 50% of all enterprises to 9%. Again, diffusion increases by company size. If the use of CMS is applied as a complementary indicator, the chemical industries are no longer ahead of the all sector average. This is plausible, as it is in line with online sales activities in the sector.

Exhibit 2-25: Online marketing and e-commerce activities (2003)

	Have a website on the internet	Maintain a website with a content management system	Make online sales	Allow online payment of products ordered	Online sales system with secure transactions capability
Sector total (EU-5)					
% of employment	84	17	9	3	5
% of enterprises	50	9	8	3	3
0-9 employees	39	6	7	3	2
10-49 employees	59	11	10	3	6
50-249 employees	82	16	8	0	4
250+ employees	96	23	10	5	8
All (9) Sectors (EU-5)					
% of employment	66	22	16	7	9
% of enterprises	35	9	9	4	4
Sector by country (% of employment)					
BE Belgium	89	43	9	0	7
DE Germany	96	10	4	0	1
ES Spain	67	22	6	4	4
FR France	75	15	8	0	2
IE Ireland	89	17	11	7	7
IT Italy	75	14	3	0	3
SE Sweden	97	31	48	14	17
UK United Kingdom	91	34	24	13	20
CZ Czech Republic	93	14	17	6	4
EE Estonia	86	27	8	1	3
LV Latvia	70	15	16	0	0
PL Poland	82	23	4	1	0

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

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

Less than 10% of all companies from the chemical sectors say that customers can order their products online, and only 3% of firms allow online payment for products ordered online. Also, only 3% have implemented an online sales system with capability for secure transactions (for example based on the SSL standard). These are surprisingly low figures, even if conceding that functionalities such as "allowing online payment of goods/services ordered" or "operating an online sales system with secure transactions capability" are rather oriented towards the requirements of consumer oriented sectors (for instance in tourism) which cater for a large number of dispersed customers.

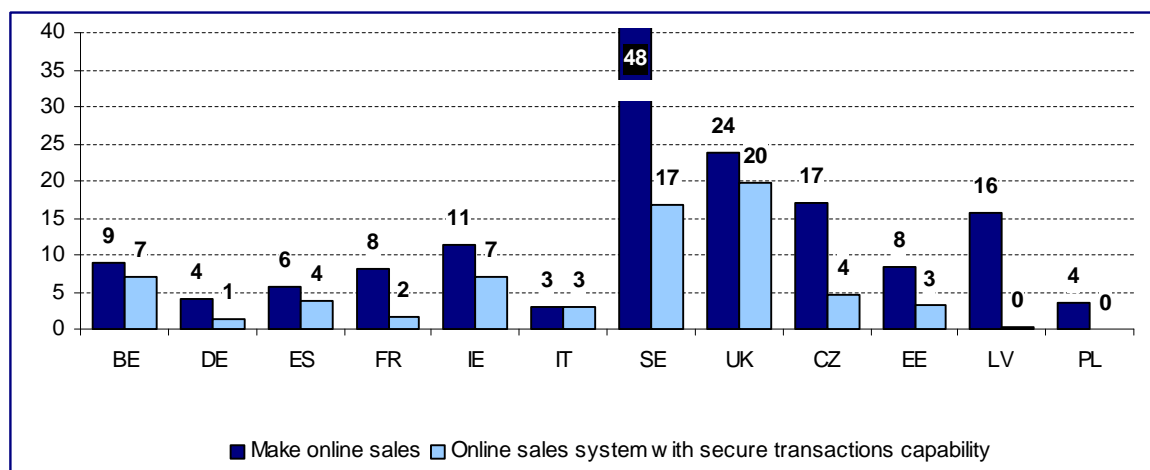
These observations lead to a frequently cited paradox. If e-procurement activities have gained momentum, and if a significant number of enterprises report to buy supply goods online, who is the seller on the other side of the line? In fact, there is no straight forward simple answer, but two assumptions seem quite plausible.

- First, it appears that there are only a limited number of companies in the sector which have specialised in selling chemical products on the internet, either through their own website or on B2B marketplaces, while – on the other hand – there are quite a number of companies from the sector that make use of this offer without selling their own products online. In other words, online selling is to some extent a one-to-many activity. The situation can be structurally compared to the

situation in the retail market, where a few online selling companies sell to a large number of customers (who *buy* online but do not *sell* online themselves).

- Second, some companies make only rudimentary use of e-procurement, for instance for rather insignificant purchases of office material or other MRO goods, but do not sell anything online themselves. This assumption is backed by the relatively high percentage of companies that report buying less than 5% of their total purchases online.

Exhibit 2-26: Companies selling online by country (2003)



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

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

Types and relative importance of online sales

The preference for selling online via the company website mirrors the preference of chemical companies to order from suppliers' websites. However, in sell side e-commerce, selling through B2B marketplaces which are maintained by other operators and through EDI are relatively more important channels than for placing online orders. Connecting to customers via extranet or EDI is used by large enterprises in particular. Only a fraction of companies uses these channels, but they account for a considerable percentage of economic activity among the online sellers.

Exhibit 2-27: Distribution platforms and protocols used for online sales in the chemical industries (2003)

	Own company website	B2B Marketplaces	Extranet of a supplier	EDI	Mobile services (e.g. WAP)
Sector total (EU-5)					
% of employment	52	34	19	52	5
% of enterprises	84	27	3	10	5
All (9) Sectors (EU-5)					
% of employment	81	34	15	14	6
% of enterprises	79	38	4	5	1

Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=45 for EU-5 sector total. Reporting period: March/November 2003.

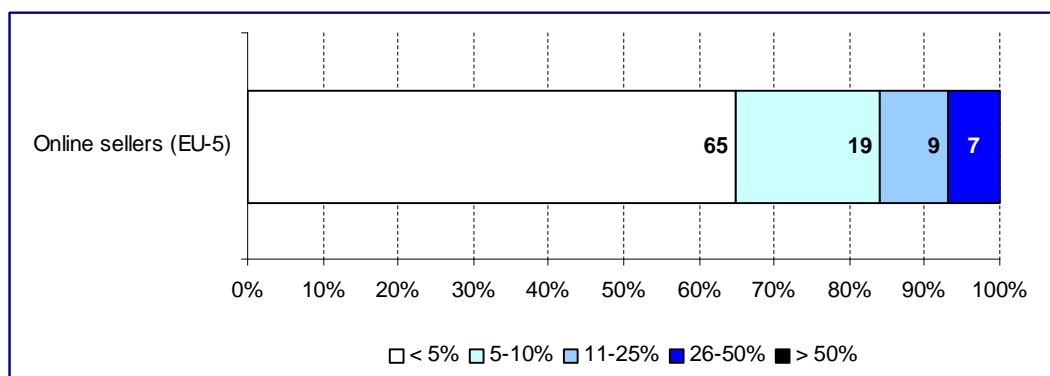
Source: *e-Business W@tch* (2003/04)

However, these figures do not include information about the actual volumes traded via each of these channels and platforms. Data just show that some channels are used by fewer companies than others.

Nevertheless it could be possible that online trade conducted through B2B marketplaces or EDI connections is more intensive, involving larger volumes of goods traded, than orders from single supplier websites, even if used by fewer companies. The use of B2B marketplaces for selling online, in contrast, is not dependant on company size.

Two thirds of all companies that make online sales report that these account for less than 5% of the total sales volume. Another 20% of firms estimate that online sales are about 5-10% of their total sales. None of the 502 chemical companies from the EU-5 that was interviewed by the *e-Business W@tch* in 2003 said that they sell more than 50% of their products online.

Exhibit 2-28: Share of online sales (all protocols) as % of total sales in the chemical industries (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=45. In % of enterprises.
Reporting period: March/November 2003.

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

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

Since the percentage of companies that sell online is rather low in the chemical industries, any further analysis of the level of business process automation is necessarily based on a rather small number of observations and should be treated with care. Evidence suggests that online sellers among the chemical companies are slightly more likely than the industry average to link their online sales systems to their IT back-end system. This indicates a higher degree of business process automation, for instance with regard to automated invoicing or electronic stock management.

Exhibit 2-29: Business integration of online sales systems in the chemical industries (2003)

	Ordering system integrated with back-end system	Information about order by e-mail	Information about order by fax	Other
Sector total (EU-5)				
% of employment	39	43	0	16
% of enterprises	13	74	2	1
All (9) Sectors (EU-5)				
% of employment	33	53	4	7
% of enterprises	6	77	8	6

Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=45 for EU-5 sector total. Reporting period: March/November 2003.

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

The typical way companies get information about incoming online orders, however, is still by e-mail. Smaller firms that sell online are bound to e-mail based e-commerce systems in particular, while larger companies are more likely to use integrated sales systems. Weighted by employment, integrated sales

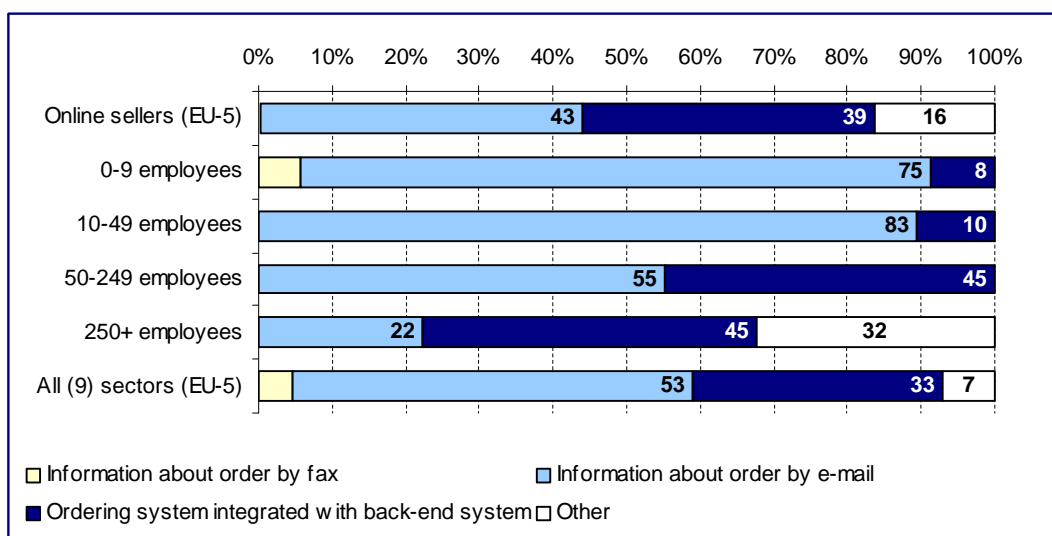
systems and simpler systems based on e-mail alerts are equally distributed among chemical companies that sell online.

Another survey carried out by EyeforChem in collaboration with Industry Insights in 2003 concludes that internal integration in the chemical industry was a given, while trading partner integration was still a question mark.¹⁴ EyeforChem reports that a slim majority of chemical companies was satisfied with the status of their internal integration, while "considerable dissatisfaction remains with the level of integration with suppliers and customers, particularly those outside the chemical industry."

More than half of respondents (54%) rated their internal integration positively and only 16% rated it negatively (the rest were either neutral or did not answer). At the other end of the spectrum, only 23% of respondents rated integration with customers outside the industry positively while 42% rated it negatively. The responses did not vary significantly by company size, with one exception. Companies with revenues larger than \$5 billion rated the status of integration between customers and suppliers within the chemical industry significantly higher than their smaller counterparts. Results are based on 92 responses from the industry, with about 80 from chemical manufacturers and about 10 from distributors. The regional distribution was 45% North America, 30% Europe, 15% Asia, and 10% South America. [Industry Insight & EyeforChem, 2003]

The survey by the *e-Business W@tch*, on the other hand, finds that external connectivity of IT systems seems to be wider deployed than internal integration. While 25% of those chemical companies that make online sales report that they have connected their IT system with that of a customer (external integration), only 13% say that they have internally integrated their online sales system with the IT backend system. Among large companies, this gap does not exist.

Exhibit 2-30: Sophistication of online sales systems in the chemical industries by size-band (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=45 for EU-5 sector total. Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

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

¹⁴ "Chemical companies still struggling with integration", by Leif Eriksen, Industry Insights, 7 Aug. 2003. <http://www.eyeforchem.com>

Exhibit 2-31: Exchange of documents and standardised data with customers (2003)

	Use of online technologies* to exchange documents with customers	External integration: IT system is integrated with that of a customer for receiving orders		Internal integration: E-sales system is integrated with back-end IT system	
		% of all firms	% of online sellers	% of all firms	% of online sellers
Sector total (EU-5)	% of all firms	% of online sellers	% of all firms	% of online sellers	% of all firms
% of employment	43	42	4	39	3
% of enterprises	34	25	2	13	1
0-9 employees	31	15	1	8	1
10-49 employees	36	29	3	10	1
50-249 employees	44	58	5	45	4
250+ employees	49	45	4	45	5
All (9) Sectors (EU-5)					
% of employment	33	31	5	33	5
% of enterprises	22	27	3	6	1

* other than free text e-mail

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Reporting period: March/November 2003.

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

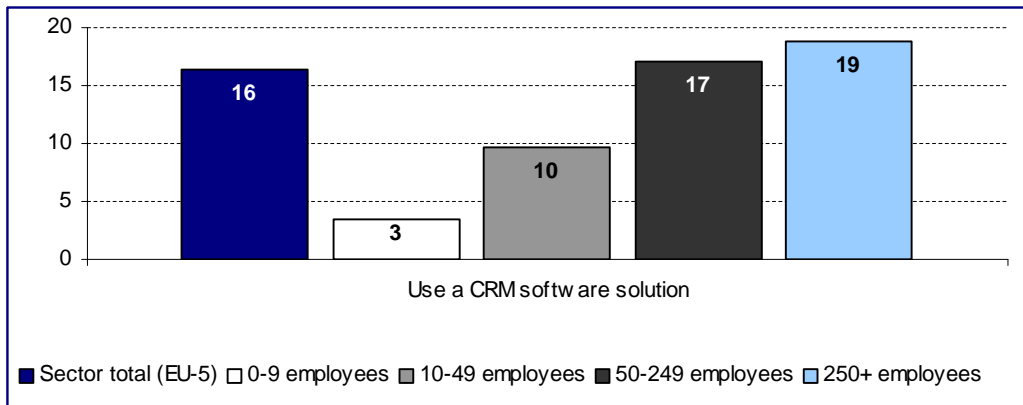
Customer relationship management

A Customer Relationship Management (CRM) system is a software system that promises the ability to synthesize data on customers' behaviour and needs and thus to provide a universal view of the customer. Although many of the more complex and expensive software suites have not lived up to the expectations promised at the height of the new economy boom time, reasonably scaled CRM systems are helpful for companies dealing with a large number of customers.

Since many chemical companies trade predominantly with a limited number of business partners, CRM systems are not widely diffused, albeit slightly above industry average (16% compared to 13% on average). 17% of medium-sized enterprises and 19% of large companies from the chemical sectors use a customer relationship management system.

It should be noted, though, that there is a wide variety of software that addresses the requirement to organise customer data, with very different levels of sophistication. Even rather simple software programmes to manage contacts, which can be integrated into e-mail clients, serve this purpose. It is therefore difficult to draw an exact borderline of what constitutes a CRM system and what not. Data should be taken as an indication for the general importance of handling a large amount of customer data in a sector rather than as a precise measurement for the use of specific software.

Exhibit 2-32: Companies from the chemical industries using a CRM (customer relationship management) software application (2003)



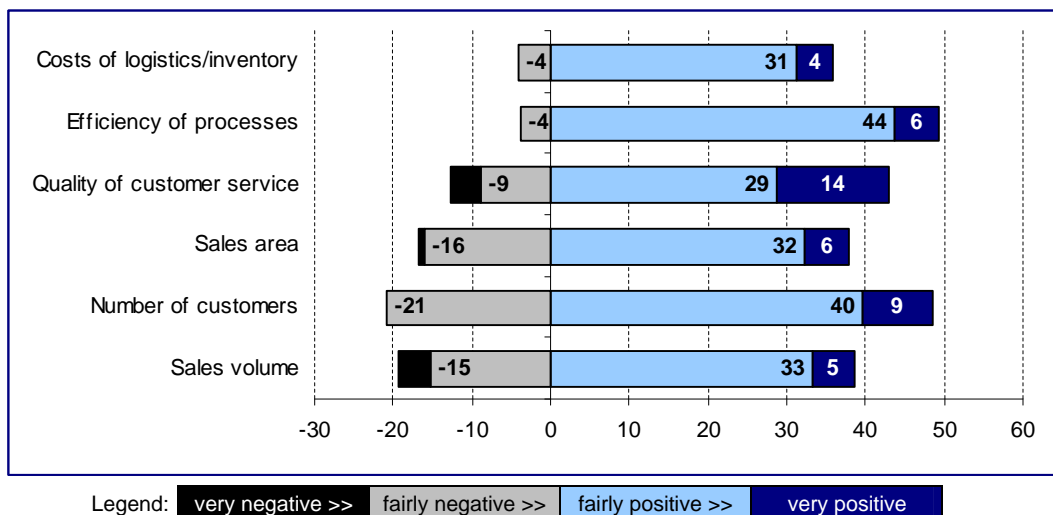
Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.
 Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Perceived impact of online selling

Replies to questions about the perceived effects of online selling present a similar picture as the equivalent data on the impact of procuring online. Depending on the item, between 35-50% of all companies selling online report "fairly positive" or "very positive" effects, and about 30-45% of enterprises have not yet observed any effect. At first sight, it strikes that a relatively high percentage of companies that make online sales observes negative impacts on the volume of sales, the sales area and the number of customers. However, considering that these percentages are based on a relatively small number of observations (n=45), these represent a rather small fraction of all companies, and results should not be overrated.

Exhibit 2-33: Perceived effects of selling online on sales and business processes efficiency in the chemical industries (2003)



Base: enterprises selling online. EU-5 = DE, ES, FR, IT, UK. N=45. In % of enterprises.
 Reporting period: March/November 2003.

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

Case study:**Online sales in the pharmaceutical industry**

In Germany, there are about 21,500 pharmacies (2002), employing about 140,000 people. Online sales of pharmaceutical have been prohibited by law until recently. This regulation was changed by the health reform which came into effect on 1st January 2004.

In the online pharmaceutical market, Doc Morris is the market leader with a turnover of 22 million Euro in 2002 (compared to 5 million in 2001). For 2003, revenues are estimated at about 45 million Euro. Revenues of internet pharmacies are increasing at high growth rates, but their overall market share is still on a low level – with high probability below 1% – compared to the traditional pharmacies. The turnover of the online market leader is about 30 times higher than the turnover of the average pharmacy at the corner.

Prices of internet pharmacies for pharmaceuticals which do not require prescription are on average 5-10% lower than in stationary pharmacies, thanks to economies of scale and procurement in other countries.

The e-Business W@tch estimates that, in the long run, traditional stationary pharmacies and online pharmacies are likely to co-exist as it is the case in non-medical retail sectors. Consumer decisions will not only depend on personal general preferences for traditional buying or online ordering, but preferences will also differ for various types of products and application areas. Particularly in the case of acute symptoms, online pharmacies cannot substitute the network of stationery ones.

However, internet pharmacies are likely to show further growth. If the pharmacists' associations' warning that many pharmacies may have to close down because of the new online competitors holds true, the convenience for customers offered by the current network of stationary pharmacies with an outlet practically at each corner may be weakened, which could in effect further boost online sales.

2.2.5 Functions of the extended enterprise

The main idea behind the concept of an extended enterprise is that a company is not only constituted by its management, employees and means of production, but also by a functioning network of business partners, including its suppliers and customers. The co-ordination and management of this network often include third-party relationships maintained on behalf of the 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 including EDI networks, supply chain management (SCM), and certain types of e-marketplaces address these issues of an extended enterprise. This chapter explores the use of e-business standards and of electronic B2B marketplaces in the chemical industries. In addition, it offers some statistics on the use of online technologies for collaborative business processes.

Collaborative business processes between enterprises

Manufacturers of chemicals, rubber and plastic products use online technologies to co-operate with external business partners to a lesser extent than other manufacturing sectors such as the electronics or automotive industries, but still on a level that is very close to the all sector average. Considering the relatively strong interconnection in the chemical supply chain, there is probably still untapped potential to intensify e-business for collaborative purposes.

About 15% of all chemical companies say they use online technologies for collaborative product design processes. Within the different sub-sectors of the chemical industries, current use is most likely driven by the formulated and speciality chemicals, where product design processes have the highest importance. The size of a company, on the other hand, does not seem to determine the use of e-design tools. The survey indicates that use among medium-sized companies is even more widely deployed than among large ones.

Exhibit 2-34: Use of online technologies (other than free text e-mail) for business processes between companies (2003)

	Collaborative product design	Collaborative demand forecast	Capacity / inventory management	Contract negotiation
Sector total (EU-5)				
% of employment	16	14	20	13
% of enterprises	14	8	10	11
0-9 employees	11	6	7	10
10-49 employees	15	8	10	12
50-249 employees	21	13	15	12
250+ employees	17	18	27	16
All (9) Sectors (EU-5)				
% of employment	17	12	14	13
% of enterprises	12	8	6	11
Sector by country (% of employment)				
BE Belgium	28	35	29	4
DE Germany	5	9	16	1
ES Spain	12	15	8	10
FR France	15	13	18	33
IE Ireland	29	11	29	4
IT Italy	12	8	23	11
SE Sweden	13	5	28	12
UK United Kingdom	41	27	34	18
CZ Czech Republic	25	29	11	22
EE Estonia	10	17	11	38
LV Latvia	31	38	23	53
PL Poland	17	7	10	27

Base: enterprises connected to the Internet. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total and 50-100 per country.

Weighting: Figures for size-bands in % of enterprises. Figures for countries are weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Exchange of standardised data between chemical companies

A prerequisite for online collaboration with external business partners, and for e-commerce in particular, 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 transmitted as simple, unstructured digital information. E-business standards help in organising and exchanging information in a way that is consistent across enterprises and IT systems.

Companies from the chemical, rubber and plastic industries are in a privileged position to benefit from standardisation since many of the products traded can easily be categorised. This facilitates the development of standardised product catalogues and, in consequence, the potential for online trading. Since February 2003, Cefic and CIDX (Chemical Industry Data eXchange) have been collaborating to help the chemical industry implement e-business standards for business transactions on the Internet.

Transactions between companies based on the Chem eStandards can fall into eight categories: "customer or company information", "catalogue and RFQs" (requests for quotation), "purchase orders", "financials", "logistics", "exchange interactions", "forecasting", or "miscellaneous".

E-Business Standards:

CIDX and Chem eStandards: Targeting efficient data exchanges in the chemical industry supply chain

CIDX (Chemical Industry Data Exchange) is a trade association and standards body focused on realising transactional efficiency throughout the global chemical industry supply chain. CIDX states its mission is to "improve the ease, speed and cost of conducting business electronically between chemical companies and their trading partners." Achieving this mission is based on the following objectives:

- *Ensuring Chem eStandards™ become the standards for XML trading in the global chemical industry*
- *Leading convergence of XML standards for chemical transactions with key trading industries*
- *Serving as the "voice of the industry" in the development of cross-industry standards*

The promotion of Chem eStandards is focused on to medium and small sized enterprises.

Sources: CIDX website, Presentation by Chem eStandards for the ABM meeting in Hamburg, 26th June 2003, given to Cefic's national chemical associations

While many large companies already use e-business standards – mainly the Chem eStandards – to exchange standardised data, smaller companies use standards to a lesser extent, at least in the EU Member States of 2003. In the new Member States, the size of a chemical company is not an indicator for its use of standards.

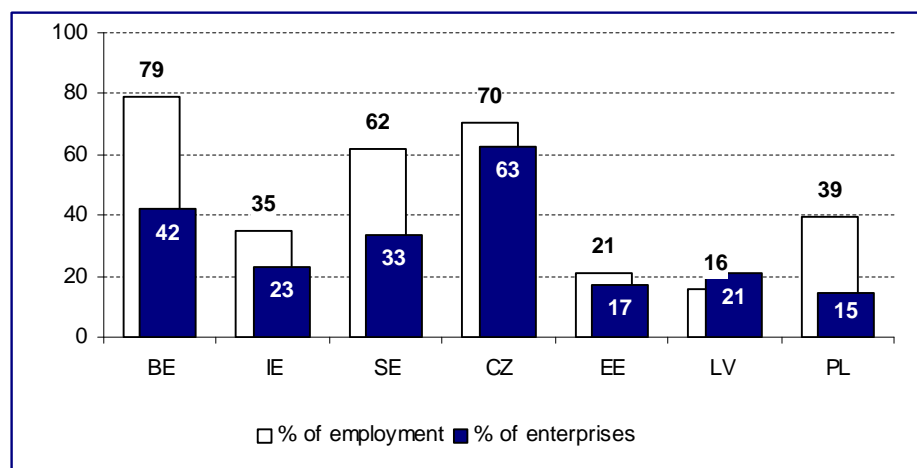
Since specific questions on the use of e-business standards were newly introduced in the second wave of the 2003 survey in November, data are not available for all countries and not for the EU-5 aggregate. In fact, data vary considerably by region. On average, between 20% (Estonia, Latvia) and about 40% (Belgium) of all companies from the sector confirm that they exchange standardised data with business partners.¹⁵ The Czech Republic stands out in that respect with a surprising quota of more than 60%. If weighted by employment, though, the use of e-business standards among Czech companies from the sector is in line with those in Sweden and in Belgium. In the opposite direction, figures for Ireland are surprisingly low.

For the chemical industries, Chem eStandards has developed into the most important technical standard for e-business. Chem eStandards and RosettaNet share some basic principles, but differ in the specific data exchanged by transactions. CIDX explains that this differentiation was necessary because the chemical industry requires specific information needs, while RosettaNet was developed to meet the needs of other industries (such as electronics, ICT): "(...) The Chem eStandards created XML data specifications within the context of transactions used by buyers and suppliers in the chemical industry. In many ways, this model copies RosettaNets PIP approach to transactions intentionally. Transactions are the basis for the Chem eStandards, which first identifies what must be done and then specifies how. This framework gives context to the specification and jumpstarts its

¹⁵ The underlying survey question was: "Are you exchanging standardised data with your buyers or sellers electronically? With standardised data we mean electronic product catalogues, orders, invoices, delivery notes and similar business documents. We do not mean plain e-mails."

implementation. The Chem eStandards also adopted some RosettaNet naming conventions and the principle regarding limited use of attributes."¹⁶

Exhibit 2-35: Exchange of standardised data between companies (2003)



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

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

Exhibit 2-36: E-Business Standards used by companies from the chemical industries (2003)

	EDI based standards	XML based standards	STEP standard	Proprietary standards	Other
In % of enterprises					
BE Belgium	9	5	0	15	1
IE Ireland	9	6	2	8	1
SE Sweden	9	1	6	1	9
CZ Czech Republic	8	9	0	6	5
EE Estonia	3	1	0	6	7
LV Latvia	0	1	0	3	3
PL Poland	5	4	0	7	0
In % of employment					
BE Belgium	35	39	0	46	12
IE Ireland	16	7	0	19	7
SE Sweden	44	34	8	14	30
CZ Czech Republic	28	7	1	20	7
EE Estonia	5	3	0	3	10
LV Latvia	0	4	0	0	0
PL Poland	19	8	1	12	6

Base: all enterprises. N ~ 50-100 per country. Weighting: in % of enterprises / by employment (read: "enterprises comprising ...% of employees"). Reporting period: November 2003.

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

The e-Business W@tch also asked companies which type of standard they used. In the chemical industries, there is no single group of e-business standards that stands out from the rest. Findings for EDI are very consistent across regions, with about 10% of companies saying they exchange data through EDI based standards such as EDIFACT, EANCOM, ANSI X12 or TRADACOM.

¹⁶ Source: CIDX <http://www.cidx.org> (FAQ section, February 2004).

XML-based standards such as cXML, xCBL, UBL or RosettaNet are also used, but are not yet as widely diffused as EDI based standards in most countries. Proprietary standards are still important, matching the level of EDI use in the sector. Data show higher variations between countries, however. The STEP standard which is used for the exchange of product model data is practically non-existent in the chemical industries.

Internet trading and marketing platforms in the chemical industries

The chemical industries are among those sectors where internet based trading platforms were expected to become very important. In the broadest sense, the concept of an electronic marketplace can be defined as a business-to-business Internet trading forum in which buyers and sellers exchange goods and services. The term is not without problems, though, since different marketplaces in fact offer different types of transaction functionality. E-marketplaces can be categorised according to these functionalities, including for example catalogue-based e-markets, pinboards (message boards), exchanges and auction services.¹⁷

After the e-marketplace hype of 1999 and 2000, and the subsequent shakeout, the assessment of marketplaces is more realistic today. Although the chemical industries are still one of the more important sectors for B2B marketplaces, it is not yet determined what exactly will be the role and importance of marketplaces for this sector in the future. For the time being, the major marketplaces seem to fare better than some of their counterparts from other industries which were in the limelight until 2 years ago. Covisint, for example, has sold off its auction business to concentrate on providing interconnection services, which has somewhat diminished the importance of Covisint for the automotive industry. In contrast, platforms such as cc-chemplorer and Elemica for the chemical industry have reported an increasing number of participants during the year 2003 and have thus managed to increase their importance for the industries they are targeting.

What most sectors have in common is that several marketplace operators have shifted their business model towards developing and selling software and solutions rather than providing an open, webbased platform for buyers and sellers. This has increased their chances of survival, although the size of these companies is typically much smaller than during boom times. This business model is not necessarily the same model with which they started.

In the chemical industries, Elemica is a good example of an intermediary that focuses on connectivity services. Elemica acts as a connectivity hub for trading partners from the chemical industry, but does not operate an "e-marketplace" in the strict sense.

¹⁷ A more detailed definition of various types of electronic marketplaces, and an overview of recent developments, is available in a Special Briefing by the *e-Business W@tch* to the European Commission: "The Current State of B2B E-Markets", Jan. 2004, 24 pages. The briefing has not been published but may be made available by the EC on request (e-mail: entr-ict-e-commerce@cec.eu.int).

Business example:***Elemica – not a "marketplace", but a facilitator of transactions***

Elemica (www.elemica.org) is a platform and network provider for the global chemical industry, developed by 22 leading chemical companies. The service focuses on improving supply chain efficiency by offering browser-based and Enterprise Resource Planning (ERP) connectivity. Elemica claims that it is not an "aggregator" of chemical purchasing, nor a "buyer," "seller," or "owner" of products, but a facilitator of transactions (order processing and supply chain management of contract and repeat chemical transactions).

Thus, Elemica is likely to present a new type of vertical B2B intermediary which does not present itself as an "e-marketplace" (in the sense of a trading platform that openly displays offers or demand), but rather as an IT service company that promises customers a more cost-efficient way of trading with business partners. The motto is "connect once - connect to all" (instead of maintaining numerous point-to-point connections with trading partners via EDI, for example).

Business example:***Omnexus vs. ebay – why web-based trading platforms (do not) work***

With the funding and support of several big chemical players, the plastics e-commerce platform Omnexus was launched in 2000. Omnexus closed its trading platform at the end of November 2003 with chief operating officer Michael Walsh saying: "Despite significant progress and several changes to its business model in the past three years, Omnexus has not been able to achieve sufficient eCommerce adoption to support its marketplace."

What went wrong? The main problem was that Omnexus simply did not have enough members. Despite the obvious benefits of deriving economies of scale through a central rather than individual web sites, the fee to use the service was not attractive because of the relatively small number of companies using it. It is a kind of ebay-phenomenon in combination with Metcalfe's Law: the attractiveness of trading platforms increases by the square of the number of users. The success of ebay is that everybody else is there.

Thus the single most important critical success factor for e-commerce oriented platforms is whether they can overcome this chicken-and-egg problem in a reasonable period of time. Get members quickly, otherwise you are doomed to fail.

*Source: Plastics in Packaging * January 2004, p. 26f.*

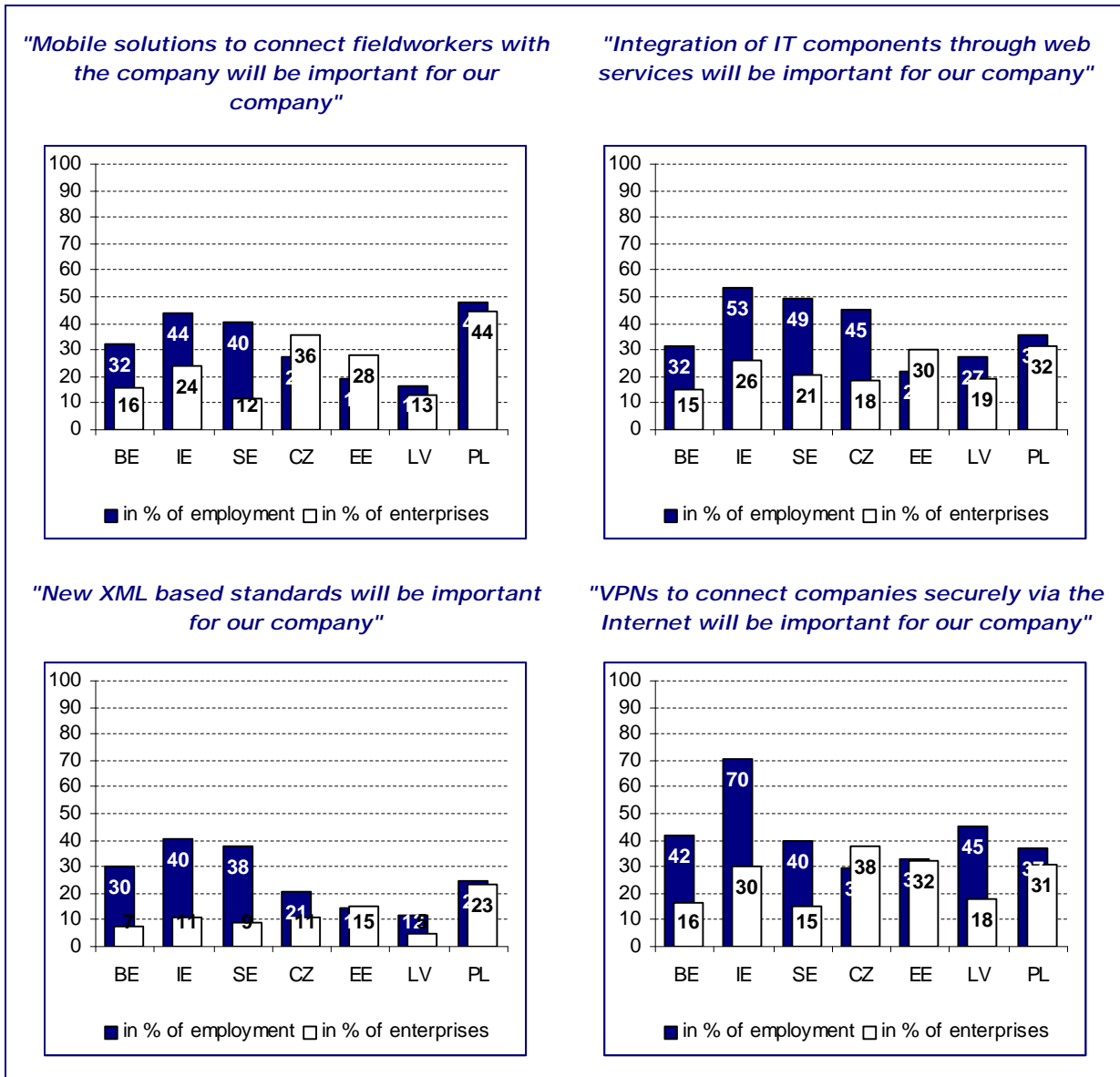
2.2.6 Outlook: What will be important

In the second phase of the e-Business Survey 2003 (November), the e-Business W@tch introduced a new question about emerging e-business standards and applications. Companies were asked to assess whether they considered the following developments to be important for their own business:

- Mobile solutions to connect fieldworkers with the company
- Integration of IT components through web services
- New XML based standards will be important for our company
- VPNs to connect companies securely via the Internet

Since this question was not part of the first phase of the survey in March, results are only available for specific countries. Nevertheless, results are quite interesting as they document that the assessment differs between regions and sectors. In the EU-15, large companies in particular are aware of these developments and consider them to be important for their business. In the new Member States, the perception does not differ a lot between size-bands.

Exhibit 2-37: Assessment by companies: The future importance of new developments



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

Base: all enterprises. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

Weighting: Figures for size-bands in % of enterprises. Figure for "Sector total" is weighted by employment ("enterprises comprising ...% of employees"). Reporting period: March/November 2003.

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

Mobile solutions to connect fieldworkers

Mobile solutions are rated important by chemical companies accounting for about 30-40% of employment in their country on average. In the Member States of 2003, large companies attribute much higher importance to mobile solutions than smaller companies. This reflects the general situation in most sectors that larger firms are more likely to employ a significant number of mobile workers (for example, sales representatives, managers, field workers). In the prospective EU Member

States, however, this distinction between larger and smaller companies does not hold true. Polish companies in particular attribute high importance to mobile solutions – more than 40% of all companies believe that this will be an important issue for them.

VPNs to connect companies securely via the Internet

A virtual private network (VPN) is a way to use a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their company's network. A virtual private network can be contrasted with an expensive system of owned or leased lines that can only be used by one organisation. The goal of a VPN is to provide the organisation with the same capabilities, but at a much lower cost. Privacy is maintained through specific security procedures and "tunnelling protocols" which, by encrypting data at the sending end and decrypting it at the receiving end, send the data through a "tunnel" that cannot be "entered" by data that is not properly encrypted.¹⁸

Chemical companies from the seven countries surveyed in November 2003 attribute a very similar level of importance to the use of VPNs as they do to mobile solutions for connecting fieldworkers with the company. This makes sense, as both network infrastructures pursue similar objectives. In Belgium, Ireland and Sweden large companies are more likely to regard VPNs as relevant for their own business. In total, only about 15-25% of all chemical companies from these countries say it will be important for them. In the Czech Republic (38%), Estonia (32%) and Poland (31%), the percentage is somewhat higher; however, in these countries the assessment is similar among small and large enterprises. On the whole, with Ireland standing out, enterprises accounting for about 30-40% of employment in the combined chemical industries think that VPNs are already or could become an important network solution for them.

Web services could boost B2B integration

After the melt-down of the new economy, many brick-and-mortar companies have slowed down the pace of their e-business deployment or even written off ambitious investment plans. However, IT analysts and market researchers predict that Web services may blaze the trail for the next boom of e-business, in which collaborative commerce and business transactions on the web could reach levels not yet anticipated by the industry.¹⁹ Web services, once they have reached the next stage of technological maturity, could greatly facilitate machine-to-machine communication and thus trigger e-business activities by dramatically reducing costs for business process integration within and between companies.

Web service based standards already exist, and companies are already experimenting with Web services, for example by using them to integrate different implementations of ERP systems within a single enterprise.²⁰ This is a highly relevant application area for many chemical companies where ERP-to-ERP connectivity is a key issue. However, there are still considerable risks in implementing Web services today, one of the main issues being network security.

Currently, about 20-30% of all companies from the chemical industries believe that integration of IT components through web services will be important for their company. In most countries, large companies are more aware of the future importance of web services. In Ireland and Sweden,

¹⁸ Definition by searchNetworking.com Definitions, a site by TechTarget for Networking professionals (<http://whatis.techtarget.com>)

¹⁹ The majority of reports on the issue conclude that web services will have a strong impact on conducting trade between businesses in the future. Cf. for instance Gartner Group: "Will Web Services Build Collaborative Commerce?", Interview with Research Director Charles Abrams, Sept. 2003, quoted by eyeforchem, Jan. 2004 (<http://www.eyeforchem.com/print.asp?news=38734>). Other references which stress the importance of web services: Briefing by eMarket Services, prepared by Ashley McKertich, New Zealand Trade and Enterprises. Datamonitor: Real Web Services. Vendor implementations and successes in the real world. Oct. 2003, Ref. Code BFTC0896. References are only exemplary.

²⁰ cf. "Gartner: Web services poised to transform the Web again", by Bernadette Hearne, Editor, e-business Chemicals Newsletter, 24 Sep. 2003. (www.eyeforchem.com)

companies representing about 50% of all employees regard web services as an important development. In the Czech Republic, the figure is only slightly below (45%).

New XML based standards

The IT and e-business specialist press is rather uniform in their assumption that XML (Extensible Markup Language) based standards will play a most important role in tomorrow's e-business. XML is a flexible way to create common information formats and share both the format and the data on the World Wide Web or on intranets. Thus, XML based standards can be used for e-business purposes, promising to simplify business transactions on the web. Facilitating data interchange may even be their strongest point.

However, the majority of companies from the chemical industries is not yet convinced (or aware) that XML based standards may become important for their future business. Out of the four items proposed to interviewees, "XML based standards" was the one where the lowest share of companies (on average) believed that it would be important. In the Member States of 2003, it is again mainly the large enterprises that are already convinced. In Belgium, Sweden and Ireland, companies accounting for 30-40% of employment in the sector say in 2003 that XML based standards for e-business are relevant for them. In the new Member States, the level is between 10-20%; in Latvia even lower.

This comes as a surprise, considering the importance which XML based data exchanges already have for industry today. The dominant e-business standard for the industry, Chem eStandards, specifies its messages currently in the form of Document Type Definitions (DTDs). A DTD specifies the syntax of a valid XML message, the acceptable sequence of data elements. In the future, CIDX intends to specify its messages in XML Schema format, which will expand the definition of a valid XML message to include characteristics of data elements, such as data type and data length.²¹

²¹ Cf. <http://www.cidx.org>, FAQs, Technical questions, "How are the Chem eStandards™ messages specified?" (February 2004).

2.3 The European e-Business Sector Scoreboard

2.3.1 Introduction

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

The indicators

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

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

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

Percentages and index values

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

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

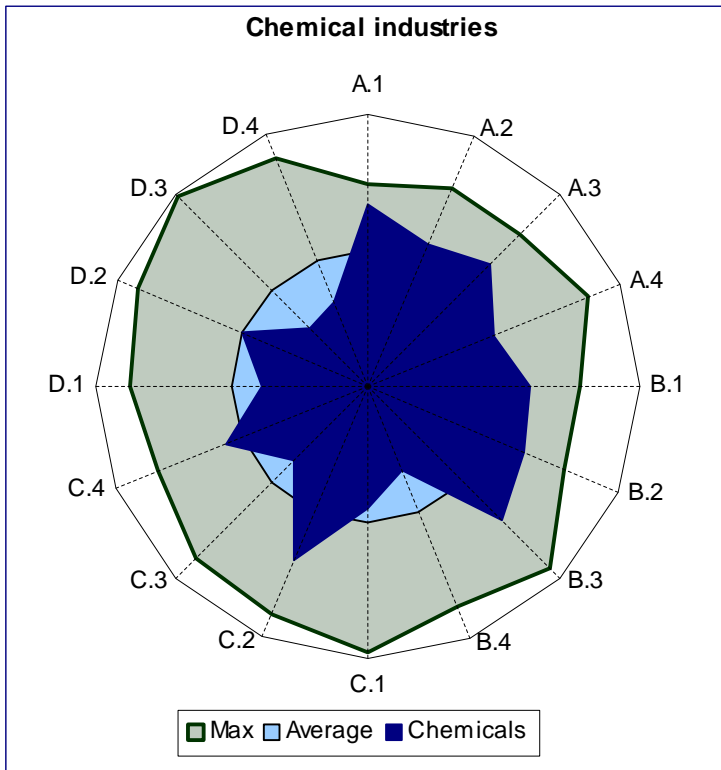
All spider diagrams are based on index values. The reason for preferring indexed values over simple percentages is that they adjust data for typical cross-sectoral gaps.

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

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

2.3.2 E-Business Scoreboards for the chemical industries

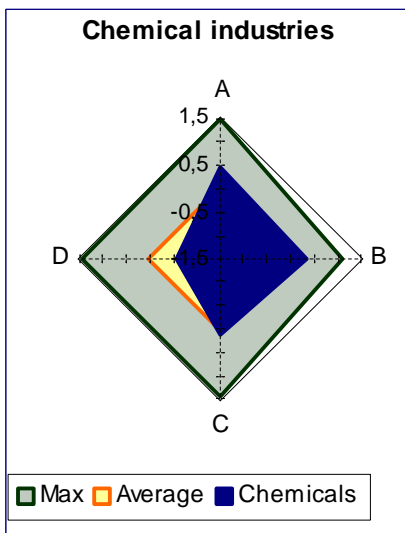
Indexed scoreboard: component indicators



Indicators

- A.1) LAN
- A.2) Internet connectivity
- A.3) Remote access to company network
- A.4) Wireless access to company network
- B.1) Use of an intranet
- B.2) Use of online technology to track working hours and/or production time
- B.3) Use of ERP systems
- B.4) Perceived impact of e-business on internal work processes
- C.1) Enterprises purchasing at least 5% of their supplies online
- C.2) Use of SCM systems
- C.3) Integration of IT system with supplier(s)
- C.4) Electronic exchange of documents with suppliers
- D.1) Enterprises maintaining a website with a content management system
- D.2) Use of CRM software systems
- D.3) Enterprises selling at least 5% of their goods & services online
- D.4) Enterprises with an online sales system offering the capability of secure transactions

Indexed scoreboard: categories (aggregate)



Categories

- A) Connectivity of enterprises
- B) Internal business process automation
- C) Procurement and supply chain integration
- D) Marketing and sales

Max = maximum indexed value for one of the 9 sectors

Average = mean value for the 9 sectors

Assessment: Manufacturing sector with a cautious e-business approach

Chemical companies tend to be pragmatic and rather conservative users of information technology. They are not a leading adopter of e-business. Other manufacturing sectors such as electronics or the automotive industries are more intensive users.

Still, in terms of business connectivity and internal business process automation, companies from the chemical industries are better equipped than firms on average across all sectors.

This does not hold true for customer facing e-commerce solutions, which are not yet widely used.

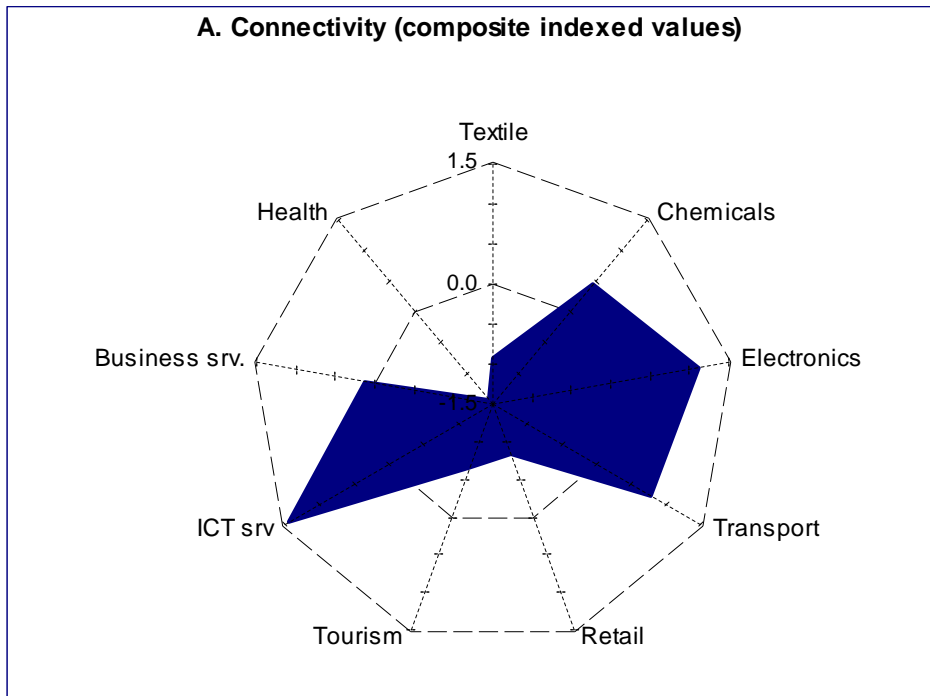
2.3.3 Cross-sector Scoreboards

Scoreboard A) Connectivity of the enterprise

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

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

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



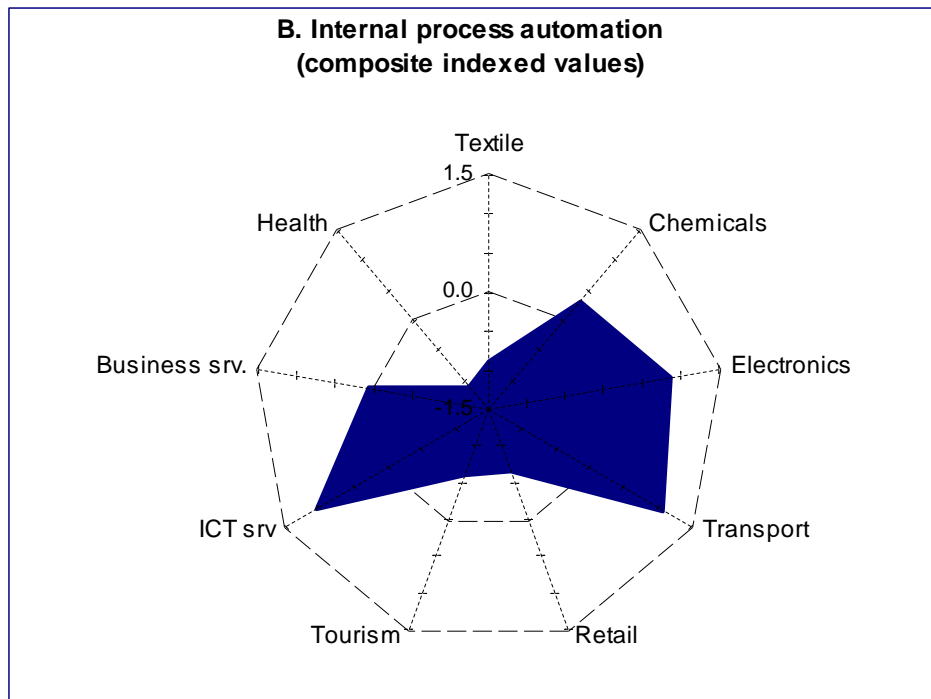
The connectivity scoreboard compares sectors with respect to the functionality of their IT networks. In general, companies from manufacturing sectors tend to be equipped with more powerful IT architectures than businesses from service sectors. The textile industries and the ICT services sector are the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

Scoreboard B) Internal business process automation

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

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

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



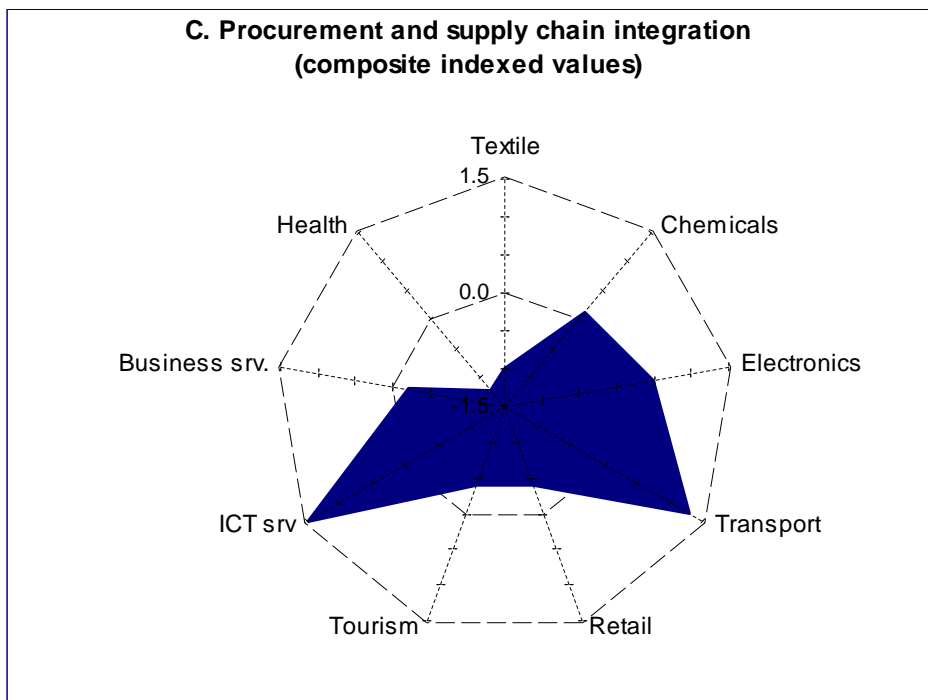
This scoreboard indicates to what extent sectors use ICT to automate internal business processes. Results are largely in line with the connectivity scoreboard. Again, the scoreboard suggests that companies from manufacturing sectors where large enterprises are particularly dominant tend to be most advanced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

Scoreboard C) Procurement and supply chain integration

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

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

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



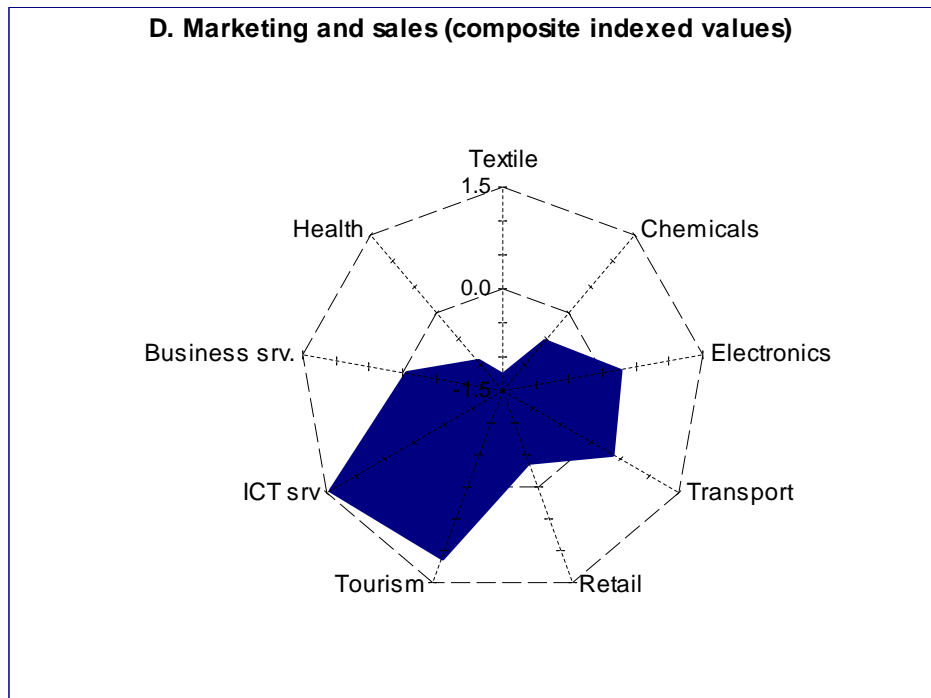
This scoreboard compares sectors with respect to the intensity and sophistication of their e-procurement activities. Results suggest that two sectors are outstanding in this regard: The ICT services sector and the automotive industries. Of the other sectors, only electronics and the chemical industries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

Scoreboard D) Marketing and sales

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

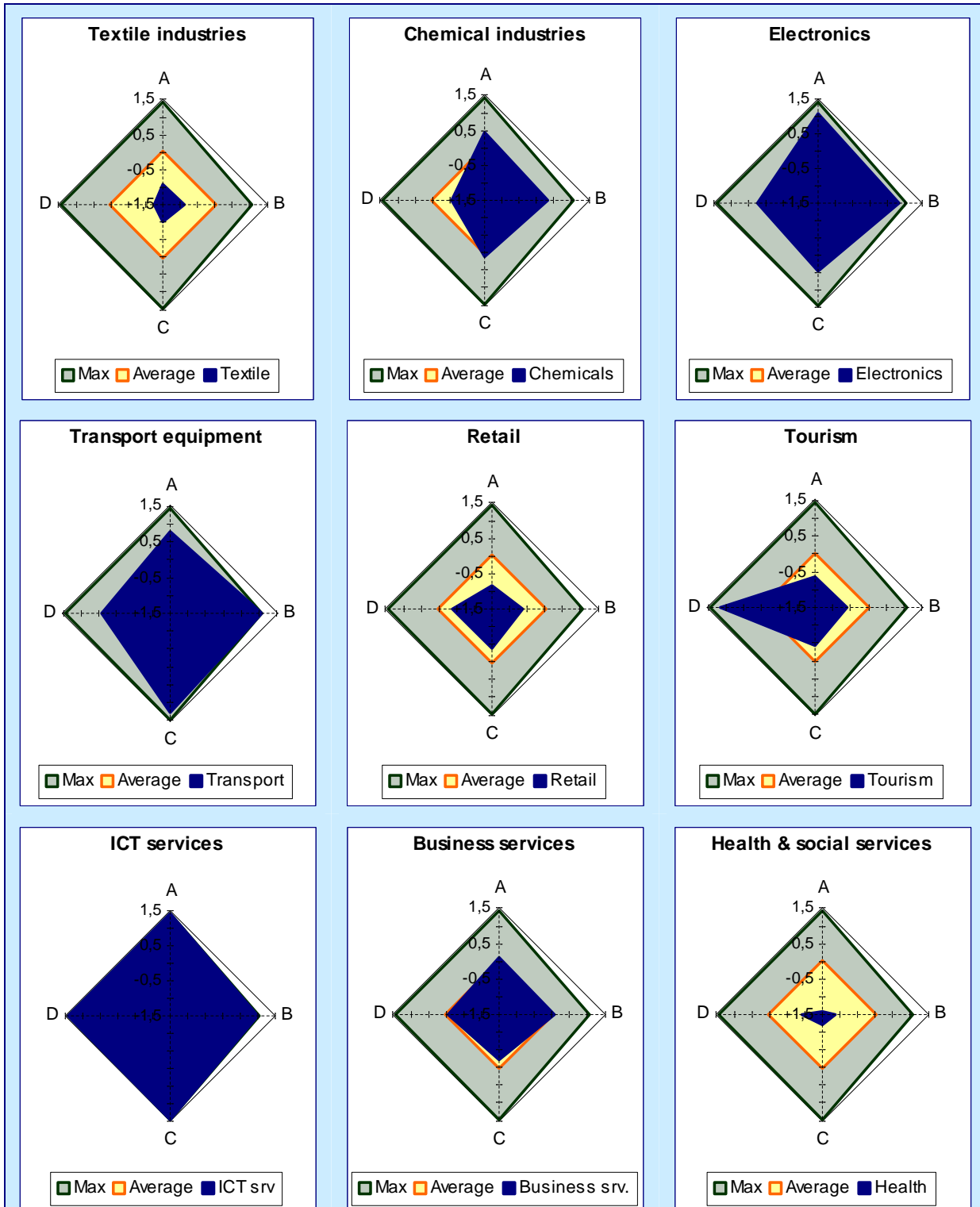
* Due to the larger number of firms and persons employed, service sectors have more weight in the "all sectors" percentage. In contrast, the mean percentage of nine sectors which is used to compute the indexed values, does not consider different sector sizes. Therefore, the indexed value of the percentage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

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



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

2.3.4 Sectors in profile



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

3 Summary and conclusions

3.1 Summary of main findings

Economic background

The combined chemical industries (NACE Rev. 1 24, 25) comprise about 72,000 enterprises in the 15 EU Member States of 2003 and employ more than 3.1 million people. Although a mature sector with rather stable and predictable demand and supply, even the chemical industry was affected by the overall economic downturn of the past few years. Since supply goods for other industries, for example for the automotive industry, for packaging and for construction, account for the majority of production in some sub-sectors, these sub-sectors were more susceptible to economic cycles than, for example, the pharmaceutical industries.

Recent economic indicators suggest a revival of the economy in 2004. The pressure to consolidate business, however, is likely to remain. One of the main current challenges for the chemical industries is that more and more products are becoming mass commodities which can easily be produced by competitors in low-wage countries. To remain competitive, companies need to minimise production costs by exploiting economies of scale or conquer niche markets with specialised products. As a consequence, the chemical industries are undergoing a restructuring process with large mergers and acquisitions taking place.

E-business is used if there is a clear promise of return on investment

The chemical industries have been a rather conservative sector when it came to using information and communication technologies for linking business processes and interacting with their suppliers and customers. However, "conservative" does not mean that companies refuse adoption and innovation. Rather, it means that management in chemical companies often presses even harder for figures on return-on-investment before giving their OK to the implementation of new IT architectures or software applications than it may be the case in other sectors. While such an approach may not have been en vogue during the new economy boom time, it is certainly seen from a different perspective after matters have been put straight and as unrealistic e-business concepts have been widely abandoned.

Many studies have already painted the portrait of an industry that hesitates first but then quickly starts to adopt e-business once the applications have become more mature, with a lower risk of adoption. This portrait has by and large been confirmed by results of the e-Business Survey 2003 and accompanying research of the *e-Business W@tch*.

The European E-Business Scoreboard 2003/04, which was developed by the *e-Business W@tch* based on data from the recent survey, shows that ICT and e-business use in the combined chemical industries is above average as regards (i) the connectivity of enterprises, (ii) the use of ICT for internal business process automation, and (iii) e-procurement and supply chain integration. E-business for marketing and sales purposes, on the other hand, is not playing an important role in the chemical industries compared to other sectors. In fact, this is reflected by the conclusions offered in this chapter. The main opportunity which e-business presents to chemical companies is not strictly e-commerce related, but addresses the improvement of business processes (efficiency, quality assurance, speed).

The main driving forces for using e-business in the combined chemical industries can differ between sub-sectors, as the chemical industries are quite diverse. Commodity-producing companies in the basic chemicals industry, for example, place different hopes in e-business than R&D-intensive pharmaceutical companies do. The following table cannot consider these internal differences in detail, but summarises the specific importance of e-business application areas for the sector.

Exhibit 3-1: Summary overview: Importance of e-business applications in the chemical industries

E-business application area	Importance	Remark / example
Facilitate remote and mobile work (field workers, homebased telework)	~ ~	Large companies are well equipped with remote access technology, SMEs less so.
Improve knowledge management by using special software	~ TM	Although an RTD intensive sector, KM software is not widely used. No clear benefit perceived.
Automate internal business processes	~ ~ ~	Improving the efficiency and quality of business processes (internally and between trading partners) is a key priority in the sector
Improve ERP-to-ERP connectivity	~ ~ ~ TM	Key e-business application area in the chemical industries. The objective is to realise cost saving potentials by making supply chain processes more efficient. The chemical sector has the highest diffusion of ERP systems (in % of enterprises using them) among all 10 sectors benchmarked.
Supply chain process integration	~ ~ ~	The sector is one of the most intensive users of SCM solutions. Application and focus are closely related to ERP objectives.
Decrease direct procurement costs through e-procurement	~ ~ TM	As in other sectors, the larger companies pursue the goal to streamlining the selection of their supply firms. In general, though, the focus is rather on making processes more efficient.
Web based e-marketing and customer related services	~ TM	Not yet widely developed, but could gain importance in the future.
Electronic customer management	~ TM	Although diffusion of CRM systems is slightly above the all sector average, CRM is not a key issue.
E-commerce: Increase sales volume / area through selling on the internet	~	Selling online through the company website is not a priority for chemical companies. The strategy is rather to use e-commerce to improve processing of orders. However, some players argue that this area precisely will be the next focus of activity.
B2B marketplaces on the internet	~ ~ TM	The function of "marketplaces" has shifted from providing platforms for buying/selling to providing connectivity services. But this could gain further importance (see business example "Elemica").
Use of e-business standards for exchanging structured data	~ ~ ~	Chemical industries are in a preferred position to benefit from standardisation since many of the products traded can easily be categorised (e-catalogues).
Web services and XML based standards	~ ~	Companies themselves are not yet convinced about XML. However, it could become the main standard for electronic transactions in the future.
Extended enterprise: collaborative (online) e-product design	~ TM	Average use of e-product design technologies. Depends on sub-sector.
~ = little relevance; ~ ~ = average relevance; ~ ~ ~ = very relevant; ~ ~ ~ ~ = highly relevance for sector TM = mixed results, depending on the sub-sector within the combined chemical industries		

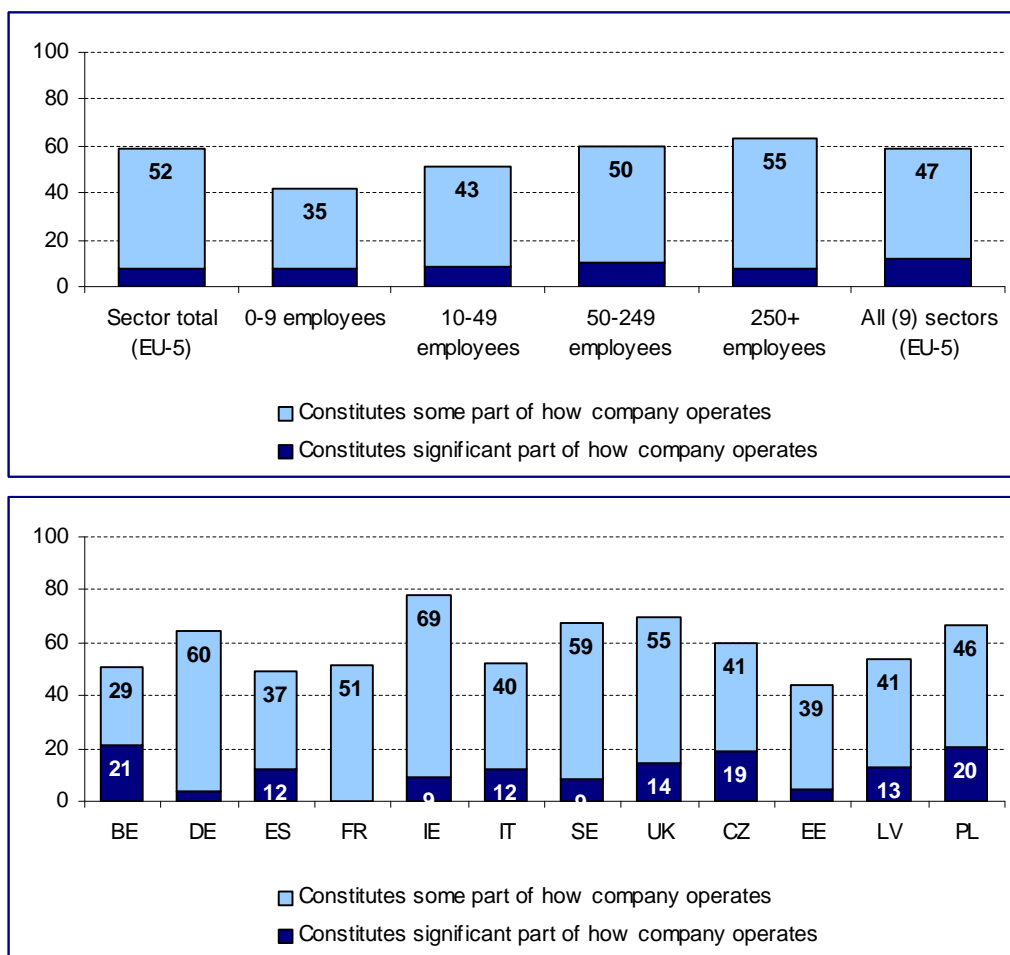
Source: e-Business W@tch (2003/04)

3.2 Economic impacts

3.2.1 Impacts on individual enterprises

In 2003, European chemical companies that represent about 60% of employment in the sector say that e-business constitutes at least some part of the way they operate. This is exactly the all sector average, which, in a way, summarises very well the general use and impact of ICT and electronic business in the combined chemical industries.

Exhibit 3-2: Overall significance of e-business for companies in 2003 (by region and by size-band)



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

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

In this sector, the adoption of ICT takes place as an evolutionary process. Chemical companies tend to have a sober, matter-of-fact view about electronic business applications. E-business is predominantly an instrument for business process innovation. Whether, when and to what extent they make use of it depends very much on the transparency of return on investment forecasts. Chemical companies are normally not the forerunners in the area of e-business. They let others go first, take their time to study developments, and only when the benefit to be gained seems clear enough do they jump the bandwagon. On the other hand, the sector is not among the late adopters or laggards (with the possible exception of the smaller companies in some respects).

However, as in other manufacturing sectors, there is a substantial gap between the use and impact of e-business among large companies and small ones. The picture for medium-sized companies is more

complex, as they are closer to the large ones in some respects while lagging behind in others. When benchmarking the chemical sector in terms of enterprise connectivity (internet access, remote access) and with respect to internal business process automation, small companies are about on the all sector average level, while large chemical companies are clearly beyond average.

E-business opportunities for chemical companies

In the chemical industries, the main impact and opportunity of e-business for companies is not really to be found in typical e-commerce metrics such as "buying cheaper" or "selling more". The *e-Business W@tch* finds that the main impact in this sector is in the optimisation of business processes, within the company and between trading partners, in three ways:

- (a) **Efficiency:** Reduced cost
- (b) **Quality:** Improved quality assurance
- (c) **Speed:** Faster accomplishment of tasks

(a) Increase the efficiency of business processes and decrease processing cost

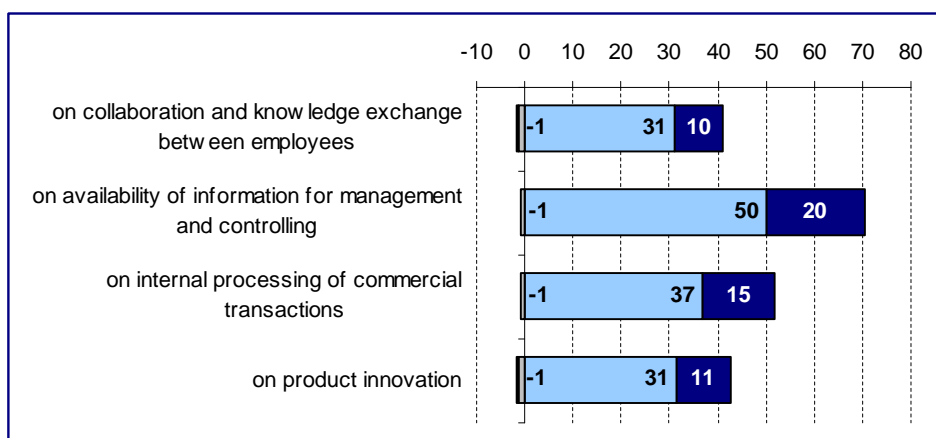
The improvement in the efficiency of business processes is the most important objective and, in fact, the most important overall impact of e-business on companies in the combined chemical industries. Internal work processes as well as transactions with business partners can be improved through the use of e-business. This includes applications for 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.

(b) Support quality assurance by improving business process management

In the November 2003 part of the survey, the *e-Business W@tch* asked companies to assess the impact of electronic business and the internet on a number of internal business processes. Among the seven countries asked in the chemical industries, there is one item that stands out, with more than 70% of companies on average saying that they have observed positive effects: the availability of information for management and controlling (see Exhibit below). Another important benefit, the "internal processing of commercial transactions", also relates to quality issues. Again, more than 50% on average say e-business has helped to improve this aspect.

In fact, the focus of electronic business might shift towards its values for management and controlling in the next few years. Managers from chemical companies have frequently reported at e-business related conferences and workshops that one of the most positive effects of implementing e-business solutions was a visible improvement in quality assurance throughout all phases of business transactions. When requests for quotation, orders and confirmations are exchanged by fax, the chances that mistakes can occur (for instance wrong product specifications, misunderstandings in the quantity ordered) are much higher than when exchanging the same information as standardised data electronically. This can lead to indirect cost savings as costs for processing orders – whether as buyer or seller – decrease in the long run.

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

Base: Companies from BE, IE, SE, CZ, EE, LV, PL. using the internet. N=500. In % of enterprises, mean value for countries.
Reporting period: March/November 2003.

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

(c) Accelerate processes – reduce time-to-market

There is another important dimension in the optimisation of business processes through linking processes electronically – the possibility that they can be accomplished more rapidly. For certain sub-sectors in the chemical industries, particularly the formulated chemicals industry, speeding up information flows and thereby accelerating processes is an important opportunity. If, for example, pharmaceutical companies manage to reduce the time for RTD related processes, including the management of clinical trials, by linking processes electronically and making them as efficient as possible, they can gain a competitive advantage, reduce time-to-market, enjoy a longer period of monopoly with their product and thus achieve higher profits. In the pharmaceutical industries, time-to-market is a critical success factor.

Another, almost trivial, aspect that has led to an acceleration of business processes in knowledge intensive sectors is the exploitation of information available on the Internet. Easy and cheap access to information, and the opportunity to share relevant information with others without any time lag and practically at zero cost has revolutionised research across sectors. Some companies have specialised in capitalising on this effect by providing added value services through web-based portals to a specific business community in the sector (see: Business Example "SpecialChem"), combining in a new way marketing with ICT support and consulting services.

E-business risks for chemical companies

Since the adoption of e-business technologies among chemical companies follows – in most cases – an evolutionary, rather unspectacular path, the *e-Business W@tch* has not identified any risks that are typical specifically for this sector. Moreover, the "risks" that could be attributed to ICT and e-business are mostly of a very general nature and are closely linked to overall economic developments such as globalisation or rationalisation in production. ICT certainly play a role in enabling and accelerating these developments, but there is no alternative way for companies such as an "opt-out". For example, it is evident that competitive pressure in the chemical industries has increased over the past 10-15 years, just as in many other sectors. Certainly, ICT and the internet have been playing a role in this development as they have dramatically increased the market transparency and subsequently competition. But individual companies cannot circumvent this situation by not adopting ICT.

E-business standards: On a more specific, technology-related level, e-business risks are similar to those in other sectors. E-business standards, although very important for making e-business efficient, always include a certain risk as it is unclear which family of standards will be used in the future.

Chemical companies need to decide, for example, whether they should migrate from EDI based to XML based standards. Such a decision needs to be based on assumptions about the future use of these standards.

Investment and unclear ROI: Closely related is the investment risk, which again is not sector specific. E-business is not a purpose in itself. At the end of the day, investments in related technologies, know-how and process adaptations must lead to a positive return-of-investment. A major difficulty in that respect is that this ROI can hardly be measured. There are no clear metrics relating operational results to e-business investments, since business activity and success are determined by many diverse factors, including general management decisions (marketing, product development), the overall economic climate and even changes in the regulatory environment. E-business software companies and consultants promise that metrics for measuring the ROI are available, but this evaluation can be costly in itself. In fact, speakers from the chemical industries at the Elemica Networking Conference 2003 in Cologne stressed this issue. They confirmed that it was difficult to convince management to invest in e-business because of the lack of ROI transparency.

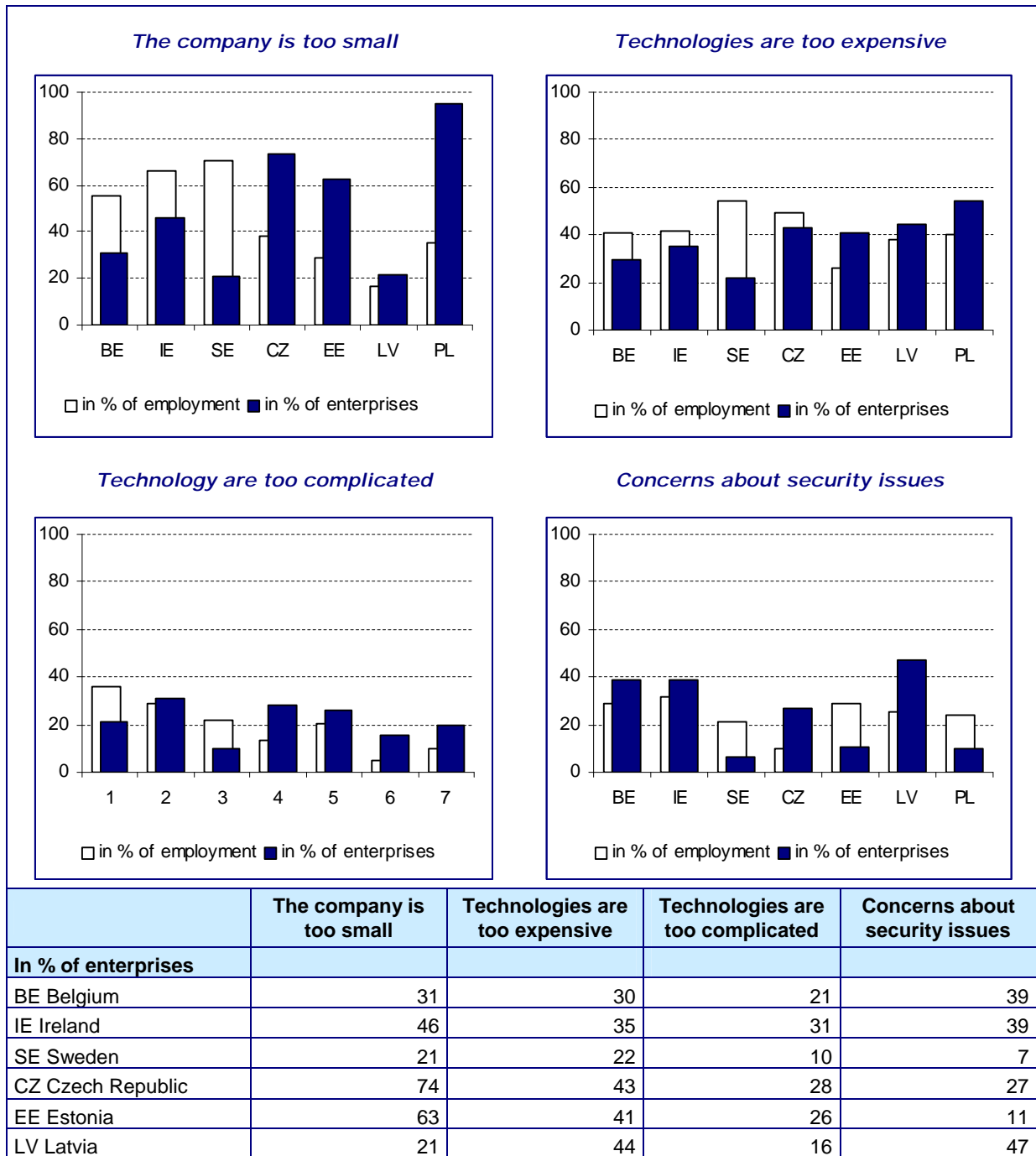
Reasons why chemical companies do not use e-business

The *e-Business W@tch* asked those enterprises that said that e-business does not yet have any significance for their business about possible reasons why they do not use e-business. The most important reason, particularly in the new EU Member States, is that interviewees consider their company to be too small for drawing benefits from electronic business.

The second important reason is closely related to the first one – the costs for technology. For small companies, investment costs are still proportionally higher than for larger companies. This can seriously hamper the modernisation of small companies.

Other possible reasons – the complexity of technologies and security issues – are considered as less important compared to the previous two issues. Results are only indicative though, as the number of observations by country was rather low (between 25 and 50).

Exhibit 3-4: Reasons why e-business does not play a role in companies



Base: enterprises not using e-business applications. N=25-50 per country. Reporting period: November 2003.

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

3.2.2 Implications for the industry

E-business will not change the fundamentals of the chemical industries in the short and medium run

Unlike young sectors such as telecommunications or the computer services industry, the chemical industries are a mature sector where supply and demand are much more predictable and less dependant on short-run business cycles or technological innovation. In such a setting, the impact potential of information and communication technologies, for example on product and process innovation, is not as pronounced as in other sectors.

The rather conservative (but not negative!) attitude of the chemical industries towards ICT and e-business fits into this picture. The chemical industries are not willing to act as guinea pig for e-business experiments, but will not refuse innovation once applications seem mature enough to withstand circumspect risk management and to promise real return on investment. Experiences made during the new economy boom strengthen the industry in taking this implicit attitude towards new technologies. The chemical industries aim at being the wise adopters rather than the early adopters.

Because of the very deliberate and careful application of ICT, it is very unlikely that e-business will radically change the fundamentals of how chemical products are traded. This is not to say that there will be no impact at all – but the major forces driving change in the chemical, rubber and plastic industries are to be seen in the internationalisation of markets and in changes of the regulatory frameworks, rather than information technology and e-business by themselves. ICT facilitate this development, but are not the cause.

Increasing market transparency implies stronger competition

The Internet has dramatically increased international transparency for products and conditions of chemicals just as in any other business sector. Although e-marketplaces – which could be the most obvious platforms aiming at increasing transparency – have not yet lived up to their own expectations, the impact of individual websites, portals and catalogues must not be underestimated. The so-called “bulk speciality chemicals” are a good example. These are produced by a large number of manufacturers and sold to a variety of buyers. Producers are increasingly facing international competition. Previously, they had occupied a niche with less competitive pressure, 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. Costs for increasing their market reach have decreased through e-marketing and online sales opportunities.

The second generation B2B marketplaces: will connectivity hubs create an industry-wide network?

After the e-marketplace hype of 1999 and 2000, and the subsequent shakeout, the assessment of marketplaces is more realistic today. In the chemical industries, the e-commerce oriented business model (marketplaces as open trading platforms for buyers and sellers) has not been successful. The failure of Omnexus which closed its trading platform at the end of November 2003 is a prominent example (see Business Example in chapter 2.2.6). Today, operators shift their business model towards developing and selling software and connectivity solutions rather than providing open web-based platforms (cf. Business Example Elemica).

This raises the question whether one of these connectivity hubs will become *the* single network for connecting companies from the chemical industries. The simple logic behind this consideration is that networks of this type necessarily imply a strong tendency towards concentration, since the value for a

company to participate increases by the number of trading partners that are also members (Metcalfe's Law, or – in other words – the ebay-logic: the success of ebay is that everybody else is there).

Today, any operator of such a second generation "marketplace" is far from being or even becoming the "ebay of the chemical industries". However, if the connectivity business model is more successful than the model of the first generation marketplaces, it is possible that one operator becomes very important indeed in the industry. In that case, the way in which chemical products are traded between businesses may be reorganised. Ideally, it could be a win-win situation for all partners involved, which is also the way connectivity-providers market their service.

However, it is too early to make a sound forecast how this business model will evolve. The *e-Business W@tch* recommends that developments should be monitored and – if the model gains momentum – assessed in more detail with respect to economic and policy implications.

3.3 Policy implications

E-business as an evolutionary innovation process – no call for sector specific policy interventions

In general, the research and survey results of the *e-Business W@tch* do not suggest an urgent need for e-business specific policies in the chemical sector. The adoption and use of ICT in the sector occurs in an evolutionary way and is unlikely to cause dramatic changes or stir-ups in the industry value-chain. The restructuring which the chemical industries seem to be undergoing these days are related to general economic developments (globalisation) rather than caused by technological determinants. E-business is certainly a facilitator to some extent, but not the cause. E-business related interventions from the public sector cannot be justified against this background.

However, there are some areas of electronic business development where policy could act as a catalyst to create a framework in which companies can take informed decisions and thus minimise their investment risks outlined in the previous chapter. For example, policy can support the development and enforcement of e-business standards. Secondly, taking into account the digital divide existing still between small companies from the sector and the large players, policy could – in co-operation with industry associations and IT companies – inform SMEs from the chemical sector about e-business opportunities specifically for small chemical companies.

Help SMEs taking informed decisions: information about sector specific e-business opportunities and necessary preconditions

The *e-Business W@tch* recommended already in its previous Sector Studies on the Chemical Industries SME specific awareness and information activities. As electronic business has become much more mature and sophisticated than it used to be a couple of years ago, reaping the potential benefits requires more than just setting up a website with a simple web-shop, or browsing the Internet for new business occasions. The main potential for chemical industries is likely to be found in improving the efficiency of internal and B2B processes through linking and automating processes electronically. However, realising this potential is a complex process that requires technical and organisational preconditions and whose implementation will normally take some time.

For smaller companies it is harder to meet these preconditions. 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 (such as 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.

These considerations suggest that there may be a role for policy to inform SMEs from the sector about the current and 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.

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

Background

Most of the data presented in this report are results of a decision-maker survey about e-business in European enterprises in 2003. This is an annual survey carried out by the *e-Business W@tch* – the first one took place in 2002 –, constituting a cornerstones of its monitoring activities. For organisational and contractual reasons, the e-Business Survey 2003 was split into two parts. The first part consisted of 3,515 telephone interviews which were conducted in March 2003 with decision-makers in enterprises from five EU countries. The second part had a scope of 4,570 interviews in the EU, 100 interviews in Norway and 2,632 interviews in the 10 new EU Member States (NMS) and was conducted in November 2003. The questionnaires used in the two parts of the survey were largely the same. A few new questions were added in the second part in order to cover issues of special topical interest for policy.

Field work

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

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

Interview method

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

Population coverage and sampling

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

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

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

Population coverage of the e-Business Survey (2002)			
No.	NACE Rev. 1		Sector Name
	Section	Division/Group	
01	D	17, 18, 19	Manufacture of textiles and textile products, leather and leather products
02	D	24, 25	Manufacture of chemicals and chemical products
03	D	30, 31 (except 31.3 - 31.6), 32	Manufacture of Electrical machinery and electronics
04	D	34, 35	Manufacture of transport equipment
05	D	Parts of (17-19), 20, (30-32), (34-35), 36, 45	Crafts And Trade: In addition to companies from sub-sections covered by other sectors: Manufacture of wood products; manufacture of furniture; construction and site preparation. Only enterprises with 0-49 employees.
06	G	52.11, 52.12, 52.4	Retail
07	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
08	K	74	Business services
09	I / K	64.2, 72	Telecommunications and computer-related services
10	N	85.11, 85.12, 85.3	Health and social services

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

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

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

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

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

Problems encountered

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

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

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

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

Weighting principles

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

- Values that are reported as weighted by employment 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. It also allowed for the constraint of predetermined ranges such that imputed data had to be contingent with published sectoral, national and European universe totals as well as for final plausibility checks for every single imputed data item. The weighting cells correspond to the data reporting pattern used as regards industries and employment size-classes. Uniform expansion factors are applied to enterprises within one of the 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 was organised into the following modules:

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

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

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

Annex II: Glossary of Technical Terms

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

ERP	Enterprise Resource Planning. A software system that helps to integrate and cover all major business activities within a company, including product planning, parts purchasing, inventory management, order tracking, human resources, projects management, and finance.
Extranet	A network using Internet protocols that allows external organisations (for example customers or suppliers) access to selected internal data. Essentially it is an Intranet which gives external users restricted access (often password protected) to information through the firewall.
ICT	Information and communication technology. ICT includes networks, computers, other data processing and transmitting equipment, and software. The application of ICT in business processes leads to e-business, if non-proprietary networks are used.
Information security	Measures taken to protect information systems against unauthorised use and attacks
Internet	The world's largest computer communication system, with an estimated 600 million users worldwide. ²² The Internet is a loose confederation of principally academic and research computer networks. It is not a network but rather the interconnection of thousands of separate networks using a common language.
Interoperability	The technical features of a group of interconnected systems (includes equipment owned and operated by the customer which is attached to the public telecommunication network) which ensure end-to-end provision of a given service in a consistent and predictable way.
Intranet	An internal Internet, that is an internal network running using TCP/IP, which makes information available within the company. Most intranets are connected to the Internet, and use firewalls to prevent unauthorised access.
ISDN	Integrated Services Digital Network. An international telecommunications standard for transmission of voice and data over dial-up lines running at 64 Kbit/s (kilobits per second). It allows sharing of multiple devices on a single line (for example, phone, computer, fax).
LAN	Local Area Network. The most common way of connecting computers in a small area (typically inside a building or organisation) for sharing databases and communication facilities. The two most common versions are Ethernet and Token Ring. Implementation is based on coaxial cables or plain wires. Speed achieved ranges from 10 Mbps to 100 Mbps.
Leased line	A private communication channel leased from the common carrier. It is usually a dedicated fixed-route link (e.g. point-to-point frame relay).
M-commerce	Mobile commerce. E-commerce that takes place using mobile connection devices and through data transmission via technical standards for mobile communication.
Micro enterprise	A company with less than 10 employees.
Modem	Modulator/Demodulator. A device that modulates outgoing digital signals from a computer or other digital device to analogue signals suitable to be transmitted through a conventional telephone line (copper twisted pair telephone). The reverse procedure takes place for incoming signals.
MRO goods	Maintenance, repair and operating goods. Supplies which companies need to maintain their operations, for example office supplies, in contrast to "direct production goods" which are components of the goods and services the company produces.
Processes	Business processes are operations that transform the state of an object or a person. This can, for example, be an order placed via the internet. Ordering an object or a service creates a liability for the supplier to deliver, and initiates the transfer of property

²² cf. Nua Internet Surveys, How many online, June 2003
(http://www.nua.com/surveys/how_many_online/index.html).

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

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

No.	Sector	Date
1	Textile, clothing and footwear industries <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
2	Chemical industries <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
3	Electrical machinery and electronics <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
4	Transport equipment manufacturing <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
5	Crafts' and trade sectors <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
6	Retail <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
7	Tourism <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
8	ICT services <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
9	Business services <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004
10	Health and social services <ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Assessment and Case Studies: Economic implications and policy recommendations. 	May 2004 August 2004