

Sector Report: No. 02-II, August 2004

Electronic Business in the Chemical Industries

Key issues, case studies, conclusions

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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 report is the second Sector Impact Study on electronic business in the chemical industries published by the *e-Business W@tch* in the 2003/04 period. It builds on the first study from May 2004 which presented mainly the quantitative picture, focusing on the results of the e-Business Survey 2003. This study analyses in more detail specific issues which were found to be particularly relevant for the sector at stake.

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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 of providing 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 launch, 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 former 15 EU Member States. In 2003, the regional scope of the survey was extended to the new EU Member States and EEA 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 concisely defines e-business in 2004 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 – to use the analogy of 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 on the level of detail in which each single issue can be explored. This must be considered when using the Sector Studies prepared by the *e-Business W@tch*.

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 to, nor could, be substitutes for 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 covers 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).

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

Title	NACE	Short Description
Textile, clothing and footwear industries	17, 18, 19	The textile, clothing and footwear industries account for about 5% of total value added in manufacturing in the former EU-15 and about 9% of employment. SMEs and co-operative SME networks play a vital role.
The chemical industries	24,25	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	30, 31, 32	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	34, 35	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	(17-19), 20, (30-32), (34-35), 36, 45	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 for many craft firms to stay competitive with industrial production.
Retail	52	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	55.1-5, 62.1, 63.3, 92.33, 92.52+53	Hotels, restaurants, travel agencies and tour operators (NACE 55 and 63.3) employ about 2.2 million people in the EU. SMEs play a very important role. In some respects, the tourism sector has always been a forerunner in using ICT. E-commerce is exerting a huge impact, challenging intermediaries.
ICT services	64.2, 72	The ICT services sector in many respects is the leading sector and 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	74	Business services are a huge sector, involving more than two million enterprises (99% 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	85.1, 85.3	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 continued importance of the SME dimension.** Sectors with a higher share of SMEs could therefore be given priority over sectors where large companies dominate.
- **Policy relevance.** The selection needs to consider the policy relevance from the perspective of DG Enterprise and, in particular, sectors for which 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 people 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 roll-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 Role of Electronic Business in the Chemical Industries in 2004: Main Issues and Challenges

This report is the second Sector Impact Study on electronic business in the chemical industries published by the *e-Business W@tch* in the 2003/04 period. It builds on the first study from May 2004 which mainly presented the quantitative picture, focusing on the results of the e-Business Survey 2003. This study analyses in more detail specific issues which were found to be particularly relevant for the sector at stake. The analysis is supported by case studies. The conclusions summarise the main business implications for firms in the sector stemming from ICT and e-business, and assess the main drivers and impediments for the future development of electronic business in the sector. Finally, the study points at ICT related policy challenges, starting with considerations about the overall implications of ICT for policy and leading to more sector specific aspects.

1 Introduction

This chapter features an updated summary of the more comprehensive introductory chapter from the first report (May 2004). Readers who are interested in more detailed economic statistics about the sector are advised to consult the first report which can be downloaded from the publications section of the *e-Business W@tch* website (www.ebusiness-watch.org).

Definition of the combined chemical industries

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 the manufacture of rubber and plastic products (NACE 25). As this report discusses both sectors, the terms “the combined chemical industries” or in short “the chemical industries” are used 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 Division	Group	Activity
24		Manufacture of chemicals, chemical products and man-made fibres
	24.1	Manufacture of basic chemicals
	24.2	Manufacture of pesticides and other agro-chemical products
	24.3	Manufacture of paints, varnishes and similar coatings, printing inks and mastics
	24.4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
	24.5	Manufacture of soap, detergents, cleaning, polishing
	24.6	Manufacture of other chemical products
	24.7	Manufacture of chemical fibres
25		Manufacture of rubber and plastic products
	25.1	Manufacture of rubber products
	25.2	Manufacture of plastic products

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

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

A short introduction to these industries, focusing on their main outputs and inputs, is included in the first Sector Study from May 2004, and – more extensively – in the very first report from August 2002.¹

Industry structure and employment

The combined chemical industries comprise roughly 72,000 enterprises, provide jobs for about 3.1 million people and generate a value added of 230 bn 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 statistics 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. The structure of the industry in the new Member States in terms of company size-bands is similar to the one in the former EU-15.

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 the former EU-15 (of 2003), the combined chemical industries account for about 11% of employment in manufacturing sectors. In the new Member States, the relative contribution to employment measured as a share of total employment in manufacturing sectors is slightly lower. Here, the combined chemical industries account for about 5-9% of employment in manufacturing.

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%).

Market size

The total production value of the combined chemical industries in the European Union is about 735 bn Euro (see Exhibit 1-2). 72% stems from the chemical industry (NACE 24) and the remaining 28% from the rubber and plastics industry (NACE 25).

In both NACE 24 and NACE 25, value added at factor cost is roughly one third of the production value (about 230 bn Euro in total), 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.

¹ Both studies can be downloaded from the *e-Business W@tch* website at www.ebusiness-watch.org.

Exhibit 1-2: Production value and value added
in the chemical industries in EU Member States (2000/01)

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	28,553	5,4	8,905	5,5	6,869	3,4	2,011	2,9
DK	6,536	1,2	2,558	1,6	2,803	1,4	1,162	1,7
DE	123,026	23,2	40,389	25,1	51,088	25,1	19,285	27,6
EL	1,939	0,4	634	0,4	860	0,4	247	0,4
ES	34,559	6,5	9,704	6,0	15,192	7,5	5,021	7,2
FR	100,499	18,9	24,754	15,4	34,604	17,0	10,631	15,2
IE	25,167	4,7	12,292	7,7	1,333	0,7	482	0,7
IT	62,824	11,8	15,296	9,5	32,131	15,8	9,524	13,6
LU	491	0,1	145	0,1	800	0,4	306	0,4
NL	36,347	6,8	7,794	4,9	5,989	2,9	1,906	2,7
AT	6,278	1,2	1,955	1,2	4,164	2,0	1,552	2,2
PT	3,505	0,7	954	0,6	2,048	1,0	643	0,9
FI	5,063	1,0	1,649	1,0	2,388	1,2	980	1,4
SE	12,485	2,4	5,000	3,1	3,302	1,6	1,197	1,7
UK	66,963	12,6	23,497	14,6	29,887	14,7	11,981	17,2
CY	156	0,0	61	0,0	71	0,0	30	0,0
CZ	3,430	0,6	894	0,6	2,377	1,2	650	0,9
EE	163	0,0	36	0,0	93	0,0	24	0,0
HU	2,965	0,6	945	0,6	1,374	0,7	370	0,5
LV	117	0,0	37	0,0	66	0,0	17	0,0
MT	66	0,0	21	0,0	94	0,0	56	0,1
PL	7,619	1,4	2,492	1,6	4,657	2,3	1,396	2,0
SI	1,407	0,3	409	0,3	715	0,4	181	0,3
SK	1,017	0,2	200	0,1	595	0,3	128	0,2
EU-24*	531,173	100	160,619	100	203,498	100	69,779	100

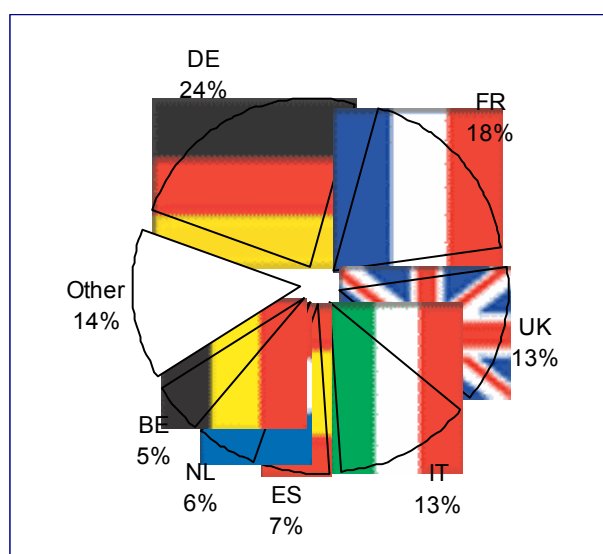
* No data available for LT.

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

Exhibit 1-3: Market shares of EU countries
in the combined chemical industries
(NACE 24+25, production value at market
prices)

The four largest EU economies (Germany, France, the UK and Italy) account for more than two thirds of the total EU production value in the combined chemical industries (at market prices). The 10 new Member States together account for about 4% of production value.

Source: Eurostat / DIW / empirica

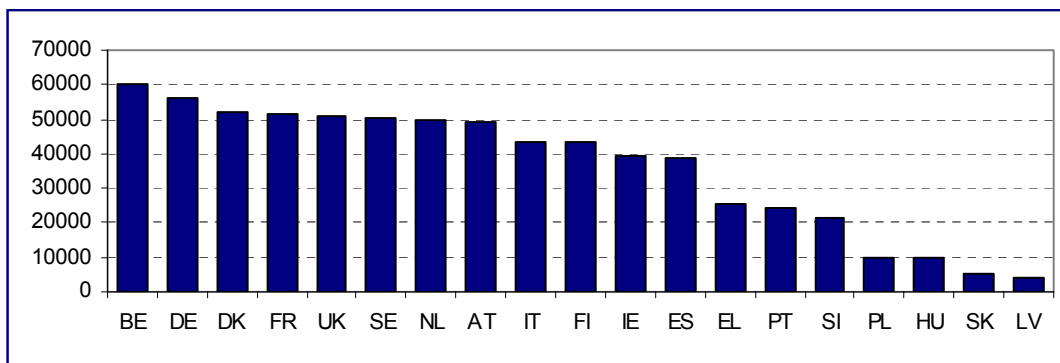


Productivity and labour costs

Productivity in the chemical industries is high compared to other sectors. In 2001, in the former EU-15 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. Thus, to keep profit margins high, it must be producing as efficiently as possible.

In the 15 old 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%). In the 10 new Member States, labour costs amount to only about one fifth of the labour costs in the Member States in both chemicals and plastics production. It remains to be seen to what extent companies from the EU-15 Member States (of 2003) will transfer production capacities to the new Member States because of the cheaper labour force.

Exhibit 1-4: Labour costs per employee in the chemical industry (NACE 24) in 2001 (in Euro)



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

Trends and challenges

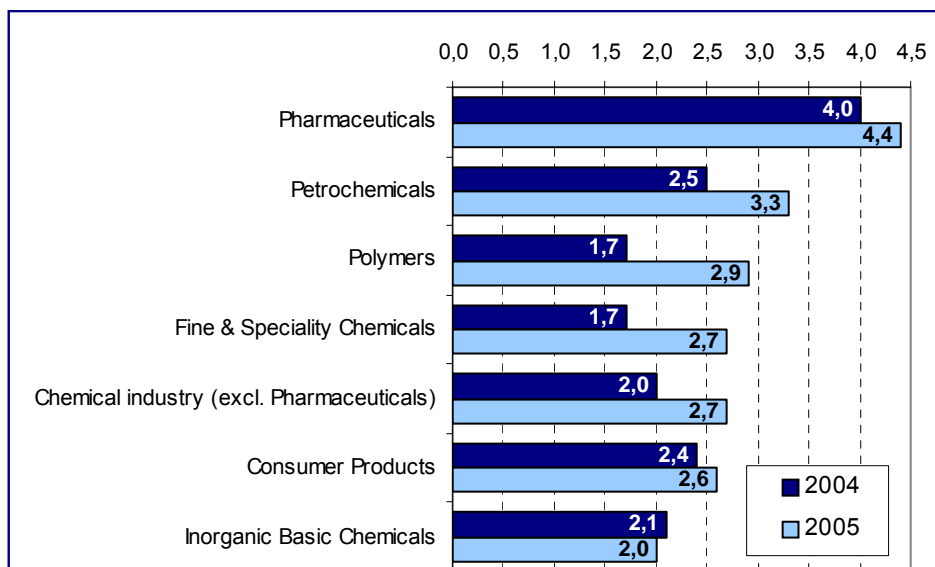
The chemical industries are a mature sector with rather stable and predictable demand and supply, but even such a sector was affected by the overall economic downturn of the past few years, and more recently by a massive increase of the prices for oil and gas. Although the various sub-sectors manufacture 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.

Increased competitive pressure – the search for cost saving potentials. According to Cefic, the European Chemical Industry Council, 2003 was a difficult year for the sector, with the majority of sub-sectors experiencing only weak growth of 0.6%.² Even if Cefic predicts a modest recovery for 2004/05 with EU chemicals output (excluding pharmaceuticals) up 2% (2004) and 2.7% (2005), the pressure to consolidate business will remain. 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.

² Cefic Press Release, 5 March 2004: EU chemical industry set for modest recovery after difficulty year.

If so, the chemical industries will focus on realising cost saving potentials even more. In this respect, ICT and electronic business could play an important role, as new technological developments (such as improved B2B connectivity) could further increase the cost saving potential of e-business applications.

Exhibit 1-5: Expected growth rate of the production volume in sectors of the chemical industries in 2004 and 2005



Source: Cefic (March 2004)

What is at stake in this context is the competitiveness of the European chemical industry. According to a recent study on the sector's long term perspectives issued by Cefic³, the sector has suffered a significant decline in its profitability since the year 2000 and has entered into a period of significant uncertainty. The competitiveness of the industry is at risk and "needs urgent action to be improved".

Product innovation – a critical success factor: In the pharmaceutical industries in particular, but also in other branches of the chemical industry, product as well as process innovation can be mission critical for their future success. As pharmaceutical products are highly research and development intensive, the process all the way through from R&D to market introduction product innovation can take a long time and consume 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, are successful once introduced to the market. Ideally, new products are sold at high margins and become "blockbusters", that is high revenue products with sales exceeding 500-1000 m Euro.

Mergers & acquisitions – restructuring of the industry: In contrast to the R&D intensive subsectors such as the pharmaceutical industries, other subsectors of the combined chemical industries (for instance basic chemicals, rubber and plastics) are manufacturers of products which tend to be mass commodities and can easily be produced by competitors in low-wage countries. Those sub-sectors in particular will experience the increasing competitive pressure in the globalised economy. One of the reactions is a restructuring of markets in the form of mergers and acquisitions, for instance in the European pharmaceutical industry.

³ Chemical Industry 2015. Study issued by Cefic. Cf. Cefic, Press Release from 5 March 2004.

Exhibit 1-6: Global Top-15 chemical and pharmaceutical companies in 2003

Rank	Company	Country	Global 500 Rank	Revenues		Profits	
				US\$ millions	% change from 2001	US\$ millions	% change from 2001
1	Merck	US	50	51,790	8.5	7,150	-2
2	Johnson & Johnson	US	101	36,298	10.0	6,597	16
3	Pfizer	US	106	35,281	9.4	9,126	17
4	GlaxoSmithKline	UK	119	31,874	8.0	5,913	33
5	BASF	DE	123	30,458	4.7	1,422	-73
6	Bayer	DE	143	28,008	3.3	1,002	16
7	Dow Chemical	US	145	27,609	-0.7	-338	N/A
8	DuPont	US	172	24,522	-3.3	-1,103	-125
9	Novartis	CH	214	20,823	9.7	4,698	13
10	Aventis	FR	238	19,497	-5.1	1,977	47
11	Roche Group	CH	245	19,096	10.5	-2,586	-218
12	Bristol-Myers Squibb	US	252	18,119	-11.3	2,066	-57
13	AstraZeneca	UK	253	18,032	9.4	2,836	-4
14	Abbott Laboratories	US	263	17,685	8.6	2,794	80
15	Pharmacia	US	281	16,929	-12.3	597	-60

Source: Fortune Global 500 (2003)

Environmental issues / REACH regulation: With respect to policy, environmental issues play a most important role for the chemical industries. The challenging task is to create a framework that has the right balance between ensuring sustainability objectives (protecting the environment, risk assessment) and competitiveness goals (not undermining the competitiveness of European enterprises by stipulating too harsh regulations). Risks to be addressed are twofold in this context. Firstly, much of the output of the industry (chemical products) is potentially harmful, if not used or disposed in appropriate ways. Secondly, the production processes in this industry are also frequently subject to environmental concerns. The industry is under constant pressure to develop innovative manufacturing processes that minimise the burden on the environment.

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 competitiveness and enhancing the innovative capability of the EU chemicals industry.⁴

The Commission's Impact Assessment estimates the direct costs of REACH to the chemicals industry at a total of some 2.3 bn Euro over an 11 year period, including fees to the Agency of 0.3 bn Euro. The chemical industry, however, argues that costs implied will be much higher and estimates them at about 15 bn Euro. To bridge differences, the EU Commission

⁴ see <http://europa.eu.int/comm/enterprise/chemicals/chempol/whitepaper/reach.htm> and previous Sector Study (May 2004) for a more comprehensive description of REACH.

and the European chemical industry have agreed to launch a Strategic Partnership to test REACH in practice called "SPORT".⁵

IP rights and other legal issues: Intellectual property issues are very important in R&D intensive sub-sectors of the chemical industry, particularly the development of the legal framework concerning patents. The industry makes a strong point that restrictions on patentability and inadequate intellectual property rights will negatively affect the industry's innovation potential, its R&D activities and ultimately its competitiveness. Regarding biotechnology, the industry advocates a harmonised system for patenting biotechnological inventions. The European Union has adopted a Directive on the legal protection of biotechnological inventions (98/44/EC), which has been welcomed by Cefic, the European chemical industry association. However, several Member States were rather reluctant to adopt this Directive, and in 2003 eight Member States were referred to Court for failure to implement the Directive.

Other emerging issues in the legal and IP context that will have to be addressed by policy, as well as by the industry itself, include the protection of traditional knowledge, access to genetic material and indicating the origin of genetic material.

⁵ Cf. Cefic press release, 9th July 2004 and http://www.cefic.org/files/Publications/SPORT_040702.pdf

2 The role of electronic business in the chemical industries – analysis of selected issues

2.1 Key application areas of electronic business in the sector

The previous Sector Study (May 2004) concluded that the combined 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." The study pointed out, however, that this does not mean that companies from the sector refuse adoption and innovation. It means rather that management in chemical companies often presses even harder than it may be the case in other sectors for concrete return-on-investment figures before approving the implementation of new IT architectures or software applications.

The overall conclusion was that the main opportunity and current objective of electronic business in the chemical industries is not strictly e-commerce related, but addresses the improvement of business processes with respect to efficiency, quality assurance and speed. The following business objectives and related application areas were found to be among the most important ones in this sector:

Optimising transactions with suppliers and customers

The objective of decreasing the costs related to commercial business transactions, for example processing and exchanging orders, and at the same time reducing error rates, is a major driver of electronic business in the chemical industries. Implementing efficient online procurement schemes is of particular importance in this context.

32% of all companies from the sector, accounting for more than 50% of employment, say that they order direct supply goods and/or MRO (maintenance, repair and operations) goods online from suppliers. The industry has been experimenting with different modi operandi of doing this in the most efficient way. Internet based trading platforms ("B2B marketplaces") offered themselves as the most efficient buyer-seller exchange, but many of those failed. A revised model of these marketplaces has emerged in the forms of B2B connectivity hubs (such as Elemica) or as service portals (for instance SpecialChem, see Case Study).

There is still major potential for improvement, though. Only 4% of all companies from the chemical sectors say that they have integrated their IT system with that of a supplier for placing orders. This is below the average share of integrated enterprises in other sectors and holds true even for large companies (8%).

Improving supply chain processes

The combined chemical industries are among the sectors with the widest diffusion of ERP (Enterprise Resource Planning) systems among its companies (13% of all enterprises, 48% if weighted by employment). With the increasing demand for electronic inter-firm data exchange, the challenge today is how to improve the ERP-to-ERP connectivity between firms, that is, connecting different systems and their technical standards. In fact, this a major target of many e-business projects in the chemical industries. Several service providers, including connectivity-hubs, focus on this issue.

Similarly to the wide ERP diffusion, the level of Supply Chain Management (SCM) adoption among chemical companies is above the average of sectors, even among the manufacturing sectors which are typical users of SCM.

Exhibit 2-1: The importance of various e-business objectives and applications in the chemical industries in overview

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	●○	Although some sub-sectors are highly RTD intensive, KM software is not widely used.
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	●●●○	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 studied.
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	●●●	As in other sectors, larger companies pursue the goal of streamlining the selection of their supply firms and saving procurement costs.
Web-based e-marketing and customer related services	●○	Not yet widely developed, but could gain importance in the future.
Electronic customer management	●○	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. However, companies could turn to electronic sales once e-procurement objectives have been accomplished.
B2B marketplaces on the Internet	●●	The function of "marketplaces" has shifted from providing platforms for buying/selling to providing connectivity services.
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	●○	Average use of e-product design technologies. Depends on sub-sector.
● = little relevance; ●● = average relevance; ●●● = very relevant; ●●●● = high relevance for sector ○ = mixed results, depending on the sub-sector within the combined chemical industries		

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

Exploiting the potential of e-standards

A technical precursor and prerequisite for the objectives outlined before is the widest possible agreement on electronic standards for inter-firm data exchange. This is critical to improve the ease, speed and cost of transactions and other information exchange. The main e-business standard used in the chemical industries is the Chem eStandards®, Version 4 of which has been announced in May 2004 [CIDX, 2004]. Since February 2003, Cefic and

CIDX⁶ (Chemical Industry Data Exchange) have been collaborating to help the chemical industry implement e-business standards for business transactions on the Internet.

Based on these findings, a number of specific issues are analysed in more detail and illustrated by case studies in the following chapters:

- The following section (chapter 2.2) compares the intensity of ICT use and electronic business in the two subsectors which are covered by this Sector Study: the chemical industries (NACE 24) on the one hand, and the rubber and plastics industries (NACE 25) on the other. The objective is to test whether the structural differences between these sectors translate into different patterns of ICT intensity or not, and to draw conclusions regarding implications for innovation and productivity.

Case study: The e-procurement strategy of Slovnaft, a refinery and petrochemical company based in Bratislava in the Slovak Republic

- Chapter 2.3 discusses the importance of electronic standards for the combined chemical industries. Theoretically companies from the sector should be in a privileged position to benefit from standardisation since many of their products can easily be categorised. The analysis will put this assumption to a critical test and explore the role of e-standards today. Of particular interest in this context is to explore the strategies and methods used by chemical companies for their supply chain management and to establish efficient inter-firm connectivity with suppliers, which is where e-standards play their most important role.

Case study: "Electronic BASF" - Supply Chain Management at a global player

- Finally, chapter 2.4 analyses the evolution of electronic marketplaces in the sector. The chemical industries used to be among those sectors where Internet based B2B trading platforms were until recently expected to become very important. In the wake of the imploding new economy, however, many initiatives failed or had to completely revise their business model. The chapter investigates the role and business model of marketplaces today and assesses their future role in the sector.

Case study: SpecialChem – helping companies with e-marketing and sales promotion

⁶ CIDX (www.cidx.org) is a trade association and standards body focused on realising transactional efficiency throughout the global chemical industry supply chain.

2.2 A comparison of the chemical industries with the rubber and plastics industries

The first Sector Study (of May 2004) presented statistics on the use of electronic business for the combined chemical industries which 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 Division 24); and
- the manufacture of rubber and plastic products (NACE Division 25).

The study presented only the aggregated results for these two sectors. It was not possible in the context of that analysis to break down the survey data on e-business for each sector. However, the economic structure of the two NACE divisions shows some remarkable differences. This leads to the question to what extent the role of ICT and electronic business is also different in the chemical industries from the rubber and plastics industries. The assumption is that the chemical industry, where large firms play a more dominant role than in the rubber and plastics sectors,⁷ could be a more intensive user of e-business. This assumption is tested in this chapter.⁸

2.2.1 Economic differences

There are major structural differences with respect to the typical size of firms, employment and production value. Although the rubber and plastics manufacturing industries (NACE Rev. 1 25) comprise almost twice as many enterprises in Europe as the chemical industries (NACE Rev. 1 24), total employment is nearly 20% lower. The reason is that very large companies play a more important role in the chemical industries (5% of enterprises account for nearly 70% of employment), while in the rubber and plastics sector more than 60% of employees work in SMEs.

Exhibit 2-2: The chemical sector vs. rubber and plastics: Key economic indicators

Indicator	NACE 24: Chemicals and chemical products	NACE 25: Rubber and plastic products
Number of enterprises (EU-15) *	26,300	45,900
Number of persons employed (EU-15) *	1.7 million	1.4 million
% employment in SMEs (0-249 employees)	32 %	61%
Production value (bn Euro)	514	193
Value added at factor costs (bn Euro)	156	67
Labour costs per employee (1000 Euro)	50.2	33.6

* Data for the former EU-15 are used because of gaps for some countries in statistics for the new Member States, which would distort aggregate figures.

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

⁷ This may not hold true for the rubber industry, which consists of the tyre and the non tyre industries. Virtually all tyre manufacturers are large multinationals and dominate this industry.

⁸ It is acknowledged that NACE 24 and 25 are not homogeneous in themselves and could also be broken down into subsectors for comparison. However, survey data available do not allow a further breakdown of a single NACE division, as the number of observations would become too small for any reasonable comparison. Therefore, this comparison is restricted to the aggregates of firms from NACE 24 and NACE 25.

Production value and value added are higher in the chemical industries by a factor of about 2.5. In NACE 25, manufacture of plastic products is more important from an economic point of view than rubber manufacture on the aggregate level. The plastic industry comprises 88% of enterprises, 79% of employees and 78% of value added.

The sectors (and even their sub-sectors) not only differ in their structure, but also in terms of inputs used, outputs produced and with respect to the knowledge intensity of their typical business – the combined chemical industries consists of both R&D intensive and low-R&D sectors.

The chemical industry (NACE 24)

At the foundation of the chemical industry are basic chemicals (NACE 24.1). 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 of output are petrochemicals, used as input for plastics, paints, and fibres (see case study on Slovnaft), basic inorganics (used as input for glass, food, and paper), basic organics (used as input for detergents, adhesives, agrochemicals), and industrial gases (used as input for chemicals and petroleum, laboratories, construction and metals). The production is characterised by large output volumes, and high capital and energy intensity. R&D intensity is comparatively low. Outputs are also commodities, that is, standardised products that are bought in huge amounts, with price being the major decision criterion.

Fine and speciality chemicals are the next element in the value chain of the chemical industry (mainly firms from NACE 24.1, 24.5 and 24.6). The companies in this segment use basic chemicals, including monomers, polymers, solvents, and petrochemicals, as a major input to produce a huge variety of special substances, often in relatively small volumes. The life-sciences industry is an important user of fine and speciality chemicals. Production differs considerably from the basic chemicals industry, since much of the output is manufactured specifically for individual customers.

The formulated chemicals sub-sector (mainly from NACE 24.2-24.4) typically uses basic chemicals as well as speciality chemicals as inputs. These are typically bought with long term contracts that specify the price as well as quality and delivery criteria. The most important sub-sector within formulated chemicals is the production of pharmaceuticals, medical chemicals and botanical products, which are characterised by a high R&D intensity.

The rubber and plastics industry (NACE 25)

The manufacture of rubber and plastic products uses considerable amounts of petrochemicals and specialty 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. These constitute between 30-50% of total cost.

The rubber products industry and the plastic products industry differ in themselves very much in market structure as well as in output markets. Within rubber, the manufacture of tyres accounts for roughly 45% of production value, thus making it the most important single area. The industry's most important customer is the automotive industry, not only for tyres but also for non-tyre products, such as wiper blades, belts, weather stripping or window and door seals. The tyre industry is dominated by a few large companies operating worldwide, including Goodyear, Michelin, Bridgestone/Firestone, Pirelli and Continental.

In contrast, the plastics industry is characterised by a high number of SMEs that 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.

2.2.2 ICT and e-business use

The following analysis is based on data from the e-Business Survey 2003. For reasons of comparability with other sectors, aggregate data from the EU-5 (DE, ES, FR, IT, UK) are used. On this level of aggregation, data are available for all sectors monitored by the *e-Business W@tch* in 2003/04. The analysis follows the main structure of the E-Business Scoreboard 2004.⁹ The two sectors of the combined chemical industries are compared to each other, to other manufacturing sectors and to the ICT services sector which is the most intensive user of ICT itself (the "benchmark") in most business areas.

ICT infrastructure in companies

The ICT network infrastructure used by firms reflects to a large extent the structural differences between the two (sub-)sectors that are being compared. For example, the significantly lower share of firms that have a Local Area Network (LAN) in the rubber and plastics industry can be explained by the prevalence of micro and small companies in this sector. Similarly, the share of companies that allow employees to remotely access the firm's computer network is much higher among the chemical industries, which has to do with the dominance of larger firms where remote access has become a standard.

The diffusion of broadband (defined as Internet connections with a bandwidth of at least 2 Mbit/s), however, is similar among firms from the two sectors and can be compared to the situation in other manufacturing sectors such as the electrical machinery and electronics industry or the manufacture of transport equipment. While companies from the chemical industries are more likely to use DSL and other fixed network connections than their counterparts from the rubber and plastics industry (42% vs. 26% of firms with Internet access), ISDN is the preferred access mode in the rubber and plastics sector (41% of firms with Internet access, vs. 32% in the chemical industries).

Exhibit 2-3: ICT infrastructure in the chemical and rubber and plastics sectors

	Use a LAN		Broadband Internet connection		Remote access to company network	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined chemical ind.	40	83	8	29	23	57
<i>Chemical industries</i>	49	88	11	27	32	67
<i>Rubber and plastics</i>	34	78	7	31	19	48
Textile industries	17	50	4	18	7	26
Electronics	60	89	14	36	27	61
Transport equipment	37	88	7	43	20	70
ICT services	72	87	26	51	53	73

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 217 (chemical industries), N = 285 (rubber and plastics), N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

⁹ For an introduction, see previous Sector Study (May 2004)

It could be expected that these (structurally determined) differences in the ICT infrastructure would translate into different patterns of e-business applications. However, when it comes to internal business process automation and to the level of e-commerce transactions, differences are much less pronounced, as the following section will show.

Automation of internal business processes

Firms from the chemical and from the rubber and plastics industries show a very similar behaviour and maturity in using ICT for automating internal business processes. The deployment of ERP systems can be used as an example. The percentage of firms from the chemical industry that have an ERP system is slightly higher (16% compared to 11% in rubber and plastics). However, differences are levelled out when comparing data on an employment-weighted basis (which adjusts for the large share of micro and small enterprises in NACE 25). Similarly, the diffusion of online technologies for production controlling purposes¹⁰ is nearly identical in the two sectors compared.

In conformity with these empirical findings, the perception of companies regarding the overall significance of electronic business for their day-to-day operations is also similar, at least it is much closer than compared to the perception to be found in other manufacturing sectors. 46% and 48% of firms from the two (sub-)sectors of the combined chemical industries say that e-business has at least "some significance" for the way they operate. In contrast, only 19% of the firms in the textile industries do so, but 57% of those from the electrical machinery and electronics industry.

Some differences can be found in the diffusion of other applications for internal business process automation, for example in the use of online technologies to support the human resources management (not included in exhibit below). Here, companies from the chemical sectors tend to be more intensive users. On the whole, however, the pattern of adoption is comparable.

*Exhibit 2-4: Automation of internal business processes
in the chemical and rubber and plastics sectors*

	Use online technology to track working hours		Use ERP system		E-business has at least some significance for company (perception)	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined chemical ind.	11	33	13	48	47	59
<i>Chemical industries</i>	11	33	16	48	46	56
<i>Rubber and plastics</i>	12	33	11	48	48	62
Textile industries	3	15	2	18	19	37
Electronics	8	36	13	45	57	67
Transport equipment	9	42	10	72	45	80
ICT services	20	43	4	21	75	82

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 217 (chemical industries), N = 285 (rubber and plastics), N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

¹⁰ The underlying question is whether the firm uses online technologies "to track working hours and/or production times".

Electronic procurement and supply chain management

The deployment and usage pattern is strikingly similar among the two industries when it comes to applications related to purchasing and managing supplies. This is particularly important, since cost cutting through electronic procurement and supply chain management currently constitutes the major e-business objective in both sectors.

The percentage of firms that say they purchase at least 5% of the total supply volumes online is 11% and 15% in the two sectors, and 22% and 24% respectively, if weighted by employment. It is higher in other manufacturing sectors (electronics, transport equipment), and definitely in the ICT services sector, but lower in the textile and clothing industry. This indicates the proximity of the chemical industries to the rubber and plastics industry in the online purchasing behaviour of firms.

The integration of supply chain processes by means of an SCM system is again similarly deployed among firms from the two sectors of the combined chemical industries. Firms comprising 14% and 13% of employment are SCM users. While both sectors are among those with the highest use of SCM, comparatively few firms have actually linked their IT system with that of a supplier, for instance through EDI or an extranet. Supplier-buyer connectivity is more common in other manufacturing sectors, albeit mainly among larger firms. The actual percentage of firms (if not weighting firms by employment) is low in all sectors.

Exhibit 2-5: Procurement and supply chain integration in the chemical and rubber and plastics sectors

	Purchase at least 5% of their supplies online		Use SCM system		IT system integrated with that of a supplier	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined chemical ind.	13	23	4	13	4	6
<i>Chemical industries</i>	11	22	6	14	3	6
<i>Rubber and plastics</i>	15	24	3	13	5	7
Textile industries	5	6	1	7	1	2
Electronics	28	30	2	10	5	12
Transport equipment	12	31	3	19	5	14
ICT services	58	54	2	11	8	19

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 217 (chemical industries), N = 285 (rubber and plastics), N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

Furthermore, there is great consistency in the kind of products that are purchased online. The percentage of firms that order direct production goods online is 58% and 61% respectively (base: companies purchasing online). The respective figures for procuring MRO goods online are 62% and 58%, while other examples could also be quoted. It can therefore be concluded that e-procurement patterns and objectives are highly comparable among firms from the chemical and the rubber and plastics industries.

Electronic marketing and sales activities

In contrast to online purchasing, there are some differences in the use of e-business for marketing and sales purposes. However, it should be considered that this is an application

area which is in general comparatively underdeveloped in the combined chemical industries (but could possibly become more important in the future¹¹).

In fact, customer facing e-commerce activities seem to be extremely rare among firms from the plastics and rubber manufacturing sector. A mere 1% of firms report that they make more than 5% of their total sales online. In the chemical industry, 6% of all firms say they do so. However, it appears that in both sectors online selling is not dominated by the large players, since the level of activity does not increase when weighted by employment. This is in contrast to other manufacturing sectors, where customer facing e-commerce activity has obviously gained momentum among some of the larger firms. In the transport equipment manufacturing industry, for instance, the overall percentage of firms selling more than 5% online is also low (4%), but represents 13% of employment in the sector.

While selling online is not yet widely used in the combined chemical industries, e-marketing activities are more common. Again, firms from the chemical industries are more active. The share of firms with a website is higher than in the rubber and plastics industry. Slightly more companies use a CRM (customer relationship management) system. The difference is more pronounced when weighted by sector-employment, as CRM systems are mainly used by large firms.

Exhibit 2-6: Electronic marketing and sales in the chemical and rubber and plastics sectors

	Have a website on the Internet		Use a CRM system		Sell at least 5% of their goods and services online	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined chemical ind.	50	84	7	16	3	2
<i>Chemical industries</i>	58	89	8	22	6	4
<i>Rubber and plastics</i>	45	80	6	12	1	1
Textile industries	22	47	1	7	1	1
Electronics	61	87	7	23	4	8
Transport equipment	49	89	4	26	4	13
ICT services	69	88	15	36	11	11

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 217 (chemical industries), N = 285 (rubber and plastics), N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

2.2.3 Conclusion

Since its launch in late 2001, the *e-Business W@tch* has clearly demonstrated that the use of ICT for automating intra and inter-firm business processes differs across sectors, and in particular between manufacturing and services sectors.

The comparative analysis of two sectors from the combined chemical industries, however, proves that this statement should not be misunderstood as meaning that no two sectors of the economy are similar in their use of ICT. In fact, the e-Business Survey 2003 among companies from the chemical industries (NACE 24) and from the rubber and plastics industries (NACE 25) shows that the diffusion of technologies and applications is very similar

¹¹ Cf. Case Study on SpecialChem in this report, section "Outlook and lessons learned".

in these two sectors, in spite of the structural differences outlined in the introduction to this chapter.

The only significant difference is that the ICT infrastructure of firms from the chemical industries tends to be more powerful and advanced than in firms from the rubber and plastics industries. This is clearly related to the structural differences – the larger share of small (and micro) companies in rubber and plastics clearly translates into different demand profiles regarding infrastructure. However, when it comes to e-business applications and the level of e-commerce transactions, differences are much less pronounced. If any, chemical companies have a slightly higher propensity towards electronic marketing and sales activities.

This has important consequences regarding methodological considerations, particularly the adequate aggregation of sectors for the purpose of studying e-business use and impacts. The results of this comparative analysis justify the definition of aggregated sectors. In the case of this report it is the "combined chemical industries", but it is likely that a similar exercise in other aggregated manufacturing sectors of the *e-Business W@tch* (for instance in the "electrical machinery and electronics" industry) would lead to similar results. However, in other cases the situation may be different, which calls for a more differentiated perspective in the analysis.

Summing up, the hypothesis that the status of electronic business in the chemical industries differs significantly from the rubber and plastics industries must be rejected, at least on the basis of quantitative statistics about ICT deployment. While this finding makes it difficult (if not irrelevant) to develop distinct, specific e-business profiles for the two sectors, it justifies their aggregation for the purpose of monitoring e-business developments as presented in the reports of the *e-Business W@tch*.

CASE STUDY: SLOVNAFT¹²

Abstract

Slovnaft is a refinery and petrochemical company based in Bratislava in the Slovak Republic. Since its privatisation in 1992, the formerly state-run company has aggressively focused on modernising and adopting Western European business practices. In 2002, the management decided to make an effort to improve business processes by implementing an Oracle e-business solution for e-procurement. The major objectives were to cut down procurement costs and reduce paperwork. Today, Slovnaft is one of the most advanced companies in its industrial sector in Central and Eastern Europe.

Case characteristics	
• Sector focus	Petrochemical
• Business focus	Large company
• Geographical focus	Slovakia
Case objectives	
• Online procurement	****
• e-Auctioning (reverse auctions)	****
• Business process efficiency	***

* = some relevance for case; **** = high relevance

Background and objectives

Slovnaft, a.s. is a refinery and petrochemical company based in Bratislava, Slovak Republic. Since its privatisation in 1992, the formerly state-run company has aggressively focused on modernisation and adapting to Western European business practices. In 2000, it established a cross-border strategic partnership with MOL (www.mol.hu), one of Hungary's biggest corporations. In 2003, MOL acquired a majority stake. Slovnaft is now fully integrated in the international MOL Group, a leading company in the energy sector in Central Europe.

Since 1995, the Slovnaft Group has spent more than 625 million Euro on its retail marketing operations and on upgrading the refinery (Heavy Petroleum Residue Upgrading – HPRU), with a budgeted cost of about 445 million Euro. The HPRU became fully operational in late March 2000 and has resulted in a significant increase of the volume of lighter products (gasoline and diesel) in the Bratislava refinery, which is considered the most complex refinery in Europe.

¹² This case study is a contribution from the Technical University of Košice, Faculty of Economics, researched and edited by Ing. Radoslav Delina, PhD, Ing. Viliam Vajda, doc. Ing. Tomas Sabol, PhD (contact: radoslav.delina@tuke.sk).

Between 1995 and 1997, the company expanded its marketing operations by acquiring an 85.2% stake in Benzinol, a.s., Bratislava, the former state-owned retailer and wholesaler of refined products. The company has developed its own Slovnaft-branded network of service stations in the Slovak Republic. The company maintains retail operations in the Czech Republic, Poland and Ukraine, operated by its local subsidiary companies.

Slovnaft states its vision as “building our prosperity on integration within the oil industry in Central Europe by means of advanced technology, skills and knowledge of our employees”. Based on this vision, and reflecting new managerial trends and the requirements of business reengineering, the corporate services focused its activities during the 1st quarter 2002 on the improvement of internal procurement processes, starting with e-procurement for chemicals and special equipment. The main objective to be achieved in this area was to improve the efficiency of processes by simplifying and reducing time and costs of the procurement process.

The achievement of this objective should be enabled by the introduction of electronic procurement. This included the integration of systems with suppliers and the implementation of an automated rating of suppliers. In accordance with these operational goals, it was decided that the centralization of procurement process for all commodities and services was a strategic requirement.

Activities

Starting from paper-based procurement

The strategic plan to launch and implement an integrated e-procurement scheme in the company was prepared at a time when procurement activities of the company were still paper-based, typically consisting of the following steps:

- Slovnaft sent specification requirements to potential suppliers in the traditional way (by mail);
- On the basis of accepted quotations, the company started negotiations with suppliers;
- After selecting a supplier, the procurement manager sent a paper order;
- At the same time, the purchasing information had to be put into the enterprise information system for accounting, controlling, and stock control purposes;
- When the material was delivered, the invoice and the delivery order were produced and processed.

All these processes were slowed down by a lot of paperwork, for example filling in and signing warehouse receipts for goods delivered.

E-business technology implementation

The production process at Slovnaft is highly specific and requires a stable and efficient management system. Since growth in performance and demand was expected, and since consolidation of multiple servers to one platform was required, Slovnaft decided to upgrade its old Oracle Financials software to the e-Business Suite of the same make. The US based development centre of Oracle participated in this upgrading. Based on the user requirements, the supplier provided applications and functionality which was – at that time – available for other customers only in the forthcoming version of its software.

Slovnaft defined its primary, long-term e-business strategy as to benefit from an integrated, centralised enterprise system and efficient collaboration with suppliers.

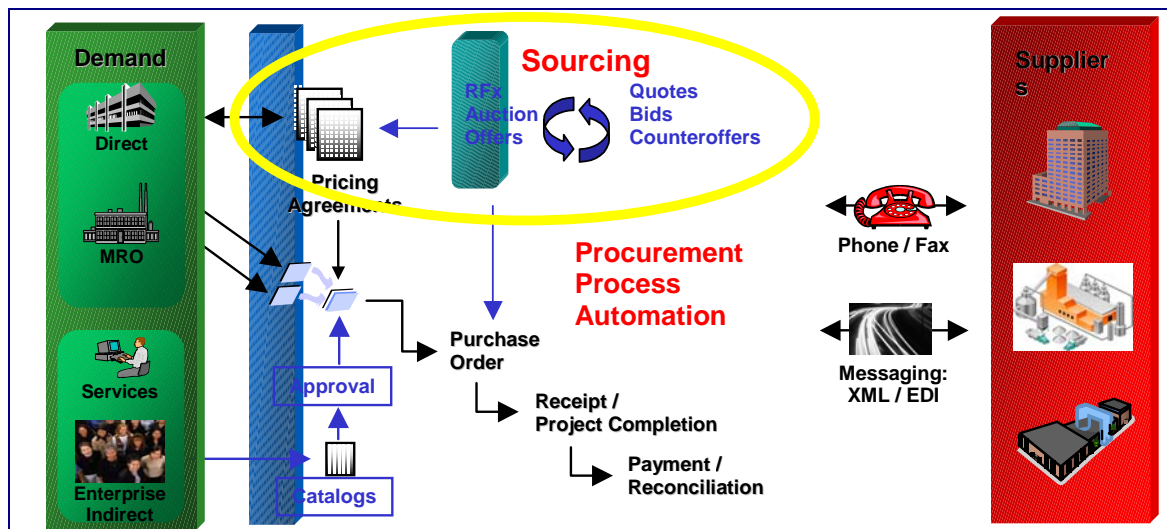
From January 2002 to February 2003, Slovnaft upgraded its enterprise information system GEMMS (Global Enterprise Manufacturing Management System). Since 1995 GEMMS had been supporting most of the firm's main processes. The upgraded system was called OPM (Oracle Process Manufacturing) and was a part of the Oracle e-Business Suite, which consists of almost 300 modules.

Upgrading the e-Business Suite contributed substantially to the integration of a large number of partial applications into the online central system. Although the specialization of the industry production is high, the amount of customisation necessary could be significantly reduced in comparison to the preceding version of the suite. The system is based on an integrated relational multidimensional database (Oracle 9i) and uses Java technology with thin client applications.

As one of the major effects to be achieved, the purchasing process became digitally integrated at a satisfactory level. Procurement control was increased significantly and integrated from different systems to a central one for the whole company. Currently, the Oracle iProcurement and Oracle Purchasing applications are the basis for purchasing processes.

The integrated e-procurement solution electronically links production processes to procurement. Requests for supply goods are triggered right from the manufacturing processes. After needs identification, users can select goods or services from an electronic catalogue. After approval of the electronic requisition record, the system checks warehouse resources. If the goods are not available but covered by a general contract with a specific supplier, the system automatically generates an order.

Exhibit C1-1: Scheme of the eProcurement process at Slovnaft



Source: Slovnaft / Technical University of Košice, Faculty of Economics (2004)

Electronic tendering procedure and use of B2B marketplaces

While small orders are thus automatically processed, product orders which exceed a certain cost have to be purchased on the basis of a tendering procedure. In this case, potential suppliers have first to be selected and then invited to tender. Suppliers can be selected from a database of suppliers who cooperate or have already cooperated with

Slovnaft. It is also possible to invite new potential suppliers through electronic marketplaces, from the Internet or from other sources.

As the ongoing search for new potential suppliers is important for Slovnaft, the enterprise's Oracle applications were integrated with ChemUnity.com, the first European vertical B2B marketplace in the chemical industry. In the field of horizontal B2B marketplaces, Slovnaft has decided to use Trade2B.com for eRFQ (electronic Request for Quotation) and for reverse auctions. In the case of RFQs, the purchasing department can use the Oracle purchasing application or external portals, for example Chemunity.com.

Use of reverse auctions

After the evaluation of the various offers received from potential suppliers, the purchasing department can select a single supplier or invite some of the suppliers to participate in a reverse auction. An auction needs to be carefully prepared, taking the following steps:

1. Spend analysis: analysis of former costs on the same product, market analysis and impacts on price of purchased product
2. Strategy planning: identifying the period for the tender, its specifics and type.
3. Request for information (from potential suppliers): this is needed in case of complex requests, for instance if it is not possible to specify the product in detail.
4. Request for price: asking for the first price offered by suppliers
5. Technical and commercial evaluation: the auction can only be held if the technical offers and first offers are comparable. The fulfilment of requirements must therefore be evaluated beforehand.
6. Auction: call for participation and conduct of the auction

It is important that the buyer can still decide whether to conduct traditional negotiations with suppliers or whether to go for a reverse auction procedure. In the case of reverse auctions, buyers have to carry out a rather complex evaluation beforehand in order to assure equal commercial and qualitative conditions before the auction begins. Otherwise, the auction cannot be held. Before launching a reverse auction, Slovnaft requires participants to submit authorization documents (for the auction participation) in paper form, including the name of a responsible person. The department then defines the start time, the auction date and possibly a starting price for the auction.

In a reverse auction, participants do not know each other. The auction is finished when there have been no new bids for 10 minutes. The winner in a reverse auction is the supplier offering the lowest price. The whole price negotiation process is carried out in an online environment among the suppliers, without any intervention of the purchasing department. According to Slovnaft, reverse auctions can reduce procurement costs and time, if the auction is well prepared in advance.

Lessons learned

The upgrade to Oracle's e-Business Suite contributed substantially to integrating a large number of formerly separated applications into one central online system. Slov-

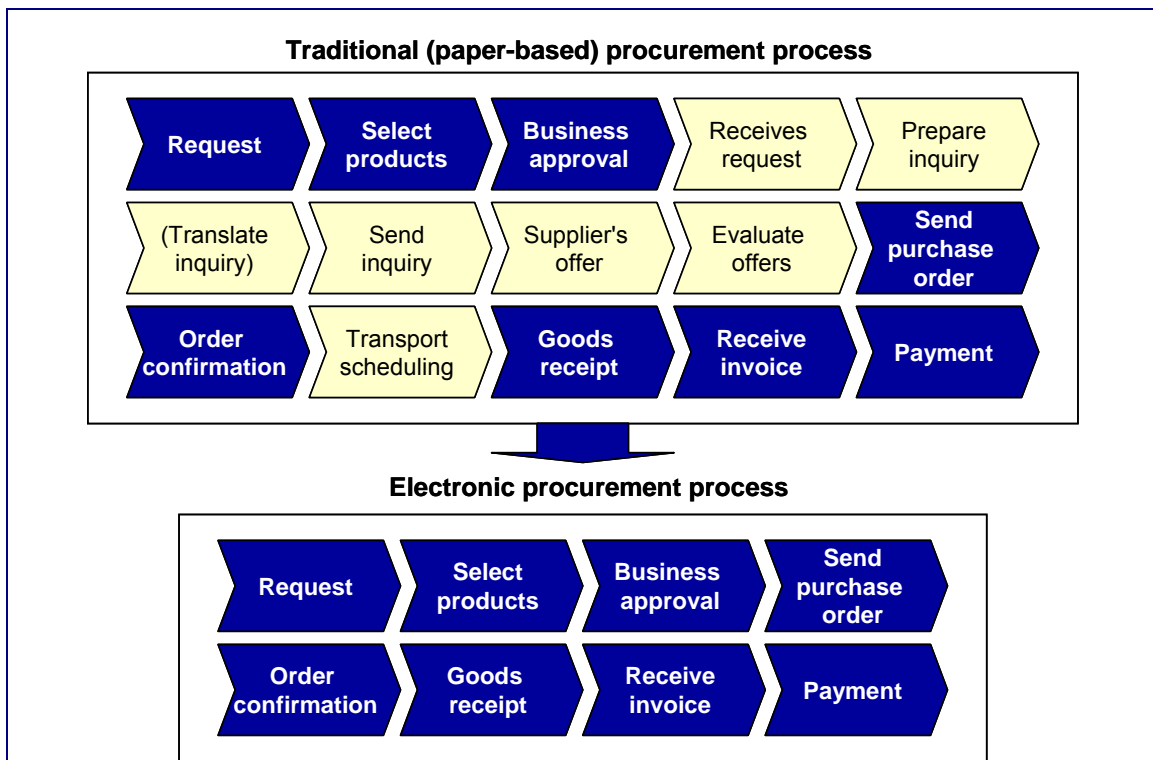
naft estimates that it reduced the time for materials daily balancing¹³ from two hours per day to 15 minutes, and for a calculation of the 10-days' production costs¹⁴ from 15 to 2.5 hours.

The supplies purchasing process was successfully digitally integrated for the whole company. This resulted in a reduced purchasing time and created free capacity for so called value added activities of professional purchasers, such as market research, quality negotiations and improvement of the relationships with suppliers. These activities should in the medium and long run result in even more substantial cost savings and are expected to positively influence the profit of the company.

Furthermore, the new system substantially substituted former paper-based workflows and helped to standardise and increase the transparency of the purchasing process. These objectives have also been accomplished.

Effectively, the former paper-based procurement process has been considerably streamlined by eliminating some phases, as illustrated in the exhibit below.

Exhibit C1-2: From paper-based to electronic procurement at Slovnaft



Source: Slovnaft / Technical University of Košice, Faculty of Economics (2004)

¹³ "Materials daily balancing" is the process of pricing outputs by inputs. The system monitors particular aspects and data related to inputs and calculates final product prices according to that data. The time needed to accomplish this process could be reduced by implementing the e-business system.

¹⁴ Every 10 days, management performs some revisions and adjustments in the calculation of production costs taking into account externalities and internal process changes which are not reflected in the direct costs.

In general, the new system provides the following functions:

- Electronic requisition record and its approval directly in the information system. Generation of electronic demand
- e-Quotations
- Electronic approval of orders
- Sourcing
- e-catalogue of suppliers, products and services
- Automated matching of invoices with receipts and the purchasing orders

In 2002, when the project started, Slovnaft purchased goods electronically for approximately 25 million SKK (625,000 Euro) and reduced procurement costs for these initial purchases by 12% on average. The total savings from eSourcing are presented in Exhibit C1-3. The minimum cost saving realised in a purchasing transaction was 3%, and the highest 35%. This auction with the maximum saving ran for 5.5 hours. During the last four hours, only two suppliers were bidding. From this experience, Slovnaft learned that the overall success of the auctions is significantly determined by their careful structure and preparation by the procurement department.

Exhibit C1-3: Cost savings due to the introduction of eSourcing at Slovnaft

eSourcing		Vertical marketplace		Horizontal marketplace	
		2002	2003	2002	2003
No. of projects	eRFQ	80	93	2	77
	eA	0	0	34	63
Total saving		30.0%	12.7%	23.3%	14.2%

Source: Slovnaft / Technical University of Košice, Faculty of Economics (2004)

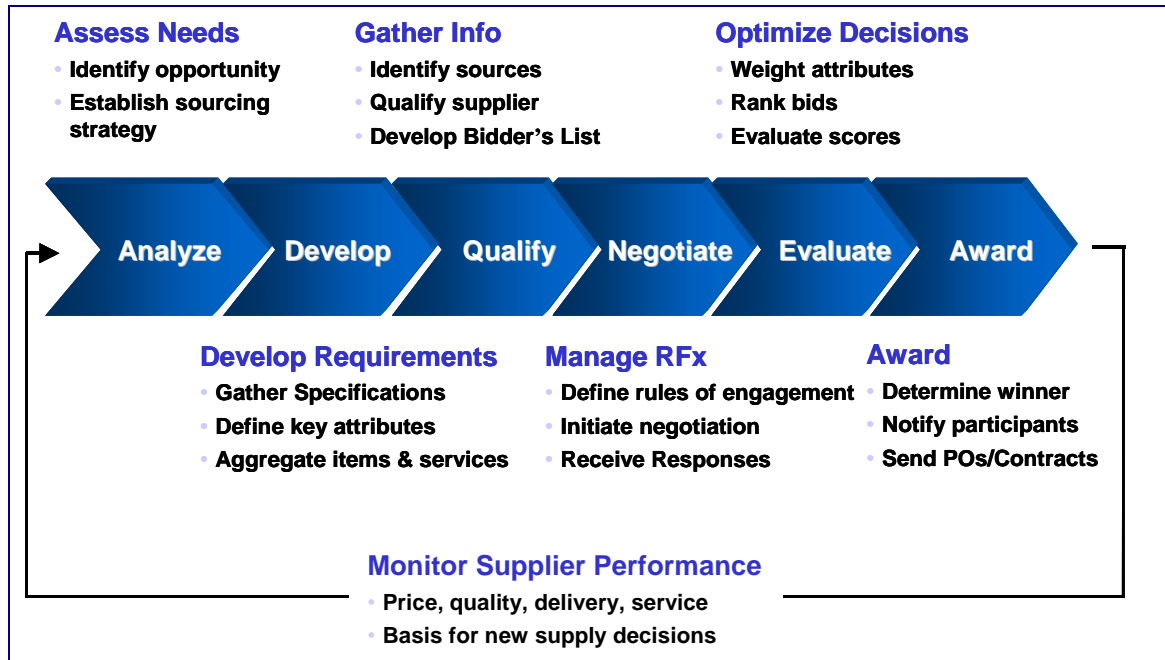
Setting targets and providing incentives for reaching them

One of the biggest challenges and problems of implementing e-procurement at Slovnaft was overcoming both internal and vendors' resistance. All users, internal as well as the purchasers, were trained to use the e-auction tools in special training sessions. There were separate trainings for the sourcing process and for using the system. Thereafter, experts from the e-procurement department were available for advice. Vendors received training manuals. In addition, the day before an e-auction is to take place, the vendor can test the system for over 5 hours if necessary. The e-procurement experts from Slovnaft assist vendors how to use the system. The responsible managers say that without good preparation of how to use this system the required acceptance by users would not have been achieved. This is a major lesson learned from the implementation experience.

In each of the departments, project managers were appointed with a clear responsibility to coordinate the electronic auctions and RFQs. One of the departments was appointed to coordinate the overall process and to assist the project managers, for example by explaining how to collect information, how to work out a strategy, and how to communicate with suppliers. During the whole process, clear objectives and targets had been specified and incentives were provided for reaching them. The required user training was supported by the software provider and representatives of the marketplace operators that were used.

The system has been in place for about two years and some experience has already been gained with using it. Slovnaft believes that it is a success story helping them to become one of the most IT-advanced companies in the chemical industry in Central and Eastern Europe.

Exhibit C1-4: Phases of eProcurement



Source: Slovnaft / Technical University of Košice, Faculty of Economics (2004)

Sources and references

- Interviews with representatives of Slovnaft: Ing. Dušan Valúch, Manager of the PR Department; Mgr. Silvia Brodanská, Expert for eProcurement and MGU Department. Interviews were conducted by Ing. Radoslav Delina, PhD, Technical University of Košice, Faculty of Economics, in May/June 2004
- "Slovnaft successfully implemented ORACLE E-Business Suite", Slovnaft Press Release, 12 March 2003.
- Various documents provided by Slovnaft, www.slovnaft.sk

2.3 The importance of electronic standards in the combined chemical industries¹⁵

The previous *e-Business W@tch* Sector Study on the chemical industry (May 2004) noted that the CIDX (Chemical Industry Data eXchange) Chem eStandards have become recognized and supported by Cefic and others as the most important technical standards for automated e-business in the chemical industry. It also favourably highlighted the cross industry commonality whereby Chem eStandards have adopted key aspects of the RosettaNet framework. On the downside it raised several unanswered questions, particularly regarding the perceived slow and uneven adoption of standardized data exchange with business partners by small and medium chemical enterprises across Europe.

This section of the current report describes the latest Chem eStandards achievements, and the increasing relevance and utility of the integrated CIDX strategies and ongoing work to the actual implementation, enhancement and assessment of new e-business processes. Specific attention is given to factual information and the implications for supply chain management (SCM) and inter-firm connectivity. The BASF supply chain case study complements the analysis.

2.3.1 Supply chains and the chemical industry

A supply chain is a “network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm¹⁶”. Many supply chains have been significantly altered over the past decade, but this core definition and observation on complexity remains unchanged.

The NIST 04-2 report¹⁷, although not explicitly focused on the chemical industry, notes that there is ample scope for supply chain integration improvements within industry in general. It cites the lack of universally accepted and implemented standards for the format and content of messages that flow between supply chain partners as the main cause which most often reduces the potential for inventory and expense savings. This lack is also leading to duplication of effort, maintenance of redundant systems, and investment in non-ideal information processes. According to this report, when any of the following is evident within an industry, the required ideal supply chain information system integration is not evolving as it could:

- Manual data entry is widespread, even when machine sources are available; critical information is often manually re-entered at many points in the chain.

¹⁵ This chapter was contributed by Henry J. F. Ryan, Lios Geal Consultants, Ltd., Galway, Ireland (contact: henryryan@eircom.net). Assistance and review provided by Kenneth R. Hutcheson, CIDX Chem eStandards Initiative Director is gratefully acknowledged.

¹⁶ Ganeshan, R., and T. Harrison. 1995. “An Introduction to Supply Chain Management” (http://lcm.csa.iisc.ernet.in/scm/supply_chain_intro.html)

¹⁷ Economic impact of inadequate infrastructure for supply chain integration (Planning Report 04-2) / prepared by RTI International for National Institute of Standards and Technology, June 2004.

- Interventions from purchasing clerks, order processors, and expeditors are required to maintain supply-chain information flows.
- The use of translators to convert data from one format to another is almost universal, even between systems that are nominally compliant with established protocols.
- Organizations of all sizes and across industry tiers use “informed” estimates rather than actual or production plan data in scheduling, materials management, and expediting.
- Large numbers of firms, especially in the lower tiers, simply operate without essential data.

This type of situation and the corresponding business case for better supply chain integration using low-cost standardized pan-industry information and communications technology processing has certainly been evident in the chemical industry. Several features make or have made the ongoing move to e-business methods extremely attractive for the chemical industry.

- Firstly, the supply chain represents a very significant portion – generally between 55-70¹⁸ – of a typical chemical company's cost structure.
- Secondly, the main customers of chemicals are the big industrial companies: the metals, mechanical & electrical industries, textiles & clothing, the automotive industry and paper & printing products and because the major share (27%¹⁹) of initial products is further processed within the industry itself, the chemical industry itself is its own best customer.
- Thirdly, the chemical industry has many commodity products that are easily described and suitable for electronic auctions and spot markets.
- Finally, the industry base is global and chemical manufacturing is gravitating to lower cost regions. In line with this trend, chemical companies source new manufacturing supply chain partners abroad and must be able to cost effectively manage their new or expanded remote production facilities. This particular aspect is becoming increasingly critical in view of the crowding-out of production in Europe:

Asia and China especially are becoming more and more the manufacturing workshop for low-cost commodities. Their comparative cost advantage will extend to a greater production palette within manufacturing including chemicals. This pattern will limit the production base of traditional industries in the OECD-region. The lowered domestic production volume of downstream users will therefore diminish the usage of commodity chemicals located in Europe, US and Japan.²⁰

This shift has already taken place. Since 2002 Europe is no longer the largest producer of chemicals in the world. The 1.3 trillion Euro world chemical market is now dominated by Asia (with a market share of 33%), ahead of Europe (with a market share of 32%) and the United states (with a 26% market share). Furthermore, in the last 10 years employment in the

¹⁸ Supply Chain Excellence in the Chemicals Industry by Barry Jennings, Tom Parry and Jonathan Whitaker, December 2003 (www.accenture.com/supplychain)

¹⁹ Cefic Horizon 2015 report, Executive summary, p. 13

²⁰ Horizon 2015: perspectives for the European chemical industry. Executive summary of “Chemical industry 2015: Roads to the future” a study by the European chemical industry council (Cefic) March 2004.

European chemical industry (EU-15, without the pharmaceutical industry) has decreased by 16% to 1.7 million, and by 40% in central and Eastern Europe to 1 million.²¹

On the positive side, the voluntary expert work by leading chemical companies and their system partners since 2000 has resulted in the availability of the CIDX Chem eStandards v4.0 (May 2004) and its accompanying suite of Implementation Accelerator, and Business Process Guidelines. This mature work and the ongoing CIDX plans provide the solid foundation needed for chemical industry players of all sizes to implement and utilize integrated supply chains within their own sector, and increasingly in the future with customers and suppliers in other related sectors as well.

CIDX: Open standards that open markets

Chem eStandards: speak the same language

CIDX (Chemical Industry Data Exchange) is a global trade association and standards body focused on improving mutual electronic connectivity between chemical companies and their trading partners and the improvement of cybersecurity within the global chemical sector. The CIDX mission is to "improve the ease, speed and cost of securely conducting business electronically between chemical companies and their trading partners."

2-3 year objectives for achieving this mission have been agreed and include:

- Chemical sector companies have implemented CIDX Business Process guidelines/Standards for common business processes, use common code structures for electronic transactions, and use a version of Chem eStandards™ based upon cross-industry standards;*
- CIDX implementation support and guidance enables adoption and implementation of CIDX supported practices, standards and specifications;*
- CIDX will provide tools and resources to help the Chemical sector address cybersecurity risks through the recommendation of sector practices, standards, specifications and associated guidance on implementation.*

Source: CIDX Annual Business Meeting 24 September 2003.

2.3.2 Standards and business models for Chemical Supply Chain excellence

The CIDX Chem Standards initiative is driven by industry needs. The ultimate CIDX goal in this area is to achieve widescale adoption and implementation of electronic connectivity by the global chemical industry. To do this, it is developing and assisting companies to implement pan industry standards which will reduce the barriers to electronic business transactions with key trading partners.

In addition to this focus on Chem eStandards development and implementation, CIDX has a separate very active Cybersecurity Practices, Standards and Technology Initiative with its own membership and fees for participation. Having participated in preparing the U.S. Chemical Sector Cybersecurity Strategy, this CIDX Cybersecurity Initiative was launched at

²¹ Francois Cornelis, Chairman of the Cefic Programme Council International trade and competitiveness and CEO of Atofina. In address "Horizon 2015: perspectives for the European Chemical Industry" to Cefic – trade and Economic Conference, Brussels, March 5, 2004.

the beginning of 2003. The cybersecurity initiative is not considered further here, as it is outside the specific scope of the supply chain issues being analysed. For anyone interested, more details on the programme are available from the website www.cidx.org.

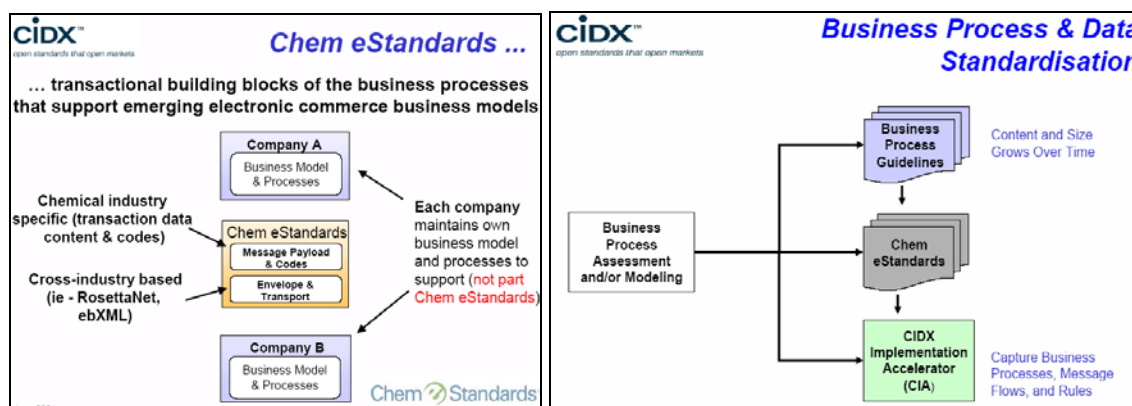
Chem eStandards

The Chem eStandards initiative has adopted a holistic approach which is being rolled out in stages in line with the business needs and related standards maturity. The latest version 4.0 (May 2004) has reached a very stable level of maturity. It is a complete set, including documentation, UML (Unified Modelling Language) activity diagrams, and XML Schemas. It contains over 100 enhancements to version 3.0, based on real user feedback to existing messages and adding 8 more, thus bringing the total of message types now handled to 60. The most significant changes were introduced to meet specific European needs in the areas of hazardous materials and value-added tax (VAT) and to enable the paper industry to use the Shipping Instructions message. New messages were introduced to meet the requirements of an order-to-cash process unique to Japanese business practice and to support product movement reporting in the Agri-Chemical industry. Such major releases of the Chem eStandards suite are not necessarily backwards compatible. This is done so that the valuable benefits of latest proven technologies and closer integration with practices in other sectors can be realised. Version 4 for instance changed from the XML DTDs (Document Type Definition) to the more powerful XML schema approach. This means that, in future, compliant systems will be able to parse and interpret data more easily allowing for easier application level enhancements.

Ongoing developments

Recognising that all companies, and especially small and medium enterprises, would welcome assistance in the consistent implementation of the Chem eStandards, CIDX member companies have added two important additional components to the original package. These are the Business Process Guidelines and the implementation Accelerator tools. All three components, are openly available without charge. The latest versions of the Implementation Accelerator are available only to CIDX members.

Exhibit 2-7: Chem eStandards Suite



Source: CIDX

Business process guidelines

Based on the identified industry demands for more robust descriptions of business processes with trading partners, CIDX has developed guidelines for use of the Chem eStandards. For

each business process, multiple successful scenarios and their “scenario processing guidelines” have been provided. These individual pieces are capable of being combined into a range of larger processes.

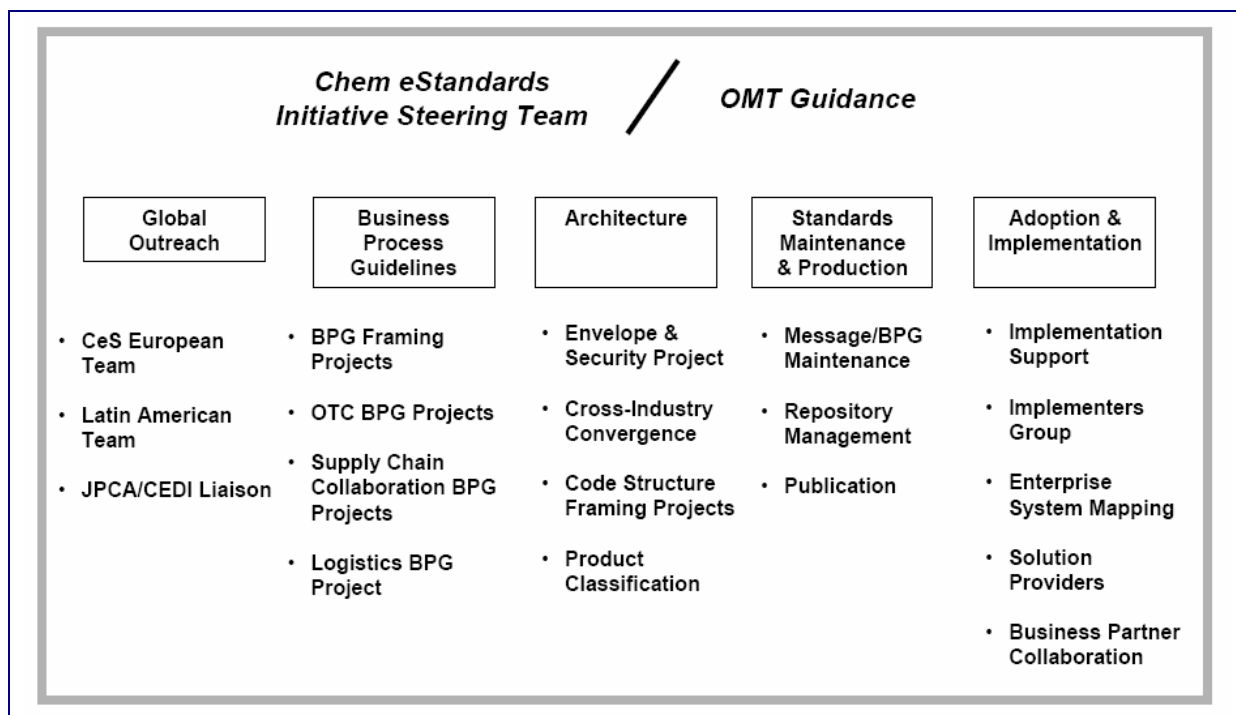
Chem eStandards Implementation Accelerator (CIA)

This is a set of tools and a proven methodology designed to help companies implement the Chem eStandards more easily, rapidly and cheaply. The CIA is divided into a number of phases, namely plan, assess, enable, test, and go-live. After extensive field testing and practical user feedback, the latest versions deliver easy-to-use, practical tools and are widely used. For example it is estimated that more than 200 of the partner pairings between Elemica clients in the first quarter of 2003 relied on use of the Implementation Accelerator.

Ongoing developments

There is more to e-business standards than XML message standards for specific industries. There are standards that address message delivery, business processes, trading partner agreements, registries and repositories, fundamental building blocks of messages and many more. Some of these are industry specific, while others are clearly identified as cross-industry. The current organizational structure for Chem eStandards development is shown in Exhibit 2.8. Extensive work is underway in each of these groups and on each of the listed sub-headings.

Exhibit 2-8: CIDX organization structure for Chem eStandards Development



Source: CIDX

2.3.3 The importance of Chem eStandards for Business Supply Chain

Kichan Nam in his paper in the UNESCAP (2003) compilation²² includes an excellent review on e-business in the chemical industry in Germany, together with a study case on the business approach of Celanese AG. Three stages of increasing e-business implementation as defined by IDC (International Data Corporation) are presented in his report:

- Stage 1: Marketing and e-business priority setting
- Stage 2: Channel innovation
- Stage 3: Full integration

Success in each of these stages is greatly assisted by the availability of the CIDX Chem eStandards and accompanying tools and guidelines. However despite the various acknowledgements of their importance, precise data on savings and other benefits associated with their use in supply chain improvements is hard to find and certainly not widely available. The BASF study which outlines how a large chemical company has successfully used the Chem eStandards as part of their strategic e-business implementation is a useful exception as it highlights the traffic volumes and turnover associated with the electronic business channels. More data collection and analysis in the area needs to be done before drawing strong conclusions and any recommendations on best practice business models.

The chemical industry is widely supporting the adoption and implementation of the Chem eStandards as indicated in Exhibit 2-9.

Ongoing outreach and adoption of the Chem eStandards around the world is an important continued goal of CIDX. As part of this goal, CIDX has established a Communications Team which is compiling and looking for endorsements, implementation profiles and case studies that will strengthen the CIDX communication effort by providing additional third party credibility to the CIDX messages. The case studies are intended to be longer and more detailed than the implementation profiles. The story must be about connection(s) made between two chemical companies using Chem eStandards and must have quantifiable results gained from at least 3-6 months of operation, including ROI, reduction in operating costs and/or errors etc. These stories will be developed and used in the CIDX Quarterly and on the CIDX website.

²² Initiatives for e-Commerce capacity-building of small and medium enterprises / by the Trade and Investment Division, United Nations Economic and Social Commission for Asia and the Pacific. 2003 (available online from www.unescap.org/publications/)

Exhibit 2-9: Support for Chem eStandards

Categories	Sources + some Sample Quotations				
Chemical Companies	Practically all major chemical companies worldwide, for example: <ul style="list-style-type: none"> - Air Products & Chemicals - Atofina chemicals - BASF AG - BAYER - Celanese - Degussa - Dow Chemicals - Eastman Chemical - El Dupont de Nemours - Methanex - Rohm & Haas - SOLVAY - Vulcan chemicals 				
IT System partners	ERP and Enterprise Integration service/product suppliers (and their specific product offerings where relevant to Chem sStandards), including: <ul style="list-style-type: none"> - Accenture - CSC - EC Outlook: <i>Announces full support for CIDX Chem eStandards (PR June 26, 2001)</i> - IBM corporation - Microsoft (Biztalk Server 2000 CIDX SDK) - * <i>Implements support for CIDX Chem eStandards (PR Sep 9, 2001)</i> - SAP (NetWeaver™): <i>out-of the box support of industry standards ... enables immediate support of data exchange standards such as RosettaNet and CIDX (PR June 11, 2003)</i> - Vitria Technology: <i>announced its endorsement of the Chemical Industry Data Exchange (CIDX™) Chemical eStandards (PR June 4, 2001)</i> WebMethods (Integration Platform): <i>announced its full support of the Chem eStandards through the webmethods integration platform (PR July 9, 2001)</i>				
Distributors and logistics providers	including (amongst others) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Ashland</td> <td style="width: 50%;">Univar</td> </tr> <tr> <td>Chemcentral</td> <td>Vopak</td> </tr> </table>	Ashland	Univar	Chemcentral	Vopak
Ashland	Univar				
Chemcentral	Vopak				
Industry associations and other organisations	Cefic: <i>Recommends Chem eStandards to its 40,000 members (2002)</i> CEDI (Japanese Petrochemical Association): <i>recommends adoption of Chem eStandards to its chemical company sponsors (2002)</i> RAPID, <i>the agri-business standards organisation, has adopted the Chem eStandards as its own standard and actively participates in the CIDX standards process.</i>				
Online Marketplaces					
Elemica www.elemica.com	Founded in August 2000 by 22 of the world's biggest chemical companies. Has interconnectivity with other e-marketplaces in mining rubber.				
cc-chemplorer www.cc-chemplorer.com	The leading international online marketplace for Maintenance, Repair and Operations supplies for the processing industry. Over 15,000 orders per week.				
ChemConnect www.chemconnect.com	Founded in 1995, is a global trading hub for chemical products. Merged with Envera (2003)				

Source: e-Business W@tch / Henry J F Ryan (2004)

2.3.4 Outlook: developments to be expected in the next few years

The business strategies of CIDX member companies dictate the investments they will make in e-business. These are long term issues and depend on the business environment and regulatory conditions. For example, the 2004 CIDX planning assumptions include the following:

- inter-industry data exchange will become increasingly important;
- standards convergence (e.g. core components) will continue and possibly accelerate, resulting in increased emphasis on the convergence of technologies used by multiple industries;
- global code lists will increase in importance for the industry;
- certification will not be an issue for Chem eStandards;
- there will continue to be a gap in understanding and a reluctance to act among followers and laggards regarding electronic business capabilities;
- cybersecurity threats will continue to evolve and increase in frequency.

CIDX has clearly adopted a strategic long term practical view. It engages in practical outreach and in implementation assistance. It also actively monitors and, where relevant, influences or leads collaborative discussions and agreements related to inter-industry standards convergence with the major players in web services and advanced XML standards development.

The reason for the strong emphasis on inter-industry and multiple-industry convergence is a straightforward business one. Supply Chain Management (including Logistics) is accepted across all sectors as an increasingly important way to optimise both costs and revenues. Over the last few years, several strong supply chain management trends have emerged²³ which are common to many industries.

- Demand-driven supply chain management: This means changing supply chain planning and execution functions so that they are driven by demand in real-time, i.e. to build products on receipt of actual orders and not just according to forecasts of future demand. At the same time it is recognised that, as part of their risk management strategies, some companies will continue to require reserve stocks in the supply and customer chains rather than move to a full pull model.
- Supply chain integration: This means integrating trading partners across the supply chain, by connecting to their information systems. Examples include Vendor Managed Inventory (VMI) and Supplier Managed Inventory (SMI).
- Emergence of XML and web services as a messaging platform and support for more collaborative ways of working along the complete value chain. This is an area with many different players and ideas. The eBusiness Standards Convergence Forum is very active in this area and one of the main forums where CIDX is beginning to exert its influence.

At conceptual level, the benefits of supply chain integration using e-business are widely acknowledged within and across specific sectors. The hard slog required to achieve these benefits, while simultaneously meeting the challenges of everyday business, is not an easy task and is certainly not confined to the chemical industry alone. In fact, that is what makes supply chain integration so interesting and so difficult.

²³ State-of-the-Art Report on e-Fulfilment. December 2003. Prepared by e-Thematic *IST-2001-37056 Thematic Network on e-Fulfilment* (Project co-funded under the "Information Society Technologies" Programme (1998-2002) of the European Union)

CASE STUDY: ELECTRONIC BASF ²⁴

Abstract

BASF is the world's leading chemical company headquartered in Ludwigshafen, Germany with production sites in 41 countries and customers in more than 170 countries worldwide. In response to growing pressures in its commodities business, BASF turned to modern e-Business solutions to contain costs. It has successfully implemented a customer focused global best-in-class supply chain integration initiative using Internet and extranet hub portals conforming to the leading industry eChem Standards™. Supply Chain Data on use of Elemica, WorldAccount and the strong focus on VMI (vendor managed inventory) are outlined.

Case characteristics	
• Sector focus	Chemical and plastics
• Business focus	Large company
• Geographical focus	Worldwide
Case objectives	
• Supply chain management	****
• eChem Standards™	***
• Vendor Managed Inventory	****

* = some relevance for case; **** = high relevance

Background and objectives

BASF is one of the world's leading chemical companies comprised of the parent company, BASF Aktiengesellschaft of Ludwigshafen, Germany, and 160 consolidated subsidiaries and affiliates. The company has customers in more than 170 countries and production sites in 41 countries. It reported sales of 33,361 million Euro in 2003. During this period, Europe accounted for 57.3% of sales, North America (which includes the United States, Mexico and Canada) for 21.5%, the combined Asia, Pacific Area, Africa region for 15.9%; and South America for the remaining 5.3%.

BASF operates in five separate business segments: Chemicals, Plastics, Performance Products, Agricultural Products & Nutrition and Oil & Gas. These are linked in the "BASF Verbund" structure. Verbund, which loosely translates as "integration", encompasses far more than what is traditionally associated with backward or forward integration. The advantages of Verbund are applied throughout BASF. Production processes at Verbund sites use byproducts and heat from chemical reactions, that might otherwise have to be disposed of, as raw materials and energy for other processes. This positive integration concept is also being applied to other areas: from

²⁴ This case study was researched and edited by the e-Business W@tch Standardization expert, Henry J. F. Ryan, Lios Geal Consultants, Ltd., Galway, Ireland (contact: henryryan@eircom.net).

R&D, to purchasing, to customer connections, and of course to total supply chain integration.

As an evolution of BASF's previous strategy to the evolving global chemical industry, four strategic guidelines, along with a new logo and a new slogan ("BASF: The Chemical Company") were announced in December 2003. The new strategic guidelines committing to earning a premium on cost of capital, helping customers to be more successful, forming the best team in the industry, and ensuring sustainable development, now guide all BASF business units. Through this vision BASF aims to actively capitalize both on the structural and technological changes that will affect the global chemical industry, and economy as a whole, over the next decade. Not surprisingly therefore, growth of customer focused e-business and industry leadership therein is a central part of the "BASF 2015" strategic response.

e-Business Activities and Chem e-Standards

BASF has actively engaged in standards development and implementation for chemical e-business from the mid 1980s. Initially the focus was mainly on EDI and tailored one-to-one solutions. During 2000-2001, BASF, together with a small number of leading chemical companies and partners, were instrumental in developing the first version of Chem eStandards™. Since then, BASF and its partners have continued to significantly lead and encourage the adoption and use of Chem XML through a partnership process for standardization and simplification.

Also during the first half of 2001, BASF successfully handled initial transactions via Elemica (basic and specialty chemicals). Elemica as well as cc-chemplorer, an e-market for the procurement of technical goods and services, were co-founded by BASF in 2000.

The BASF approach to B2B e-connectivity is customer focused (see Exhibit C2-1). In addition to being a member of several web portals dedicated to the Chemical Industry, BASF conduct their e-business activities mainly via its own portal WorldAccount, an integrated global extranet platform for customers, and through the Elemica network.

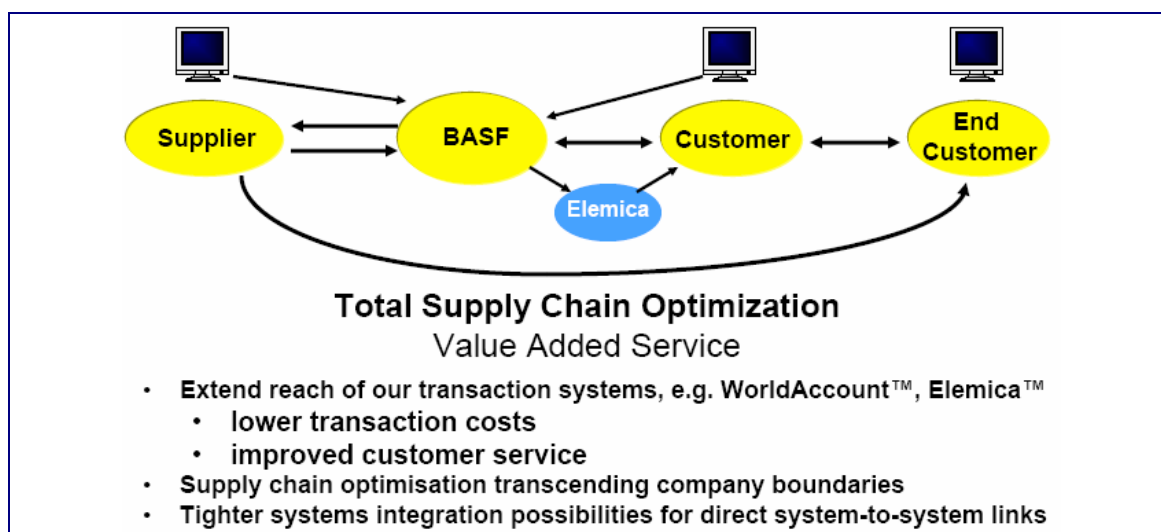
Exhibit C2-1: eConnectivity: Customer segment focused

Customer Segment	ELEMICA		WorldAccount <i>Your online access to BASF</i>		
	System Integration for Order Management	Personalized Informationen	Product Information	Order Status eReporting	Order Entry
Key Account global/regional	Full integration (Yellow circle)	Blue circle	Blue circle	Blue circle	Blue dash
Middle Segment	Light Connectivity (Yellow circle and dash)	Blue circle	Blue circle	Blue circle	Blue dash and circle
Small Direct Customers	Blue dash	Blue dash	Blue circle	Blue circle	Blue circle

Source: Lars Henze, BASF Director E-Commerce Global (CIDX European User Forum 04/2004)

In addition to being customer focused BASF eConnectivity is targeted at optimisation and integration of the total supply chain (see Exhibit C2-2).

Exhibit C2-2: eConnectivity: Total Supply Chain Optimisation



Source: Lars Henze, BASF Director E-Commerce Global (CIDX European User Forum 04/2004)

WorldAccount, the BASF Global extranet platform

From early 2000, BASF introduced and successfully operated a variety of customer portals in Europe and North America. The launch of its WorldAccount (www.worldaccount.basf.com) in 2001 provided customers with a globally integrated extranet platform for seller and buyer based on the latest XML technology.

By the end of 2001 WorldAccount had seamlessly integrated the existing regional BASF industry portals for different product categories, including plastics, under one single Internet address. WorldAccount functionalities include: order placement, order status, e-reporting, access to certificates of analysis and material safety data sheets, as well as a range of options for personal contact and customer support. The 24-hours-7-days-a-week service enables customers to make quick, transparent and cost-efficient purchasing decisions around the clock by providing detailed product information and uncomplicated ordering procedures.

After initial customer registration, all that is required for a variety of electronic trading opportunities with BASF is an ordinary PC with standard operating software, Internet connection and a browser. Strict confidentiality is assured through encryption and the use of firewalls.

The 11 languages already supported include German, English, Spanish, French and Italian. Additional languages to be supported include Portuguese, Chinese, Japanese, Thai and Korean.

Elemica

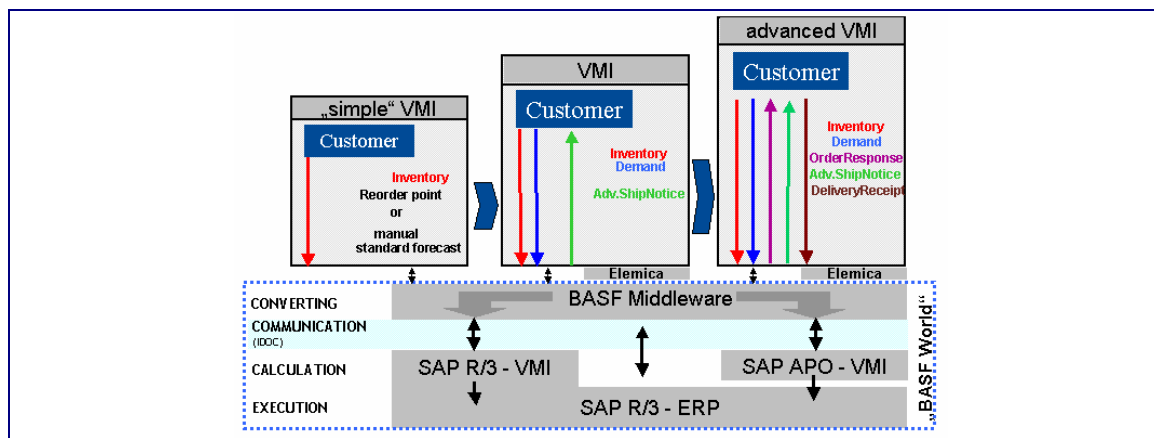
BASF's ERP is linked to Elemica Holding Ltd., a neutral electronic marketplace acting as a transaction hub for the purchase and sale of basic, intermediate, specialty and fine chemicals. In addition to the full connectivity services of Elemica, BASF uses the Elemica Buyer Direct and the Elemica Seller Direct solution as a "lite" working channel to small and medium sized companies. BASF is widely recognised as a leader in this hub space. It was the first company to transact via Elemica in Europe, USA, South

America and Asia and operates across the three NAFTA countries. Using the Elemica hosted solution it conducts both buy/sell relationships using VMI and SMI. In 2003 it was the top growing buyer on the network and ranked second overall in both buy-side and sell-side volumes. It is now expanding into new downstream industries in carpet, agricultural chemical industries and paper industry (cf. Exhibit C2-5 for the annual relative sales volumes in 2001-2003).

Supply Chain Integration: Advanced VMI developments

Vendor Managed Inventory (VMI) is the main instrument for building up an integrated supply chain network. BASF has just launched its VMI solution which makes full use of the Chem eStandards™ data structure and processes. Use of the proven Chem eStandards™ functions such as order create, order response etc., have enabled the rapid development and testing of this application (see Exhibit C2-3 for the landscape and various industry standard messages and tools incorporated).

Exhibit C2-3: BASF Vendor Managed Inventory Landscape

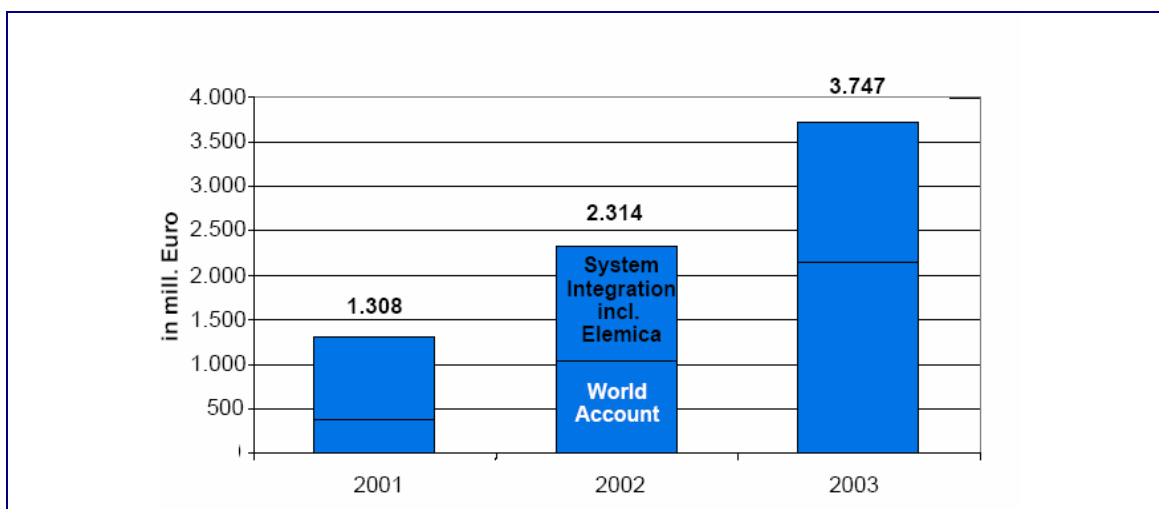


Source: W. Backhaus, BASF E-Commerce Consultant (CIDX European User Forum 04/2004)

Results realised and lessons learned

BASF's sales through its global e-Business portal WorldAccount exceeded 2 billion Euro in 2003. In total, during 2003, 11.25% of BASF's global sell-side sales volume amounting to 3.747 billion Euro was conducted electronically as compared to 4% (1.308bn Euro) in 2001 and 7.2% (2.314bn Euro) in 2002 respectively. The traffic and sales volumes have steadily increased over each of the three years.

Exhibit C2-4: e-Commerce Sell-side Order Volume



Source: Lars Henze, BASF Director E-Commerce Global (CIDX European User Forum, April 2004)

Exhibit C2-5: BASF e-business sizing

Description	Since eChem Standards		
	2001	2002	2003
Elemica + WorldAccount (€ billion)	1,308	2,314	3,747
Total BASF Group Sales (€ billion)	32,5	32,2	33,4
% E-Commerce share	4,0	7,2	11,2

Source: BASF Annual Report 2003^c and presentation^b by Henze at CIDX April 2004;
shaded row inferred from this and data presented by Daniv at CIDX April 2004

BASF expects that sales via these distribution channels will continue increasing in the future. Increasing data traffic volumes are one indicator. European data traffic for system to system supply chain messages (including logistics and other messages in addition to orders) averaged 220,000 messages per month during each of the first three months of 2004. If sustained, this indicates a 37.5% increase on the corresponding average of 160,000 messages per month during 2003. Extrapolating from these comparative traffic volumes together with the transaction data in Exhibit C2-5 (e-business sizing) indicates that significantly larger volume and sales increases using electronic business channels will likely be realized in 2004.

The channel strategy and expectations vary across segments. There are already Business Units of BASF that have exceeded an e-share of 50%.

Across all segments BASF sales and marketing departments work closely with customers to develop systems and solutions, as well as new products, that suit their requirements.

One of the key lesson is that the standardisation of electronic data exchange is a critical success factor in electronic business. That is the reason why BASF's further emphasis is focused on CIDX activities and development of standards.

Conclusions

Evidence shows that BASF is successfully using electronic business to increase the efficiency of its procurement processes and make purchasing easier for its customers. Portals as well as electronic marketplaces are playing a strategic role in this. The strategic vision of total supply chain integration is being realized through the BASF VMI developments. BASF's leading roles in CIDX and its strong focus on total supply chain integration complement one another.

Sources and references

- Interviews with Peter Vogel, BASF Manager E-Readiness conducted by Henry J F Ryan, Lios Geal Consultants Ltd., in June 2004
- Desk research, annual reports and various documents issued by BASF and CIDX.

2.4 The evolution and current state of electronic marketplaces in the chemical industry²⁵

2.4.1 Introduction

The term "e-marketplace" is usually identified with a "butterfly" model, i.e. with Internet websites bringing together several sellers and several buyers to conduct e-commerce transactions. According to this concept, e-marketplaces primarily provide trading functions such as auctioning tools or catalogues that increase the efficiency of the matching process in a win-win situation. Buyers benefit from savings in product costs due to the increased competition among sellers. By aggregating the buying power in catalogue-based e-marketplaces, they could further increase their pressure on sales prices. Sellers, on the other hand, would be able to extend their market reach and thus increase revenues. In addition, both market sides should benefit from savings in process and transaction costs. Particularly during the dotcom boom, e-marketplaces were regarded as the ultimate vehicle to realise all these benefits.

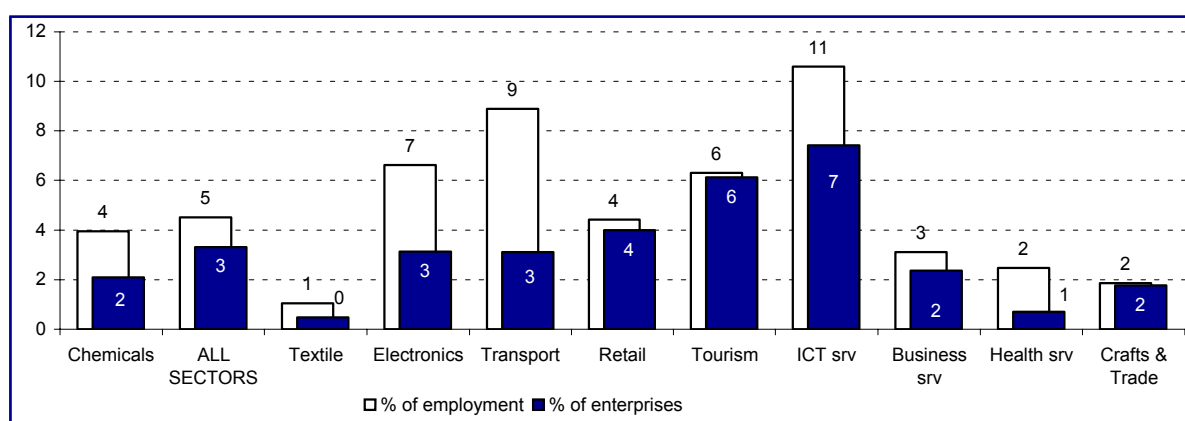
From the very beginning of this development, the chemical industry was regarded as a prime example for the usefulness of e-markets. In the first instance, the goods to be traded can be easily described and are standardised, which facilitates trading on Internet-based platforms. In addition, the industry itself is rather fragmented, which facilitates the establishment of industry-wide trading platforms, since a significant amount of trade between companies is taking place within the chemical industry itself. Finally, the global nature of the chemical industry requires that companies are actively selling and/or procuring in a variety of international markets.

²⁵ This chapter was prepared by Berlecon Research (www.berlecon.de), a consultancy specialising in the study of electronic marketplaces, and member of the *e-Business W@tch* team.

The current use of e-marketplaces

Although the chemical sector appears as a well-suited candidate for exploiting the potential of e-marketplaces, their usage as shown by the *e-Business W@tch* is rather disillusioning. The proportion of enterprises in the chemical industry participating in e-marketplaces (2%) is rather insignificant and furthermore even ranks below the average of all sectors covered. This appears to hold true even for the large enterprises: only about 5% of large companies in the chemical industry participate in e-markets (not displayed in Exhibit 2-10). The numbers illustrated in Exhibit 2.10 indicate that the importance of e-marketplaces in general, and particularly in the chemical industry, is much lower than initially expected.

Exhibit 2-10: Participation in e-marketplaces by sectors



Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 4516 for all sectors, N ~ 500 for sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

Exhibit 2-11: Use of online technologies by sectors

	Use of online technologies other than e-mail for...					
	Online management of capacity / inventory		Electronic exchange of documents with suppliers		Electronic exchange of documents with customers	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Chemical industry	10	20	39	44	40	45
All (9) sectors	6	14	32	42	30	38
Textile and footwear	5	10	23	37	17	38
Electronics	11	20	41	46	37	43
Transport equipment	10	19	40	56	40	60
Retail	10	15	34	42	20	23
Tourism	6	13	33	39	31	32
ICT services	11	21	53	51	56	60
Business services	4	10	29	45	40	50
Health services	5	10	27	30	13	19
Craft & trade sectors	5	5	36	39	32	34

Base: enterprises with Internet access, EU-5 (DE, ES, FR, IT, UK). N = 3995 for all sectors, N ~ 380-500 for sector entries. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

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

However, it would be wrong to interpret the specific results as evidence for B2B e-commerce totally fading away. A closer look shows that a large part of B2B e-commerce activities takes place outside these platforms.

E-marketplaces as described above are actually only one among several options for using the Internet to achieve cost savings or increasing revenues. Buying on a supplier's website, for example, is a serious alternative. The *e-Business W@tch* results show that, although participation rates in e-marketplaces are insignificant, 31% of enterprises in the chemical industry procure online. Furthermore, 80% of enterprises procure through their suppliers' websites. Several large companies in the chemical sector have already established portals to support their sales process and their customers' order processes. On BayerOne, for example, the web-based portal of the chemical giant Bayer, business partners find various trade-supporting applications. They may, for example, order Bayer products online and track the current state of shipments.

In addition, the traditional concept of e-marketplaces as mediators for the exchange of goods and services is too limited. It neglects the various opportunities of Internet platforms for supporting processes along the entire supply chain. Particularly the seamless collaboration with business partners within supply chain processes is a key success factor in the chemical industry. This is also supported by the above-average use of online tools for the exchange of documents with suppliers and customers, as well as for the management of capacities or inventories. A number of Internet platforms support these tasks, but the usage of their services is most likely not included in the answers about "participation in e-marketplaces".

2.4.2 The current landscape of Internet trading platforms in the chemical industry

Subsuming all the different types of Internet-based platforms that offer services for process support under the heading "e-marketplaces" would be misleading. Many of the current Internet platforms have specialised in supporting specific process segments. In contrast to traditional e-marketplaces they often focus on supporting one-to-one relationships or concentrate on settling transactions that are conducted within existing contracts on the basis of pre-set prices.

This holds true for many platform operators that started as e-marketplaces during the dotcom boom and afterwards changed their business models. Today they often reject being described as an e-marketplace (see box below). In order to clarify the concept and to reflect the current reality of Internet-based B2B relations, an expert group of the European Commission's DG Enterprise has proposed to use the rather neutral term "B2B Internet trading platform". This term has been proposed to summarize "*all Internet-based technical solutions that aim at facilitating existing relationships or the establishment of new trading relationships between companies*".²⁶

²⁶ See "Final Report of the Expert Group on B2B Internet trading platforms", European Commission, DG Enterprise, July 2003 (<http://europa.eu.int/comm/enterprise/ict/policy/b2b>)

From e-marketplaces to B2B Internet trading platforms

Information on the front page of the RubberNetwork's website

"In the past, we have defined ourselves as a B2B Marketplace emphasizing our 'dot com' roots. Although we still have many characteristics of a marketplace and continue to use technology as an enabler of services to our Members, we think it's clearer and more accurate to describe RubberNetwork as the following:

RubberNetwork is the first and largest tyre and rubber industry strategic sourcing consortium. RubberNetwork was formed to provide its Members best in class e-Sourcing, Managed Sourcing, and Procurement Services. These services are enabled by a global staff of sourcing and e-Business professionals and enhanced by web-based technologies which focus on e-Procurement/Catalogue access, Demand Collaboration, Supply Chain, and Supplier connectivity. RubberNetwork's services allow Members to streamline and extend these vital sourcing processes and to facilitate their business relationships with Suppliers."

Source: Website of RubberNetwork (www.rubbertnetwork.com)

Even though the number of e-marketplaces has strongly decreased since the dotcom boom in 1999/2000, there is still a large variety of B2B platform services related to the chemical industry. The B2B marketplace directory eMarket Services²⁷ is currently listing about 34 platforms worldwide for chemicals and 23 sites for plastic and rubber. In addition, there are a few dozen services closely related to the chemical industry such as sites for medicals and pharmaceuticals, paper and pulp or energy and fuels. While not all of these are dedicated to the chemical industry in the strict sense, chemical companies can act as sellers on some sites (for instance for medicals or pharmaceuticals) and as buyers on others (for instance for energy and fuels).

*Exhibit 2-12: Estimated number of e-marketplaces
in the chemical industry and related sectors in June 2004*

	World	Europe	North America
Total	948	489	378
Chemical Industry	34	15	15
Plastics and Rubber	23	10	10
Medical and Pharmaceuticals	44	21	24
Paper and Pulp	11	5	3
Energy and Fuels	41	21	25

Note: The regional information denotes activity (e.g. sales offices) within the respective region, not necessarily the headquarters.

Source: B2B marketplace database from eMarket Services (www.emarketservices.com) (June 2004)

The numbers presented in Exhibit 2.4-3, however, have to be taken with a pinch of salt. There is most probably a correlation between the number of e-markets found and the amount of resources invested in discovering and evaluating new platforms. In addition, the changing definition and significance of e-marketplaces from the analysts' perspective may also

²⁷ eMarket Services (www.emarketservices.com) is a not-for-profit initiative that aims to facilitate the use of B2B Internet-based platform services for SMEs. It was initiated by several European Trade Promotion Organisations (TPOs) and is co-funded by the EU Commission's DG Enterprise from 2004 to 2005.

influence the numbers. Even though eMarket Services has undertaken considerable efforts to keep the directory always up-to-date by deleting low-quality or deceased platforms and by adopting the concept of e-marketplaces to the changing reality, there is still a high degree of variance in the quality of the services listed. Therefore, the numbers by themselves cannot provide a thorough picture of the state of B2B e-markets today. To gain more insight a closer look at the individual platforms is needed.

Types of Internet trading platforms for the chemical industries

Internet trading platforms suitable for the chemical industry can roughly be divided into three types: B2B portals, B2B trading networks and Sourcing Services Providers.

Most of the platforms which are relevant for the chemical industry are of the B2B portals type. Primarily, they support information gathering, matching supply and demand and, sometimes, simple negotiations. Most B2B portals for the chemical industry provide product and supplier directories that are often combined with simple trading functions such as online forms for requests for information (RFIs) or requests for quotations (RFQs). The major value added of this type of trading platforms is that they facilitate the search process by summarizing products, suppliers and actual offers in ordered catalogues. Besides general horizontal portal sites, such as Chemkey (www.chemkey.com) or ChemIndustry.com (www.chemindustry.com), several B2B portals are specialised in providing services to

- sub-sectors or product groups, such as Hydrocarbon Online for the hydrocarbon processing industry (cf. www.hydrocarbononline.com);
- regions or countries, such as the China Chemical Network for the chemical industry in China (cf. www.chinachemnet.com) or Sourcerer for the chemical industry in Great Britain (cf. www.sourcerer.co.uk); or
- niche markets such as RecyTrade (www.recytrade.com) for recycled plastics.

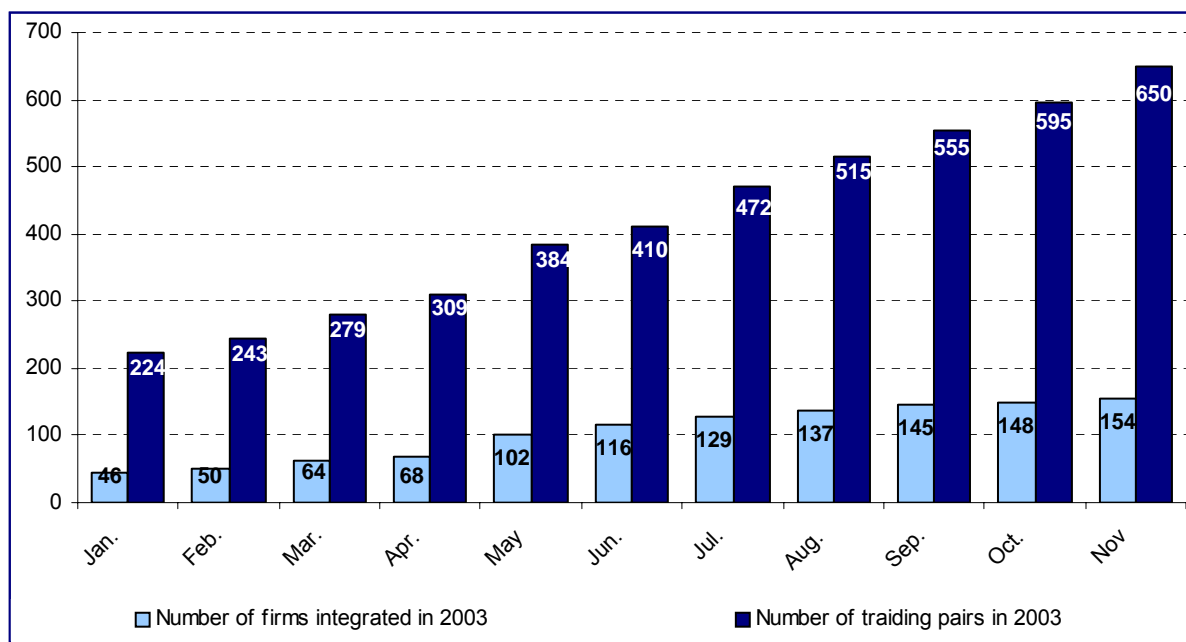
B2B trading networks propose to offer a different value than B2B portals. They offer support to the ordering and collaboration processes. This is conducted by interconnecting ordering, procurement or ERP systems of different companies with the purpose of reducing processing costs. In contrast to traditional e-marketplaces, they typically focus on the support of existing relationships, not on establishing new ones. B2B trading networks can be further divided into aggregated catalogues and integration hubs.

Aggregated catalogues, that is trading platforms that compile different product catalogues of different suppliers into a single catalogue, often support the procurement of indirect goods such as office supplies, IT equipment or MRO (Maintenance, Repair and Operation) goods. Since the processes for procuring indirect goods (as well as many suppliers) are very much the same for different industries, there is no real need for industry-specific catalogues. This is demonstrated by the recent development of cc-chemplorer, often described as catalogue aggregator for companies in the chemical industry. While it has started in the chemical industry, the company has step by step targeted firms from other industries to incrementally extend its market reach. In March 2004, the company announced a merger with the French catalogue platform operator Hubwoo-Avisum. cc-chemplorer today is a significant trading platform that provides a large catalogue network with European reach but no longer with its original focus on the chemical industry.

Currently, the two most prominent operators of B2B trading hubs for the chemical industry are Elemica and ChemConnect. Both platforms offer integration platforms and thus support the collaboration of companies along the supply chain, which is a key priority in the chemical sector. Their approach to the market, however, differs.

Elemica focuses on providing ERP-to-ERP connectivity to major companies in the chemical industry. Elemica reduces industry supply chain costs by standardising and automating information exchange via its network in up to 30 different messaging types. This allows companies to establish modern supply chain concepts such as vendor managed inventory (VMI), i.e. the complete outsourcing of inventory management to the respective suppliers. As illustrated in Exhibit 2.13, more than 150 chemical industry firms were connected to the Elemica network at the end of 2003. The number of active trading pairs (e.g., Bayer and BASF) amounted to about 650.

Exhibit 2-13: Development of Elemica's trading network in 2003



Source: Elemica (2003)

Compared to Elemica, ChemConnect follows more a holistic approach. On the one hand, it offers connectivity services based on its interconnection hub, just as Elemica does. On the other hand, ChemConnect is active as sourcing services provider by offering a large variety of negotiation tools on the platform. In addition, market information services help companies to evaluate market conditions before selling or buying services. At the end of 2002 the trading volume on the ChemConnect platform had already exceeded 8.8 billion Euro. In the second quarter of 2003 the company announced an increase of more than 30% in the number of e-negotiations conducted on the platform compared to the year before. According to Tim Fetters, vice president of the negotiating services at ChemConnect “*complex events – involving multiple products and multiple sites in multiple regions – have grown 15% year over year*”.²⁸

Besides ChemConnect only a few other specialised providers of sourcing services for chemical companies exist, such as RubberNetwork for the tyre and rubber industry. Since negotiation processes are less industry specific, companies in the chemical industry can instead use the services of multi-industry sourcing providers such as Freemarkets and

²⁸ “Increasingly, contract season means e-negotiating.”, Article at EyeForChem (www.eyeforchem.com), 09.04.2003. See also information on company website (www.chemconnect.com).

Portum. Alternatively, they can make use of the negotiation facilities integrated in procurement-focused enterprise applications such as supplier relation management (SRM) software.

Current trends

During the last years, a rather stable market structure of B2B trading platforms for the chemical industry has emerged. Elemica and ChemConnect have been established as the two major players in this sector and their integration hubs support the collaboration of companies along the entire supply chain. There are also a large number of various B2B portals that are well-suited to facilitate the search process. Although developments are much less dynamic than during and shortly after the dot.com boom, they have not come to an end. The main current trends in the trading platform landscape for the chemical industry are the following:

- a continuing consolidation process;
- the extension of hub-to-hub links with networks in related industries;
- an enhanced integration of third parties; and
- an enhanced integration of SMEs.

Even though the sharp decrease in the number of e-marketplaces after the e-market boom has slowed down, the consolidation process will most likely continue. B2B portals and B2B trading networks show – from an economic point of view – strong network effects. The more sellers participate, the larger are the benefits for the buyers and vice versa. Therefore, the existence of several similar offers is an indicator for still existing potential for consolidation. In addition, many of the platform services are still struggling to stay or to become profitable. The most recent example for the ongoing consolidation process is Omnexus, a joint catalogue of about 20 major plastic companies, which was sold in December 2003 to SpecialChem, while the transaction business is redirected to Elemica.²⁹

Co-operation with integration hubs from related sectors increases the success chances for trading networks in the chemical industry. Supporting processes along the entire supply chain requires such a cooperation. For this purpose, Elemica has established hub-to-hub connections with Quadrem, a B2B trading network for the mining industry and with RubberNetwork, a network for the rubber and tyre industry. For the same reason ChemConnect cooperates with Global eXchange Services (GXS), a global multi-industry trading network, and has established a partnership with ForestExpress (today named Liaison), a transaction network for forest products and allied industries.

Elemica's motto "*Connect Once, Connect All*" illustrates nicely the promise of the integration hubs to their customers. This also includes the integration of third parties involved in the procurement process such as logistic companies or banks. To integrate them successfully, however, applications for managing third-party-relationships are required. In order to make the integration of logistic services more efficient, Elemica has, for example, acquired the marine logistics software vendor Optimum Logistics in March 2003. Based on the Optimum software, Elemica released a new version of its logistics application Translink. It supports the management of multimodal logistics covering motor, rail, container and bulk marine. By the

²⁹ See company website of Omnexus (www.omnexus.com) as well as AMR Research (2004): "Omnexus closes, Elemica benefits", Alert Highlight, January 07, 2004; or The Wall Street Journal Online (2004): "Top online chemical exchange is an unlikely success story", January 08, 2004.

end of 2003 more than 100 logistics services providers had been connected to the Elemica network.³⁰

The integration of small and medium-sized enterprises can increase the valued added of trading networks. Attracting SMEs, however, requires an improved cost-benefit ratio for connecting to the network. The benefits will certainly increase with the size of the network. Therefore, the trends listed above such as a further consolidation, links to other hubs or the integration of third parties will make participation more interesting for small and medium-sized companies. In addition, platform operators are trying to lower the costs of integrating with the platforms. Elemica, for example, cut connectivity costs in 2003 to about 10,000 Euro. In addition, in September 2003, Microsoft released a new version of the Microsoft BizTalk Toolkit as an Elemica certified solution. This toolkit facilitates a quick and comparatively cheap connection to Elemica, thus facilitating the integration of SMEs.

The previous analysis has shown that the initially rather narrow concept of Internet-based "electronic marketplaces" has become very multifaceted. The following Case Study illustrates another approach of how to earn money from organising web-based industry portals ("marketplaces"), followed by a small company with 30 employees.

³⁰ See Forrester (2004): "Surging Elemica signals the rise of the networks", TechStrategy Research, Brief, January 12, 2004.

CASE STUDY: SPECIALCHEM – HELPING COMPANIES WITH THEIR E-MARKETING AND SALES PROMOTION

Abstract

SpecialChem, founded in April 2000, is a gateway to several portals on the Internet which offer a variety of information and support functions for users of chemical products. The user community currently comprises 80,000 registered firms and individuals. While all online services delivered through the portals are provided for free, the company uses its community as an asset to offer targeted marketing and sales support to its business clients from the chemical industry itself.

Case characteristics	
• Sector focus	Chemical industries
• Business focus	Small firm
• Geographical focus	France / international
Case objectives	
• Electronic marketing	****
• Internet portal – community building	****
• B2B marketplaces	**

* = some relevance for case; **** = high relevance

Background and objectives

SpecialChem, founded in April 2000, is a small company of about 30 employees located in Paris. The company defines itself as a "knowledge and solution provider helping industry professionals to fully benefit from the infinite source of value provided by chemicals" (www.specialchem.com). What makes SpecialChem an interesting case study on electronic business is that it has essentially developed an innovative approach for targeted electronic marketing and sales promotion, specifically for companies from the chemical industries. Support in this respect is the main service that SpecialChem sells to customers.

SpecialChem has doubled the number of its employees within the past 18 months. The company says that employment will be kept at the current level in 2004, but expects further growth in 2005. Figures about turnover and profits are confidential, but the company states that it is operating with profits.³¹ This is not self-evident, considering the short record of the company and its circumstances. Founded at the height of the dotcom hype, and in many ways using an Internet-based "new economy" business model, SpecialChem is one of those newly set up firms that have survived the crash of 2001 and are confident to have successfully established themselves in a niche with good prospects for the future.

³¹ Information by Mr. Bernard Hasson, CEO (telephone interview)

Activities

SpecialChem's business model is based on two closely interrelated activities: community building via Internet portals, and the provision of electronic marketing services on behalf of clients. The approach is interesting as the first of these two business areas does not create any income for the company by itself, but provides the "intelligence" necessary for the second. In a way, the business model resembles the one from free-TV and from magazines that are distributed for free: these media provide their content to the audience for free, but in return "sell" their audience to the advertising industry. All their income is advertising based. That is exactly what SpecialChem does for the chemical industries: it "sells" the users of its various portals to chemical companies that want to market their products to these users.

Activity 1: The portals – communities of users of chemical products

SpecialChem is a gateway to several portals on the Internet which offer a variety of information and support functions for users of chemical products. Its users' community currently comprises 80,000 registered firms and individuals ("members"), with about 3,000 new registrations per month. Registered members can access these portals and use the services offered for free. All they have to do is to provide some information about their company and interests when registering.

In 2004, the company operates the following platforms for specific groups of products and the related user markets:

- Adhesives & Sealants: launched in December 2000, 34,000 registered members (<http://www.specialchem4adhesives.com>)
- Polymer Additives & Colours: launched in October 2002, 11,000 registered members (<http://www.specialchem4polymers.com>)
- Paints, Coatings & Inks: (launched in October 2003, 5,000 registered members) <http://www.specialchem4coatings.com>
- Plastics: Omnexus acquisition in December 2003, 27,000 registered members (<http://www.omnexus.com>)³²

On each of these portals, the company runs a comprehensive range of online services, including large chemicals databases organised by function and application (with thousands of entries), electronic newsletters, patent monitoring services, technical articles and online support services allowing fast question & answer interaction with leading experts in many specific technical fields. This technical support service ("TechDirect") aims at answering questions within a period of 48 hours. Questions are answered by business partners of SpecialChem (a smart method to put them into contact with their customer community) or by freelancers who have been contracted for this purpose.

The geographic distribution of the 80,000 members who have registered with one or several of the portals is international. About 35% are from the USA, about 30% from Europe, 25% from Asia, and the remaining 10% from other countries and continents.

³² Omnexus by SpecialChem, launched on 8th Dec. 2003

The main asset of SpecialChem that results from building these communities is a well structured database of various users of chemical products. This database has great potential value for producers of chemicals.

Activity 2: Carrying out e-marketing and sales promotion for clients

The second activity of SpecialChem is the one from which it earns its income: organising targeted e-marketing and promotion activities for clients. This activity exploits the database of product users and the profound knowledge about these users collected via the various portals. Producers of chemical products, for instance of coatings and inks raw materials, can take advantage of SpecialChem's innovative e-marketing services. These services help them to directly reach decision-makers within the respective downstream industries and allow them to deliver solutions in collaboration with complementary producers.

Most customers that work with SpecialChem pursue one (or both) of the following business objectives:

- Market introduction of new products. A company has introduced a new chemical product in any of the markets covered by the SpecialChem portals and wants to inform its potential customers in a targeted, efficient way about this product.
- Broadening the customer base. A company has decided to broaden its existing customer base and relations, by hunting for new, not yet exploited sales opportunities.

Either of the two situations constitutes the typical condition that makes SpecialChem's offer and services attractive for companies.

In 2004, SpecialChem has about 30 clients. Working arrangements are mostly on the basis of contracts that run for 2-3 years, with a clear perspective to renew the contracts and continue the cooperation if the client is satisfied with the services. Thus it is typically not a single-project-based cooperation that ends when the project is completed. The intention of SpecialChem is clearly to establish long-term relationships with clients, just as advertising agencies often maintain long-term cooperation with some of their clients.

SpecialChem says that there are three typical categories of clients, depending on the products they manufacture and their needs with regard to their marketing and sales activities:

- producers of commodity chemicals, who often completely outsource their business development activities;
- producers of specialty chemicals, seeking to intensify their sales and marketing activities in a specific case (for instance when developing a new product), but not wanting to totally outsource the entire business function;
- producers of specialty chemicals, who are looking for new marketing approaches to reach new customers, searching for ways to achieve additional growth which they could not do on their own. A good example of this category are producers of pigments, which have typically marketed their products only to direct buyers, but now want to broaden and deepen their relationships to indirect buyers (for instance with firms from the automotive industries and with manufacturers of detergents).

About two thirds of SpecialChem's customers are large firms and most of them are based in Europe and the USA (about 50% each). Customers include renowned companies such as Ciba, DuPont, Eastman, Clariant and Solvay.

SpecialChem's work with its clients usually starts with the development of a business plan and strategy, stating the objectives to be achieved. Based on this plan, concrete communication and promotion projects are implemented, typically involving the use of online content and mailings to the targeted customer community. In a way, SpecialChem acts as a combination of media and agency. The media part possesses excellent knowledge about the target group and enjoys credibility among this group in the way special interest magazines do. The agency part undertakes the design of the communication and promotion strategy to effectively reach the target audience.

To give an idea about the size and impact of a marketing project, a recent project carried out by SpecialChem on behalf of one of its clients had the following scope:

- 8,000 potential contacts were identified among the SpecialChem members;
- Among these contacts, 1,050 relevant profiles (13%) were identified and contacted by e-mail;
- 377 e-mail recipients (36%) clicked to the site for additional information on the product that was introduced;
- 55 users (14%) thereupon contacted the firm;
- 45 new potential customers are currently evaluating the product.

A most important aspect esteemed by customers is the speed of the implementation of such promotion activities. In the case outlined above, it took less than 6 weeks from the briefing about the objectives to the results mentioned.

Technologies used by SpecialChem

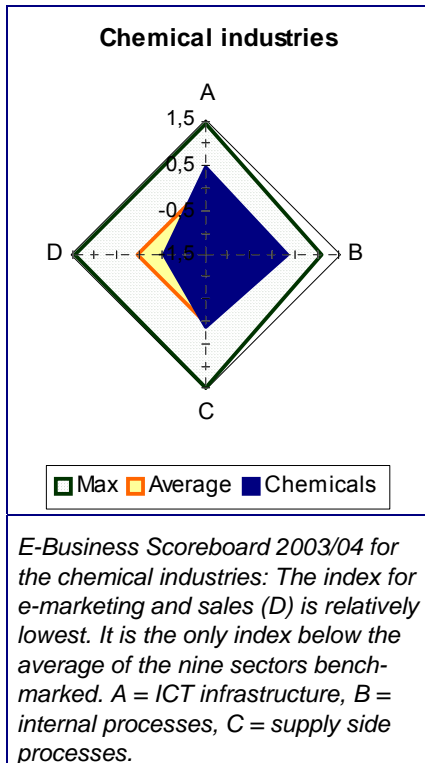
Most of the web-based tools and databases which constitute the technological backbone of the business activity have been developed internally by SpecialChem, by customising existing standard applications. SpecialChem uses a Knowledge Management system and stresses that a high level of integration of the various components for interaction with customers within the Knowledge Management system is very important.

SpecialChem uses online conferencing to communicate with customers and web-casting to promote its services to prospective customers. Systems used for online conferencing include Webex and Microsoft NetMeeting.

Outlook and lessons learned

Will electronic marketing be next after supply chain integration?

"Right now", says Mr. Bernard Hasson, CEO and co-founder of SpecialChem, "the industry's focus for electronic business is still on cost cutting and optimising supply processes. However, there is an end to that story at some point, and it's not too distant, I believe." Notwithstanding that there is still a lot of potential to be exploited to make supply-side processes more efficient for many firms, Mr. Hasson argues that a lot of players, the large ones in particular, have already optimised their supply side processes in highly sophisticated ways or are in the process of doing so.



In contrast, the use of ICT for marketing and sales purposes is still remarkably underdeveloped in the sector, according to SpecialChem's experience. "We still see many companies who do not even know the e-mail addresses of their customers, or at least have not organised them in a way that they could be used even for simple direct mailings", argues Mr. Hasson.

In fact, this observation is backed by the results of the e-Business Survey 2003 of the *e-Business W@tch*. The Scoreboard, which is based on this survey, shows that e-marketing and sales activities are underdeveloped in the sector, at least compared to the maturity of applications in other areas such as procurement, supply chain and internal business processes.

If SpecialChem's forecast that improving marketing and sales strategies will become the next big thing for doing business electronically in the chemical sectors holds true, the company should definitely be among the winners.

Sources and references

- Telephone interview with Mr. Bernard Hasson, CEO and Co-Founder of SpecialChem, 4th June 2004
- Website of SpecialChem (www.specialchem.com)
- Various documents provided by SpecialChem



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3 Conclusions: Opportunities and challenges, drivers and barriers

The analysis and case studies presented in this report by and large confirm the conclusions drawn from the e-Business Survey 2003 as presented in the first Sector Study in May 2004. In the chemical industries, electronic business is predominantly an instrument for business process innovation, with the clear objectives of improving the efficiency of these processes and – ultimately – saving costs. Whether and to what extent firms from the sector make use of available applications depends to a large degree on the transparency of return on investment forecasts.

Developments appear to take place as a continuous, evolutionary process and not as a technological revolution. Most of the larger companies from the sector have already introduced electronic business processes into their day-to-day operations. Communication with customers and suppliers, as well as transactions within the value chain, are increasingly ICT based. Procurement and supply chain integration constitute the most important application areas in this sector, as there are proven benefits for companies (see Case Studies on BASF and Slavnofit). Thus, electronic business is a reality and not a vague promise of the future.

Electronic business as an accelerator of process innovation

It is clear that electronic business has accelerated the speed of process innovation in the sector, especially when compared to the pre-digital era. There is an ongoing process of further improvements and refinements of the systems. It can be quite demanding for companies to follow this constant innovation and to draw the correct conclusions about adoption. A certain level of know-how about the state-of-the-art in electronic business, however, can be regarded as a basic, indispensable skill for firms operating in today's international business environment. In a way, managing electronic relationships with customers and vendors is a natural extension of managing the same kind of relationships in a traditional, more paper-based way. Top-down approaches that might have caused a radical change in the way firms trade with each other have not been successful in this sector. The partial failure of the "electronic marketplace" concept in this sector (as in other sectors) can be indicative for this observation.

If this assessment holds true, it is unlikely that ICT and electronic business will exert a major impact on the structure of the sector, at least not beyond the point which it already does today. Moreover, the impact potential of information and communication technologies on product innovation and on production is not as pronounced as in other sectors where these technologies are more intensively used in the production process (for example in the automotive industries) or are even part of the products themselves (as in the electrical machinery and electronics industries, and in ICT services).

On the other hand, the importance of electronic business for the sector should not be dismissed. There are certainly opportunities for companies, with implications for the sector and its value chain. Firms may gain a (temporary) competitive advantage from possessing better e-business skills than their key competitors. As with all innovations, imitation and replication will level out this advantage over time, resulting in increased aggregate productivity. However, there is still a long way to go before e-business reaches this stage of maturity in the chemical industries. The following pages highlight the main opportunities and

challenges for firms, as well as the main drivers and inhibitors for the further development of e-business in this sector, at this stage of the development.

3.1 Opportunities and challenges

Exhibit 3-1: Overview of e-business related opportunities and challenges for firms from the chemical industries

Opportunities	Challenges
<ul style="list-style-type: none"> • Save costs by improving the efficiency of supply chain processes, in many cases with a rapid return on investment • Reduce the error rates in B2B transactions by eliminating paper-based processes • Faster accomplishment of tasks by using electronic planning and controlling tools • For buyers: reduced procurement costs • Possibly, not yet exploited: innovative, better focused marketing approaches to reach new customers 	<ul style="list-style-type: none"> • For suppliers: Further pressure on profit margins due to sophisticated e-procurement mechanisms (such as e-auctioning) • Investment risks due to uncertainty about the technology and market development: Potential lock-in to specific applications and B2B connectivity modes

Source: e-Business W@tch (2004)

Opportunities

Save costs by improving supply chain processes: In the chemical industries, the main opportunity of e-business for companies is to save processing costs. This is achieved by improving the efficiency of business processes in transactions between trading partners and related processes within the company. The Case Studies on electronic business at BASF and Slavnofit featured in this report demonstrate this point, at least for large firms. The question is whether this is a win-win-situation or whether large companies are the main beneficiaries. Both companies from the two case studies argue that their (smaller) customers and suppliers also benefit from more efficient transactions. This is certainly correct for those firms involved, but does not take into account possible exclusion effects for firms that cannot cope with the technical requirements of these e-systems. Moreover, pressure on prices and margins may increase (see "challenges" below). However, the cost saving potential of systems and standards for electronic supply chain processes can be regarded as proven. The question is how long it will take for these systems to deploy from the large firms to medium-sized and small ones. Considering the growing maturity of e-business applications and the focus on targeting SMEs (see "e-business drivers", next chapter), the development could be faster than expected.

Reducing error rates by eliminating paper-based processes: As per definition, doing business electronically aims at eliminating paper-based processes. In some cases, this can even be an explicit objective for implementing e-business systems. The main advantage for the company is that the error rate in transactions with other firms tends to decrease in parallel with reducing the handling of printed documents. This increases the quality of business processes and can ultimately help to save costs. Celanese quotes "reduced errors" as a potential saving stemming from using Elemica as a hub for integrating their business processes with trading partners. Celanese reports a figure of 1,341 "opportunities for improvement" in 2002 caused by human error, inadequate communication, procedures not

followed or by similar causes. The company assumes that, by integrating processes electronically, it can halve this rate and thus save opportunity costs on a six-digit level per year.³³

More rapid accomplishment of tasks: In manufacturing sectors, integrated electronic supply chain systems help companies to perform various planning and controlling tasks much faster. The Slovnaft Case Study shows that, after implementing an e-procurement suite, the company was able to reduce the time for materials daily balancing from two hours per day to 15 minutes, and for calculating the 10-days' production costs from 15 to 2.5 hours. This amounts to about 100 working days per year. The main point here is not that this helps the company to reduce labour, but that the system allows employees to use some of their working time for value added planning and controlling tasks which may eventually lead to further improvements. Other electronic business applications – if successfully used – have similar effects with regard to other business functions, for example in customer relationship management and human resources management.

Reduced procurement costs: The e-Business Survey 2003 has shown that 50% of those companies from the sector that make online purchases observe positive effects on direct procurement costs (45% have not observed any effects on direct costs). The Slovnaft Case Study shows that this petrochemical company from Slovakia was able to reduce its procurement costs by about 12% after introducing an electronic purchasing system in 2002. In some orders, cost savings of up to 35% could be achieved through e-auctions. Thus, although the main objective for e-purchasing systems is to improve processes, direct savings are certainly an opportunity for buyers and electronic auctions can be an instrument to achieve this effect.

Targeted marketing strategies to reach new customers: Many firms from the sector have already made substantial progress in exploiting supply side e-business opportunities. It therefore seems plausible to assert that attention will gradually shift toward customer facing strategies. The case study on SpecialChem shows an innovative approach how to make professional use of electronic opportunities in this area. Most probably it will be the large companies that go first. Most of the large players from the sector have already optimised their supply side processes in highly sophisticated ways and may now seek opportunities to further modernise their communication and marketing strategies. The E-Business Scoreboard shows that the combined chemical industries still have to catch up in this area. The use of Customer Relationship Management (CRM) systems, for example, is not yet at the levels that can be found in other manufacturing sectors.³⁴

Challenges

Erosion of profit margins: While saving procurement costs is an opportunity for buyers, it equally puts pressure on suppliers. It has long been observed and pointed out that electronic procurement schemes of large companies may eventually lead to an erosion of profit margins. The underlying mechanism is as follows: Electronic purchasing tools reduce the transaction costs for purchasers to solicit offers from potential suppliers. As a consequence, more suppliers can be invited to make a bid, which naturally increases the level of competition. In other words, e-procurement is a double-edged sword for suppliers: they can

³³ Knight, Timothy (Celanese): Leveraging a connection beyond buy/sell. A case study. Presentation held at the Elemica Networking Conference, Cologne, 2 Dec. 2003. Cf. conference proceedings / Elemica website.

³⁴ In the chemical industries, 16% of firms (weighted by employment) use a CRM system, compared to 23% in the electrical machinery and electronics industry and 26% in the automotive industries.

benefit from improved access to the supply chains of potential customers, but they have to pay a price for this convenience in the form of increased competition, as their competitors enjoy the same advantage.

Costs for technology implementation / investment risks: About 40% of those firms from the sector that say that electronic business does not yet play a role in their day-to-day operations argue that the required applications "are too expensive".³⁵ Whether something is "too expensive" or not is always measured in terms of return on investment (ROI) and amortisation time. The return on ICT investments can be very difficult to measure (although the Slovnaft Case Study presented in this report shows that some measures are possible). As a consequence, upgrading the ICT network or introducing new ICT supported processes can bear considerable investment risks for companies. Moreover, the intended effect of innovation could possibly be achieved in another way than using ICT (see chapter 4.1.2 on "Innovation and technology policy").

3.2 E-business drivers and barriers

Exhibit 3-2: Overview of e-business enablers and barriers in the chemical industries

Enablers	Barriers
<ul style="list-style-type: none"> • International competition and resulting pressure on exploiting all cost saving potentials • Structure of supply chain processes in the sector is well suited for B2B online trading • Sector is well suited for use of e-standards • Growing maturity of e-business software and focus of providers on the not-yet-exploited small company market 	<ul style="list-style-type: none"> • Reluctance to re-engineer business processes among smaller firms • Dichotomy between large players and small firms • Shortage of investment capital after the overall economic downturn

Source: e-Business W@tch (2004)

Enablers: factors that could drive e-business adoption

The cost cutting paradigm as a driver for e-business: The major push for doing business electronically in the chemical industries comes from the pressure to save costs wherever possible. From an economic research perspective, the "cost cutting" paradigm is still prevalent among many firms, mainly as a result of increased competitive pressure on prices in a global economy. Economists, most prominently Michael Porter, have pointed out that cost cutting and operational efficiency are necessary to be competitive, but are not strategies in themselves and may thus not be sufficient to succeed in the long run. However, for the time being, the enormous pressure on large firms to cut costs in order to return stable or increased profits to shareholders is a major driver to target efficiency gains by implementing e-business. Medium-sized firms have started to replicate the respective strategies. Small companies are – to a large extent – still in a waiting position.

Supply chain processes in the sector are ideally suited for e-business: In the chemical industries, the supply chain represents a very significant portion, generally between 55-70%,

³⁵ Result of the e-Business Survey 2003, carried out by the e-Business W@tch. Data are reported in Sector Impact Study No. 02- I (May 2004).

of a typical chemical company's cost structure. Several characteristics of the sector's supply chain processes make them suitable to be accomplished electronically. An important factor in this context is that many of the main customers are big industrial companies, for instance from the metals, mechanical & electrical industries, the automotive industry, and the industry itself (the sector is its own best customer). These customers are driving the introduction of electronic supply chain processes. Moreover, the chemical industry has many commodity products that are easily described and suitable for electronic auctions and spot markets.

Broad acceptance of e-standards: The sector possesses some excellent preconditions for a broad adoption and use of electronic standards, which should drive e-business use in general. Chem eStandards has emerged as the dominant standard initiative, which is supported by practically all major chemical companies worldwide. Moreover, Cefic (the major European industry association) recommends Chem eStandards to its 40,000 members (2002), as does CEDI (the Japanese Petrochemical Association). The Chem eStandards has been successfully rolled out in stages in line with concrete business needs and related standards maturity. The BASF Case Study in this report demonstrates how a large chemical company has successfully used the Chem eStandards as part of their strategic e-business implementation. However, this success story should not conceal that there is still a long way to go for the sector as a whole. Particularly among small and medium sized chemical enterprises, the adoption of standardized data exchange with business partners across Europe continues to be a slow and uneven process.

Growing maturity of e-business applications and focus on SMEs: Last but not least, the market of e-business solutions has become more mature and stable after some of the costly aberrations that occurred during the new economy boom time were corrected. Moreover, it appears that software companies and solution providers increasingly discover smaller firms as a potential target market, as the large company market is becoming increasingly saturated. However, e-business back-end integration is still much more complicated and expensive than simple front-end desktop computing. This issue, however, is not specific to the chemical industry, but applies to many sectors, notably to manufacturing ones. Whether e-business systems will eventually spread from the large firms to the small ones, and how long this evolution will need, is a game of educated guessing.

Barriers: factors that may inhibit e-business diffusion

Reluctance to re-engineer business processes among smaller firms: To some extent there exists a paradox. On the one hand, small firms are much more flexible than large companies in implementing changes, and many of them take advantage of this strength. On the other hand, small firms can be particularly reluctant to introduce innovation in their business processes, if it requires abandoning long-term cultivated business traditions. In many cases, the implementation of new technology and electronic business is connected to handing over management from one generation to the next.

Dichotomy between large players and small firms: The development of electronic business is currently in a transition phase. While ICT and their use for doing business electronically have become a standard in most of the larger companies, this development needs to be replicated among the smaller firms, adapted to their needs. A large dichotomy between small firms and the large companies in a sector can be an impediment in this process. The chemical industry is a sector which is characterised by a substantial gap between its global players on the one hand, and a large number of small companies still doing business the traditional way on the other. Bridging this gap can be more difficult than in sectors with a more homogeneous structure of companies across the various size-bands.

Shortage of investment capital: While the pressure to cut costs is certainly a main driver for e-business, the lack of the necessary investment capital is the other side of the coin. 2003 was a difficult year for the chemical industry, with the majority of sub-sectors experiencing only weak growth of 0.6%.³⁶ According to a recent study on the sector's long term perspectives issued by Cefic³⁷, the sector has suffered a significant decline in its profitability since the year 2000 and has entered into a period of significant uncertainty. In such an overall business environment, companies will be rather risk adverse and may shy away from making investments into process innovation. This may slow down the catch-up process of small and medium-sized companies, in particular.

4 Policy challenges

4.1 General considerations on electronic business as a policy challenge

Independent from this particular sector report, there are a number of areas where electronic business developments could coincide with European or national policies. These are in particular the following areas:

1. The regulatory environment for telecommunication services
2. Innovation and technology policy
3. Education and labour market policy
4. The role model of the public sector
5. Other policy areas which have possibly some overlap with electronic business developments (e.g. patenting law, trade regulations)

This section discusses on a general level how these policy areas relate to ICT use by enterprises and for electronic business development. It points out some concrete policy challenges as well as some caveats with respect to possible policy actions, based on evidence delivered by the *e-Business W@tch*. The focus is on the first four issues mentioned above, which are the most obvious and direct ones, placed at the intersection of technological development, policy and regulatory environment.

4.1.1 Regulation of telecommunication services

The regulatory environment for telecommunication services and goods provides an important basis for the provision of ICT access in the European Union, both for enterprises and private households. A highly developed telecommunication infrastructure with a high quality of service, easy access for anyone and anywhere, and affordable prices are preconditions for a fast take-off of Internet usage and – at least at this stage of the development – for e-business technologies.

³⁶ Cefic, News Release (5 March 2004): EU chemical industry set for modest recovery after difficult year.

³⁷ Chemical Industry 2015. Study issued by Cefic. Cf. Cefic, Press Release from 5 March 2004.

A good example to support this argument is the diffusion of Internet access in European households. It became evident during the mid 1990s that Internet access would eventually become a standard in most households. However, it was only after the massive tariff reductions for online connections (compared to voice telephony), which were introduced mostly after the liberalisation of the EU telecommunication markets in 1998, that the Internet access boom started in most countries. The situation is now similar with regard to broadband deployment. While many households have connected to the Internet, the diffusion of broadband connections differs considerably between regions and depending on socio-economic configurations of households. While basic Internet access has become affordable for a vast majority of citizens in Europe, the costs for broadband Internet access remain rather high and constitute a main barrier for adoption.

The European Commission is currently working on the timely and effective transition to the new EU framework for electronic communications networks and services, which was adopted by the Parliament and the Council in March 2002. The new framework is designed to ensure that ex ante regulation is applied only where the level of competition in defined markets is considered to be insufficient on the basis of an analysis consistent with competition law methodology. Newly emerging markets also should in principle be free from regulation. Other key aspects of the framework are designed to support this approach to regulation and promotion of consumers' interests. The new framework is an important initiative that will support the continued growth and development of the electronic communications sector in Europe.³⁸

A favourable regulatory environment is not in itself a sufficient condition for a high usage of the Internet and associated technologies and services within a region, but it is definitely an enabler and an important requirement. Positive examples of such framework conditions within Europe are the Nordic countries, Ireland, Italy, Austria, Estonia, and the UK. Empirically, these examples show that countries with a modern, competitive telecommunication infrastructure are usually among the early adopters of ICT. This facilitates the development of internationally competitive enterprises in the provision of ICT products and services, along with competitive advantages for enterprises using these products and services.

However, not all countries in the European Union have yet realised a regulatory environment that enables them to develop a modern, competitive telecommunication infrastructure. In some of the new Member States, the regulatory environment of telecommunication markets as well as the de facto market structure is still underdeveloped in terms of competition and offer compared to the markets in the former Member States of 2003.³⁹ Also, six of the former Member States currently face Court action for failing to put in place the new rules on electronic communications. Thus, regulatory challenges are not unique to the new Member States.

It will certainly constitute an important challenge and objective for policy – both on the European level as well as in the concerned Member States – to ensure that the take-up process in these markets occurs as rapidly as possible and that the new regulatory framework will be fully implemented soon. This requires constant monitoring of market

³⁸ http://europa.eu.int/information_society/topics/ecommm/all_about/implementation_enforcement/index_en.htm;
Further information on the current initiatives of the European Commission can be found at
http://europa.eu.int/information_society/topics/ecommm/index_en.htm

³⁹ This assessment was confirmed by speakers from the new Member States at the e-Business W@tch Workshop on "e-Business in Acceding Countries", Brussels, 10 December 2003.

developments and, possibly, further improvements in the regulation of telecommunication services in the respective Member States.

4.1.2 Innovation and technology policy

Technology adoption at the firm level

The adoption of e-business technologies at the firm level is essentially an investment decision which carries risk for the business owners and is subject to a multitude of relevant framework conditions. These include the sector and type of business, the market structure, endowment and resources of the firm, the behaviour of competitors, suppliers and customers, and the availability of alternative technologies to carry out a specific task. Risk means in this context that the payoff of the investment into technology adoption is uncertain at the time of the investment decision. However, it is also possible that individually optimal investment decisions lead to sub-optimal outcomes on the aggregate level (market failure).

According to normative economic theory, policy intervention would be desirable in both circumstances: in the case of market failure and in the case of sub-optimal investment decisions by firms due to unequal access to information. Such an asymmetric situation could occur, for example, if a lot of complex information has to be gathered and evaluated, which is very time consuming and therefore costly. In such a case, it could be argued that large enterprises with strong economies of scale have an incentive to gather this information, while small companies do not. This could result in sub-optimal investment decisions in SMEs because of a lack of relevant information. The objective of policy action in such a case could be to improve the availability of objective and reliable information about the technologies for all market players.

Another possible source of market failure are company-external network effects of a new technology. For example, if the value of a new technology to the user strongly depends on the number of other users, the individual decision to adopt will be largely influenced by expectations about the behaviour of others. In such a situation, market failure can theoretically occur as a result of either of two equilibriums: one in which everyone adopts, or one in which nobody adopts. It could be that one of the two equilibriums dominates the other in terms of social welfare (for example, everyone could be better off with the adoption scenario), but that the less favourable one develops in the market. This would also indicate a need for policy action.

A good example of such a situation is general purpose ICT, such as Internet access (and preferably via broadband connections). In this case, there is broad agreement that every country would be better off with a high connectivity of private households and enterprises. In countries where the development of infrastructures and user access is still in its infancy, government support or subsidies to build up infrastructures could be worthwhile policy actions. On the other hand, in countries with highly developed infrastructures, such policy action to "steer the market towards the better equilibrium" will no longer be needed.

However, due to the complexity of the investment decision framework of each enterprise, it is extremely difficult (if not impossible) to identify actual over- or under-investments in many technologies. This applies in particular to technologies that are highly specific in their purpose and do not exhibit strong firm-external network effects. For example, the lower diffusion of some e-business technologies among SMEs (such as ERP or SCM systems) compared to large enterprises does not necessarily imply that SME under-invest in these tools. There can be many good reasons for these adoption patterns, as pointed out in many

of the sector studies. A small company, for example, which is a supplier of specific parts to a small number of other firms, will hardly gain significant advantages from a CRM system.

Eventually, it is barely possible to determine precisely why certain firms do not adopt some of these technologies, while others do. One possible reason for non-adoption of a specific e-business technology is that firms may have a more efficient way to carry out specific tasks, or that more profitable investment opportunities exist (for instance investments into new products or services which are not based on Internet-technology, or hiring a new employee instead of investing in technology).

Consequently, there are good reasons to argue that policy should be cautious about promoting the adoption of non-general purpose technologies in enterprises, especially if there is no unambiguous indication of a market failure.

Economic consequences of technology adoption

ICT based applications for doing business electronically, if successfully implemented and used, can be viewed as a change in the production technology of a firm. From an economic perspective, this constitutes a change in the cost-function of the firm or the creation of a new supply function, if the technology is used to create a new product or service. Hence, e-business technology adoption coincides with innovation.

Evidence from the *e-Business W@tch* suggests that Internet-based technologies are currently an important enabler of innovation in the European economy. However, many firms also improve their internal processes or create new products or services for their customers without making use of Internet-technologies, or by using online technologies only peripherally. Innovation research shows that all sorts of innovations, whether based on the Internet or not, are in the majority of cases positively associated with business success. Thus, it is not yet proven that investments in Internet-based innovations yield superior returns to other kinds of innovation.

This means that policy should focus on stimulating a climate that is generally favourable to investments in innovation, and not exclusively on Internet-based technology investments. An important aspect of such a policy is to reduce the ambiguity and risk that face potential investors. This involves the entire environment in which enterprises operate, not only the uncertainty about specific investment opportunities like the adoption of e-business technologies.

As a means of conducting innovation, technology adoption has the potential to influence other important economic measures, such as the optimal size of the firm, the optimal market structure (degree of industry concentration, large vs. small firms), the optimal degree of vertical integration, productivity, competitiveness, and changes in the demand for different types of skilled labour. The degree to which technologies actually influence these measures is hard to estimate a priori. Even empirical ex-post analysis whether and to what degree e-business has exercised an "impact" on these parameters is extremely difficult, since it is hardly possible to filter the impact of ICT and e-business from other factors and externalities.

However, it is acknowledged that the impact of electronic business implementation can be substantial. Policy-makers are therefore well advised to closely observe these technology-induced changes in order to identify areas which may require policy action. For example, if certain technologies tend to reinforce the development toward monopolistic market structures in an industry, policy should consider interventions. In this context, the sectoral analysis of the *e-Business W@tch* and the resulting empirical evidence has already revealed important insights and provides a sound basis for further analysis of specific aspects.

4.1.3 Education and labour market policy

Information and communication technologies need complementary inputs in the form of specialised human capital in order to function properly and to generate economic value. Consequently, an economy that lacks a high level of general education, computer and Internet literacy, and an adequate supply of highly skilled specialists will not be able to realise the full potential of ICT. In addition, the rapid technological progress in computer, network and software technologies leads to a fast depreciation of ICT skills and hence requires a constant updating of skills, which eventually leads to the “life long learning” paradigm.

Since basic schooling and higher education systems are to a large extent public responsibilities in the European Union, this could be a starting point for policy-makers to develop and induce the implementation of educational schemes that are favourable for an economy that is “tech-savvy” and innovative. In addition, the realisation of life-long learning in the Member States could probably be supported by a further deployment of public-private partnerships. A substantial involvement of the private sector will be necessary to create sufficient opportunities for employees to participate in specific trainings and in a general continuing education, irrespectively of their age and work experience.

The surveys of the *e-Business W@tch* confirm that firm-size and training offers for employees are interrelated. Large enterprises are able to provide more and better training opportunities for their employees than SMEs.⁴⁰ Economies of scale in large enterprises play an important role in this context. A company with many employees can more easily delegate responsibilities to other workers. Temporary replacement of employees participating in training by co-workers, which severely inhibits formalised training programmes in SMEs (possibly more than the mere direct costs for training programmes), is therefore less complicated in large than in small firms. Public-private partnerships might eventually help to narrow this gap between SMEs and large enterprises. Such initiatives concern, for example, training initiatives carried out in cooperation with e-business technology providers, training organisations and the public sector, or SME networks that cooperate in offering training to their members.

4.1.4 Role model of the public sector

The active use of ICT, the Internet, and e-business applications in the public sector can spur an active use of these technologies in the private sector, for example via the creation of positive network externalities.

An excellent example is the case of Estonia. The Estonian government played a very active role in promoting the development and usage of Internet infrastructures. For example, the Estonian Parliament approved a proposal in February 2000 to guarantee Internet access to each of its citizens⁴¹ and immediately began to take action. The Government kick-started a high-tech drive by setting up 500 public computer centres across the country. The centres were established in cities, but also in tiny Baltic Sea islands and converted barns in desolate forests.⁴² The government also makes very active use of Internet technologies itself, playing

⁴⁰ cf. CVTS2; Statistisches Bundesamt, 2002

⁴¹ ebusinessforum, 2001

⁴² Wired News, 21. April 2003

the role of an “e-champion” in Estonia. For example, public agencies use the Internet for procurement purposes and parliamentary meetings are often organized as virtual conferences, saving substantial time and travel costs. Today, Estonia is the ICT leader amongst Eastern European countries, ranking 25th out of 102 countries (ahead of Italy, Spain, Portugal, and Greece) in the Global Information Technology Report by the World Economic Forum (2002/03 edition). The active use of ICT in the public sector helped Estonia to leapfrog other countries that are still wedded to older technologies, and has also helped to make the public sector in Estonia efficient and slim.

Similarly, the public sector in the European Union and its Member States can help to support the development and usage of ICT in the private sector by making intensive use of the new technologies itself. This includes active use in providing services to its “customers” (citizens and businesses), but also the internal use for improving and optimising their own routines (Government-to-Government).

Government institutions with their experience in handling public calls can also serve as a role model by increasingly using public electronic tendering procedures, provided that the main objective of this technology can be achieved: realising cost advantages for all parties involved. For governments, cost advantages can stem from cheaper procurement prices or from more efficient procurement processes. A cost advantage for companies that participate in public tendering procedures via the Internet will mainly result from reduced efforts, both for getting access to calls and for submitting tenders.

However, a caveat in this context is that the technical development and implementation of electronic tendering procedures in the public sector could – to some extent – compete with already existing, functioning solutions and services from the private sector. This requires an assessment on a case-by-case basis, carefully weighing the gains and losses of either way from an aggregate economic perspective.

4.2 Policy challenges at the sectoral level

Following these considerations (and caveats) on the policy relevance of electronic business developments in general, the question is which instruments policy could use to intervene in this development, in order to counteract undesirable outcomes on the aggregate level. This chapter presents a synthesis of policy challenges which have been identified in the first series of Sector Impact Studies (published in May 2004) on 10 sectors. As this analysis bears close links to ongoing policy initiatives of the Commission’s DG Enterprise, the introduction offers a brief summary of the current approach to e-business policies. The analysis attempts to map the challenges identified by the *e-Business W@tch* into the policy framework that was proposed in the Communication from the European Commission “Adapting e-business policies in a changing environment: The lessons of the Go Digital initiative and the challenges ahead”.⁴³

4.2.1 Taking stock of existing policies – a record of recent EU initiatives

In this context, the Enterprise Directorate General has already undertaken a substantial effort to systematize “e-business policies” with respect to their objectives, targets and contents.

⁴³ COM(2003) 148 final

The "Go Digital" campaign can be regarded as the starting point and initial background of this activity, and in particular the Communication "Helping SMEs to Go Digital",⁴⁴ in which the Commission identified benchmarking as a major step to further promote the use of ICT and the Internet by SMEs.

The Communication defined a policy-oriented objective for this benchmarking activity, namely "to describe and benchmark national and regional policies and instruments for the promotion of e-business for SMEs". The objective was to help Member States and regions to assess their policies and identify best policy practices. This policy benchmarking initiative received widespread political support and attention from all relevant stakeholders.

In February 2002, the first Synthesis Report "Benchmarking National and Regional E-Business Policies" was issued. It summarised the process, which was envisaged at that time, in five steps:

1. Getting a clear picture about the adoption of ICT and e-business by SMEs
2. Benchmarking policy initiatives in favour of helping SMEs
3. Presenting the results of this benchmarking initiative, including examples of good practices in policy-making, to a broader audience of policy-makers in a high-level conference
4. Identifying a number of quantitative targets to be achieved by national and/or European policies
5. Monitoring the implementation of the policy targets

Since the publication of this report, the first four steps of this process have been addressed and mostly successfully accomplished. The e-Business Surveys carried out by the *e-Business W@tch* and Eurostat since 2002, and the analysis of issues in the Sector Studies of the *e-Business W@tch*, have largely contributed to a substantial improvement of the picture about the adoption of ICT and e-business by SMEs.

Step 2 has been addressed in special reports, including the above mentioned Synthesis Report and, in particular, the Final Report of the e-Business Policy Group on Benchmarking national and regional e-business policies for SMEs from June 2002. This report provides an impressive documentation of different types of policies that have been applied in the Member States of the European Union. The report structures the policies into four categories (see Exhibit 4-1).

The collection and case-study like description of these policies in the quoted report can be regarded as a breakthrough in systematizing European e-business policies. In parallel to this initiative of gathering evidence on e-business policies, and as a vehicle for doing so, DG Enterprise had started to develop a network of stakeholders and policy intermediaries to advance the processes of policy-making and policy co-ordination across Member States. This led to the founding of the e-BSN (e-Business Support Network), which had its first European workshop in January 2003 in Athens, in the context of the Greek EU presidency.

⁴⁴ COM(2001) 136 final

Exhibit 4-1: E-business policy objectives and categories identified in the EU in 2002

Main policy objective / category	Examples of good practice
Framework policies	<ul style="list-style-type: none"> • UK: UK online for business • Greece: the e-business forum • Norway: the VerDI programme • NL: The Netherlands Go Digital Programme • Spain: Catalunya on the Net
E-business awareness raising and training	<ul style="list-style-type: none"> • Finland: eAskel • UK/Scotland: First Steps Workshop Series • Austria: ECAustria ("Let's e-biz") • Sweden: SVEA • Germany: the B-on-line project
Promoting SME support networks	<ul style="list-style-type: none"> • Ireland – The PRISM II initiative • Germany – Network of e-business centres • The Netherlands – 'Digikringen' • UK – Opportunity Wales
Promotion of Internet platforms for SMEs	<ul style="list-style-type: none"> • Denmark - Rakat in Roskilde • Ireland – Empower • Spain – The ARTEPYME II • France – project Achat-ville • UK - Local Shops On Line

Source: European Commission, DG Enterprise: Final report on benchmarking national and regional e-business policies for SMEs by the e-Business Policy Group (June 2002)

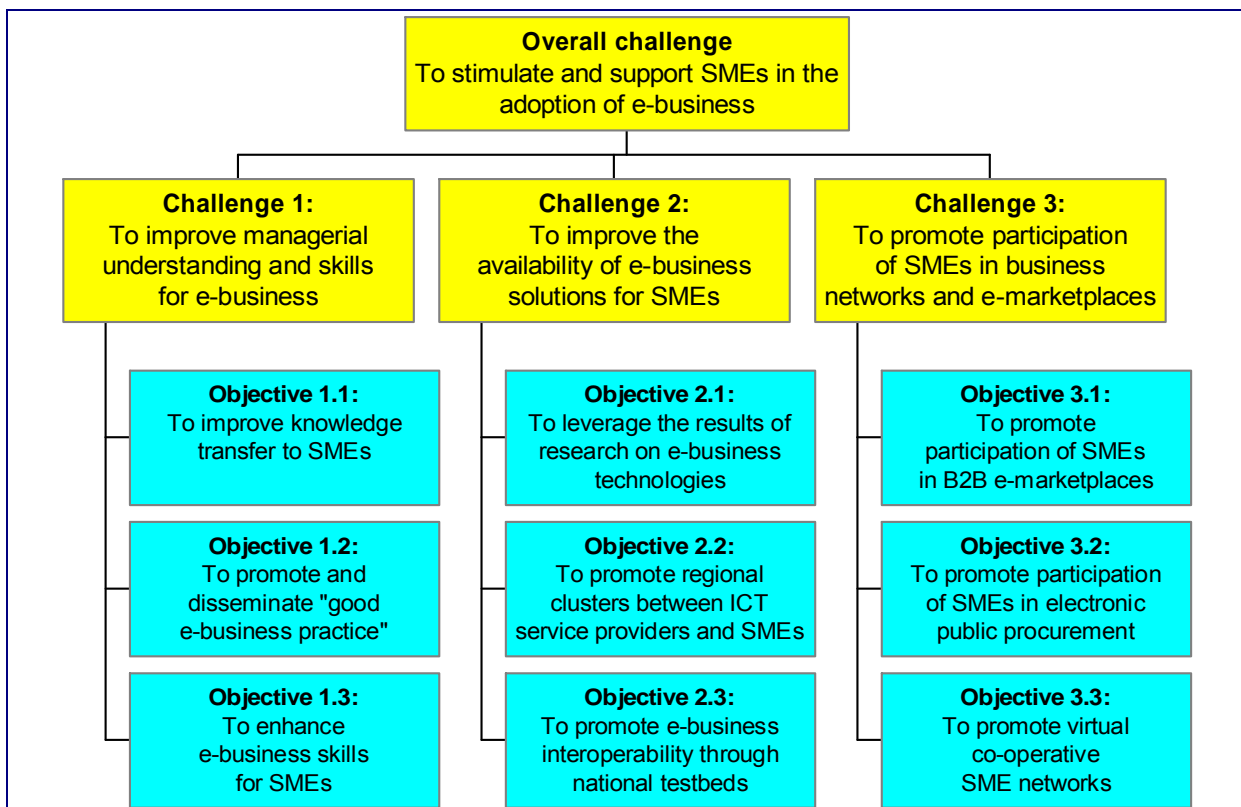
This e-BSN Workshop was the kick-off event for the fourth step of the master plan, as the title of the event already indicates: "Workshop on quantitative targets for e-business policies". From the beginning, it was a courageous move by DG Enterprise to promote target oriented policy-making processes, considering the substantial amount of debate and scepticism whether and to what extent policy objectives can be translated into concrete (measurable) targets or not. This debate has not yet ebbed away, but has rather increased, in particular in the context of the eEurope benchmarking which shows all the difficulties and challenges that are inevitably connected with this approach. The first challenge is that the stakeholders involved have to agree on targets and on adequate indicators to measure the achievement of a target. The second challenge is whether the required data can be collected in a comparable and reliable way, and – an important aspect with all data collection activities – with a reasonable economic effort.

In this context, it must be considered that most e-business policies are implemented on a regional or national level. Therefore, when it comes to setting targets for these policies, the European Commission can only act as a promoter and catalyst, but cannot enforce any targets for regional or national governments. To stimulate the debate in this area, and as "food for thought", the Commission issued in March 2003 the Communication "Adapting e-business policies in a changing environment: The lessons of the Go Digital initiative and the challenges ahead" (COM(2003) 148 final). This Communication, which proposed a further elaborated framework for e-business policies, attracted considerable attention and was praised for its clarity and practical applicability. The European Economic and Social Committee, for example, believes that "the European Commission has produced an excellent

proposal document on the need for Member States and regions to re-orient e-business policies" and welcomed "the highly practical approach".⁴⁵

The Communication outlines a framework for SME specific e-business policies that consists of three main challenges and nine objectives related to them (three each, see Exhibit 4.2-2). Continuing from this framework, the latest workshops of the e-Business Support Network at Paris (October 2003), Budapest (February 2004) and Barcelona (May 2004) have advanced the debate on appropriate targets for each of these objectives. Moreover, DG Enterprise has recently launched an evaluation study that will benchmark 10 selected e-business policies with respect to measurable targets and criteria.

Exhibit 4-2: A framework for SME specific e-business policies



Source: European Commission [COM(2003) 148 final]

Based on these achievements, the Commission has now gradually moved to start the fifth step of the process according to the "Road Map" outlined above: monitoring the implementation of the policy targets. In this context, the recently established European e-business policies portal on the Internet (www.e-bsn.org) will play an important role. The portal already provides a valuable overview of e-business policies and best practices across the European Union, with links to related resources.

⁴⁵ Opinion of the European Economic and Social Committee on [COM(2003) 148 final], published in the Official Journal of the European Union, 2004 / C 108 / 02, 30 April 2004, p. 23-28

4.2.2 Synthesis of policy challenges identified by the *e-Business W@tch*

The policy challenges which the *e-Business W@tch* has identified and outlined in the previous series of Sector Impact Studies (May 2004) on a sector-by-sector bases can – to a large extent – be mapped into the framework developed by the EC Communication [COM(2003) 148 final] as shown above. This can be expected, as the framework covers a broad range of policies. In this chapter, an effort is undertaken to synthesize the various sectoral policy challenges by integrating similar issues under one heading, and to provide an overview of the relative importance of various policy areas by sector.

As a first overview, Exhibit 4-3 indicates the relevance of the three main e-business policy challenges identified in the EC Communication on adapting e-business policies. The mapping has been made from the perspective of small and medium-sized enterprises, and not from the large firms' point of view. This appears to be consistent as the EU framework for e-business policies has been developed specifically for SME policies, and as the conclusions on policy challenges drawn by the *e-Business W@tch* in its Sector Studies also concentrate on the SME aspect.

Exhibit 4-3: Relevance of SME e-business policy objectives by sector

	To improve managerial understanding and skills for e-business among SMEs	To improve the availability of e-business solutions for SMEs	To promote participation of SMEs in business networks and e-marketplaces	Other measures (sector specific)
Textile industries	●●	●●●	●●	●
Chemical industries	●●	●●	●	○
Electronics	●●	●●●	●●	●
Transport equipment	●●●	●	●	●
Craft and trade	●●●	●●	●●●	●●●
Retail	●●●	●●	●●	●●
Tourism	●●●	●●	●●●	●
ICT services	●	●●	●●	●●
Business services	●●●	●●	●	●
Health services	●●●	●●	●●	●●●

○ = not relevant; ● = some relevance; ●● = rather relevant; ●●● = highly relevant

Source: *e-Business W@tch* (2004)

In summary, the following conclusions can be drawn from this overview, backed up by the analysis and recommendations from the various Sector Studies presented by the *e-Business W@tch*:

- The policy objective "to improve the availability of e-business solutions for SMEs" has certainly some relevance for all sectors. It holds true for all sectors that the major (positive) impacts of e-business stem from rather powerful applications that are mainly adapted to the needs of large enterprises. However, the objective to stimulate the development of useful applications for small business is even more relevant for manufacturing than for service sectors, as handling the supply chain of physical materials is a major application area for systems under consideration.
- The policy objective "to improve managerial understanding and skills for e-business among SMEs", which includes awareness raising activities, appears to be most important for those sectors which are dominated by a huge number of micro (and very

small) enterprises, for example the textile industries and in the craft and trade sectors. There are two main arguments in support of this position. Firstly, small enterprises cannot employ specialised staff in the way larger enterprises do. A company of five people cannot afford a (full time) "IT manager", but needs to assign related tasks to one of the five. Therefore, some public support mechanisms can be justified. Secondly, it has frequently been experienced that the adherence to traditional, established business cultures can be very strong among small firms, particularly in craft and trade sectors. This can be an impediment to introducing new, IT based processes.

- A certain reluctance among many small firms to abandon traditional business cultures and models, even if for the benefit of doing things more efficiently, can also be an obstacle to cooperation among themselves. In some sectors, however, new ways of cooperation among SMEs have already proved to be successful and necessary, for example in the furniture and in the textile industries.⁴⁶ Policy measures to stimulate the participation of SMEs in business networks are therefore particularly relevant in sectors where such cooperation appears to have the highest potential.

The grouping of policy challenges identified in the *e-Business W@tch* Sector Studies into the three objectives of the EC framework is a useful but rather crude simplification. Furthermore, the framework does not indicate whether the challenges must or should rather be dealt with at a European, national or regional level. Some policy approaches require a co-ordination of the different governmental levels, for example RTD oriented policies, while others need to be implemented predominantly on a specific geographical level. The support of standardisation developments, for example, which has been recommended in several of the reports, can best be addressed by the European Commission or European industry groups, if at all (considering that standardisation is mostly a voluntary process). Awareness-raising targeted to SMEs, on the other hand, can only be effectively achieved through intermediaries on the regional level.

Exhibit 4-4 groups suggestions for possible policy initiatives that were raised in the Sector Studies according to the underlying objective and the policy level (from regional to European) on which the suggested action should probably be addressed, although many of the policies could of course be addressed at different levels. Thus, it can be considered as an extension of the SME e-business policy framework proposed by the EC.

It is not possible in the context of the *e-Business W@tch* to develop blueprints for how to implement these policies. Clearly, the methods and instruments used will depend on the local situation, the administrative structures, and the sectors to which activities are mainly targeted. However, such blueprints are available, as it must be assumed that most of the policy measures proposed have already been implemented in some place in the EU, whether successfully or not. It is the main objective of the e-Business Support Network (www.e-bsn.org) that these blueprints are communicated and exchanged across the EU, together with the lessons learned. Replication of successful policies, while avoiding making the same mistakes again, is the goal of this exercise.

⁴⁶ There are many examples for ICT supported SME collaboration; see, for example, case study on Textilebusiness.it in the Sector Study on the Textile Industries, No. 01-II, August 2004.

Exhibit 4-4: Suggestions for policy actions mapped by objectives and level

Objective	EU	National	Regional
To improve managerial understanding and skills for e-business among SMEs	<p>Make it easier for small firms to participate in European RTD programmes</p> <p>Monitor the demand for ICT skills among enterprises, possibly at sectoral level (at least on the levels of manufacturing and services), develop profiles of skills required and assess the supply situation for those skills</p>	<p>Public administration as a role model in using electronic procurement</p> <p>Promote IT and e-business training opportunities, for instance by providing incentives for participation</p> <p>Develop high-quality ICT education programmes (at university level)</p> <p>Collect good e-business practice examples to overcome mental or cultural reservations among SMEs</p>	<p>Encourage ICT training, especially among micro and small enterprises and in the new Member States</p> <p>Improve access of SMEs to information about e-business</p> <p>Improve the knowledge transfer between competence centres, business development agencies and SMEs</p> <p>Educate SMEs about opportunities of using simple Internet applications</p> <p>Encourage links between small firms and schools & universities to give them access to young skilled people</p> <p>Change the investment attitude of SMEs from saving costs by not investing to building value by investing in ICT</p>
To improve the availability of e-business solutions for SMEs	<p>Encourage the adoption of e-standards</p> <p>In particular: promote the standardisation of computer languages used for more advanced forms of supply chain management</p>	<p>Provide financial incentives for innovation through e-business adoption</p> <p>Develop web-based resources and interactive modules for e-business support in craft and trade</p> <p>Stimulate the customisation of e-business tools as part of innovation policies</p>	<p>Stimulate cooperative projects involving software providers and regional SMEs</p>
To promote participation of SMEs in business networks and e-marketplaces	<p>Monitor the evolution of marketplaces / Internet trading platforms and the related business practices</p>	<p>Monitor the participation of SMEs on electronic marketplaces</p>	<p>Support the establishment of local e-commerce platforms for SMEs, particularly in retail</p> <p>Emphasis on and support for the development of network relations among SMEs and customers</p>
Other measures	<p>Monitor market concentration in online retail markets</p>	<p>Reduce legal barriers to craft business market entry (e.g. in DE, LU), particularly in ICT-related crafts</p> <p>Create the regulatory environment for a competitive telecommunication market, so that companies have access to services at low prices</p>	<p>Educate SMEs about regulatory changes and consequences of the EU enlargement</p>

Source: e-Business W@tch (2004)

4.3 Sector specific challenges

The analysis of specific e-business issues and the case studies presented in this report do not disprove in any way the general conclusion that was drawn in the first Sector Study (May 2004) based on the results of the e-Business Survey 2003: "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."⁴⁷

The restructuring which the chemical industries seem to be undergoing these days is related to general economic developments (subsumed under the catchword "globalisation") rather than caused by technological determinants in a narrow sense. Electronic business is certainly a facilitator of this development, but not the cause in itself.

While this conclusion does not call for urgent sector specific e-business policies, it also remains true that there are some fields related to the development of electronic business where policy could act as a catalyst, for example by creating a framework in which companies can take informed decisions and thus minimise their investment risks. These areas are largely described in the previous sub-chapters (4.1, 4.2) and are not specific for this sector.

As the policy priority is to focus on support measures for small and medium-sized enterprises, most initiatives will probably be related to the objective of providing information about sector specific e-business opportunities and necessary preconditions to smaller firms. In the SME policy framework suggested by the EC in its Communication on "Adapting e-business policies in a changing environment" [COM(2003) 148 final], related objectives are summarised under the heading "to improve managerial understanding and skills for e-business". Activities in this area will mostly be carried out on a regional level, by typical intermediaries such as business support agencies and chambers of commerce.

On the European and national levels, the *e-Business W@tch* recommends continued monitoring and studying the impacts of electronic procurement on supply chains. The analysis of the *e-Business W@tch* has brought some evidence (see, for example, the BASF and Slovnaft case studies in this report) that large companies may benefit from e-trading more than their smaller counterparts. This is an interesting issue, not only specific for this particular sector, which goes beyond the scope of the analysis and the level of detail that is provided by the *e-Business W@tch*.

⁴⁷ *e-Business W@tch* (2004): Sector Impact Study No. 02-I on e-Business in the Chemical Industries. Quantitative report: E-business use in 2003/04. May 2004. p. 73. Cf. www.ebusiness-watch.org (publications)

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 - ChemConnect (www.chemconnect.com)
 - RubberNetwork (www.rubbertnetwork.com)

Annex I: 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, subsidiaries and branches.
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 700 million users worldwide. ⁴⁸ 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 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.

⁴⁸ Cf. Global Internet Statistics by Global Reach, www.gireach.com

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 II: 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 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.

Fieldwork

The fieldwork 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*. Fieldwork 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 fieldwork organisations based on acknowledged business directories and databases (see table).

Population coverage of the e-Business Survey (2003)			
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 + Krediinfo (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 Address 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 fieldwork

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 level and on the financial level. On the other hand, the general manager may not always be aware of the technical implementation status. The Irish fieldwork organisation, for instance, reported that some of the smaller companies were not familiar with technical terms such as used for standards ("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 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 allows 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 four 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 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: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
2	Chemical industries	
	<ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
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: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
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: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
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: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
6	Retail	
	<ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
7	Tourism	
	<ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
8	ICT services	
	<ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
9	Business services	
	<ul style="list-style-type: none"> • Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe • Report II: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>
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: Key Issues, Case Studies, Conclusions 	<p>May 2004 August 2004</p>