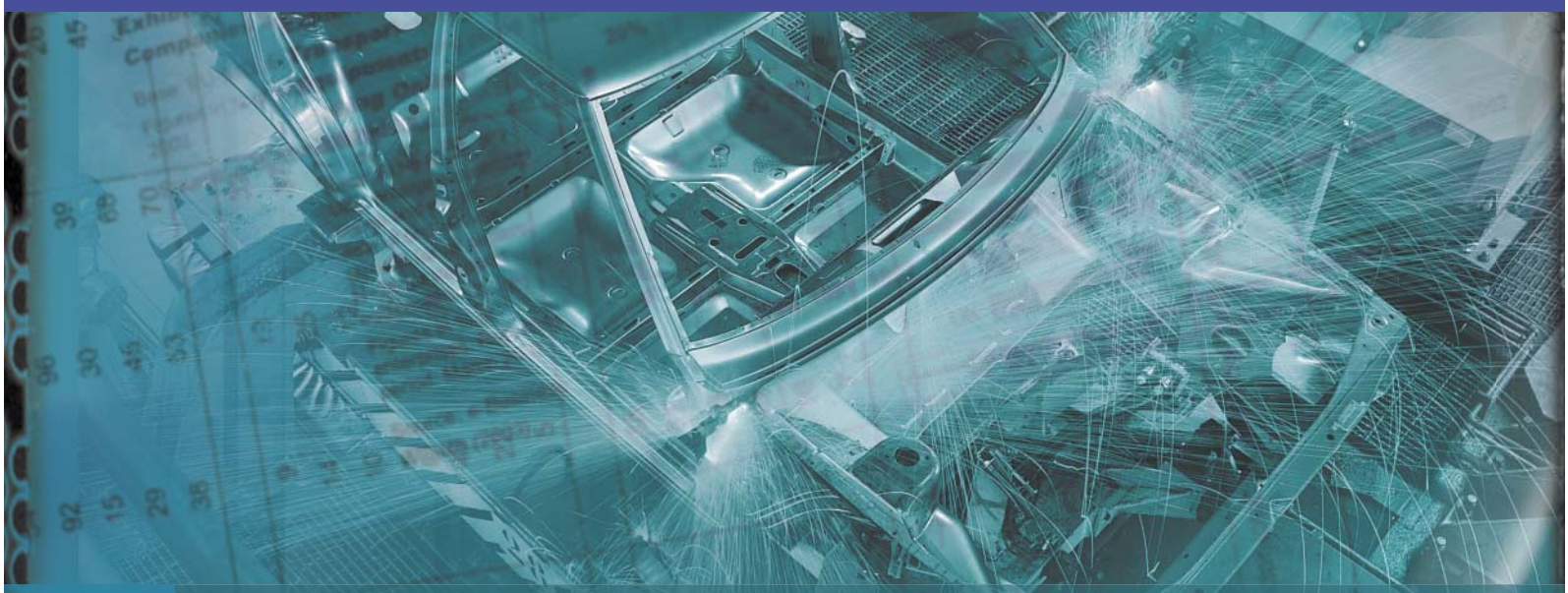
The European **e-Business Market Watch**



Sector Report: No. 04-II, August 2004

Electronic Business in **Transport Equipment Manufacturing Industries**

Key issues, case studies, conclusions

e-business w@tch

European Commission

Enterprise publications

The *e-Business W@tch*

The European Commission, Enterprise Directorate General, launched the *e-Business W@tch* to monitor the growing maturity of electronic business across different sectors of the economy in the enlarged European Union and in EEA countries. Since January 2002 the *e-Business W@tch* has analysed e-business developments and impacts in 17 manufacturing, financial and service sectors. Results are continuously being published on the internet and can be accessed or ordered via the Europa server or directly at the *e Business W@tch* website (www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm or www.ebusiness-watch.org). This document is the second Sector Impact Study for the transport equipment manufacturing industry. It analyses the implications of electronic business for the sector and features case studies to illustrate the arguments.

Disclaimer

Acknowledgements

This report was prepared by DIW Berlin on behalf of the European Commission, Enterprise Directorate General. It is part of a deliverable in the context of the *e-Business W@tch*, which is implemented by a team consisting of empirica GmbH (co-ordinating partner), Berlecon Research, Databank Consulting, DIW Berlin, IDATE, RAMBØLL Management and Saatchi & Saatchi Business Communications on behalf of the European Commission based on a service contract running from July 2003 until September 2004.

Contact

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

DIW Berlin German Institute for Economic Research **DIW Berlin** Königin-Luise-Str. 5 DE-14195 Berlin, Germany pkoellinger@diw.de	e-business w@tch ***e-Business W@tch*** c/o empirica GmbH Oxfordstr. 2 DE-53111 Bonn, Germany Fax: (49-228) 98530-12 info@ebusiness-watch.org	**European Commission** Enterprise Directorate-General e-Business, ICT Industries and Services Fax: (32-2) 2967019 entr-ict-e-commerce@cec.eu.int

Rights Restrictions

Berlin / Brussels, July 2004

Table of Contents

Index of tables and charts

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 this series of Sector Studies prepared by the *e-Business W@tch*. The second series of these Sector Studies (to be published in August 2004) will investigate and analyse specific issues in more detail, as well as taking into account feedback from a number of case studies.

The role of economic analysis in the Sector Reports

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

It appears that this practice, combined with the growing interest in the *e-Business W@tch* analysis, has caused some confusion: Some readers mistakenly consider that an *e-Business W@tch* "sector report" is a piece of economic research on the sector itself, and not a report focussing on the use of e-business in that particular sector. It is, therefore, necessary to underline that, while some background information is provided in order to better understand the context and the economic impact of e-business, the *e-Business W@tch* reports are neither intended 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, that is for which sectors the DG has responsibility.
- **Roll-out strategy.** Some new sectors (not covered in 2002/03) should be included in order to broaden the monitoring scope of the *e-Business W@tch*. Among sectors with a comparable economic size, new sectors (not yet covered) may be given priority.

In order to come to an initial ranking of economic importance, the *e-Business W@tch* has computed a simple Index using two component indicators: the number of 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 Transport Equipment Manufacturing Industries in 2004: Main Issues and Challenges

This report is the second Sector Impact Study on electronic business in the transport equipment manufacturing 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 and statistical results from the 2003 survey. 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

1.1 Economic profile

Definition

According to the NACE Rev. 1 Code the activities in the transport equipment manufacturing industries include:

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

NACE Rev. 1 Division	NACE Rev. 1 Group	Activity
34		Manufacture of motor vehicles, trailers and semi-trailers
	34.1	Manufacture of motor vehicles
	34.2	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
	34.3	Manufacture of parts, accessories for motor vehicles
35		Manufacture of other transport equipment
	35.1	Building and repairing of ships and boats
	35.2	Manufacture of railway, tramway locomotives, rolling stock
	35.3	Manufacture of aircraft and spacecraft
	35.4	Manufacture of motorcycles and bicycles
	35.5	Manufacture of other transport equipment

Whereas the activities in the sub-sectors of NACE sector 34 – which we call the “automotive” or “car industry” – form a cluster of closely interrelated firms, the shipyards, the railway equipment industry, and the aircraft and spacecraft industries (NACE 35 “other transport equipment”) operate in markets with rather different profiles.[1]

[1] For details, see *e-Business W@tch,* July 2002.

Industry structure

This section summarizes key economic indicators describing the size and structure of the transport equipment industries. It is based on chapter 1.2 of the previous report (May 2004), which deals with the economic structure of the sector in greater detail.

The two sub-sectors together (NACE 34+35) contributed a value of 731bn Euro to manufacturing production in Europe[2]. 702.5bn or 96% originate from the 15 old Member States, 29bn or 4% from the 10 new Members. 78% of the production value can be attributed to the automotive industry (NACE 34) and 22% to "other transport equipment" (NACE 35). Within the automotive industry, the manufacture of motor vehicles, comprising the very large producers of final products, is by far the biggest industry, accounting for 73% of production value in the NACE 34 category in the EU-15 (see exhibit 1-2). Nearly two-thirds of the production value in the "other transport equipment" sector is produced in the aircraft and spacecraft industry.

Together, the two sub-sectors (NACE 34+35) employ 2.82 million people - 2.64m in the old EU-15 and 0.18m in the New Member States. The EU-15 recorded 33,533 enterprises in the two sectors for 2001.

Exhibit 1-2: Transport equipment industries in EU-15 2001: Structure by kind of activity

	Enterprises	Production value	Value added at factor cost	Persons employed
	(Number)	(Mill. Euro)	(Mill. Euro)	(Number)
34 Motor vehicles, trailers and semi-trailers	**15,027**	**547,931**	**116,747**	**1,939,403**
34.1 Manufacture of motor vehicles	1,681	401,909	72,594	1,055,371
34.2 Manufacture of bodies (coachwork), trailers	6,473	23,582	6,679	167,488
34.3 Parts and accessories for motor vehicles	6,874	122,440	37,473	716,544
35 Manufacture of other transport equipment	**18,506**	**154,570**	**44,682**	**702,408**
35.1 Building and repairing of ships and boats	13,315	30,731	8,709	203,996
35.2 Railway, tramway locomotives, rolling stock	477	13,995	3,844	87,416
35.3 Manufacture of aircraft and spacecraft	2,007	99,914	29,545	347,732
35.4 Manufacture of motorcycles and bicycles	2,132	8,978	2,222	54,894
35.5 Manufacture of other transport equipment n.e.c.	576	952	362	8,370

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

The transport equipment industries are precursors of economic development in Europe. As a major purchaser of basic metals, metal products, chemicals, rubber, plastic, electronics, electrical machinery, business and financial services, the sector plays a key role for the European economy in general. Products of the transport equipment sector also belong to the most important export goods of the European Union, contributing a large positive share towards the European trade balance.

Regional distribution of production value

Germany and France contribute the largest share towards European manufacturing in the automotive industry (NACE 34), together accounting for 64% of production value in the old

[2] 2001 data for EU-15, 2000 data for 10 new Member States (without Lithuania, missing data) – source: Eurostat New Cronos 2003.

EU-15 in 2001. At a great distance follow the UK, Spain, and Italy. Thus, the industry is highly concentrated with respect to regional distribution. The accession of the new Member States added 5% to total European production value of the car industry. Among the new Members, Poland, the Czech Republic, and Hungary have by far the largest share in the production of cars. Slovakia and Slovenia follow far behind, while the contribution of the remaining countries to total European production value in the automotive sector is very small.

The "other transport equipment" industries (NACE 35) are also highly concentrated in certain regions in Europe. More than half of the European production value in these sectors are contributed by France (32%) and the UK (22%). Germany and Italy together contribute another 30%. The accession of the 10 new Member States has added only 3% to European production value in NACE 35. Among the new Members, Poland has by far the largest share. The contribution of the remaining countries to total European production value in this sector is almost negligible.

Employment, productivity and labour costs

The car industry (NACE 34) directly provided jobs for 1.94 million people in the old EU-15 in 2001. The majority of these jobs were located in Germany (45%), France (15%), and the UK (11%). The importance of the car industry for the German economy in particular is emphasized by the high share of the car industry in total employment – 12% of all employees in the German manufacturing sector work in the car industry, compared to 7% on EU-15 average. Labour costs also vary greatly among the old EU-15 countries. Germany exhibits the highest labour costs in the EU automobile industry, paying 53,694 Euro per employee, which includes social benefits received by employees. On the other extreme is Portugal, paying on average 17,988 Euro per employee in this sector.

Unfortunately, the employment-related data for the 10 new Member States still have great gaps. Nevertheless, the available data reveal some interesting insights. First of all, it shows that in some Central European countries the automotive industry is an important part of economic activity. In the Czech Republic, for example, 6% of all manufacturing employment is already attributable to the automotive industry, which is the same share as in the UK. Secondly, statistics show that some of the New Member States offer an attractive combination of relatively high productivity and very low labour costs (Hungary, Slovakia, Poland, and the Czech Republic). This is one of the main reasons why car manufacturers and suppliers (especially those originating from the former EU-15 and Asia) have discovered Central Europe as an advantageous region to establish new manufacturing facilities.

Regional differences are also visible in the "other transport equipment" industries (NACE 35), but they are not as pronounced as in the automotive industry. NACE 35 sub-sectors have the highest share in total manufacturing employment in the UK (4%), the Netherlands (3%), and France (3%). The average share of NACE 35 in manufacturing employment in the old EU-15 is 2.5%, which is not even half of the share that the automotive industry exhibits. The situation in the new Member States is quite different in NACE 35 from NACE 34. The "other transport equipment" industries do not yet play a major role in employment shares in countries like the Czech Republic and Hungary, which on the other hand exhibit high shares of employment in the automotive industry. By contrast, the employment share of NACE 35 is much higher in Malta (12.3% of total manufacturing employment), Latvia (3.5%), and Estonia (2.2%) – most probably due to a higher share of the shipbuilding industry in these countries.

The average productivity figures in the new Member States do not even reach 13% of the level reported in the EU-15. This means that the productivity advantages of the EU-15 are

much more pronounced in NACE 35 than in the car industry.[3] This will not necessarily last in the long run – productivity figures in the new Member States could rapidly rise in the future if companies invest in modern manufacturing facilities there, just as the automotive industry did in Poland, Hungary, the Czech Republic, and Slovakia. The low average labour costs in the new Member States could be an incentive for such investments.

Industry structure by size-class distribution

The entire transport equipment manufacturing sector is characterised by an extremely high degree of concentration. In the automotive industry (NACE 34) in the old EU-15, only 6% of all enterprises have more than 250 employees, but this small fraction of large firm accounts for 88% of value added at factor cost and 84% of total sector employment. On the other hand, 55% of enterprises have less than 10 employees, but these only account for 1% of value added and 2% of sector employment. This strong degree of industry concentration is also visible in the new Member States, which suggests that this industry structure is not a regionally limited phenomenon, but is inherent to the sector by industry-specific factors such as substantial investments for production facilities and high engineering costs.

A pronounced degree of industry concentration is also observable in the "other transport equipment" sectors (NACE 35). Here, large firms with more than 250 employees make up only 2% of the number of enterprises in this sector in the EU-15, but account for 82% of value added and 74% of sector employment. Again, the structure in the 10 new Member States is quite similar to that in the old EU-15.

1.2 Trends and challenges

There are several long-term challenges in the transport equipment sector, including sensitivity towards the general economic situation, an ongoing process of restructuring of the value chain, globalisation and consolidation in the entire industry. Further elaboration on these issues can be found in earlier *e-Business W@tch* reports on this sector (July 2003, July 2002).

One of the most important current developments in the European transport equipment sector is the EU enlargement. In particular for the car industry the disappearance of customs borders between the old EU-15 and the 10 new Member States has major implications. In addition to easier export conditions for new cars from the former EU-15 to the new Member States, exports of used cars also became unrestrained. As a consequence, imported used cars are winning growing market shares in the new Member States. In general, the increasing demand for used cars from the "old" Member States could lead to higher used car prices in countries with close proximity to the new Members (e.g. Germany, Austria, Italy). This could make new cars relatively more attractive to customers and eventually yield a slightly higher demand for new cars in these countries, ceteris paribus. Vice versa, re-imported cars from the new Member States could put price pressure on cars sold in the old EU-15.

[3] The available productivity statistics are not corrected for price differences between the countries. Price differences could be responsible for some of the variance observed between the countries.

The consequences for the established car manufacturers in the former EU-15 Member States are mainly positive. In addition to an increasing demand for their products as a direct result of the accession of the new countries, Central Europe offers interesting potential as a production location.

An additional trend is that many supplier firms follow original equipment manufacturers (OEMs) to the East with their production facilities. These developments have led to an increasingly important role for the transport equipment sector in the new Member States. In Slovakia, for example, the car industry already contributes approximately 20% to total manufacturing volume, and plays a significant role in the economic growth of the country. Manufacturers will have to adjust to the changing environment of the enlarged EU, but overall the accession of the new Member States provides primarily good business opportunities for enterprises in the transport equipment sector.

2 The role of electronic business in the transport equipment manufacturing sector – analysis of selected issues

This chapter analyses in detail five main issues that are of particular importance. We use data from the 2003 enterprise survey to test hypotheses that relate the adoption of e-business technologies to innovation, financial performance, and employment development. The hypotheses are derived from the economics literature, specifically from the research on innovation and technological change. Our findings are further illustrated by case studies. Before starting with the analysis, we summarize some of the main results from previous reports in section 2.1. For a more detailed discussion of the general role of ICT in the sector, we refer to the earlier sector publications (*e-Business W@tch*, July 2002, February 2003, July 2003 and May 2004). Sections 2.2 through 2.6 analyse and test the five hypotheses that were introduced in the previous sector report (May 2004).

2.1 Key application areas of electronic business in the sector

The diffusion of basic Internet access and standard Internet applications, such as e-mail and the WWW, have almost reached saturation levels in the transport equipment sector throughout Europe. 99% of sector employees in the EU-5 (France, Germany, Italy, Spain, UK) work in companies that have Internet access and use e-mail, 94% in companies that also use the WWW, and 81% in companies that use an intranet. Compared to the average across the sectors studied by the *e-Business W@tch* (the "9-sector average"), the employment-weighted access rates reported in the transport equipment sector are very high.

The sector's e-business activities are largely shaped by the character of its processes of production. The manufacturing of sophisticated cars for a competitive mass market requires the exploitation of cost saving opportunities without threatening sensitive and complex relationships along the supply and distribution chains. Production in "other transport equipment" industries, on the other hand, is characterised by the domination of small production lots, often individually ordered products, such as railway equipment, aeroplanes or ships. Obviously, the use of tools designed to address large customer groups, such as Internet-shops, does not play a dominant role for these manufacturers on the sales side.

Particularly large enterprises in the automotive industry are also leaders in using e-business technologies to automate internal processes, but SMEs remain reluctant. Three reasons can be responsible for this:

- Small firms have no meaningful use for many tools that facilitate organisation in large entities, such as intranets or systems that track travel expenses or employees' working hours.
- Economies of scale in the establishment and use of e-business systems make it relatively more expensive for small firms to engage in this technology.
- Small firms are lagging behind because they lack the expertise and qualified labour to introduce complicated e-business schemes.

Notwithstanding the good endowment with basic infrastructures and the often-publicised opportunities of electronic markets for the sector, some factors are also slowing down the adoption of various e-business technologies:

- The automotive industry in Europe had already begun to introduce new very efficient supply-chain management tools in the early nineties, mostly based on EDI. These systems required substantial investment and resulted in a complex re-organisation of customer-supplier relationship. Some companies argue that there is no urgent need to introduce new systems before EDI-investments have amortised.
- Only part of the external and internal flows of information and communication lend themselves to be organised in typical Internet-based e-business systems.
- Industry-wide implementation of e-commerce systems, such as procurement marketplaces initiated by OEMs, have often resulted in a battle over a shift of power between OEMs and their supplier base in the past. The reluctance of many smaller suppliers to join e-commerce initiatives of OEMs that were mainly used to reduce prices has slowed down industry-wide adoption of e-business tools.

Contrary to the publicity they have received, electronic marketplaces are scarcely used in this sector. Firms seem either to prefer their own historically grown supplier relationships or else use the Internet to operate their own e-procurement systems. The Covisint case study at the end of this section, which extends and updates our first case study on Covisint from the July 2002 report, illustrates how poor management decision and strategic mistakes of marketplace operators contributed to the marginal role online marketplaces currently play in this industry.

Furthermore, our previous reports showed that not all e-business technologies are being adopted to the same extent:

- Online purchasing has gained wide acceptance and is currently used in companies representing 65% of all employees in the sector. Enterprises that purchase online report positive or very positive impacts on the efficiency of their procurement processes, procurement costs, the overall costs of logistics and inventory, and also on supplier relations, although the last point seems to require a cooperative management approach that shares the benefits of online procurement with suppliers.
- On the other hand, online sales remain a niche application in this sector. The advantages of the Internet as a mass medium for standardized information does not come into play for many final and semi-finished products of this sector (airplanes, ships, highly customized components with high engineering content etc.). Customers are often not willing to purchase these high-value products via the Internet. In addition, specific arrangements between vehicle manufacturers and their dealers limit the use of the Internet as a sales channel. Vehicle manufacturers need a functioning dealer network to provide customers with after-sales and repair services. Also, customers want to test drive a car before they purchase it. This service is usually also provided by the dealer network. The specific responsibilities and rights of dealers and manufacturers are usually fixed in contracts. Thus, vehicle manufacturers cannot easily pass over their dealer network by selling their products online. However, the Internet does have an important role for marketing and customer relation purposes in this sector via corporate websites that can provide customers with detailed information about products, service offers, etc.
- The exchange of documents via the Internet is a common feature, whereas online contract negotiations or collaboration to forecast product demand seem to remain rather marginal applications.

- Customer relationship management systems (CRM) seem to be more important than supply chain management solutions (SCM). This can be due to the fact that firms had already optimised their supply systems, while e-business offers truly new features for optimising customer relations. Another interpretation could be that SCM is simply too complex to be implemented by a larger number of firms in the sector and therefore remains a niche application.

Exhibit 2-1: Summary overview: Importance of e-business applications in the transport equipment industries

E-business application area	Importance	Remark/example
Facilitate remote and mobile work (fieldworkers, homebased telework)	●●	Large companies are well equipped with remote access technology, SMEs less so.
Improve knowledge management by using special software	●●	Knowledge management is an issue in some of the large, international companies. SMEs barely use such applications.
Automate internal business processes	●●●●	Improving the efficiency and quality of business processes (internally and between trading partners) is a key priority in the sector, especially in large enterprises.
Improve ERP-to-ERP connectivity	●●●	An important e-business application area in the transport equipment industries: The objective is to realise cost saving potentials by making supply chain processes more efficient. Particularly relevant for large firms: 76% of large enterprises (EU-5) use ERP systems, but less than 10% of small enterprises (<49 employees).
Supply chain process integration	●●	Only used by a few large companies with the objective of realising cost savings and efficiency gains along the entire supply chain. However, the implementation of web-based SCM is very complex, expensive, and error-prone.
Decrease direct procurement costs through e-procurement	●●●●	Companies use e-procurement mainly to cut procurement costs and streamline procurement processes. E-procurement is one of the most important Internet applications in this sector.
Web based e-marketing and customer related services	●●	Mainly used by large firms in the sector. Some OEMs do not use the Internet to actually sell their products, but mainly for marketing purposes and to gather and manage customer-related data.
Electronic customer management	●●	CRM systems are mainly used by large enterprises to manage and collect customer-related data to improve customer service.
E-commerce: Increase sales volume/area through selling on the internet	●	Selling online through the company website is not a priority for companies in the transport equipment sector.
B2B marketplaces on the internet	●	Covisint, the major initiative in this sector, is abortive. Large companies rather rely on their own solutions; SME's remain generally sceptical towards online marketplaces.
Use of e-business standards for exchanging structured data	●●	EDI and proprietary standards still dominate.
Web services and XML based standards	●	XML is not widely used yet.
Extended enterprise: collaborative (online) e-product design	●●	Slightly above average use of e-product design technologies, mostly in large companies.
● = little relevance; ●● = average relevance; ●●● = very relevant; ●●●● = high relevance for sector		

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

The survey results exhibit some regional differences in e-business development. Although an unambiguous country ranking is hardly possible, it appears that companies in Germany, Austria and Sweden are generally leading in e-business development, whereas those in Greece and Estonia are clearly underdeveloped compared to the European average in this sector. Interestingly, firms in Hungary, Poland, and the Czech Republic do not significantly lag behind in terms of Internet access and e-business usage. A special situation appears in Estonia. Estonia already has a highly developed ICT infrastructure, but exhibits a very low level of e-business usage. However, this might be a sector-specific result. The transport equipment sector in Estonia does not play a large role in terms of contribution to total manufacturing volume. The only relevant sub-sector of the transport equipment industries in Estonia appears to be building and repair of ships and boats. In this sub-sector, e-business is generally underdeveloped compared to other branches, not only in Estonia. Thus, the specific structure of the sector in Estonia might explain the great gap between high endowment with basic ICT infrastructures and very low level of e-business usage.

To summarize the relevance of various e-business technologies in this sector, exhibit 2-1 provides an overview of application areas and an assessment of their importance.

CASE STUDY: COVISINT – FOUR YEARS LATER

Abstract

Covisint – the most spectacular e-business venture in the automotive industry – has not lived up to its promise. After four years of struggle and despite the involvement of some of the biggest industry players, the residual of Covisint was taken over by Compuware Corporation in February 2004. Inflated ambitions, a vague business model, insufficient support from the sponsors and a lack of trust and acceptance among automotive suppliers led to failure. However, the failure of Covisint does not imply that all e-marketplaces in this sector have similar problems.

Case characteristics	
• Sector focus	Transport Equipment
• Business focus	An online supply platform for the automotive industry
• Geographical focus	International
Case objectives	
• Strategy and development of an online marketplace	✱✱✱✱
• Electronic commerce	✱✱✱✱

✱ = some relevance for case; ✱✱✱✱ = high relevance

Background and objectives

On February 5, 2004 the software and technology service company Compuware Corporation and Covisint LLC announced that they reached an agreement for Compuware to acquire the products and technology of Covisint. This settlement ended the process of discarding key operational segments of the four year-old exchange that was built in cooperation with the biggest US automakers and promised to reinvent how business was done in the automotive industry. One month earlier, on December 31, software company called 2003 FreeMarkets Inc. a, announced an agreement to buy the sourcing and service assets of Covisint. In this agreement Covisint transferred its customer contracts and auction services to FreeMarkets. Covisint had already abandoned its e-catalogue business in October 2003.

Exaggerated ambitions, the lack of a clearly defined business model, insufficient support from the sponsors, and the reluctance of automotive suppliers to join the platform are believed to have led to a failure (Supplierbusiness.com, February 23, 2004). The following sections discuss these explanations and draw some general conclusions about the feasibility of similar e-business ventures in the automotive industry.

Activities

Covisint started with great ambitions as a business-to-business supplier exchange for the automotive industry at the beginning of 2000. The company's original founders – General Motors, Chrysler, and Ford – were joined later on by Renault-Nissan and PSA/Peugeot-Citroen. At the time when Covisint was established, it was considered to be one of the most promising e-business ventures. Hoping to cash in via an IPO, the company's founders invested over $500 million into the e-business enterprise. Today it remains doubtful whether these investments will ever be recouped.

The company was deemed a success by most observers in the early days. In particular, the back-up and commitment of some of the industry's most important players sent positive signals and could have initiated positive feedback that was crucial for building a significant customer base, a prerequisite for the success of a network-based firm. But, despite widely held expectations, the idea of the one-for-all industry online exchange did not gain momentum. After a vociferous start, the company had to gradually trim its operations and aspirations. Plans to expand into Europe and Asia have also failed. Similarly, expected profits have not been met by Covisint's financial performance. The initial estimations projected that Covisint would generate $240 billion in sales and around $5 billion in annual revenues. After two years of operations the company succeeded in generating monthly revenues of about $6 million and had to accrue over $10 million of monthly expenses. The number of employees was also dramatically reduced – from the initial work force of 420, only 270 remained in 2002. About 100 employees will keep their jobs after the take-over.

What went wrong?

The exchange originally aimed at achieving an industry dominant position in providing services in three key operational fields: procurement, product development, and supply chain management. The company's name reveals these high aspirations – "Co" from connectivity, collaboration, communication and content; "vis" from visibility and vision; and "int" from integration, international and Internet. A company aiming to provide such a broad range of services faces the problem of "specialising in everything". Covisint did

not seem to have a clear strategy or focus. The wide range of services proved to be too much to handle for the Internet start-up. Offering auction services and catalogues on the one hand and product development tools on the other, Covisint aimed at taking over strategic activities of both car manufacturers and their suppliers. In addition, the desire to establish a common standard for the entire industry came prematurely. As a result, many suppliers were resistant to join the network and perceived it as a bulldozer intending to restrain competition and dictate standards and practices to the exclusion of others. Furthermore, even OEMs remained unwilling to abandon their proprietary standards to accept a common system.

Covisint's affiliations with the OEMs did not help to create a trustworthy business environment. In the procurement field Covisint's services were dominated by reverse auctions for commodity-type production components. The fact that auctions were governed by OEMs created the suspicion of an uneven playing field and biased rules. Soon rumours emerged in the industry that suppliers frequently participated in auctions hosted by OEMs only designed to screen for the lowest price without granting actual contracts. Ultimately, suppliers saw Covisint's e-procurement practices as a way to drive down prices at the sole expense of suppliers and not as a means of increasing efficiency of procurement processes and decreasing costs for both trading partners. Thus, the exchange faced difficulties in winning customers, especially among smaller suppliers. OEMs dominated the auctions and accounted for around half of the trading volume in 2001. Currently, the online auction concept in Covisint's business model is considered as flawed by some observers.

"*What they misjudged was the level of distrust that suppliers may have had for the auction business*", said Compuware's chairman and CEO, Peter Karmanos Jr., "*Nobody likes auctions. I don't like auctions either*." (SiliconValley.com, February 5, 2004).

However, the takeover of Covisint's auction business by FreeMarkets means that auctions will remain a part of business in the automotive industry. What has changed is that independent service providers – not directly affiliated with the OEMs – will administrate them.

Just like the e-catalogue and auction business, the e-collaboration services in product development were far from being a success. Covisint began to offer MatrixOne software to its customers in September 2001, a suite of real-time collaborative design and project management tools that was supposed to help OEMs to bring new car models to market in as little as 12 months. According to Covisint's product development expert, Bob Matulka, using this application Covisint would be able to instantly distribute parts and engineering specification, engineering changes, and other information about new car models, a process that usually takes months (InformationWeek.com, September 5, 2001). Nevertheless, the founding automakers eluded MatrixOne software preferring their own systems, which were kept behind corporate firewalls. But without their support the whole concept could not gain momentum.

OEMs' reluctance to use Covisint's product development services illustrates their vain support for the platform. However, this attitude was not exceptional to product development service and, in fact, OEMs remained unwilling to fully exploit the capacities of the platform in other areas as well. For example, being concerned about strategically valuable information, the auto manufacturers were wary to use Covisint's auction tools to purchase goods in a public environment. In addition, every OEM

participating in the joint venture had already begun to build a public exchange on its own before deciding to join Covisint. This casts doubts on the earnestness of the support of the OEM for Covisint.

The lack of a solid managerial leadership also had a negative effect on Covisint's reputation and, hence, its performance. Initially the company had been run by a group of executives from GM, Ford and DaimlerChrysler. The provisional management team was supposed to stay in charge until the appointment of a CEO. Yet, due to undisclosed reasons, the appointment was long delayed. Eventually, the e-business specialist Kevin English, who had no previous manufacturing or supply chain experience, was appointed, only to resign a year later. Harold Kutner, GM's former purchasing expert, took over in June 2002. However, he left the company in April 2003. His successor, a purchasing executive from Ford, led Covisint for only a month. The last CEO of Covisint, Bob Paul, who was the company's former senior vice president of sales and marketing, took over and administrated the unbundling of the company. He is currently still the head of the Covisint subsidiary of Compuware.

What's ahead?

After abandoning the auctions business, Covisint decided to focus its efforts on getting suppliers to use its remaining messaging and portal capabilities. In November 2003 together with GM, Ford, Daimler Chrysler, Johnson Controls, Delphi and Lear, Covisint introduced Connect, its new data messaging service. The aim of the new service is to improve communication between OEMs, first tier and lower tier suppliers. Based on the XML standard, Covisint Connect is supposed to provide an alternative to EDI transmission methods and promises to reduce the complexity and costs of maintenance. According to Covisint's estimations, 9,000 messages are exchanged between companies in the automotive industry every second. The three OEMs, together with the three biggest suppliers, are said to account for 80% of the industry messaging traffic in the US. Covisint hopes that charging a few cents per kilo-character could generate a considerable and stable revenue flow. Although some believe that Covisint's portal hosting abilities and its new data messaging service have potential, it remains unclear whether the company will succeed this time in getting lower tier suppliers to get connected to their network. This will be even more difficult since there is already a stiff competition from existing firms providing similar services, such as Agilisys, which claims to have a 70% stake in this market.

Lessons learned

Covisint's failure raised some questions that do not only address the company but also the viability of any e-marketplace in the automotive industry. However, there is a clear distinction between the two issues. There are some obvious reasons why Covisint has not succeeded. Firstly, the ownership structure had undermined Covisint's credibility among suppliers. Furthermore, it was frequently said that the founders had indeed taken advantage of their power and used Covisint as a means to drive down prices at the expense of their suppliers. The company has also been suspected of arrogance towards non-participants and much of the supplier sector, which has certainly not improved the corporate image. The close connections with OEMs aroused fears that partially materialised and, as a result, initiated negative feedback. Therefore, many suppliers joined only reluctantly and feared a lock-in to a standard controlled by OEMs. Secondly, the company suffered from inflated ambitions and over-confidence that resulted in the lack of a coherent and realistic business model. Covisint overlooked the

needs of many small suppliers – customers that they urgently needed to make their business model work. Finally, unstable management further diluted the chances of success.

The failure of Covisint does not imply that e-business or procurement platforms do not work in the automotive industry. Other online exchanges operating in the automotive industry are actually quite successful. An example of a booming industry exchange is SupplyOn – an online platform owned by a few German automotive suppliers. Being established at the same time as Covisint, it managed to withstand the difficulties of the infancy period and today operates as a profitable business. Although the platform competes in the same areas as Covisint, it adopted a different approach. In particular, it succeeded in accommodating the interests of both buyers and sellers to an equal degree. Furthermore, SupplyOn benefited from its "suppliers for suppliers" origins. Covisint's failure might only accelerate further expansion of SupplyOn and other industry exchanges. The lesson learnt from Covisint is that over-confidence, poor management decision and strategic mistakes contributed to the failure of an enterprise that started with great ambitions. The fact that online marketplaces currently only play a minor role in the automotive industry is certainly influenced by the reputation of Covisint and the turmoil of its failure.

Sources and references

- AutomotiveNews.com, Compuware to buy Covisint products, technology, February 5, 2004.
- AutomotiveNews.com, FreeMarkets to buy Covisint assets, December 31, 2003.
- CIO Magazine , Covisint's Last Chance, December 1, 2002.
- ComputerWeekly.com, Compuware buys auto industry hub Covisint, February 6, 2004.
- Compuware.com, Compuware Corporation signs definitive agreement to acquire Covisint, February 5, 2004.
- Covisint.com, FreeMarkets signs agreement to acquire Covisint auction services, December 31, 2003.
- GartnerG2.com, Covisint sheds auctions to focus on real business opportunity, January 06, 2004.
- InformationWeek.com, Covisint switching to MatrixOne apps, September 5, 2001.
- It-director.com, FreeMarkets drives Covisint forward, January 7, 2004.
- Network World Fusion, Compuware to acquire Covisint B2B exchange, February 5, 2004.
- SiliconValley.com, Compuware to acquire struggling automotive e-commerce company, February 5, 2004.
- Supplierbusiness.com, Covisint reverses out of auctions, January 2, 2004.
- Supplierbusiness.com, Covisint's demise highlights SupplyOn strengths, February 23, 2004.

2.2 Sub-sector differences in e-business usage

Hypothesis 1: Significant differences in e-business usage exist between the sub-sectors of this sector

The sub-sectors covered in this report are not homogeneous. Whereas the activities in the automotive industry (NACE 34) form a cluster of closely interrelated firms, the shipyards, the railway equipment industry, and the aircraft and spacecraft industries (NACE 35 "other transport equipment") operate in markets with rather different profiles. The car industry produces for a competitive mass market, whereas production in "other transport equipment" industries is characterised by the domination of small production lots, often individually ordered products. An interesting question is whether the different market structures, market dynamics, and production processes in the sub-sectors result in different levels of ICT usage. If significant differences prevail, it would raise questions about the usefulness of covering both sub-sectors in one report, i.e. the aggregation of e-business adoption data for NACE 34 and 35 together. Also, it may require a more detailed discussion of business and policy implications at the sub-sector level.

In this section, we compare adoption frequencies of six basic e-business technologies between the automotive industry (NACE 34) and the "other transport equipment" industries (NACE 35) in the EU-5. Exhibit 2-2 shows figures for Internet access, email usage and broadband Internet access for the two sub-sectors. In addition to the descriptive results, we conducted a T-Test[4] for significant differences in group means for each variable based on unweighted case-level data. It turns out that for the most basic technological prerequisites that enable a company to participate in e-business, having Internet access and using email, no significant sub-sector differences can be found according to the T-Test. Both sub-sectors show a very high endowment with these basic ICT applications. It can be concluded that in both sub-sectors in the EU-5, basic access to the Internet no longer constitutes a barrier to e-business usage.

This message also holds for the average bandwidth that companies in both sub-sectors have available. Around 8% of enterprises in both sub-sectors currently use broadband access technologies with more than 2Mbit/s. The last sector report (May 2004) showed that broadband access is sensitive to the size of a firm. Only 8% of micro-enterprises in the EU-5 have a broadband Internet connection with more than 2Mbit/s, compared to 46% of large enterprises. Consequently, the employment-weighted data for broadband availability are highly sensitive to the size-class distribution in an industry. The slightly higher share of employees working in a company which has broadband access in the automotive industry compared to the "other transport equipment" industries is mainly a result of the survey answers given by the few large enterprises in both sub-sectors. The aggregate differences for both sub-sectors are insignificant.

[4] The T-Test evaluates if two independent samples represent two populations with different mean values. It compares the empirical T value of the two samples with the tabled critical values of the T distribution, which is related to the normal distribution. If the result is significant, it indicates that there is a high likelihood that the samples represent populations with different mean values.

Exhibit 2-2: Equipment with basic ICT infrastructure in NACE 34 and 35

	Internet access		Use email		Bandwidth >2Mbit/s	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined transport equipment ind.	83	99	78	99	8	44
NACE 34 (automotive)	*85*	*99*	*79*	*99*	*8*	*47*
NACE 35 (other)	*81*	*99*	*78*	*99*	*9*	*36*
All sectors	76	88	68	84	15	31

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 501 (transport equipment manufacturing industries), N = 336 (NACE 34), N = 165 (NACE 35), 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.
Note: No group means significantly different at the 95% confidence level according to T-Test.

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

Exhibit 2-3 compares the group means in both sub-sectors for three basic e-business applications: ERP, which is primarily used to optimise in-house information flows, online sales and online purchasing. Both sub-sectors use online sales to the same degree, the differences being insignificant at the 95% confidence level. For ERP and online purchasing, however, we find significant differences between both groups according to the T-Test. Companies in the "other transport equipment" industries (NACE 35) seem to make more frequent use of these two technologies than their counterparts in the automotive industry (NACE 34). This result is interesting because it contradicts earlier findings (July 2002). However, the differences are negligible if enterprise-weighted data are compared. Still, these new results could indicate that the "other transport equipment" manufacturers have caught up and in some fields and regions even surpassed automotive manufacturers in terms of e-business usage. On the other hand, it should be kept in mind that the sample size of the survey was not designed to be representative at the sub-sector level.

Overall, the data analysis suggests that the equipment with ICT infrastructure and the usage of e-business tools is similar in both sub-sectors, despite the different market structures, market dynamics, and production processes in both industries. This has also been confirmed by business practitioners that operate in both industries (interview with Damian Macznik, Masterform, Sales Department). Thus, hypothesis 1 can be rejected. The aggregation of both sub-sectors is justified for the purpose of monitoring e-business developments.

Exhibit 2-3 Usage of ERP, online sales, and online purchasing in NACE 34 and 35

	ERP*		Online sales		Online purchasing*	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Combined transport equipment ind.	10	72	8	17	30	65
NACE 34 (automotive)	*10*	*69*	*9*	*18*	*30*	*59*
NACE 35 (other)	*10*	*80*	*6*	*16*	*31*	*80*
All sectors	5	19	10	16	31	46

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK). N = 501 (transport equipment manufacturing industries), N = 336 (NACE 34), N = 165 (NACE 35), 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.

*: Group means for ERP and Online purchasing significantly different at the 95% confidence level according to T-Test.

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

However, although no major differences can be found between the two sub-sectors in terms of endowment with technologies, there are still significant differences in the specific types of data standards that are being used in the sub-sectors. Furthermore, there are also numerous data standards being used within each industry. For example, there are a number of competing data exchange standards being used in the automotive industry, and these are still different from the data standards being used in the shipbuilding or aircraft industry. These different standards have been developed independently and partially reflect different needs, historical circumstances and priorities in the particular industry. However, the multitude of data exchange standards constitute a challenge for companies that could actually slow down adoption. Firms that want to comply with a certain standard usually have to invest in hardware, software, and the organisation and structure of relevant data. Small firms in particular that serve different customers and markets cannot adopt all standards simultaneously due to cost reasons, and find it hard to choose between these standards. This is illustrated in the following case study about a small Polish supplier to both the automotive and the ship building industries.

CASE STUDY: IT AT MASTERFORM

Abstract

Masterform is a small family-owned company specialising in metal processing and the manufacture of machine parts and devices. Based in Poland, the firm takes advantage of the growing trend of outsourcing production work to Central Europe. In order to increase competitiveness and meet high quality standards, Masterform has adopted various e-business solutions. Although successful in adopting IT systems to support internal processes, the firm finds it difficult to choose a system for data exchange with its customers. The variety of applications used by Masterform's customers prevent the company from adopting one particular solution.

Case characteristics	
• Sector focus	Transport Equipment, Machinery
• Business focus	Small Company, Supplier of the Automotive, Shipbuilding and Machinery Industries
• Geographical focus	International Company's Headquarter: Swiebodzice, Poland
Case objectives	
• Information Management	✱✱✱✱
• IT Standards	✱✱✱✱
• Quality Management	✱✱✱

✱ = some relevance; ✱✱✱✱ = high relevance

Background and objectives

Established in a garage in 1985 in the South-West of Poland, Masterform is a family-owned company. Back in the mid 80's, the small firm focused on metal processing and manufacturing of machinery parts and devices. Masterform has survived the tremulous transition of the Polish economy. Today the firm employs around 80 people and the list of its customers includes a few large international companies from the automobile and shipbuilding industries. The company also cooperates with a number of smaller domestic and foreign firms. In the last couple of years, Masterform has faced a growing demand for its services from foreign businesses. This reflects the increasing interest of manufacturers from the former EU-15 in outsourcing production work to low cost countries in Central Europe.

Challenged by a growing number of orders submitted by Western companies, Masterform has initiated a process of internal transformation aimed at preparing it for cooperation with foreign partners and protect it against rival firms. The firm has constantly modernised its machinery and improved production quality standards. As a result, in May 2004 Masterform obtained an ISO 9001:2000 certificate.

In order to facilitate the process of internal transformation and intensify cooperation with its customers, Masterform decided to invest in relevant IT solutions. For example, the process of quality certification required the adoption of certain procedures concerning document handling. With the aim of fulfilling the prerequisites of a quality-oriented information flow, the company decided to implement an information management system. However, although the company has been successful in reorganizing business processes with the help of IT applications, Masterform finds it difficult to implement any solution to support cooperation with external partners. The main reason for the delay of investment into a particular data exchange system is the vast variety of standards and the different requirements across the various industries which Masterform supplies. The small firm cannot adopt all the relevant standards and solutions of its customers, and finds it strategically problematic to favour one over another.

Activities

Masterform has successfully adopted a number of ICT tools to optimise internal routines. For example, an information system was implemented in order to meet and maintain the quality standards concerning document handling required by ISO 9001:2000. The implementation process of the information system consisted of three phases. Firstly, business processes were defined and analysed, after which the consulting team specified system requirements. The second phase was focused on employee- and system administrator training. In the third phase, the technology providing firm installed servers and configured user interfaces. The application is based on an MS SQL server and uses the XML standard. It allows authorized employees to get access to any document and information through LAN, Intranet, Extranet or Internet. Furthermore, the on-line version of the system enables users to enter the document database with the help of portable devices.

According to Masterform, the implementation of the system has considerably improved the process of document management and information exchange. Firstly, the flow of documents has been automated and, as a result, document processing was simplified. Accordingly, electronic handling of business documents has also reduced the need for printed documents. Secondly, due to the reorganization of business processes, some activities traditionally performed by the management and engineering workforce have been eliminated. This has released some resources that can be now used in more value-added activities. Thirdly, since the system ensures compliance with procedures and predefined rules of document flow, the number of mistakes is expected to decrease. This could lead to a reduction of administrative costs. Furthermore, the company reckons that the system has introduced new standards in company management and, in a longer perspective, will contribute to the improvement of its performance and competitiveness. Thus, Masterform expects that the internal transformation will help it strengthen its market position and acquire new customers.

Considering the size of the company, Masterform seems to have gathered extensive experience in IT use. Apart from the information management system discussed above, the firm operates an engineering programme supporting design and manufacture processes. Having gained an advantage from applying IT in business processes, Masterform plans to further extend the scope of business activities supported by IT solutions. In the near future the firm intends to reorganize its marketing, sales and customer service operations. In order to facilitate this process, adoption of a Customer Relationship Management application is planned.

Recognizing the importance and value of e-business, Masterform also considers further adoption of IT solutions supporting data exchange with external organizations. At present, the firm expects that its IT architecture will evolve towards Electronic Data Interchange systems. According to Robert Zawadzki, CEO of Masterform, implementation of such a system would significantly improve the quality of communication with a company's customers, as well as increasing the speed of information exchange. However, due to its many partners and customers representing different industries, Masterform finds it difficult to choose an application that would enable it to conduct business with every customer. The company admits that the choice of application becomes a hurdle primarily because of the variety of standards applied across industries. Masterform's customers in the automotive industry already use a variety of standards including EDIFACT, VDA and ODETTE. Additional standards are used by Masterform's customers in other industries, for example in shipbuilding. Thus, any decision concerning the adoption of a data exchange system implies very close cooperation with one or only some business partners. This, however, would pose a significant risk for a small company because it would limit its activities to a certain market segment and eventually narrow opportunities to leverage fluctuating demands by doing business with customers from various industries.

Industry exchange platforms and online marketplaces might offer a partial solution to the standards dilemma. Being based on non-proprietary Internet technology, they would not require substantial investments and would enable cooperation with a greater number of business partners. In fact, Masterform reports that some large customers require that every piece of business correspondence must be exchanged over a particular industry exchange platform, for example SupplyOn. Confronted with such prerequisites for doing business, the small firm will thus be forced to join some industry data exchange platform in the future.

Lessons learned

Despite its size, Masterform dynamically adapts to new market conditions and follows the recent industry trends. In order to meet high quality standards and to increase its competitiveness, the firm uses e-business solutions to improve internal processes. However, Masterform currently still hesitates to adopt any system for external communication and data exchange. The lack of a common system in most industries together with considerable up-front costs of the investment for various applications currently still hinder the implementation of a data exchange standard by the small firm.

Sources and references

- www.masterform.pl
- Project documentation provided by Masterform, May 2004.
- Correspondence with Robert Zawadzki, CEO of Masterform, May 2004.
- Telephone interviews with Damian Macznik, Sales Department, Masterform, June 2004.

2.3 E-business and innovation

Hypothesis 2: E-business technologies enable innovations

The purchase of a new technology alone does not immediately lead to efficiency gains or other positive impacts. The new technology must be implemented in the firm, which often requires a re-organisation of routines and processes, i.e. process innovations. E-business technologies might also be used for marketing purposes or to offer new services or products to customers. The case studies at the end of this section provide detailed real-life examples of how e-business technologies can be used to conduct innovations in various parts of a company. For example, the case study on Wix-Filtron demonstrates how a supplier of filters to the automotive industry has changed information flows and processes by the implementation of a CRM system to better monitor and control customer-related information and to improve customer service. The case study on Blaupunkt shows how the adoption of an online shop solution and its watchful implementation and continuous further development has changed ordering processes significantly and enabled the company to reduce operating costs and to improve the relationship with Blaupunkt's customers.

In previous sector reports it was pointed out that it is not information technology *per se* that determines the economic impact of e-business, but rather what companies decide to do with it (July 2002). Thus, it is necessary to combine technology adoption with process or product/service innovations to realise economic gains from the investment. Hardware and software tools offer a set of technologically feasible opportunities. Its potential will most likely keep increasing due to constant further developments and technological improvements. However, technology is flexible and the extent to which it is implemented and used to change existing procedures and product or service offers depends on the strategic decision of firms in the sector, and their ability to successfully manage and complete change processes. We hypothesise that a large share of companies that adopt e-business technologies use these technologies to conduct process innovations or to create new product or service offers.

The *e-Business W@tch* survey conducted in November 2003 contained for the first time questions regarding the innovative activities of firms. Two introductory questions asked to every subject elicited whether a company had introduced substantially improved products or services to its customers during the past 12 months. The question was also asked if the company had introduced new internal processes during the past 12 months. These introductory questions were adopted from the Community Innovation Survey (CIS)[5] to determine the share of companies in the sector that recently introduced product or process innovations. The advantage of adopting the questions from CIS is that it enables us to use a well accepted and matured survey instrument.

In addition to the introductory questions on innovation, we were particularly interested to find out the share of innovative activity that is directly related to or enabled by Internet-based technology. Therefore, companies that indicated in the introductory questions that they have conducted innovations in the past 12 months were asked follow up questions. The results for the transport equipment sector are shown in exhibit 2-4.

36% of enterprises in the sample introduced substantially improved products or services to their customers in 2003. Roughly one third of these product innovations has been directly related or enabled by Internet-based technology. This corresponds to 14% of enterprises in the sample that have introduced Internet-based product or service innovations in 2004.

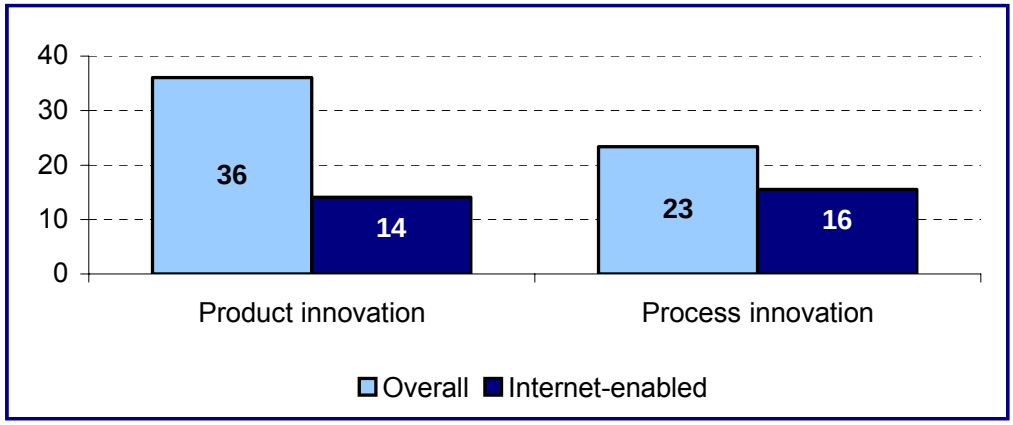
[5] CIS - http://www.cordis.lu/eims/src/cis.htm

These figures underline the current importance of the Internet and e-business technologies as drivers of innovation and change.

The importance of the Internet is even more pronounced for process innovations in the transport equipment sector: 23% of enterprises introduced new internal processes in 2003. About two thirds of these process innovations were directly related to or enabled by Internet-based technology.

Thus, we can conclude that the Internet is currently an important enabler of innovation in the transport equipment sector and that many firms actually make use of ICT to conduct process innovations or even to offer new products or services to their customers.

Exhibit 2-4: Innovation in the Transport Equipment Sector 2003



Base: all enterprises, unweighted. Reporting period: November 2003. Data from EL, AT, PT, SE, CZ, EE, HU, PL. N = 581.

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

CASE STUDY: CRM AT WIX-FILTRON, POLAND

Abstract

Wix-Filtron is an international supplier of filters to the automotive industry. Serving a wide range of customers, the company lacked a centralised customer data management. To solve this problem, the firm decided to implement a CRM application. The new system improved the flow of information, and enabled the better monitoring and control of business processes. Furthermore, the system deployment increased the quality of customer service and reduced sales and marketing costs.

Case characteristics	
• Sector focus	Transport Equipment
• Business focus	Large Company, Supplier of the Automotive Industry
• Geographical focus	International, Company's Headquarter: Gostyn, Poland
Case objectives	
• Information Management	✱✱✱✱
• Improvement of Customer Service	✱✱✱
• Streamlining of business processes	✱✱

✱ = some relevance; ✱✱✱✱ = high relevance

Background and objectives

Wix-Filtron is a company specialising in the production and distribution of filters applied in the automotive and machine industries. Established in 1982 in Gostyn, Poland, the company became a part of DANA Corporation, USA, an international supplier of the automotive and manufacturing industries in 1997. Currently, Wix-Filtron employs around 600 people and sells nearly 20 million items, which generates over PLN 100 Million (2 m Euro) in annual revenues. During the last 20 years the company achieved a sound position in the domestic market where its share accounts for 37% of total sales of filter products. In addition, the company has developed its presence on international markets and today more than half of its production is exported to a number of countries in Europe, the Americas, Asia and Africa. The company supplies some of the biggest OEMs, including Ford, GM, the VW-Group, and others.

Following its motto, "Leader through Quality", the company strives to achieve an advantage over competitors by carefully implementing the principles of TQM (Total Quality Management). As a result, it has been one of the first Polish enterprises awarded with such quality certificates as ISO-9001, ISO-9000 or QS-9000.

Confronted with new challenges from a globalized market, the company realised the importance of Information Systems in business and, as a result, adopted an Enterprise Resource Planning (ERP) system in 2000. In addition, in order to reach a wider range of customers, the firm offered its product catalogue online.

Supplying a number of customers worldwide, it was critical for the company and its future expansion plans to have immediate access to all relevant information on its customers. However, the traditional procedures and paper-based workflows significantly hindered every effort to better utilise the available information and to improve the quality of customer service. The company's management came to the conclusion therefore that these obstacles could be removed by introducing a specialised data management system.

"*High level of customer service, fostering good relationships with customers, analysis and assessment of these relationships, together with an active acquisition of new customers constitute the core of our business"*, says Tomasz Grabias, Sales Director at Wix-Filtron. "*Objectives, which we had defined before implementation, included collection of complete information on customers and products; obtaining information on customer's structure; immediate access to multifaceted information on sales plans and development; improvement of information flow; improvement of document flow and processing; and better control over business processes."*

The main aims of the new system were to improve the flow of information, and to increase the quality of customer service. Furthermore, because the company's customer base includes a variety of buyers, the company needed an efficient tool for customer structure analysis, which would also enable the comparison of prices of competitive products. In order to achieve these aims, the company decided to bring together all issues concerning its customers into a centralised database. The new application also needed to be compatible with existing business IT systems, i.e. the ERP application and the internal mail application. Thus, in 2002 Wix-Filtron decided to implement a CRM (Customer Relationship Management) application.

Activities

Project description

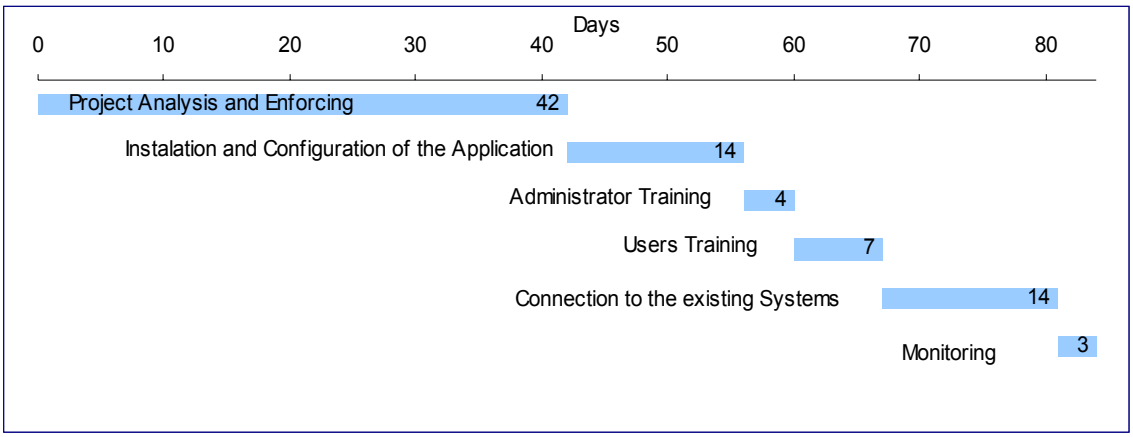
In accordance with companies' requirements, Wix-Filtron appointed a domestic technology provider, Logotec Enterprise S.A., Wroclaw, to implement its standard CRM system. The entire project was scheduled for three months and comprised the activities presented in Exhibit 2-5. Within the pre-implementation phase, the company's business processes were examined and, in accordance with the requirements, system specifications were configured. It was decided that the application would enclose the front office business units, i.e. the marketing department, the national sales department, the export department, the key customers' service department, the OE (Original Equipment) department, and, in addition, the management board. Having continuous access to the current sales developments, the top managers can use the application as a monitoring and decision supporting tool. The group of final users was predicted to contain 20 employees and managers altogether.

To facilitate access to current information, the application is provided with the state-of-the-art sales data from the ERP system once every 24 hours. In order to integrate the CRM system with the ERP application, the transfer of relevant data is supported by DTS (Data Transformation Services), an application facilitating data migration from one database to another. Exploiting the data, the CRM system can generate reports on sales, payments, customers' structure, and assortment.

Further activities performed during the implementation project included training for administrators and end-users, creating an interface with the ERP and the mail systems, and final monitoring.

The major technical problem encountered during the project concerned the collection of information required by the new application. Previously, various pieces of information were stored in separate forms and applications. An effective use of the CRM features involved assembling the dispersed information and converting it into the format used by the application. Furthermore, connecting the new system to the existing ones required some additional effort. Despite these obstacles and financial constraints, the project was completed on time and within budget to full satisfaction of Wix-Filtron.

Exhibit 2-5: Implementation of the CRM System at Wix-Filtron



Source: Logotec Enterprise S.A., Wroclaw

Results

The primary objective of the project – creation of a complete information base on a company's customers – was successfully fulfilled. Currently, every entitled employee is able to immediately obtain a profile of every company's customer, which includes contact data, list of employees responsible for the relationship, and a record of dealings with the customer. This feature enables employees who have not dealt with a particular business partner before to immediately get an overview of past transactions and, if necessary, to prepare an ad-hoc business meeting. Having this information at hand, employees can thus primarily concentrate on customer support and not on information search.

"Although the company's ERP system significantly improved internal workflows and disposed of extensive features supporting sales, procurement and manufacturing processes, it was the implementation of the CRM application which made us exempt from the traditional paper-based customers' information management." says Aurelia Kaczmarek, Head of Marketing Department at Wix-Filtron. *"This has also considerably improved the quality of customer service. Our staff does not need to struggle any more with paper files every time they have to record, search or extract a piece of information about our customers. All they need is available at one click."*

Apart from the basic information on a company's customers, the system allows a real-time access to the strategic information on sales plans and developments broken down by separate customers. This enables more time and resources to be devoted to the most profitable customers. Thus, the system enabled the transformation of separate

pieces of information on customer relationships into valuable knowledge. For example, it is possible to analyse the structure of different customer groups, i.e. final users and re-sellers. As a result, it became easier to define relevant target groups, which allows marketing activities to be optimised and, thus, to efficiently utilise resources.

The implementation of the CRM system improved information flows within the company. The application allows having a complete overview over the entire business correspondence. It has also streamlined the documents flow along business processes and helped to monitor work progress at every stage of document processing.

Some features of the system make it suitable for use in other business activities. For example, the accurate information on sales generated with the help of the system allows future production and sales to be precisely assessed. Furthermore, since the application also delivers information on workforce performance, it has also been used for reporting purposes.

Lessons learned

After over 1.5 years of using the CRM system the company's employees express full satisfaction with the application. The major targets have been achieved and the system is constantly used in everyday business. In addition, Wix-Filtron is considering further extension of the system to a larger number of employees.

Although there are no estimates of cost savings or other forms of formal evaluations of the investment, the application has delivered some visible benefits. Above all, the system introduced new ways of customer information management, thus considerably improving the quality of customer service. Furthermore, it is believed that the reorganization of customer management processes increased the firm's performance and strengthened its market position.

Sources and references

- www.wixfiltron.com.pl
- Project description obtained from Artur Górecki, Vice-President of Logotec Enterprise S.A., Wroclaw, www.logotec.pl, May 2004.
- Telephone interviews with Aurelia Kaczmarek, Head of Marketing Department at Wix-Filtron, June 2004.

CASE STUDY: BLAUPUNKT EXTR@NET

Abstract

Blaupunkt, one of the world's leading and most innovative producers of car infotainment equipment, implements various e-commerce application to improve its performance. For example, in order to optimise procurement activities, the firm has participated in industry initiatives such as SupplyOn. Furthermore, since the mid 90's Blaupunkt has successfully operated its online retail channel - Extr@Net. Designed for online sales, the platform has significantly reduced operating costs and improved the quality of relationships with Blaupunkt's customers.

Case characteristics	
• Sector focus	Transport Equipment
• Business focus	Large company, supplier of the automotive industry and the automobile aftermarket
• Geographical focus	International, Company's headquarter: Hildesheim, Germany
Case objectives	
• Information Management	✱✱✱✱
• Automation of Internal Processes	✱✱✱
• Improvement of Customer Service	✱

✱ = some relevance for case; ✱✱✱✱ = high relevance

Background and objectives

The history of Blaupunkt dates back to the 1920s, when the company started to produce headphones under the brand name "Ideal". Every manufactured product was thoroughly examined and, after passing the internal quality control, marked with a blue dot – Blaupunkt. Before long the symbol of the blue dot was associated with high quality and innovation and became both the company's trademark and its name. Paving the path for later generations of car audio systems, in 1932 Ideal presented the Blaupunkt AS 5, the first European car radio. Over the years, the firm had introduced many innovative products and continuously broadened its product range. In the thirties, the company was acquired by the Bosch Group, currently one of the most prominent producers of automotive technology. Today, Blaupunkt is part of the automobile equipment manufacturing unit of the Bosch Group. Located in Hildesheim, Germany, the Blaupunkt owns production facilities in Germany, Hungary, Malaysia, Tunisia and Portugal, and employs around 7,500 people worldwide. Specialising in the production of electronic equipment for the automotive industry, the firm ships over 5 million car radios and half a million navigation systems around the world annually. In the last couple of years Blaupunkt's strategy has closely followed the advance of one of the important trends in the car industry – infotainment. As a result, the company's focus

has widened from offering car audio systems to developing mobile telephony, traffic messaging, global positioning systems and navigation systems, which enables driving routes to be automatically optimised.

Due to stiff competition in the industry, Blaupunkt has not confined itself to introducing innovative products but has also sought more efficient ways of performing business activities and serving its customers. A reflection of these efforts is the history of company's experience with information technologies. In the middle of 1990's, Blaupunkt worked with the traditional EDI (Electronic Data Interchange) and BTX[6] (Videotext) applications, just like most companies in the sector at that time. With the arrival of the Internet, Blaupunkt recognized that it offered fundamentally new methods of organizing business processes and approaching customers. Consequently, Blaupunkt started to procure goods over some of the online platforms for the automobile industry. Furthermore, the company launched its own e-commerce initiative for online sales.

"We realised early on that EDI and BTX were limited technologies, therefore we looked at e-business to intensify customer ties and simplify business with our reseller channel," says Andreas Franke, e-commerce Project Manager at Blaupunkt. *"Furthermore, the conventional tools allowed us to work only with large partners who could afford the costly tools, whereas the new medium enabled us to cooperate with our smaller customers."*

Thus, Blaupunkt decided to initiate Extr@Net, its own website for selling products to business customers. However, the project's aim was not only to develop an Internet-based sales channel. Above all, the new medium was meant to improve relationships with business partners and serve as a way of delivering value-added services and support to customers.

Activities

The first milestone on Blaupunkt's e-commerce roadmap was traversed in September 1996, when the company established its Internet presence. The introduction of this solely informative service was further followed by another deployment of the Internet for business use. In July 1998 Blaupunkt launched Extr@Net, its new e-commerce solution for the retail channel. At first, the platform's reach was limited to Blaupunkt's partners located in Germany. However, due to a high level of acceptance, access to the application was successively extended over other countries and geographical regions. Since 2003 Extr@Net can be used worldwide and, in addition, the application has been adapted to be used by field sales staff. Despite the global reach of the platform, Blaupunkt has not adopted a one-for-all approach. Instead, the firm makes sure that country specific characteristics are also taken into account while configuring product offers for certain countries.

The e-commerce solution for Blaupunkt's resellers offered a number of features that transformed the way the company communicates and deals with its customers. Traditionally, orders were placed by phone or fax. After the introduction of Extr@Net, with its 24/7 availability, retailers could practically eliminate these traditional ways of communication. The ease of interactions was further boosted by such online functionalities as shopping basket, checking of order status, distribution of marketing collateral and technical information, delivery of the most recent product information,

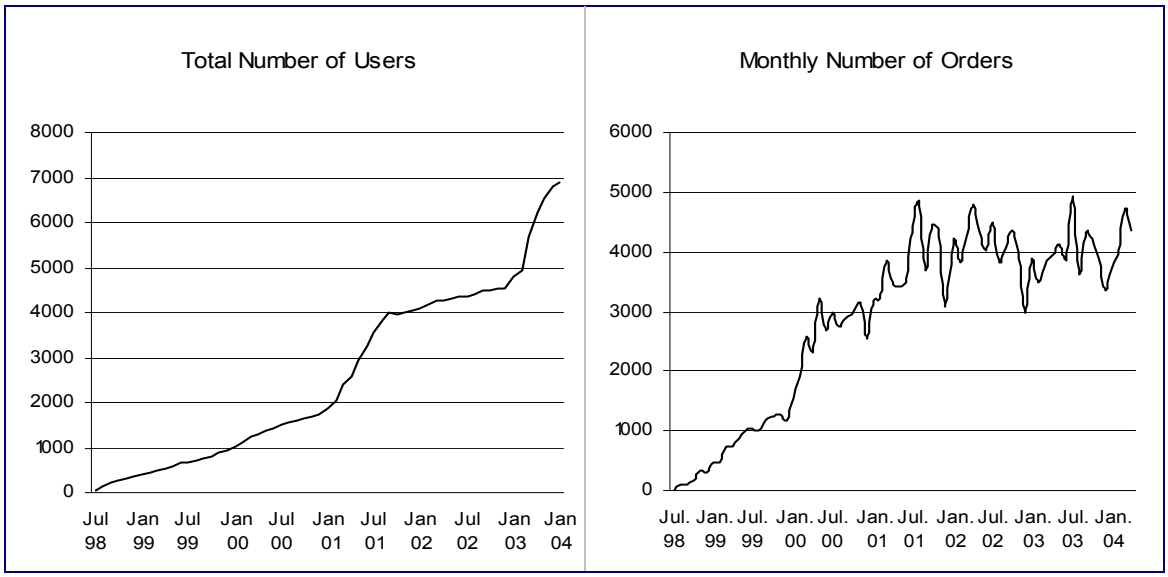
[6] BTX – Bildschirmtext (eng. Videotext). Service offered by Deutsche Telekom for individual communication.

promotion of merchandizing collections, and the integration of BIRDS (Bosch Integrated Retail and Distribution System). Using Extr@Net, Blaupunkt distributes all relevant information about its products including photos, text, and technical drawings for ordering spare parts. In the future, the company aims to eliminate circulation of paper documents. Furthermore, Extr@Net enabled the integration and automation of internal business processes. As mentioned above, in the past the ordering process was triggered by a customer's phone call or fax. Nowadays, due to the integration of Extr@Net with the internal information system supporting the exchange of data between the mainframe and the front office, the entire process is performed automatically.

In introducing Extr@Net, Blaupunkt intended to create a new dialogue system with its partners. The platform enabled a 24/7 access to Blaupunkt's products and services that, together with other features, increased the intensity and quality of the interactions between the firm and its business partners. Furthermore, since the customers are able to access the original data, the application facilitates a trustworthy business environment. On the other hand, due to closer relationships with the customers, Blaupunkt benefits from more accurate and consistent information about the partners.

However, the Extr@Net take-off was far from immediate (see exhibit 2-6). According to Andreas Franke, due to the high cost of Internet connection, companies were reluctant to use the Extr@Net services in the early days. In the first year of operation the innovative process of ordering was adopted by nearly 1,000 users. It was not until the beginning of the Internet hype that the platform gained wide acceptance among Blaupunkt's customers. From the beginning of 2001 the number of users significantly increased and today there are around 7,000 firms registered on the site who use it for ordering Blaupunkt's products and spare parts. Thus, over 90% of Blaupunkt's customers use the e-commerce solution. The growing number of users increased the number of orders (see exhibit 2-6) and currently around 4,000 orders are placed over Extr@Net every month, which accounts for nearly 50% of total orders.

Exhibit 2-6: Use of Blaupunkt's Extr@Net between July 1998 and January 2004



Source: Blaupunkt

Andreas Franke is convinced that e-commerce allows Blaupunkt to achieve a competitive advantage over rival companies. Due to Extr@Net, Blaupunkt is able to

commit more resources to value-added activities in marketing and sales such as consulting, customer care, service, and acquisition of new customers. The implementation of the e-commerce solution considerably simplified order processing and increased convenience for customers. *"The e-commerce platform has also contributed to a considerable reduction of operating costs,"* says Andreas Franke. *"Every day there are around 600 log-ins to Extr@Net. It is easy to imagine what amount of manpower it would take to process such a number of phone calls and faxes"*.

Lessons learned

Blaupunkt chose a watchful approach when it first started to adopt e-commerce solutions. At first, the company limited the reach of Extr@Net to Germany. Having time to observe the development of the service, Blaupunkt was able to correct possible errors encountered in the early stages of the technology use and adopt it to the customers' needs. As the level of Internet diffusion increased, the company was able to successively extend the range of countries covered by the platform. The process of expansion was further intensified by customers who demanded access to the new medium. Thus, Blaupunkt, faced with pull-demand, needed only to increase the technological capacities without excessive investing in promotion of the new technology.

The solution has enabled Blaupunkt to further strengthen the relationships with its customers. However, despite the general success of the sales platform, the company does not consider allowing end-users to purchase products directly from Blaupunkt. The company believes that, due to a high level of product complexity, it is not desirable to omit the resellers who have experience and knowledge about products and, thus, are able to professionally advise the final user on Blaupunkt's car equipment. Hence the firm wants to further foster the relationships with its retail network with the help of Extr@Net.

All in all, Blaupunkt's e-commerce initiative is considered a success. The new platform for ordering processes has been widely adopted by firms' customers and the number and volume of online orders have been steadily growing. The company hopes that in the near future Extr@Net will completely eliminate printed documentation and the traditional ways of communication in the order processing activities.

Sources and references

- http://www.blaupunkt.com
- http://www.intershop.com, Blaupunkt Chose Enfinity to Sell to Businesses.
- http://www.intershop.com, Intershop Success Story: Blaupunkt.
- Franke, A. 2004. "Experience and Success. eCommerce bei Blaupunkt", Blaupunkt.
- Telephone interviews with Andreas Franke, eCommerce Project Manager, Blaupunkt, May 2004.

2.4 Innovation and financial performance

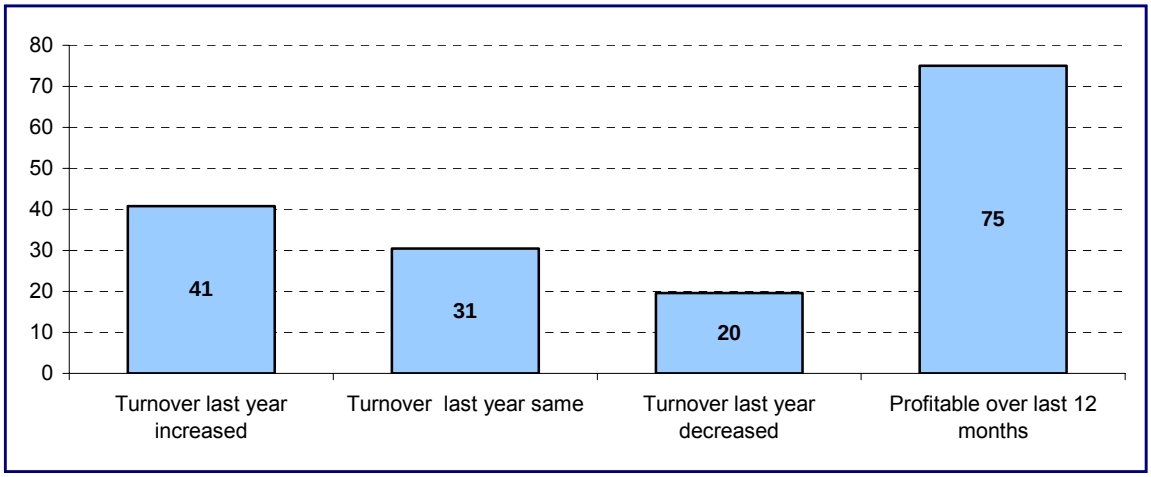
Hypothesis 3: Innovations, both Internet-related and non Internet-related, are positively associated with financial performance.

The adoption of new technologies such as e-business can result in business success in two basic ways: (1) efficiency gains via process innovations – this corresponds to an outward shift of an existing supply function; (2) the creation of new products or services – this corresponds to the creation of a new supply function. In both cases, firms that succeed in these endeavours should experience increasing turnovers, profits, and market shares, ceteris paribus.

The joint occurrence of innovations, increasing turnovers and profitability can be tested on the basis of data from the November 2003 *e-Business W@tch* survey. One particularly interesting question is what specific kind of innovation is most frequently used by the more successful companies in the sectors.

Exhibit 2-7 shows the financial performance of enterprises in the transport equipment industries in 2002/2003. 41% of firms in the sample experienced increasing turnover in this period. 31% report unchanged turnover in 2003 compared to 2002, and only 20% report decreasing revenues. A very high share of companies (75%), state that they have been profitable over the last 12 months prior to the survey (Nov. 2003).

Exhibit 2-7: Financial performance of enterprises in the transport equipment manufacturing sector 2002/2003



Base: all enterprises, unweighted. Reporting period: November 2003. Data from EL, AT, PT, SE, CZ, EE, HU, PL. N = 581.

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

Exhibit 2-8 shows how these financial performance parameters correspond to the six types of innovative activities that were captured by the *e-Business W@tch* survey in November 2003:

- Product or service innovations – any kind
  - Product or service innovations – general (not Internet-related)
  - Product or service innovations – Internet-enabled
- Internal process innovations – any kind
  - Internal process innovations – general (not Internet-related)
  - Internal process innovations – Internet-enabled

The variables in the dataset were recoded as dummies and Kendall-Tau-b[7] correlation coefficients were calculated using unweighted individual level data.

Not surprisingly, increasing turnover and profitability are strongly positively correlated. Vice versa, decreasing turnovers are negatively associated with profitability at the 99% confidence level.

At the most general level, without differentiating between Internet-enabled and non-Internet-enabled innovations, it turns out that both product and process innovations are positively correlated with increasing turnovers. This is as expected and shows that growing companies are more innovative than companies with stagnating or decreasing turnovers. One should keep in mind that the direction of causality is not easy to determine, primarily because the data from the survey compare innovative activities and financial performance for the same time period (the questions in the survey refer to developments in the last 12 months prior to the poll). Thus, it is not possible to conduct a rigorous empirical causality test. Theoretically, it could be that companies are growing faster *because* they conducted successful innovations, or that companies innovate *because* they have better liquidity and access to financial resources due to previous growth. In any case, our results clearly show that companies with increasing turnover are significantly more innovative than enterprises with stagnating or decreasing turnover.

At a more detailed level, differentiating between Internet-enabled and non-Internet-related types of innovation, exhibit 2-8 shows only weak and insignificant correlations with the financial performance dummies. However, most of the results show the expected sign. All four differentiated innovation dummies are positively associated with increasing turnovers, and negatively with steady or decreasing turnovers. They are also positively correlated with increasing profitability, with the exception of Internet-enabled internal process innovations which shows a negative coefficient. The reason for the insignificance of these correlation results lies in the small absolute number of positive observations (for each kind of innovation) in this sector. We conducted the same exercise using data from all sectors of the survey – and in this case, with much more observations, all innovative activities (aggregated and differentiated according to type of innovation) turned out to be significantly correlated with financial success. These results will be reported in the upcoming final report of the project during the summer of 2004.

Another important issue is that all kinds of innovations need some time to affect financial performance and could therefore be much more strongly correlated with financial performance measures if a time lag is taken into account. This is probably also the reason why none of the types of innovations turned out to be significantly correlated with profitability. Investments into ICT, process changes, and new products simply need time to pay off and to show up as profitability in the balance sheets. Unfortunately, it has not been possible to conduct a statistical test that includes time lags with the currently available survey data[8].

Another interesting pattern becomes visible in exhibit 2-8. There is a strong significant positive correlation between non-Internet-enabled product innovations and non-Internet-enabled process innovations. Similarly, Internet-enabled product and Internet-enabled

[7] Kendall's Tau is a measure of correlation between two variables. It can take values between -1 and 1. If two variables are totally independent, Kendall's Tau takes a value of 0. If two variables are identical (always occur together), Kendall's Tau takes a value of 1 and a value of -1, if they always occur together but with reversed signs.

[8] Theoretically, a possible solution would be to organise forthcoming surveys of the *e-Business W@tch* as a panel that interviews the same companies over several time periods. This would add a reliable, dynamic perspective to the data.

process innovations are also positively correlated at a high level of significance. On the other hand, Internet-enabled innovations are negatively associated with non-Internet-related innovations. Hence, it appears that there are two clusters of firms in the automotive industry: those that use the Internet extensively to conduct both product/service and internal innovations, and those that also innovate in both domains, but without using the Internet. This is quite interesting and demonstrates that companies have various strategic options to gain competitive advantages. From the remaining correlation results it is unclear which of these two clusters actually performs better financially, since the coefficients are not significant. Judging only by the absolute size of the coefficients, it could be that the cluster that innovates intensively without using the Internet outperforms the IT-savvy innovation cluster. However, no strong conclusion can be drawn since the effects are all insignificant.

Exhibit 2-8: Correlation of innovative activities and financial performance

	Turnover increased last year	Turnover same last year	Turnover decreased last year	Profit in last 12 months	Product innovations – general	Product innovations – Internet-related
Profit in last 12 months	0.349**	0.019	-0.266**			
Product innovations – any kind	0.090*	-0.097*	-0.037	0.063		
Product innovations – general	0.068	-0.070	-0.029	0.053		
Product innovations – Internet-related	0.036	-0.043	-0.014	0.017		
Internal innovation – any kind	0.099*	-0.079	0.056	0.028		
Internal innovation – general	0.079	-0.039	-0.058	0.075	0.329**	-0.096*
Internal innovation – Internet-related	0.042	-0.056	-0.008	-0.050	-0.164**	0.400**

Kendall-Tau-b correlation coefficients ; * significant at 95%, ** significant at 99%.
N = 581. Base: all enterprises (unweighted); EL, AT, PT, SE, CZ, EE, HU, PL and 21-104 per country.
Reporting period: November 2003

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

2.5 Performance effects of various e-business technologies

Hypothesis 4: Not all e-business technologies lead to equally important performance gains.

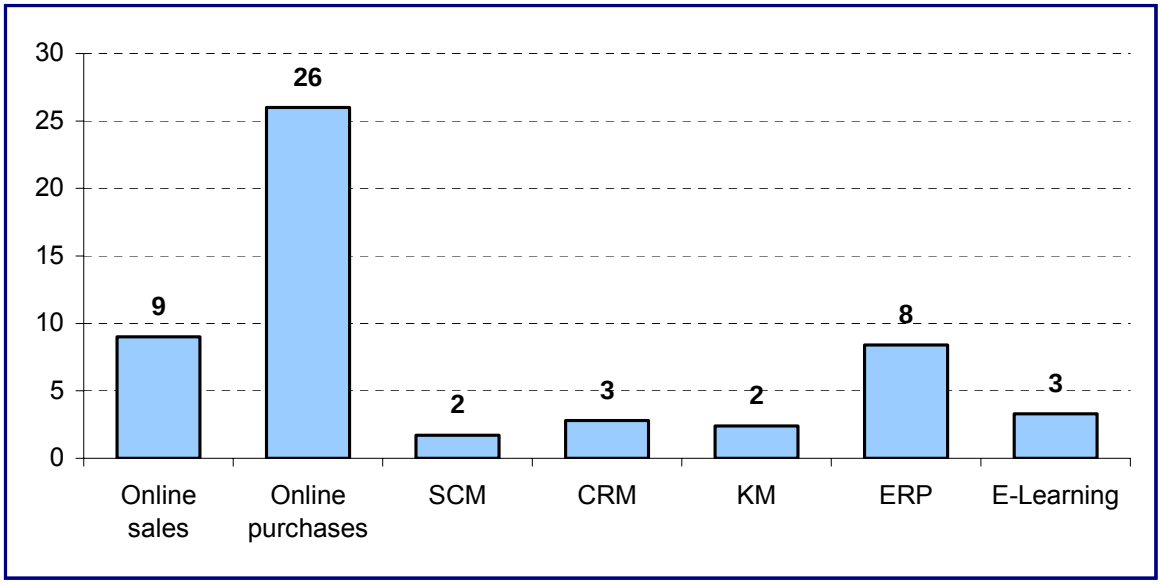
One can view e-business as a set of related technological tools that are jointly based on one unifying paradigm – the Internet. Each of these tools serves the purpose of supporting specific activities within an enterprise and/or between the enterprise and its environment. The adoption of these new technologies within firms often requires the re-organisation of internal procedures. Similarly, the new technologies can also be used to offer new customer services or to develop entirely new products. It was shown in section 2.3 that Internet-based technologies are currently important enablers of both process and product innovations in the transport equipment industry. However, not all e-business tools necessarily have the same potential for creating economic value for an enterprise. This section takes a more detailed

look at several specific technologies, and how their adoption is associated with financial performance.

It is well known that there is usually a time lag between investments into technology adoption and actual performance improvements of an enterprise. Hence, for the analysis in this section, we make use of the fact that the *e-Business W@tch* contains information about when firms have adopted certain technologies. This way, we account for a possible time lag between adoption and investment payoff by correlating financial performance last year (2003 relative to 2002) only with technology adoptions that took place before 2003[9].

Exhibit 2-9 shows how many enterprises in the sample had adopted different e-business technologies before 2003 (unweighted results). Only online purchasing was a widely used application in the transport equipment sector before 2003 (26%). Online sales and ERP were only used by 9%, respectively 8% of enterprises in the sample before that time. All other tools for which pseudo-time-series data are available were niche applications with not even 4% of enterprises in the sample having adopted them before 2003.

Exhibit 2-9: E-business technologies adopted before 2003 in the transport equipment sector



Base: all enterprises, unweighted. Reporting period: November 2003. Data from EL, AT, PT, SE, CZ, EE, HU, PL. N = 581.

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

Exhibit 2-10 correlates dummy variables again. The technology dummy variables were coded as “true”=1, if a company had adopted the technology before 2003 and “false”=0 otherwise. It turns out that online sales and online purchasing adoption before 2003 are significantly correlated with increasing turnovers from 2002 to 2003. Thus, companies that were early adopters of these technologies were significantly more likely to experience revenue growth last year. The slightly higher coefficient of online sales suggests that this application had a stronger positive impact on increasing turnovers than online purchasing.

None of the technologies correlate significantly with profitability. This means that increasing turnover does not necessarily correspond to profitability. The early adoption of e-business

[9] A more detailed time-lag model is not possible at the sector level because of the small absolute number of adoptions before 2003.

technologies seems to be a strategy more frequently chosen by high-growth enterprises than by companies purely focused on short-term profitability.

Finally, none of the other technologies (except online purchasing and online sales) significantly correlate with any of the financial performance variables. For example, the adoption of ERP does not show any significant effects, although ERP systems showed a similar degree of diffusion as online sales before 2003. The remaining insignificant results could simply be the consequence of the very small number of firms in this sample that have actually adopted these technologies before 2003 (see exhibit 2-9). Therefore, no strong conclusions yet can be drawn on these technologies. Results may, however, look different in a year or two, if more companies have adopted these applications.

The analysis presented here seems to support hypothesis 4: only two out of seven technologies correlate significantly with financial performance. Thus, not all e-business technologies seem to have the same potential to create economic value for all enterprises.

Exhibit 2-10: Correlation between technology adoption and financial performance[1]

	Turnover increased "yes"	Turnover same "yes"	Turnover decreased "yes"	Profit "yes"
Online sales	0.120**	-0.077	-0.033	0.028
Online purchases	0.099*	-0.043	-0.065	0.070
SCM	0.052	-0.030	0.001	-0.015
CRM	0.032	-0.020	-0.004	0.024
KM	0.007	0.042	-0.049	0.013
ERP	0.038	-0.012	-0.025	-0.040
E-Learning	0.044	0.025	-0.042	0.017

[1] Technologies adopted before 2003

Kendall-Tau-b correlation coefficients ; * significant at 95%, ** significant at 99%
N = 581. Base: all enterprises (unweighted); EL, AT, PT, SE, CZ, EE, HU, PL and 21-104 per country.
Reporting period: November 2003

Source: e-Business W@tch (2004)

2.6 Innovation and employment

Hypothesis 5: Process innovations are associated with employment reduction, while product innovations create new jobs.

The widespread adoption of new technologies such as e-business also has impacts on labour demand. Firstly, new job opportunities become available for individuals with technology (e-business) specific skills throughout all sectors that make use of the technology.

But there might also be sector-specific employment effects. For this reason it is important to distinguish between the technology supplying sectors from the technology using sectors. The widespread diffusion of new technologies normally leads to employment growth in the technology supplying sector. For the technology supplying sector, the new technologies are essentially product or service innovations. In economic terms, this is equivalent to the creation of a new supply function (a new market) that needs labour input. Generally, the faster these markets grow (i.e. the faster the new products or services gain acceptance in the market), the more employment growth can be expected.

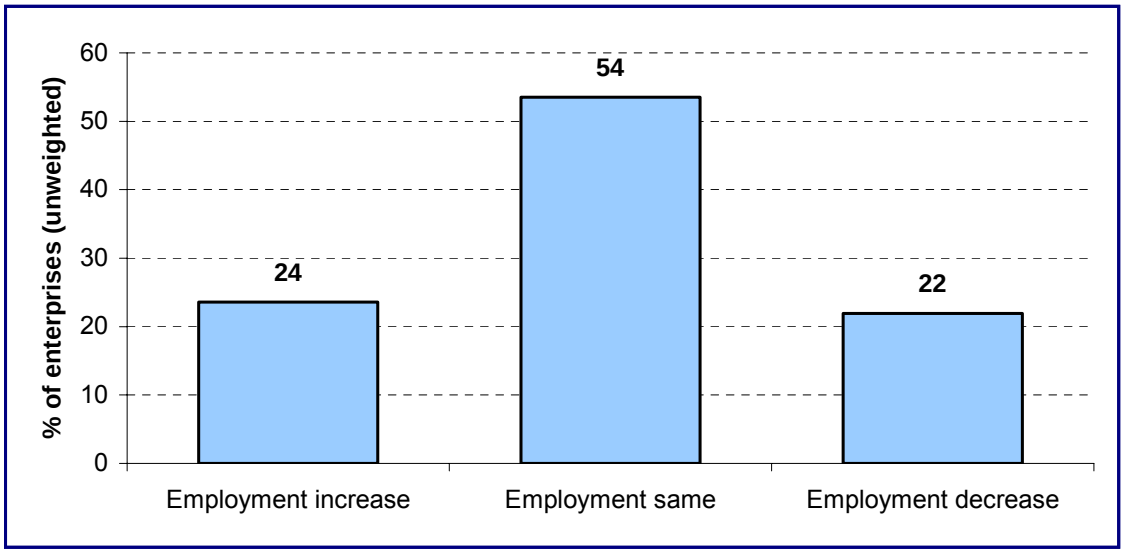
However, the employment effects are more complex in the technology using sectors. Let's say an enterprise adopts a new technology with the purpose of optimising its internal routines, in order to conduct a technology-induced process innovation. In this case, it could be that the efficiency gains of these process innovations are mainly accomplished by automating business routines that were formerly carried out by employees, eventually leading to a substitution of labour by capital. Thus, the widespread adoption of e-business technologies might actually lead to a reduction of some administrative office jobs. On the other hand, the enterprise might be required to hire additional staff with the competence to run and maintain the new technology. Finally, if the technology is successfully implemented and eventually leads to productivity gains, this could result in the overall growth of the enterprise via the market feedback mechanism. In economic terms again, this would be an outward shift of an existing supply function. Ultimately, this could lead to a higher demand for labour in various divisions of the enterprise. Thus, the net employment effect of a technology-induced process innovation is hard to evaluate a priori.

Finally, the new technologies could also be adopted to conduct technology-induced product or service innovations. An example would be a car parts supplier who decides to adopt an online shop technology as an additional sales channel. This would be a technology-induced service innovation that could allow customers to get real-time quota of prices and availability, and eventually to speed up ordering processes and delivery time, possibly leading to higher customer loyalty or a competitive advantage vis-à-vis competitors. Such types of product or service innovations either improve existing offers significantly (which is again an outward shift of an existing supply function) or create entirely new markets (a new supply function). Comparable to product or service innovations in the technology-supplying sectors, positive employment effects of these innovations could also be expected in the technology-adopting sector.

To summarize, we can expect positive employment effects of product or service innovations, whereas the employment effects of internal process innovations could be either positive or negative. We can test these hypotheses for the transport equipment sector using data from the November 2003 survey of the *e-Business W@tch*, which includes variables on innovative activities of firms and on the development of employment within firms.

Firms were asked if the number of their employees increased, decreased, or roughly stayed the same during the past 12 months prior to the survey. Exhibit 2-11 shows the unweighted results for the transport equipment sector. 24% of enterprises in the sample recorded an employment increase, 22% stated a decrease. In the majority of firms (54%), employment roughly stayed the same.

Exhibit 2-11: Employment development in the transport equipment sector - 2002/2003



Base: all enterprises, unweighted. Reporting period: November 2003. Data from EL, AT, PT, SE, CZ, EE, HU, PL. N = 581.

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

Exhibit 2-12 shows how employment development in this sector corresponds to the six types of innovative activities that were captured by the *e-Business W@tch* survey in November 2003:

- Product or service innovations – any kind
  - Product or service innovations – general (not Internet-related)
  - Product or service innovations – Internet-enabled
- Internal process innovations – any kind
  - Internal process innovations – general (not Internet-related)
  - Internal process innovations – Internet-enabled

Similar to the correlation analysis in the previous sections, we correlate dummy variables using the non-parametric Kendall-Tau-b procedure. Significant results in the table are marked with * (significant at 95%) and ** (significant at 99%).

Exhibit 2-12: Correlation of innovative activities and employment development

	Employment increased last year	Employment same as last year	Employment decreased last year
Product innovations – any kind	0.131**	-0.106*	0.001
Product innovations – general	0.097**	-0.082*	0.001
Product innovations – Internet-related	0.054	-0.039	0.001
Internal innovation – any kind	0.156**	-0.156**	0.022
Internal innovation – general	0.133**	-0.129**	0.022
Internal innovation – Internet-related	0.054	-0.059	0.004
Kendall-Tau-b correlation coefficients; * significant at 95%, ** significant at 99% N=581. Base: all enterprises. Reporting period: November 2003			

Source: e-Business W@tch (2004)

The results in exhibit 2-12 clearly show that both product/service and internal innovations are positively related to employment growth. Surprisingly, the coefficients for internal process innovations are even higher than for product/service innovations. Both product/service and internal innovation are negatively correlated with steady employment development, and entirely unrelated to decreases in employment. Thus, based on this evidence we can clearly reject the hypothesis that process innovations are associated with employment reduction. On the other side, we find strong support for the positive interrelation between product/service innovations and employment growth.

Taking a more detailed look at the sources of these innovations (Internet-related vs. non-Internet-related), one finds that in the transport equipment sector non-Internet-related innovations have a much stronger correlation with employment than Internet-related innovations. In fact, for this particular sector, we cannot reject the hypothesis that Internet-related innovations and employment development are entirely independent. This is an interesting result that we cannot attribute to the low number of positive observations. Exhibit 2-4 shows that the majority of internal process-innovations in the transport equipment sector are currently related to the Internet. Thus, the dataset contains a higher absolute number of companies that conduct Internet-related process innovations than of non-Internet-related process innovations. Still, in exhibit 2-12 one only finds significant results for non-Internet-related innovations.

We compared these results to an identical analysis that was carried out for the aggregate of all sectors. It turns out that if all sectors are analysed, Internet-enabled product/service and process innovations have the stronger correlation with employment development than non-Internet-related innovations. Thus, the insignificant effect of Internet-related innovations in exhibit 2-12 is actually a sector-specific result that one cannot generalize.

There is some parallel between this finding and the results from section 2.4, where it was found that Internet-enabled innovations seem to have a slightly weaker correlation with financial performance than all other kinds of innovation in this sector. These results, however, are sector-specific and do not show up in the same way in the overall analysis of all sectors. This could suggest that enterprises in the transport equipment sector are less successful with Internet-enabled innovations than some other sectors. A possible reason for this could be that other sectors have a higher level of IT-competence, or conversely that the transport equipment industry is more experienced and skilled in the execution of non-Internet-based innovations. Relating this to the results from section 2.4, one could say that the cluster of firms that innovates without the Internet exhibits a much higher growth of employment than the cluster of firms that innovates using the Internet.

It must be kept in mind that this analysis does not permit drawing conclusions about causalities. In other words, we do not know if innovative activities in firms resulted in hiring of new staff, or if companies that currently exhibit high growth for some alternative reason invest systematically more in innovations, for example simply because they had better financial resources to do so. Thus, without more detailed information about the sequence of events it is not possible to conclude that innovation *leads* to employment growth. However, we can conclude that innovative activities and employment growth *systematically occur together* in the transport equipment sector.

3 Conclusions: Opportunities and challenges, drivers and barriers

The transport equipment sector exhibits a high endowment with basic ICT infrastructures, such as Internet access and e-mail usage. Compared to other manufacturing sectors, the transport equipment industry is among the most intensive users of e-business technologies and applications. Large enterprises in this sector in particular are leaders in using e-business technologies to automate internal process. Online purchasing is one of the most popular applications in this sector and is currently used in companies representing 65% of all employees in the sector. On the other hand, online sales remain a niche application in this industry. Nevertheless, the Internet does have an important role for marketing and customer relationship purposes in this sector. Also, we presented evidence that the currently low usage level of online marketplaces in this industry is partially due to strategic management mistakes of the providers of online marketplace services in this industry. It could be that different kinds of online marketplace services that avoid these mistakes will actually have development potential in this sector.

Size-class specific differences

A particularity in the transport equipment industries is the pronounced gap in ICT usage between large firms and SMEs. While large enterprises in the transport equipment industry are among the most intensive users of ICT, many SMEs remain reluctant users. Some of these differences can be explained by economies of scale in using e-business. Many IT solutions seem to require a “critical mass” of in-house users to be run profitably. They often have high fixed cost components and benefits that increase with the number of users, making non-adoption of such “critical mass technologies” in small firms a rational decision. In other words, many of these technologies are supposed to solve problems that only exist in large enterprises. Examples of this are Intranets, Knowledge Management and ERP systems.

But this is not the only reason for the overall lower adoption figures among SMEs in this sector and does not explain why the gap in ICT usage is much bigger in this sector than in many others. Considering that only 55% of micro enterprises in the sector make use of the WWW and only 70% use e-mail, it is not surprising that these companies also exhibit much lower adoption rates for online purchasing or corporate websites. Interestingly, the reluctance of SMEs to adopt Internet technologies is more pronounced in Germany, France, Sweden, and the UK than in the remaining countries. This cannot be sufficiently explained by economies of scale or cost-advantages of large enterprises, especially not for the applications mentioned. It appears rather that disinterest, Internet illiteracy, and an unawareness of useful application delay adoption in micro-enterprises in some countries in this particular sector. This might lead to disadvantages of these SMEs in the market and may thus contribute to a further increase of industry concentration in this sector.

Regional differences

The 2003 survey results of the *e-Business W@tch* revealed some regional differences in e-business development. Although an unambiguous country ranking is hardly possible, it appears that companies operating in Germany, Austria and Sweden are generally leading in e-business development, whereas those in Greece and Estonia are clearly underdeveloped compared to the European average in this sector. Interestingly, firms in Hungary, Poland, and the Czech Republic do not significantly lag behind in terms of Internet access and e-business usage.

Sub-sector differences in e-business usage smaller than expected

Our analysis shows that there are only small differences between the automotive industry (NACE 34) and "other transport equipment" industries (NACE 35) in terms of ICT infrastructure and e-business usage. Thus, although both sub-sectors are subject to different market structures, market dynamics, and production processes, this does not seem to lead to very different endowments with ICT and e-business tools. This result justifies the aggregation of both sub-sectors for the purpose of monitoring e-business developments as presented in the reports of the *e-Business-W@tch.*

E-business as an enabler of innovation is positively associated with firm growth

Our research has further shown that the Internet is currently an important enabler of innovation in the transport equipment manufacturing sector. Many firms actually make use of ICT to conduct process innovations or to offer new products or services to their customers. In fact, about two thirds of all process innovations in the sector in 2003 appear to be directly related to or enabled by Internet-based technology. Furthermore, we found evidence for the existence of two major innovation strategies in the sector. It appears that there are two clusters of innovative firms in the transport equipment manufacturing industry: those that use the Internet extensively to conduct both product/service and internal process innovations, and those that also innovate in both domains, but without using the Internet. We find that all types of innovation are positively associated with increasing turnover, profitability, and employment growth. However, not all e-business technologies seem to have the same potential for creating economic value. Our results show that online sales and online purchasing are significantly associated with increasing turnovers, while other technologies, such as ERP systems, are not. Also, empirical evidence does not suggest that Internet-related innovations lead to superior returns on investment compared to non-Internet-related innovations. Thus, e-business technologies and the Internet do begin to have a significant impact on enterprises in the sector and their performance. However, investments into the adoption of e-business technologies are not the only strategy for firms in the sector to gain competitive advantages.

3.1 Opportunities and challenges

Exhibit 3-1: Overview of e-business related opportunities and challenges in the transport equipment manufacturing sector

Opportunities	Challenges
• Enabling innovations and strategic changes via: o Cost savings o Greater speed and efficiency of standardized procedures o Improvement of relationship with customers and suppliers o Transparency o Reduced overheads – unleashing additional resources for value-added tasks • Proven strategy to accompany enterprise growth	• Initial uncertainty about ROI[10]: o Implementation risk o Acceptance o Opportunity costs • Potential lock-in to a specific technology, standard, or industry-group

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

Opportunities

As in other manufacturing sectors, many companies in the transport equipment industry currently use Internet-related technologies to successfully optimise their routines and information flows, or to introduce new services to their customers. This was illustrated by the figures and the case studies in chapter 2.3. These technology-induced changes can lead to significant cost saving potentials by optimising standardised, repetitive procedures such as procurement or processing of customer orders. In addition, many companies have successfully implemented e-business solutions in a way that actually led to an improvement of the relationship with customers and/or suppliers. For example, the case study on the introduction of a CRM at Wix-Filtron showed that this particular e-business solution helped the company to improve its customer service by providing employees in the marketing and sales department with accurate and up-to-date information about each customer.

Furthermore, information technologies may help to increase transparency about various types of information and to efficiently store and manage them. Examples are order data, customer data, inventories, status of certain procedures, or various types of documents. This additional transparency can be exploited to reduce errors, optimise planning, inventories, processing and engineering times.

In many cases, e-business technologies reduce the time required for carrying out routine tasks (such as searching for paper-based information about customers) and therefore unleash additional work time of employees to carry out value-added tasks (like assisting customers). This potentially improves efficiency and contributes towards satisfaction of employees. Taking advantage of these opportunities is particularly important for firms in this industry to stay competitive in an increasingly globalised market. The empirical evidence provided in this report shows that there is a significant interrelation between e-business usage, innovation, financial performance, and firm growth. Based on this evidence, we conclude that Internet-based technologies enable a substantial amount of innovations and strategic change within companies, and that companies that actively engage in these activities are disproportionately successful in their markets.

[10] ROI: Return on Investment

Challenges

Like all investment decisions, investments into e-business technology are also subject to risks. Foremost at the time of the firms' investment decision is uncertainty about the return on their investment. In other words, there is always some risk that the investment will not pay off. This can happen for various reasons. For example, the new system might prove incompatible with other existing systems and processes. In addition, there is always an inherent risk that after making the investment the system will not function as proposed or that the training received by employees will be insufficient for effective use. It is important to realise that investments in IT can only pay off if additional, complementary investments are taken into process re-design and employee know-how. Given the comparably low level of IT know-how among SMEs in this sector compared to other sectors (such as the electronics or computer service industries), these necessary complementary investments make the adoption of e-business solutions more costly and therefore reaching positive ROI less likely than in SMEs in other industries. There is also an initial uncertainty about the acceptance of the new technology among its potential users (employees, customers etc.). Even if the technology is successfully integrated into the company's IT infrastructure and runs without problems, it will not generate any value if it is not intensively used by the intended target groups. This means that in addition to the adoption of the new technology by the company, the technology also needs to be adopted and used by the relevant employees inside the company. Again, this might be more difficult to achieve in SMEs in this industry than in other industries were more employees are IT-savvy and more used to working in a computerised environment.

In addition, given that most companies have only limited financial resources for investments, there are opportunity costs involved with every investment. Financial resources that are attributed to e-business investments are not available for alternative investment opportunities. E-business investments are not necessarily superior to other investments, so firms have to make a careful strategic decision about how to allocate their scarce resources. The results presented in chapter 2.4 and 2.6 of this report have pointed out that e-business investments are at least not superior to other kinds of investments into innovation that are not based on Internet technology.

Finally, there is the risk of getting locked-in to a specific type of technology, a technology provider, a particular standard, or even an industry group. This basically applies to all industries. A lock-in usually occurs if there are network effects involved in an investment. Network effects occur when the value of a network increases with the number of its components. The "network" could be a number of enterprises in an industry that decide to use a particular communication standard to exchange data. The more enterprises adopt this communication standard, the more valuable the communication network becomes. Each additional enterprise that joins the network provides additional value to everyone else who is connected. This way, a dynamism can occur that binds everyone to that standard. This could be problematic if such a communication standard is for example used by a dominant industry player to "lock-in" all other firms in the industry to its standard and "rules of the game". For example, it was partially this risk of a "lock-in" to a critical standard that caused the reluctance of many suppliers to join Covisint. In addition, our interviews with industry practitioners revealed that some supplier firms that are original founders of the e-marketplace SupplyOn request of their business partners to use this service in order to be able to conduct business with them. In fact, every company that uses the communication services of SupplyOn has to pay for it. Thus, the original founders of SupplyOn charge their business partners for participation in this online marketplace and request participation. Another example was presented in the case study on IT at Masterform (chapter 2.2). The small

supplier firm decided not to adopt any of the numerous data exchange standards at the moment, partially because it fears to lose strategic flexibility by getting "locked in" to a particular group of customers.

Similarly, the "network" could be a number of related information technology tools that a firm uses to manage its data flows. In this case, the components of the "network" are the hardware and software tools, that are either directly linked to exchange data or indirectly compatible, because they require similar skills to operate them (IT knowledge and experience of employees with IT tools). In this case, the presence of previously adopted technologies in a firm provide a positive network externality towards the adoption of any additional, related technology. Thus, there can also be firm-internal network effects that lead to a lock-in of an enterprise to a specific way of doing business (based on a specific group of related technologies). In recent research, it was shown that the probability of adopting any additional type of e-business technology increases the more other e-business technologies a firm had already adopted (Köllinger and Schade, 2004). Thus, firms have to be aware of the fact that current investment decisions into technology will influence future dimensions of technology, firm-internal knowledge and experience, and hence economic opportunities. Firms might get "locked-in" to doing business with strong reliance on IT. As pointed out by the results presented in chapter 2.4 and 2.6 of this report, e-business investments are at least not superior to other kinds of investments in innovation in this particular industry. Hence, getting "locked-in" to the e-business paradigm must not necessarily be a superior strategy for firms in the transport equipment sector.

Finally, firms might get "locked-in" to a specific technology provider. This is also true for firms from other sectors. An important part of the value of communication technologies is the ability to store and exchange data and documents in formats that are readable by many others. This again is a network effect – every additional user of the same data standard (which is often directly related to a specific software programme delivered by a single technology provider) provides an additional utility to everyone else who is using the standard. Thus, technology providers can easily gain dominant market positions (like Microsoft with its office suite). Also, the introduction of a new technology often requires specific types of training and gaining of experience, which leads to a technology-specific development of skills and work routines inside a company. Consequently, investments into ICT could easily lead to a lock-in to a specific technology provider who can then exploit its position by charging monopoly prices. Thus, it will also be important to monitor the strategy and pricing policies of industry-specific platforms such as SupplyOn.

Lock-in effects are not very problematic as long as there is no superior alternative to the lock-in scenario. For example, a "lock-in" to the e-business paradigm of doing business is fine as long as no other alternative exists that would yield a higher pay-off to enterprises (for example technologies that allow business processes to be optimised without being based on the Internet). Alternatively, if a firm gets locked in to the best technology provider in the market, this should also not be problematic as long as the technology provider does not gain a monopoly position and abuses its market power. But enterprises should be aware that investments into e-business technologies are likely to be subject to network effects and possible lock-ins. They need to carefully evaluate whether such lock-ins could lead to disadvantages or not.

3.2 E-business drivers and barriers

Exhibit 3-2: Overview of e-business enablers and barriers in the transport equipment manufacturing sector

Enablers	Barriers
• Competition • Access to technology • Positive network externalities	• Implementation costs • Need to re-engineer business processes • Lack of e-business skills and experience • High endowment with EDI • "Battle of power" between OEMs and suppliers • Return on investment issues

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

Enablers: factors that could drive e-business adoption

Competition is intense in the transport equipment sector, both among OEMs and their suppliers. This leads to a rapid imitation of innovations and, hence, to a continuous search for new diversifying features as well as cost-saving techniques and opportunities. E-business provides a set of powerful tools for these objectives and can thus become an important competitive variable.

Access to technology does not appear to be a problem for many companies. The sector exhibits a high endowment with basic ICT infrastructures that are a necessary prerequisite for participation in e-business. In most countries in Europe, necessary communication infrastructures are widely implemented, ranging from high-quality telephone networks, computing hardware, and a large number of competing software and network access suppliers that court for business.

In addition, the increasing usage of e-business technologies in many firms in the sector provides positive network externalities to other potential e-business adopters. Often, firms decide to adopt certain technologies primarily because some of their most important business partners also use them. In addition, there can be knowledge and experience spill-overs between firms via communication or employee migration. Finally, some e-business technologies and services have reached critical mass and therefore become attractive for enterprises which had previously chosen a "wait-and-see" approach. An example is the supplier online procurement platform SupplyOn.

Barriers: factors that may inhibit e-business diffusion

Implementation costs are still a major barrier for many e-business initiatives, especially for firms with constrained budgets and, more often, for smaller firms.

The need to re-engineer business processes might also be an adoption barrier for some firms. Although this is an opportunity to improve overall business performance, it often involves changes to the work routines that can easily lead to conflicts. If these changes are implemented half-heartedly or in isolated batches, the expected positive results might not materialise. This is particularly important for those SMEs in the sector that do not yet have much experience with Internet-supported business routines. Furthermore, the implementation of new e-business technologies and work processes often requires extensive training and motivation measures. This is costly, time-consuming, and often seen as an opportunity

cost to doing “productive work”. This is partially reflected by the low number of SMEs that support the development of IT skills in this sector.

Another factor that slows down the adoption of some e-business applications in this sector is the high endowment of many larger firms with EDI technologies. These technologies were mainly implemented in the early nineties to optimise supply-chain-management. These systems already required substantial investment and resulted in a complex re-organisation of customer-supplier relationship. Some companies argue that there is no urgent need to introduce new systems before EDI-investments have amortised. Also, for many companies the additional value of Internet-based technologies compared to EDI is not big enough to justify additional investments or even a complete switch towards non-proprietary technologies.

Furthermore, the industry-wide implementation of e-commerce systems, such as procurement marketplaces initiated by OEMs, have often resulted in a battle over a shift of power between OEMs and their supplier base in the past. Other strategic conflicts along the supply chain, such as the reluctance of many smaller suppliers to join e-commerce initiatives of OEMs that were mainly used to reduce prices, have slowed down industry-wide adoption of e-business tools.

Finally, investments into e-business initiatives have to be justified by positive returns on investment. However, cost savings often occur indirectly or are difficult to measure. Sometime they might even be intangible, for example via increased customer satisfaction or better motivation of employees. Firms that do not yet have much experience with e-business, like many SMEs in this sector, might find it particularly challenging to make a qualified judgment about the expected ROI of an e-business solution.

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.

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.[11]

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.[12] Also, six of the former Member States currently face Court action for failing to put in place the new rules on

[11] http://europa.eu.int/information_society/topics/ecomm/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/ecomm/index_en.htm

[12] 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.

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 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.[13] 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

[13] cf. CVTS2; Statistisches Bundesamt, 2002

Estonian Parliament approved a proposal in February 2000 to guarantee Internet access to each of its citizens[14] 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.[15] The government also makes very active use of Internet technologies itself, playing 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".[16]

[14] ebusinessforum, 2001

[15] Wired News, 21. April 2003

[16] COM(2003) 148 final

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. 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”,[17] 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:

[17] 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	• 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	• 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	• Ireland – The PRISM II initiative • Germany – Network of e-business centres • The Netherlands – 'Digikringen' • UK – Opportunity Wales
Promotion of Internet platforms for SMEs	• 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)

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.

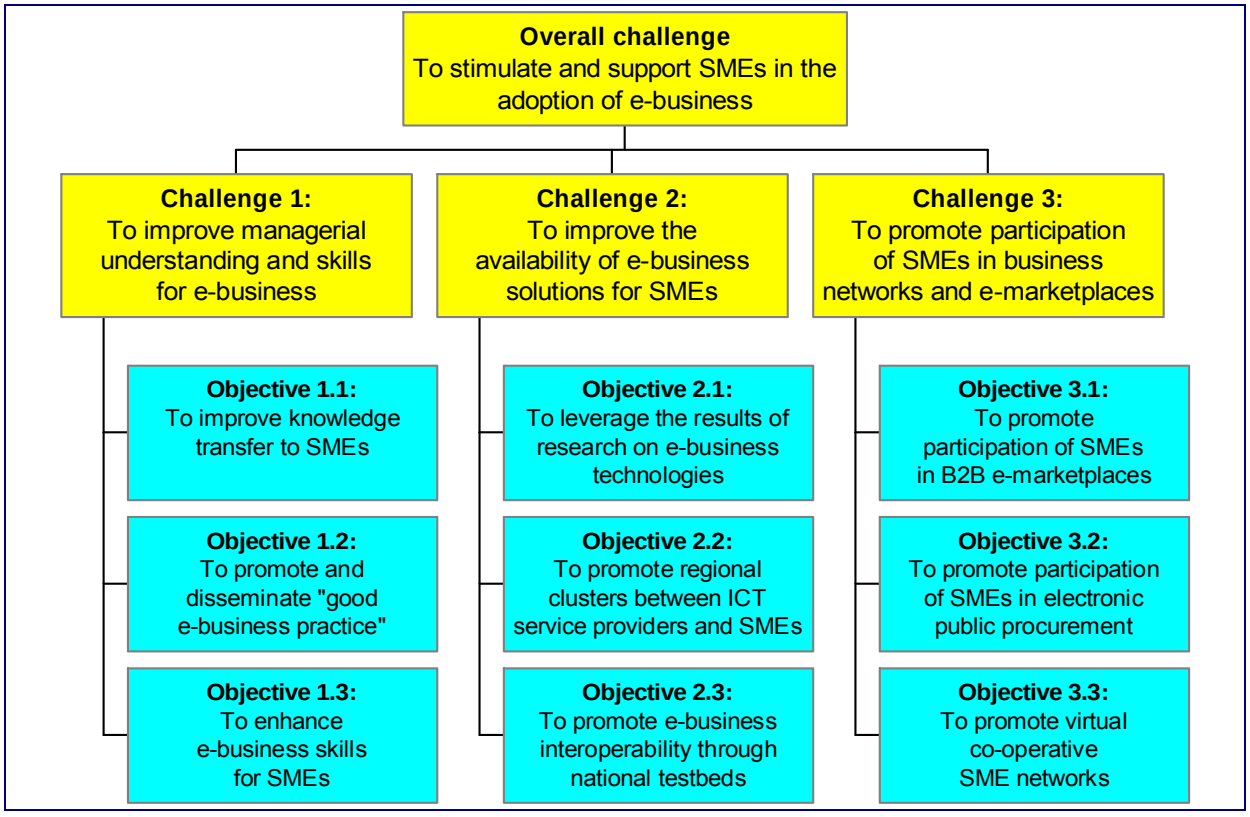
This e-BSN Workshop was the kick-off event for the fourth step of the master plan, as the title of the event already indicates: "Workshop on quantitative targets for e-business policies". From the beginning, it was a courageous move by DG Enterprise to promote target oriented policy-making processes, 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".[18]

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

[18] 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

portal already provides a valuable overview of e-business policies and best practices across the European Union, with links to related resources.

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.[19] 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.

[19] 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

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

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

4.3 Sector specific challenges

The general considerations on electronic business as a policy challenge outlined above (4.1 and 4.2) fully apply to the transport equipment manufacturing sector. In particular, two of the above mentioned policy challenges that deal with certain disadvantages of SMEs in conducting electronic business are highly relevant, given the pronounced gap in ICT usage between SMEs and large enterprises that was found in this sector:

Firstly, the possibility of sub-optimal investment by small firms due to an asymmetric information situation is important. Small companies in the transport equipment sector seem to be disadvantaged in the amount of information and knowledge they have about e-business opportunities vis-à-vis large enterprises that enjoy economies of scale for gathering this type of information.

Secondly, IT-specific employee training opportunities are usually limited in SMEs in this sector, compared to the training offers available in large enterprises. Hence, in addition to the general policy issues, the following sector-specific challenge can be derived:

Educate SMEs about opportunities of using simple Internet applications

While the decision of SMEs not to invest large amounts in expensive and complex technologies might be justified by investment calculations, SMEs should not ignore the opportunities and benefits of numerous cheap and easy to use Internet applications. Examples are using e-mail, setting up a corporate homepage, using a simple web-browser to surf for information and possibly ordering products from suppliers' websites.

If the use of e-business continues to gain in importance in many larger companies, SMEs that lack basic skills and infrastructures to engage in e-business might be unable at some point in time to meet technical requirements (such as providing all business documents electronically) of doing business with larger customers. Those companies lagging behind could suffer competitive disadvantages.

It could be that SMEs in this sector are actually unaware of a number of possibly advantageous opportunities that e-business offers, perhaps due to asymmetric information between large and small firms and limited IT-training schemes being available in SMEs in this sector. If this could be verified, a possible policy measure could be to provide SMEs with targeted information about the potential of e-business and to help them gain the necessary skills to use simple but useful Internet applications efficiently.

References

CVTS2 – Continuing Vocational Training Survey of the European Commission, http://europa.eu.int/comm/education/programmes/leonardo/new/leonardo2/cvts/index_en.html.

ebusinessforum (2001): Estonia: An e-leader. http://www.ebusinessforum.com.

e-Business W@tch (2003). The European e-Business Report 2003 edition. A portrait of e-business in 15 sectors of the economy. Second Synthesis Report of the *e-Business W@tch*. Luxembourg: Office for Official Publications of the European Communities.

e-Business W@tch (July 2002). Sector report no. 3/I: transport equipment manufacturing – economic background and e-business issues. http://www.ebusiness-watch.org

e-Business W@tch (Feb 2003). Sector report no. 3/II: transport equipment manufacturing – the statistical picture: facts & figures. http://www.ebusiness-watch.org

e-Business W@tch (July 2003). Sector report no. 3/III: transport equipment manufacturing - recent trends (2003): presentation of new survey results from 2003. http://www.ebusiness-watch.org

e-Business W@tch (February 2004): Sector report no. 3/IV: transport equipment manufacturing. http://www.ebusiness-watch.org

O'Rourke, B. (20. Aug. 2003). Eastern Europe: region grows as manufacturing point for auto industry. http://www.rferl.org/nca/features/2003/08/20082003153918.asp.

Köllinger, P. and Schade, C. (2004). Adoption of e-business: patterns and consequences of network externalities. CASE discussion paper series. http://appel.rz.hu-berlin.de/Zope/CASE/Publikationen/papers/papersKatalog/05_pk_cs.pdf.

PwCGlobal – PricewaterhouseCoopers (Nov. 2003). To the EU at low speed, in: Unia&Polska. http://pwc.com.

PWC – PricewaterhouseCoopers (15. Dec. 2003). Wheels turning for big changes, but auto sector remains flexible, in: Prague Business Journal.

Statistisches Bundesamt (2002): "Zweite Europäische Erhebung zur beruflichen Weiterbildung (CVTS2) – Ergebnisse der schriftlichen Erhebung bei zirka 3200 Unternehmen mit 10 und mehr Beschäftigten in Deutschland", Wiesbaden.

Wired News (21. April 2003). Online biz is booming in Estonia. http://www.wired.com/news/culture/0,1284,58561,00.html.

World Economic Forum (2003). Global Information Technology Report 2003-2004. http://www.weforum.org/pdf/Gcr/GITR_2003_2004/Framework_Chapter.pdf.

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 *e-Business W@tch* 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 band-width), 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.[20] 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.
Remote access	The ability of a company computer network's transmission points to gain access to a

[20] Cf. Global Internet Statistics by Global Reach, www.glreach.com

	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 *e-Business W@tch*. 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.°, 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	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
2	Chemical industries	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
3	Electrical machinery and electronics	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
4	Transport equipment manufacturing	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
5	Crafts' and trade sectors	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
6	Retail	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
7	Tourism	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
8	ICT services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
9	Business services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004
10	Health and social services	
	• Report I: The Quantitative Picture: Diffusion of ICT and e-business in Europe	May 2004
	• Report II: Key Issues, Case Studies, Conclusions	August 2004