

**Sector Report:** No. 03-II, August 2004

# *Electronic Business in the Electrical Machinery and Electronics Industries*

*Key issues, case studies, conclusions*

**e-business**  
**w@tch**



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## The e-Business W@tch

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

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

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## Table of Contents

Index of tables and charts .....	4
Introduction to the <i>e-Business W@tch</i> .....	5
The Role of Electronic Business in the Electrical Machinery and Electronics Industries in 2004: Main Issues and Challenges .....	9
1 Introduction .....	9
2 The role of electronic business in the electronics sector – analysis of selected issues.....	14
<b>2.1 Key application areas of electronic business in the sector .....</b>	<b>14</b>
<b>2.2 Differences in e-business usage between the electronics and the electrical     machinery sub-sectors .....</b>	<b>16</b>
<b>2.3 Hesitation to start selling online in the electrical machinery industry.....</b>	<b>21</b>
<i>Case Study: Voltimum</i> .....	25
<b>2.4 The necessity of supply chain collaboration across the electronics value     chain .....</b>	<b>29</b>
<i>Case Study: Lake Communications</i> .....	34
<b>2.5 The need for e-business standards in the electronics industry .....</b>	<b>38</b>
<i>Case Study: STMicroelectronics (STM)</i> .....	42
3 Conclusions: Opportunities and challenges, drivers and barriers .....	46
<b>3.1 Opportunities and challenges .....</b>	<b>47</b>
<b>3.2 E-business drivers and barriers.....</b>	<b>50</b>
4 Policy challenges.....	52
<b>4.1 General considerations on electronic business as a policy challenge.....</b>	<b>52</b>
<b>4.2 Policy challenges at the sectoral level.....</b>	<b>57</b>
<b>4.3 Sector specific policy challenges .....</b>	<b>64</b>
References.....	66
Annex I: Glossary of technical terms .....	68
Annex II: Methodological Notes on the e-Business Survey 2003 .....	71
Annex III: Sector Impact Studies of the <i>e-Business W@tch</i> in 2003/04 .....	75

## Index of tables and charts

<i>Exhibit 1-1: Configuration of the electrical machinery and electronics industries (based on NACE Rev. 1)</i> .....	9
<i>Exhibit 2-1: Summary overview: Importance of e-business applications in the electronics industries</i> .....	15
<i>Exhibit 2-2: Main e-business indicators in the electrical machinery and electronics sub-sectors and in the other manufacturing industries</i> .....	18
<i>Exhibit 2-3: Electronic purchasing in the electrical machinery and electronics sectors and in the other manufacturing industries</i> .....	19
<i>Exhibit 2-4: The evolution of the electronics value chain</i> .....	20
<i>Exhibit 2-5: Selling online in the electrical machinery and electronics sectors and in the other manufacturing industries</i>	21
<i>Exhibit 2-6: Online marketing and e-commerce activities (2003)</i> .....	22
<i>Exhibit 2-7: Increasing complexity in the industry is driving the need for collaboration.</i> .....	29
<i>Exhibit 2-8: IT integration with suppliers and Business integration of online sales systems (2003)</i> .....	31
<i>Exhibit 2-9: Use of online technologies (other than free text e-mail) for business processes between companies (2003)</i>	31
<i>Exhibit 2-10: Exchange of standardised data between companies (2003)</i> .....	39
<i>Exhibit 2-11: Distribution platforms and protocols used for online purchases in the electrical machinery and electronics industries (2003)</i> .....	40
<i>Exhibit 3-1: Overview of e-business opportunities and challenges in the electrical machinery and electronics sector</i> .....	47
<i>Exhibit 3-2: Overview of e-business enablers and barriers in the Electronics sector</i> .....	50
<i>Exhibit 4-1: E-business policy objectives and categories identified in the EU in 2002</i> .....	58
<i>Exhibit 4-2: A framework for SME specific e-business policies</i> .....	60
<i>Exhibit 4-3: Relevance of SME e-business policy objectives by sector</i> .....	61
<i>Exhibit 4-4: Suggestions for policy actions mapped by objectives and level</i> .....	63

## 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](http://www.ebusiness-watch.org).

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

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

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

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

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

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

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

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

In such a context, it becomes practically impossible to cover in depth all areas and facets of e-business in one study. The scope of such a study needs to be carefully defined and – to use the analogy of photography – it must be decided whether to "zoom in" or to use a "wide-angle" perspective. "Zoom-in" studies investigate one specific aspect of electronic business in much detail. "Wide-angle" studies adopt a broader perspective and investigate more issues at the same time, which necessarily puts limits on the level of detail in which each single issue can be explored. This must be considered when using the Sector Studies prepared by the *e-Business W@tch*.

### The role of economic analysis in the Sector Reports

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

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

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

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

### The definition of sectors and the adequate level of aggregation

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

In the context of its "wide-angle" perspective, the *e-Business W@tch* analysis covers a large part of the European economy rather than focusing on very specific (sub-)sectors. Therefore, the statistics

presented in these reports need to be carefully treated when making comparisons between countries and, occasionally, companies' size-classes. Against the previously described background, some generalisation and approximation has to be accepted, while the definition of sectors could be revisited during the implementation of the *e-Business W@tch*.

### The 10 sectors analysed in 2003/04

The 10 sectors which are being monitored and studied in 2003/04 include eight sectors that were already covered in 2002/03 (thus allowing the continuous monitoring of changes and progress), as well as two new ones (namely the textile, clothing and footwear industries and the craft and trade sector).

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

<b>Title</b>	<b>NACE</b>	<b>Short Description</b>
<b>Textile, clothing and footwear industries</b>	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.
<b>The chemical industries</b>	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.
<b>The electrical machinery and electronics industries</b>	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.
<b>The manufacture of transport equipment</b>	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.
<b>Craft &amp; trade</b>	(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.
<b>Retail</b>	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.
<b>Tourism</b>	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.
<b>ICT services</b>	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.
<b>Business services</b>	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.
<b>Health and social work</b>	85.1, 85.3	As national health systems suffer from increasing costs and political pressures to constrain these, it is hoped that strategies for the development of an e-health and e-business infrastructure will become key drivers of change.

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

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

### Primary selection criteria

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

### Secondary selection criteria

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

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

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

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

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

## The Role of Electronic Business in the Electrical Machinery and Electronics Industries in 2004: Main Issues and Challenges

This report is the second Sector Impact Study on electronic business in the electrical machinery and electronics Industries published by the *e-Business W@tch* in the 2003-2004. It builds on the first study from May 2004 which focused chiefly on the quantitative aspect, presenting the results of the e-Business Survey from 2003. This study analyses in more detail specific issues which were found to be particularly relevant for the sector in question, supported by case studies. The conclusions summarise the central implications for firms operating in ICT and e-business related sectors, and assess the primary drivers and obstacles affecting the future development of electronic business. Lastly, the study looks at the challenges involved in ICT policies, starting with a general view of the ways in which ICT affect corporate policies, followed by a more sector-specific examination.

### 1 Introduction

#### Definition

For the purposes of this study, the sector is defined as comprising those business activities included in the NACE Rev. 1 Divisions 30 ("Manufacture of office machinery and computers"), 31 ("Manufacture of electrical machinery and apparatus") and 32 ("Manufacture of radio, television and communication equipment and apparatus").

*Exhibit 1-1: Configuration of the electrical machinery and electronics industries (based on NACE Rev. 1)*

NACE Rev. 1 Division	Group	Activity
30		Manufacture of office machinery and computers
	30.1	Manufacture of office machinery
	30.2	Manufacture of computers and other information processing equipment
31		Manufacture of electrical machinery and apparatus
	31.1	Manufacture of electric motors, generators and transformers
	31.2	Manufacture of electricity distribution and control apparatus
32		Manufacture of radio, television and communication equipment and apparatus
	32.1	Manufacture of electronic valves, tubes and other electronic components
	32.2	Manufacture of television and radio transmitters and apparatus for line telephony
	32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods

Source: *e-Business W@tch*

Within this structure, two basic areas of business can be distinguished:

- The "electronics" industries, consisting of sub-sectors NACE 30 and 32, which can be described as a cluster of closely interrelated firms. In particular, a major part of the

products of NACE 32.1 is microelectronics,<sup>1</sup> which are inputs of the product outputs of sub-groups 32.2 and 32.3 and of NACE 30.

- The "electrical machinery and apparatus" industries (NACE 31) evolve within a rather distinct value chain and operate in different markets, although an increasing number of final products include both electrical and electronic components.

This chapter summarises the more detailed introduction to this sector found in the previous study. It provides basic figures on the size and structure of the industries involved, based on economic indicators from Eurostat's New Cronos database<sup>2</sup>.

### Industry structure

The European Union's electrical machinery and electronics industry is, on the whole, highly concentrated. Large companies, which account for 2% of all of the sector's firms, provide 66% of the sector's employment. Industry concentration is particularly pronounced in the electronics sector (corresponding to NACE 30 and 32), where rapid technological progress and the production of standardised high-volume electronic products have enhanced economies of scale, hence the concentration process.

Furthermore, the more traditional electrical machinery sub-sector (NACE 31) is still the largest of the three analysed sub-sectors (NACE 30, 31 and 32). Major European players with the advantage of an international presence and, above all, pan-European presence, still lead most of European market segments. Europe's most powerful players are Siemens, ABB, Schneider Electric and Legrand. European manufacturers are, however, less present in the office machinery and computers sub-sector which is largely dominated by American companies (IBM, HP-Compaq, Dell, Xerox). The rest of the European electronics industry (i.e. NACE 32) remains very competitive, albeit to varying degrees. Europe's telecommunications systems sector is still the most competitive electronics sub-segment, populated by leading companies Nokia, Alcatel, Siemens, Bosch and Ericsson, which are also competing at the global level with Motorola, Sony and Samsung.

### Production value and value added

As to the office machinery and computers manufacturing industries (NACE 30), Ireland enjoys high production value on its office machinery and computers – due chiefly to outsourcing from US companies – but lower value-added from production.

In the electrical machinery industry (NACE 31), Germany holds by far the largest share in production value in Europe. Germany appears to have "specialised" in electrical machinery<sup>3</sup>, being home to major players such as Siemens. Germany's share of this industry's value-added is also particularly high compared to the other European economies, due to a higher than average degree of vertical integration among Germany's electrical machinery firms. Europe's four largest countries (DE, IT, FR, UK) are in fact the EU's leading producers of electrical machinery, as well as being the largest markets for these products: due to national product standardisation, companies' operations are generally aimed mainly at their domestic market. A sizeable portion of electrical machinery firms are national SMEs.

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<sup>1</sup> including semiconductors, passive components and electromechanical devices.

<sup>2</sup> See the previous Sector Study (No. 03-I, May 2004) for technical details on these indicators.

<sup>3</sup> A country is said to "specialise" in a given industry sector if this sector's share of the country's total manufacturing output is well above the average share of all manufacturing sectors in a number of countries.

In the specialised sub-sector of radio, TV and communication equipment and apparatus (NACE 32) manufacturing, the United Kingdom, France and Germany have the largest regional shares in European production value. French companies in particular have long enjoyed a strong position in the EU-15, with clusters of firms which cover the entire electronics (NACE 32) product spectrum (Alcatel, Sagem, Thomson Multimedia, ST Microelectronics). Germany comes in second, with its own heavyweights, such as Siemens, Bosch and Infineon.

Concerning the new Member States, most are still far behind the initial EU-15 countries in terms of production value and value-added, although some are beginning to forge themselves a solid position. Of particular note here are Hungary and Poland with the most developed industries, and a significant role at both the regional and global level.

### Employment productivity, and labour costs

Overall, in terms of employment, the sector covered in this report accounts for approximately 2.4 million people in the EU-15. The sector with the highest absolute employment figure is the traditional electrical machinery industry, with approximately 1.4 million employees. The generic advantage of the new Member States in terms of electronics and electrical machinery (NACE 30, 31 and 32) production is their much cheaper workforce, compared to the EU-15 in 2003.

As to the office machinery and computers sub-sector, Ireland has by far the highest employment rate in percentage of total manufacturing (8%), as well as the highest value-added per person employed, due to low labour costs. Among the 10 new Member States, Hungary's production of office machinery and computers appears to be particularly high and significant. Furthermore, this sub-sector's productivity in the EU-15 (149% for NACE 30) is higher than the two other sub-sectors' (95% of manufacturing total for NACE 31 and 104% for NACE 32).

Manufacturing of electrical machinery and apparatus requires more manpower than other electronics and electrical machinery industry sub-sectors, employing 4.9% of the total manufacturing labour. Germany, Ireland and Sweden are the biggest employers in the EU-15 in percentage of total manufacturing. Germany is by far the leading employer in the NACE 31 industries (7% of total manufacturing). The other major markets (Italy, France and the UK) are well behind, even though these industries account for more than 4% of total manufacturing in those countries. Leading the way in employment rates in new Member States are the Czech Republic and Slovakia.

The manufacture of radio, television and communication equipment apparatus sub-sector (NACE 32) is particularly well-developed in Malta, Finland, Sweden, Ireland and Hungary. Productivity, measured as value-added per employee, varies considerably across Europe.

### Major trends and developments

The sub-sectors included in this study each have distinct growth dynamics, value chains and market players. Electrical machinery and apparatus industries (NACE 31) make up the most mature sector, dominated by companies and products which have been on the market for a long time. By contrast, the electronics industries (NACE 30 and 32) belong to the very dynamic and volatile high-tech market.

Electronics and electrical machinery sub-sectors exhibit significant differences in their production schemes and their degree of vertical integration. In electrical engineering, Original Equipment Manufacturers (OEM) are often highly vertically integrated, keeping large portions of the production chain and value creation process in-house.

The electronics industry, on the other hand, is characterised by the presence of highly specialised firms along the value chain. The very modular set-up of electronic products allows OEMs to outsource production steps, and to purchase parts and modules from specialised manufacturers. Consequently, the electronics industry's value chain is more complex, involving more players and stages, and an industry structure which has changed significantly over the last few decades. Most companies in these supply chains now concentrate on their core areas of expertise, typically no more than one or two processes. The non-core processes are outsourced to (specialised) partners, and increasingly so to the EMS (Electronics Manufacturing Services) industry, chiefly for the following reasons: cost reduction, assets management efficiency, shorter time to market, sharing business risks and focus on core areas of expertise.

Electronics production is now an entirely global business. The industry itself is marked by frequent international mergers and acquisitions, global price competition, and the formation of geographic production clusters which specialise in a particular area of production (e.g. hard-disks in Singapore, LCDs in Taiwan). Some trends are ubiquitous throughout the electronics value chain: labour-intensive, volume manufacturing has been shifted to Contract Equipment Manufacturers (CEMs) in Asia, while Europe and the US retain the high-end, knowledge-intensive stages of the value chain such as product development and R&D.

By contrast, the electrical engineering sector's less standardised products (engineering intensive motors, generators, etc.) are still manufactured mainly in the Member States. The electrical machinery sectors have relocated a small portion of production to low-wage countries, but mostly inside EU Member States as they possess the necessary know-how.

Furthermore, intense competition, rapidly declining prices, unpredictable customer demand, and limited material supplies are all par for the course in the global electronics supply chain. The pursuit of higher prices and margins leads to a continuous stream of new products, each able to command a premium price for a short period of time before becoming commoditized. This cycle is the daily challenge of hundreds of companies operating in virtually every segment of the electronics industry.

The most recent trends confirm that electronics industries remain very volatile. To illustrate: worldwide sales of semiconductors increased by 37% in April 2004 compared to April 2003, totalling 16.9 billion dollars<sup>4</sup>. This constitutes the highest monthly sales figure since July 2000. The rise is due to strong economic growth in China and in the USA, and the consequence of high mobile phone, computer and digital camera sales.

In the new EU Member States, abundant foreign investments and sizeable financing by the public sector have facilitated the expansion of these countries' electronics and electrical machinery industry, particularly in Poland and Hungary. Governments generally encourage both local initiatives and foreign investment (creation of industrial parks in order to attract foreign companies, for instance). In the latter case, international foreign manufacturers – chiefly European, such as Philips and Siemens – have elected to invest in these countries in a bid to dominate the sector. The majority of their industrial output is exported, mainly to the EU countries. Cases in point here include:

- Philips, which manufactures a large portion of its consumer electronics products in Eastern Europe (DVDs for the European market in Hungary, cathode-ray TVs screens in Poland);
- Thomson Multimedia which also chose Poland for the production of several types of TVs;

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<sup>4</sup> Source: SIA (Semiconductor Industry Association).

- Epson, which sub-contracts the manufacture of its printers to Asian firm EMS Flextronics' Hungarian plant.

The new EU Member States are also a prime target for direct foreign investment, due to low-cost qualified labour, export possibilities and generous incentives. Conversely, in some of the new Member States, such as Hungary, production costs are tending to increase due to a rise of the minimum wage. This trend could well lead to decreased relocation to these countries.

In future, the shift from OEM to CEM/EMS, where the emphasis will be on maintaining margins, is expected to be a contributing factor in the move from high to low cost manufacturing. Outsourcing accounted for 21% of total assembly and box-built activity in Europe in 2000, and is forecast to account for roughly 40% by 2007<sup>5</sup>. Despite the prospect of a significant amount of manufacturing being lost, Europe will probably continue to be a major producer, with a large number of SMEs benefiting from the increased use of electronics in an ever-increasing range of products. Europe will also continue to excel in the areas of R&D design and IP-based products.

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<sup>5</sup> Source: Reed Electronics Research, The yearbook of World Electronics Research, 2003.

## 2 The role of electronic business in the electronics sector – analysis of selected issues

### 2.1 Key application areas of electronic business in the sector

The previous Sector Study (May 2004) reported on the level of ICT and e-business adoption in the electrical machinery and electronics industries in the EU, based mainly on results of the e-Business Survey 2003. The findings reveal that the electronics sector is one of the most advanced of the sectors studied by the *e-Business W@tch* in terms of ICT infrastructure and adoption of e-business applications. The sector is one of the early-adopters of e-business applications. Basic Internet access and standard Internet applications, such as e-mail and use of the World Wide Web, are already in widespread use in the electronics and electrical machinery sectors throughout Europe. So lack of IT infrastructure is not an issue for the sector, and need not be dealt within this report.

#### Backwardness of the electrical machinery sub-sector

However, background research suggests that there are differences in the e-maturity between the two major sub-sectors covered by this study. While the entire electronics and electrical machinery sector is at a rather advanced stage of e-business usage, the electronics industry appears to be even more ahead. The validity of this assertion, based on figures from our e-Business Survey of 2003, has not been tested until now, as the previous report presented only aggregate sector figures. One of the issues focused on in this report is the different levels of e-business usage and adoption in the electronics industry and the electrical machinery sub-sectors. Comparisons have been computed for a range of key functional applications.

#### The low rate of enterprises selling online

Furthermore, the *e-Business W@tch* survey results show that online purchasing is currently the most widely adopted e-business application, whereas selling online is not yet a common practice. Nevertheless the Internet does play a major role in the sector's marketing and customer relations processes, particularly for electrical equipment manufacturers. The reasons for the limited online sales in the electrical machinery sub-sector are discussed in the next chapter, and illustrated by the case of low voltage products in the electrical manufacturing industry.

#### The necessity of supply chain collaboration across the electronics value chain

Industries involved in the manufacture of electronics products rely increasingly on partners for design and manufacturing activities. This trend, combined with a trend towards global sourcing, means that companies must manage end-to-end processes that extend outside of their company and across multiple tiers of their supply chain. Collaboration across the supply chain has become a crucial element in the creation of business value, whereas the previous Sector Impact Study<sup>6</sup> indicated that collaboration with external supply chain partners was not particularly common. The present report therefore examines investment in expanded inter-company collaboration, which has become a key factor for the electronics industry.

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<sup>6</sup> Sector Impact Study No. 03-I, May 2004.

## The need for e-business standards in the electronics sector

In line with the previous issue (supply chain collaboration), although the end goal of any collaborative investment may be near real-time system-to-system integration with business partners, designing a collaborative supply chain is far simpler in theory than it is in reality. These challenges are going to grow as enterprises find themselves on the sending and receiving ends of numerous collaboration requests, each of which may run on a different schedule, and use different formats or technical standards. Thus standardisation is a major enabler of supply chain collaboration. Consequently, the widespread use of standardised data exchange between companies, and the benefits of process standardisation (in particular for SMEs), are further discussed within this report.

## Most important areas of electronic business

Exhibit 2-1 lists the main areas of electronic business used by the electronics sector with their degree of importance for conducting business in this industry. The selection of the key issues discussed in this report reflects this assessment.

*Exhibit 2-1: Summary overview: Importance of e-business applications in the electronics industries*

E-business application area	Importance	Remark / example
Facilitate remote and mobile work (fieldworkers, homebased telework)	●○	The sector is well equipped with remote/wireless access and it could, in future, become an important application area in the electrical machinery sub-sector. Large companies are much better equipped than SMEs.
Improve knowledge management by using special software	●○	Use of KM software is not higher than the all-sector average, whereas use of e-learning applications is above average.
Automate internal business processes	●●	Very advanced compared to other sectors in the usage of online technologies to support internal processes. Important e-business application area for the electronics industries.
Improve ERP-to-ERP connectivity	●●	ERP use in the electronics sector is above average. ERP is used specifically by large companies which implement it to rationalise a complex chain of processes.
Supply chain process integration	●●○○	The sector is a greater user of SCM solutions than the all-sector average. Application and focus are closely related to BtoB collaboration in the electronics value chain. High relevance for the electronics sub-sector.
Decrease direct procurement costs through e-procurement	●●○	Purchasing online is one of the most widely used e-business applications in the sector, taking all size of companies into account and indiscriminately for maintenance, repair and operations goods, and direct production goods. Use of e-procurement is above the all-sector average, especially within the electronics sub-sector.
Web-based e-marketing and customer related services	●●○	Adoption of these tools is above the all-sector average, and could well become even more ubiquitous in future. A more important issue for the electrical machinery sub-sector than for the electronics sub-sector.
Electronic customer management	●○	Dissemination of CRM systems is clearly above the all-sector average, even if the electrical machinery sub-sector lags behind. Large firms use this application more frequently than smaller enterprises because it requires substantial up-front investments.

E-commerce: Increase sales volume / area through selling on the internet	●●○	Enterprises that actually sell online are still rather rare, especially in the electrical machinery sub-sector. Even though the sector is among the most intense users of e-business technologies, only 8% of companies sell online, which is below the all-sector average.
B2B marketplaces on the internet	●●○	An important issue for the electronics sub-sector but less so for the electrical machinery sub-sector. Marketplaces are an accepted channel among electronics companies that use the Internet to sell their products.
Use of e-business standards for exchanging structured data	●●○○	The use of e-business standards for exchanging structured data is more widely used in the sector than on average. Most electronics manufacturers use electronic business applications via EDI. E-business standardisation process has a high relevance in the electronics sub-sector and an average relevance in the electrical machinery sub-sector.
Web services and XML based standards	●●○	Companies themselves are not yet fully convinced about XML. However, it could become the main standard for electronic transactions in the future.
Extended enterprise: collaborative (online) e-product design	●●○○	The electronics and electrical machinery industry makes greater than average use of online technologies for inter-company business processes. High relevance for the electronics sub-sector.

● = little relevance; ●● = average relevance; ●●● = very relevant; ●●●● = high relevance for sector

○ = mixed results, depending on the sub-sector within the combined electronics industries

As an example, ●●○○ means the application area is highly relevant for one sub-sector and shows an average relevance for another sub-sector.

Source: e-Business W@tch (2004)

## 2.2 Differences in e-business usage between the electronics and the electrical machinery sub-sectors

The dichotomy between the electronics sub-sector (NACE 30 and 32) and the electrical machinery sub-sector (NACE 31) is a recurring issue in the previous Sector Impact Study<sup>7</sup>. While, as a whole, the electronics and electrical machinery sector is clearly among the early adopters of e-business, the electronics industry is more advanced than the electrical machinery sector. The two sub-sectors have different growth dynamics, value chains, and market players. These structural differences have a major impact on the use of e-business applications within each sub-sector.

### Structural dichotomy between sub-sectors

Electrical engineering (NACE 31) is the most mature of the three sub-sectors. This segment is dominated by companies and products which have been on the market for a long time. The electronics industries (NACE 30 and 32), on the other hand, belong to the very dynamic and volatile high-tech market. The electronics sector was the fastest growing business sector in many European countries during the 1990s, contributing substantially to productivity and economic growth.

<sup>7</sup> Sector Impact Study No. 03-I, May 2004.

The electrical machinery sub-sector and the electronics sector exhibit significant differences in their production schemes and their degree of vertical integration. In electrical engineering, Original Equipment Manufacturers (OEM) are often highly vertically integrated, keeping large portions of their production and value-creation process in-house, and requires more manpower than other electronics and electrical machinery industries sub-sectors.

The electronics industry, on the other hand, is characterised by the presence of highly specialised firms along the value chain. Over the last decade, outsourcing has been one of the most significant trends in the electronics industry. The entire value chain is changing and taking on a more horizontal structure in which each company is focusing on one particular production layer (semi-conductor components, hardware and assemblies, system integrators...). Companies outsource engineering and production responsibilities of increasingly complex modules to their suppliers. This requires close cooperation and efficient communication between OEMs and their supplier network.

Furthermore, the production of electronics is now an entirely global business. Conversely, the electrical machinery and apparatus sector is characterised by the fact that company activities are based mainly on their domestic market. This is due partly to strong national regulatory frameworks and to standardisation. As a consequence, most brand names (if we exclude the major brands) have more national knowledge and the market is chiefly local, requiring close relationships with providers.

The less standardised products of the electrical engineering sector (engineering intensive motors, generators etc.) are still manufactured primarily in the Member States. The electrical machinery sectors have seen some relocation of production to low-wage countries, but the majority of the manufacturing facilities nevertheless remain inside the EU member countries as they possess the necessary know-how. The markets for some electrical engineering products, such as high-voltage generators, are strongly regulated for safety reasons. This makes outsourcing more difficult because of the necessary control and supervisory work. Germany has long dominated many of the electrical engineering sub-sectors' markets.

In Europe, most OEMs in the electrical machinery and apparatus industries are large, multinational companies such as ABB, Siemens and Schneider Electric. Nevertheless, the electrical machinery industries are characterised by the presence of a large number of rather small national companies. The survey figures indicate that the average size of companies is smaller in the electrical machinery sub-sector than in the electronics sub-sector, with an average staff of 24, compared to the sector average of 34 (although higher than the all-sector average of 9 employees).

### E-business backwardness in the electrical machinery industries

Statistically, the dichotomy between the two sub-sectors has not yet been thoroughly demonstrated. The gap appears quite clearly if we look at survey statistics on use of the main e-business applications, by sub-sector. Exhibit 2-2 indicates that the electrical machinery sub-sector falls behind the electronics sub-sector for five out of six applications considered. The gap is particularly significant in terms of involvement in e-marketplaces and use of a Knowledge Management solution, which are the least used applications in the sector.

Exhibit 2-3 shows that the gap between the two sub-sectors is also significant for a more widespread application, online procurement, which is currently the most widely adopted e-business application in the sector as a whole (taking all size of companies into account and indiscriminately for maintenance, repair and operations goods, and direct production goods).

Exhibit 2-2: Main e-business indicators in the electrical machinery and electronics sub-sectors and in the other manufacturing industries

	Online procurement	Use of e-market-places	SCM use	CRM use	Use of a Knowledge Management Solution	Use of an ERP system
Electronics	59	7	11	23	11	45
Office machinery and computers	59	7	12	34	12	36
Electrical machinery and apparatus	51	1	10	19	5	56
Radio, TV and communication	67	12	10	22	15	39
Textile and footwear	23	1	7	6	5	18
Chemical industry	51	4	13	16	11	48
Transport equip.	65	9	19	26	11	72
All Sectors (EU-5)	46	4	6	13	10	19

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK), N=108 (NACE 30), N=197 (NACE 31), N= 197 (NACE 32) ,N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

Source: e-Business W@tch (2004)

Amongst the e-business indicators considered in Exhibit 2-2, the only application showing a higher rate of usage in the electrical machinery sub-sector is ERP, for data weighted by employment (ERP is used by enterprises comprising 56% of employees in the sector, compared to 45% in the whole electronics sector). In terms of data on ERP use weighted by enterprises<sup>8</sup>, the electrical machinery sub-sector again lags behind (11% of enterprises are using an ERP system in the electrical machinery industry, versus 13% in the electronics sector as a whole). This difference between enterprise weighted and employment-weighted statistics also means that most of the electrical machinery manufacturing companies adopting ERP are large companies; ipso facto, SMEs in the electrical machinery sub-sector are much slower in adopting e-business applications.

In Exhibits 2-2 and 2-3, cross-sector comparisons from the survey are also made with the other manufacturing industries (textile and footwear, chemical industry, transport equipment) and with the all-sector average. We have excluded from the comparison the service and tertiary sectors which are characterised by distinct production processes.

For all kinds of e-business applications, both electronics sub-sectors<sup>9</sup> are ahead of the all-sector average, whereas the electrical machinery and apparatus industries fall behind the all-sector average, for three types of application (participation in e-marketplaces, participation in e-marketplaces and e-procurement through company website).

Furthermore, when considering cross-sector comparisons, statistics show that the average for electrical machinery sub-sector is close to the chemical industry sector's. Textile and footwear, a more traditional industry than the two previous ones, is positioned far behind. Comparatively, the electronics sub-sector and the transport equipment industry exhibit the highest rates, particularly in the field of online procurement and of CRM usage. We can therefore place the electrical machinery sub-sector at an intermediary level of e-business

<sup>8</sup> Figure not mentioned in Exhibit 2-2.

<sup>9</sup> Office machinery and computers, radio, television and communication equipment.

technology usage: ahead of the more traditional manufacturing sectors (such as Textile and footwear) and behind the most advanced users of e-business applications (the electronics sub-sector and the transport equipment industry).

*Exhibit 2-3: Electronic purchasing in the electrical machinery and electronics sectors and in the other manufacturing industries*

	Make online purchases*		E-procurement through company website*		E-procurement through electronic market places*	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Electronics	51	59	84	78	30	48
Office machinery and computers	61	58	89	97	24	70
Electrical machinery and apparatus	39	51	73	65	35	37
Radio, TV and communication equip.	54	67	88	79	32	46
Textile and footwear	14	23	56	79	11	19
Chemical industry	32	51	80	82	24	24
Transport equipment	30	65	81	85	25	50
All (9) Sectors (EU-5)	31	46	81	85	21	24

\*Respectively percentage of companies purchasing goods or services online, of which percentage of companies purchasing online through their website and on electronic market places.

Base: all enterprises, EU-5 (DE, ES, FR, IT, UK,) N=108 (NACE 30), N=197 (NACE 31), N= 197 (NACE 32), N ~ 500 for other sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March-November 2003.

Source: e-Business W@tch (2004)

The higher penetration of e-business applications in the two latter sectors is probably due to the fact that almost all products in these industries are systems made of a complex supply chain of components. These sectors can be clearly distinguished from other manufacturing industries which are characterised by less complex and more integrated value chains. In particular, in the electrical machinery industry, the vertical disintegration and component/system complexity are lower than in the electronics industries.

### The conservative attitude of the electrical machinery industry inhibits e-business development

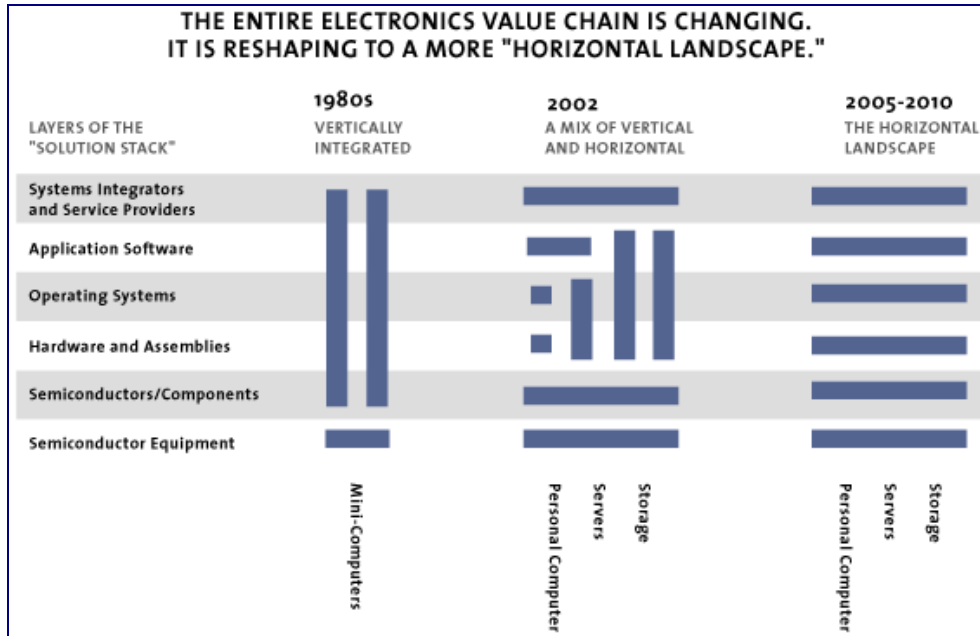
To summarize the situation, we can underline the rather more conservative (although not negative) attitude of the electrical machinery sub-sector towards information and communications technologies. This conservative attitude is illustrated by the next issue (hesitation to start selling online in the electrical machinery industry) and by the related case study regarding Voltimum. In the coming years, the electrical machinery industry will probably not refuse innovation once applications appear mature enough to withstand circumspect risk management, and to promise real return on investment. So, it appears that manufacturers of electrical machinery are more followers than early adopters of e-business technologies.

E-business solutions will probably further speed up the process of globalisation and specialisation of the electronics industry.

Outsourcing has been one of the most important trends in the electronics industry during the last decade. The entire value chain is changing and taking on a more horizontal structure. Outsourcing accounted for 21% of total assembly and box-built activity in Europe in 2000,

and is forecast to account for roughly 40% by 2007<sup>10</sup>. Exhibit 2-4 shows the development over the past years and a probable scenario for 2005-2010, resulting in a complete horizontal market structure.

Exhibit 2-4: The evolution of the electronics value chain



Source: E2Open<sup>11</sup>, [www.e2open.com](http://www.e2open.com)

However, a major uncertainty in this scenario is the future intensity of the outsourcing process within the entire electronics industry. Certain sub-sectors or parts of sub-sectors (in particular semiconductors) will likely step-up outsourcing and thus accentuate the horizontal structure. Conversely, vertical integration could remain in some other sub-sectors, the consequence being a mix of vertical and horizontal landscapes.

In both scenarios, the availability of efficient communication technologies (based on e-procurement platforms and SCM systems) will provide a favourable infrastructure for further exploration of outsourcing and cooperation possibilities. The use of e-business applications will be impossible to bypass when managing this structural change (a rather horizontal market structure) in the business process, and seeking to ensure efficient communications between OEM and their suppliers' network. The widespread use of e-business technologies enables further disintegration of the electronics industry. Thus, for the electronics sector, it is likely that the Internet and e-business solutions will further speed up the electronics industry's process of globalisation and specialisation.

So we have a marked contrast between the conservative attitude of the electrical machinery industry towards e-business, and the progressive dynamic of the electronics sub-sector. Consequently, it seems likely that the gap between the electrical machinery and electronics sub-sectors is going to shrink in the coming years.

<sup>10</sup> Source: Reed Electronics Research, The yearbook of World Electronics Research, 2003.

<sup>11</sup> E2Open is one of the major Business-to-Business marketplaces, an electronics components exchange made up of 10 founders and 300 buyers. It offers not only online purchasing throughout "open markets" (auctions), but also design collaboration, supply chain and B2B Integration and infrastructure.

## 2.3 Hesitation to start selling online in the electrical machinery industry

*Exhibit 2-5: Selling online in the electrical machinery and electronics sectors and in the other manufacturing industries*

	Make online sales		% of those ...			
			... online sales via company website		... online sales through EDI	
	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.
Electronics	8	14	89	92	3	13
Office machinery and computers	17	44	89	93	3	16
Electrical machinery and apparatus	2	8	98	89	0	0
Radio, TV and communication equip.	6	3	86	94	3	19
Textile and footwear	3	5	12	10	1	12
Chemical industry	8	9	84	52	10	52
Transport equipment	8	17	86	36	13	57
All (9) Sectors (EU-5)	10	16	79	81	5	14

Base: all enterprises / enterprises selling online, EU-5 (DE, ES, FR, IT, UK). N=108 (NACE 30), N=197 (NACE 31), N=197 (NACE 32), N ~ 500 for all sectors. "% of empl." means that data are weighted by employment ("enterprises comprising ...% of employees in the sector"). Reporting period: March/November 2003.

Some of these figures have to be analysed cautiously, taking into account the low number of interviewed companies for the two last indicators (N=39).

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

Whereas purchasing online is currently the most widely adopted e-business application in the electronics and electrical machinery sector, selling online is not yet a common practice. Even though the sector is among the most intense users of e-business technologies, Exhibit 2-4 indicates that only 8% of companies make online sales, which is below the all-sector average (10%). Moreover, this rate is particularly low (2%) in the electrical machinery sub-sector.

Exhibit 2-6 shows that 61% of companies in the electronics and electrical machinery sector have a website, the most simple means of using the Internet for sales side activities, providing information about the company, its products, and how to contact it. This rate is significantly higher than the all-sector average (36%). Furthermore, the percentage of electrical machinery companies with a website is low (44%), when compared to the other electronics sub-sectors. Significant too is the backwardness of the electrical machinery in all the other areas listed in Exhibit 2-6 (use of online technologies to exchange documents with customers, make online sales and allow online payment of goods/services ordered).

As demonstrated, enterprises actually selling online are still very rare in the electrical machinery industry. This seems rather surprising considering that this sub-sector is characterized by a high degree of B2B relations: the *e-Business W@tch* indicates that primary customers are either other businesses (74%) or the public sector (12%), while only 12% of companies have consumers as primary customers; the all-sector averages are, respectively, 28% (other businesses), 13% (public sector) and 49% (consumers). The "B2B predominance" in the electrical machinery industry could favour a more intense use of selling online.

Furthermore, as compared to the other 9 sectors studied by the *e-Business W@tch*, online exchange of documents with customers is more widely used in the sector (61% of enterprises) and even in the electrical machinery sub-sector (44%) than on average (36%). Thus online marketing relations are developed, but do not extend to selling online.

*Exhibit 2-6: Online marketing and e-commerce activities (2003)*

	Have a website on the internet	Use of online technologies* to exchange documents with customers	Make online sales	Allow online payment of goods/services ordered
Electronics total (EU-5)				
% of employment	87	42	14	4
% of enterprises	61	36	8	3
Office machinery and computers	80	39	17	8
Electrical machinery and apparatus	44	33	2	0
Radio, TV and communication equipment	64	41	6	1
All (9) Sectors (EU-5)				
% of employment	66	33	16	7
% of enterprises	36	23	10	4

\* other than free text e-mail

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

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

### Online marketing and e-commerce activities remain often limited to e-relations

The Internet does play a major role in electrical equipment manufacturers' marketing and customer relations processes. Thus, current online marketing and e-commerce activities are often limited to e-relations with distributors, which include online information, promotional tools and order management (information on products, availability of products, tariffs, orders). But these e-relations very rarely include actual online sales transactions, as practised by electrical distribution equipment manufacturers such as Schneider Electric, ABB or Legrand.

Schneider Electric, for instance, practises e-commerce on the basis of national information sites and extranet sites for international corporate customers, and certain specific market segments in some countries. These sites provide information on promotions and product launches, product specifications (installation guides, calculation software), choice of products (online catalogue, guides for helping online customers make their choices), software downloading and orders management (availability of products, tariffs, online orders).

The Voltimum case study provides an example of specific areas of online marketing (product information, e-training, e-support) in the field of low voltage products that are distributed mainly in the building industry.

## The case of online marketing towards the building industry market

The electrical machinery and apparatus industries supply three distinct end markets: the building industry, light and heavy industry, and energy (production and distribution). These three market segments correspond to distinct types of manufacturers or, for large manufacturers, to distinct product divisions. The degree of use of e-business applications also varies considerably in each market segment, especially in the field of marketing and sales:

- Manufacturers selling mainly to electrical production-distribution companies are not overly concerned with marketing issues because supply is very product-specific;
- Manufacturers selling to light and heavy industries exhibit a high degree of process automation and are advanced in their use of e-business applications;
- Manufacturers selling mainly to the building industry are focused on marketing issues, but are significantly behind in e-business use, mainly due to the conservative attitude of their customers (distributors and installation professionals).

The case study on Voltimum focuses on low voltage products, which are largely geared to the building industry. In this product segment, about 90% of product flows transit via the wholesale/distribution channel, to be sold ultimately to installation professionals. Three types of online marketing and sales activities are practised by low voltage products manufacturers:

- The manufacturer's website presents the products and promotes their brand image and relations with their distributors (some manufacturers distribute up to 100% of their products via wholesale channels). This type of relation with their main customers is exclusive, proprietary and only bilateral.
- The next stage of e-business application use allows customers to gain access to a manufacturer's online shipping management form, either through the company website or via more structured EDI exchange of data. The first solution is widely used in the electrical machinery industry, whereas EDI appears as a very marginal solution: Exhibit 2-6 indicates that, among those companies selling online, 98% of them are practising e-commerce through their website, and 0% via EDI.
- An alternative and complementary e-business solution consists of a shared B2B platform dedicated to the entire electrical professionals' user community. Typically, a distributor that sells the full range of products required by installation professionals will obtain information (via a personal access code) on a single portal for referenced manufacturer products. In the electrical industry this type of platform does not currently include transactional functions (no invoicing, no ordering online, etc); confining itself to the process of the logistic flow of information, such as practised by PTL in Spain.

Voltimum is a similar type of B2B platform, and its analysis is very instructive. It is a B2B portal website which targets the specific needs and requirements of electrical installation professionals. Voltimum is not a trading portal. It offers a shared platform for manufacturers and other industry partners for marketing and communication, and a single entry point for marketing information. It is a rich product database for the electrical installation industry.

Electricians (installation professionals) and prescription providers (distributors) are Voltimum's main target group. Distributors provide the vast majority of low voltage products to installation professionals – up to 100% of the products for some manufacturers. It would therefore not make sense for Voltimum to have a transactional model. From a strategic standpoint, Voltimum does not alter existing trading relationships in the industry, but amplifies the overall market value by making the supply chain more effective. Distributors

continue to provide commercial proximity and product availability, while receiving more product support from the manufacturers. Distributors are therefore referenced partners on Voltimum from the outset. This case underscores one type of inhibitor (the existing trading relationships) of transactional e-business activities within the electrical equipment industry.

Furthermore, the use of e-commerce appears more advanced when one considers the relationship between the distributors and their own customers: installation professionals (for the manufacturer, the final customer to be addressed). The leading European distribution groups (Rexel, Hagemeyer), which control large market shares in most Western European countries, state that in some countries they achieve up to 25% of their sales through an e-business application (any kind of electronic platform), addressing both large and small installation professionals. The high and increasing rates of e-commerce use are found in companies from countries such as Denmark, The Netherlands and Germany<sup>12</sup>.

However, when considering the transactional relationship between distributors and installation professionals, industry players point to the conservative attitude of the large majority of installation professionals. These attach great importance to personal contacts and relations with their usual distribution branch. This is particularly the case for very small electrical firms, which represent the vast majority of the customer base. Consequently, for many manufacturers of electrical machinery, e-business currently presents a means of additional service and support, but not the main way of conducting business with their customers.

#### Slight growth of online selling in the coming years

According to the previous analysis, the rise of sell-side activities in the electrical machinery industry is likely to be very slow in the coming years. The conservative (although not negative) attitude towards online transactional operations represents a strong inhibitor for the widespread use of online selling. As an example, the rate of RFQ (Request For Quotation) on the Voltimum website is currently very low (300 RFQ out of 1,000,000 requests).

When thinking about a probable scenario for the coming years in most of the EU countries, it appears that before online selling becomes ubiquitous, online delivery processes will need to become more mature. As they are still in an early stage of development, these processes have not yet reached the required level of acceptance among smaller firms from the sector in most of the EU countries. Leading ICT regions, for example in Sweden and Finland, are possible exceptions. In general, however, steering this industry to a more intensive use of transactional e-business constitutes a real challenge.

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<sup>12</sup> Source: Voltimum, from interviews with major distributors.

## CASE STUDY: VOLTIMUM

### Abstract

*Voltimum aims to be the leading B2B portal website fulfilling the specific needs and requirements of electrical installation professionals. Voltimum is not a trading portal. It offers a shared platform for manufacturers and other industry partners for marketing and communication, and a single entry point for marketing information (a rich product database for the electrical installation industry).*

<b>Case characteristics</b>	
• Sector focus	Electrical apparatus
• Business focus	Multi-firm B2B portal
• Geographical focus	Europe
<b>Case objectives</b>	
• B2B platform	***
• Online marketing (product information)	*****
• e-training, e-support	**

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

### Background and objectives

In 2000, several major manufacturers in the electrical industry – ABB, Legrand, Nexans, Osram, Philips, Pirelli and Schneider-Electric – decided to create a European portal for the electrical installation industry, and to set up the technological and organisational infrastructure of Voltimum. In 2002, Hager joined the initiative as a shareholder.

This initiative was triggered by the pressure on these manufacturers to launch e-business projects. Moreover, these founding companies also wanted to valorise their market brands throughout innovative marketing actions. Another major driver was the wish of the electrical industry to bring the commercial and logistic chain to the Internet, mainly in order to reduce the time between product search by the electricians and final delivery. Voltimum covers 6 countries (France, Germany, Italy, Spain, Sweden and the United Kingdom) with 6 distinct portals covering country-specific information. Voltimum has its headquarters in Geneva, Switzerland, and employs 22 people.

Voltimum's objectives are:

- To be the leading portal website fulfilling the specific needs and requirements of electrical installation professionals (electricians, electrical contractors, panel builders, maintenance engineers, specifiers and consultants, manufacturers, distributors, trade associations and industry bodies);
- To be the leading service provider for the industry, offering a shared platform for manufacturers and other industry partners for marketing and communication, and efficiency increases through online integration of the various actors in the industry.

The Voltimum mission statement is to be the main reference in all European countries for online product information, documentation and related services to the electrical installation industry.

## Activities

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The main services provided by Voltimum are the following:

- A portal website and online service tool for all users,
- “The richest” database for the electrical installation industry,
- An online marketing tool for manufacturers,
- An option to distributors for information-deep-linking (VoltiLink function).

Voltimum saves cost and increases efficiency along the value chain through "e-integration" of the various players (a shared platform and single entry point for marketing information). Voltimum is not a trading portal. The main target group is electricians (installation professionals) and prescription providers (distributors) to whom product or solution information regarding increasingly complex products is supplied. Distributors do not have the structures, or sufficient experience and training to be able to supply and prescript all manufacturers' numerous new products. Voltimum supplies this complementary expertise, and also answers specific questions online or by phone. A typical example is the feasibility of connecting and/or the way to connect two components.

Moreover, manufacturers' distribution networks are being drastically reduced: Voltimum supplies a substitute for a function provided by the distribution channel (product information and training). This also allows the distributors to decrease their costs (they do not need to train their staff on the large range of products sold). The distributors do not have the internal resources to create the product database (as Voltimum does), so distribution can be limited to two major functions: stock product (supply) and availability, and commercial relations with end customer (installers).

Voltimum does not push a particular brand (*brand agnostic*) because brand is a very important competitive advantage in this sub-sector. Voltimum does not compete with the manufacturing companies' websites which present the same type of information, but rather acts a complementary tool for installation professionals. A brand agnostic portal has to lead users to the brand without imposing it.

Distributors are also participating in a linking system (VoltiLink), which allows them to avoid having to create and maintain complex and voluminous databases, and to have the use of high quality and up-to-date information without having to request it. Some distributors websites include a direct link to the Voltimum product catalogue without supplying any other comparable structured product information.

Services to professionals and functionalities include:

- A catalogue and search engine with catalogue functionalities: browse and search functionality, manufacturer-based structure, multi search – multi criteria, start to build up “solution” approach, etc.
- Support and cooperation for distributors: 4.500 distributor branches listed in the directories, 5 VoltiLink deep search functionalities in place, 10 more under implementation, promotion of Project Management tools (including RFQ<sup>13</sup>).

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<sup>13</sup> Request For Quotation

- Easy access to personalised information, up to the minute product news, personal alerts for new products and features, easy access to manufacturers' helpdesks, etc.
- Additional content: industry news and new products, catalogue guide with news indicator, technical or legislative issues.
- Communication, information and support: Electronic Newsletters, growing circulation to profiled and targeted customer base, manufacturers' innovations area, training, documentation, success stories, news and events, experts link, norms, standards, FAQ.

The most appreciated functions by the users are the following:

- Database and search engine on products: multi criteria, multi universe;
- Documentation, news and new products and solutions;
- Access to manufacturers' experts (forums and FAQs).

### Inputs

To date, more than 20 million Euro have been invested in Voltimum. This includes software and hardware platforms and 3 years working capital to launch the project. It took 24 months to create this rich database, as some application development difficulties were encountered (the software chosen at the start was not suited to the required functionalities, which meant a 14-month delay). The final application is customised and based on open source software (Linux/PHP). The implementation phase required 10 people, but the current operational phase requires no more than 6 people. The first stage consisted of commonly defining the data catalogue model. The second stage was more labour-intensive, consisting of data input.

### Outputs and impacts

Voltimum established itself as the industry's benchmark portal website in 2003 with:

- 250,000 products in the online catalogue, 110 catalogues and 220,000 associated documents,
- 35 manufacturing partners and 80 brands,
- 500 wholesaler outlet distributor branches listed in the Voltimum directories.

Voltimum has achieved a high level of awareness throughout Europe with:

- More than 4 million page views per month (based on the "Webtrends" definition),
- 145,000 distinct users (75% installers/contractors, 20% specifiers, 5% distributors) of which 120,000 registered users and 33,000 regular users.

The future will involve expanding and deepening the Voltimum content, offering even more value to the electrical installation industry: more value-added functionalities; further emphasis on knowledge development and training; promoting additional relevant topics such as recycling; offering support for collaborative project management, and extension to other countries is currently being investigated.

## Lessons learned

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- From the beginning, Voltimum's scope has been European and multinational. Nevertheless, it has become obvious that the key success factors concern local/national markets and issues, even if the look and feel are similar on the 6 country websites.
- The evolution of the site to more transactional functionalities is very slow. The next step is expected to be an online delivery process, but most of the countries (except Sweden) are not yet ready for it. The rate of RFQ is currently very low: 300 RFQ out of 1,000,000 requests. This type of functionality (product prices, product availability) is already often supplied by distributors, and not often used by installers. In this respect, Voltimum constituted a real challenge.
- E-support: electricians look for solutions to real problems; it is similar to e-training and can evolve into e-learning: the next stage (2005) will consist in providing product knowledge and general technical knowledge.
- The SMEs (providing "minor brands") have shown a strong interest and were very eager to be referenced in Voltimum, already feeling overshadowed by the "major brands": their products gain more visibility, while their marketing investment in product information decreases. These SMEs are also more focused on the concrete benefits of being present on Voltimum.

## Sources and references

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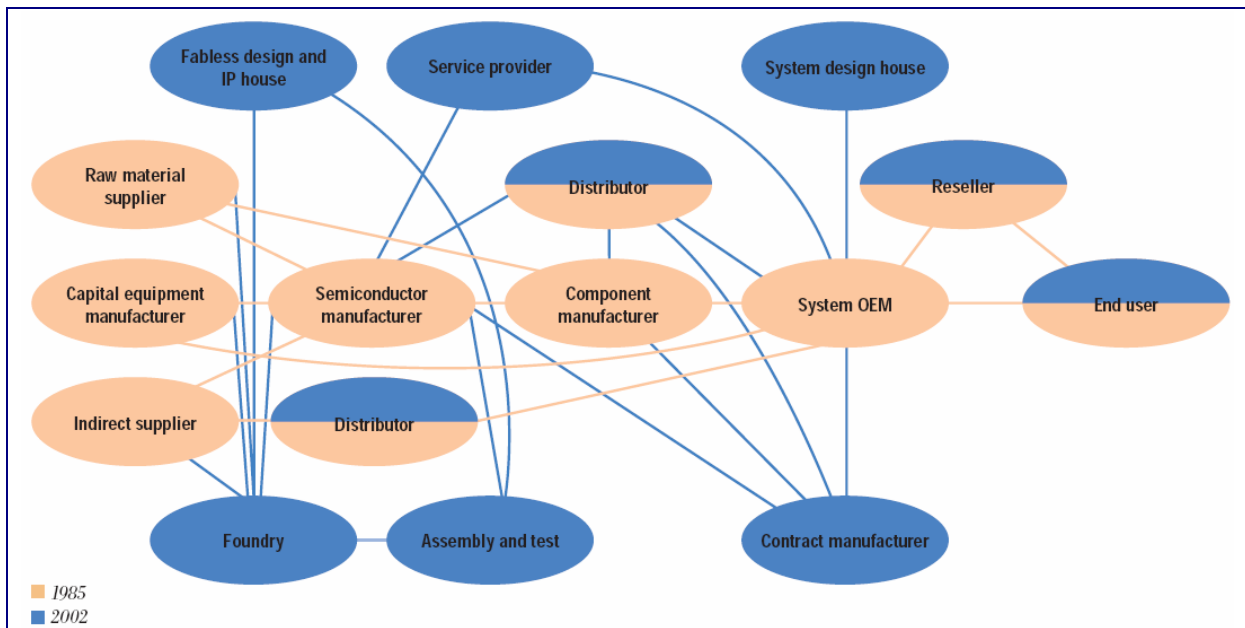
- Interview with Mr. Bruno Hamon , CEO of Voltimum, [bruno.hamon@voltimum.com](mailto:bruno.hamon@voltimum.com); May 2004
  - "Voltimum: an asset for the electrical installation industry", presentation by Hanspeter Fässler, Chairman of Voltimum and ABB wholesale channel Manager
  - [www.voltimum.com](http://www.voltimum.com)
-

## 2.4 The necessity of supply chain collaboration across the electronics value chain

Collaboration has become a crucial element in the creation of business value

At a strategic level, the electronics industry has evolved dramatically since the early 1980s. Vertically integrated companies have restructured themselves, re-focusing on core business areas, slashing costs and building networks of suppliers and partners which are also specialised and cost competitive. Industries involved in the manufacture or consumption of electronics products increasingly rely on partners for design and manufacturing activities. This trend, combined with a trend towards global sourcing, means that companies must manage end-to-end processes that extend outside their company and across multiple tiers of their supply chain. Cutting edge products are now created not by a single company but by networks of companies, each contributing a specialised, high-value element of the total solution.

*Exhibit 2-7: Increasing complexity in the industry is driving the need for collaboration.*



Source: IBM Business Consulting Services.

This complexity has made it more and more difficult for companies to get the right information at the right time, to be responsive to changes and make the informed decisions necessary to run their business. This complexity has also resulted in excess inventory buffers, expediting fees, high materials management costs, lost sales and wasted person-hours spent on manual processes. As a consequence, the new challenge consists in combining strategic industry change (specialisation and the creation of extended enterprise networks) with the operational challenges of keeping inventories low (but not disrupting the continuous cycle of new product introductions). In order to do so, business partners have to work together effectively in new ways: collaboration across the supply chain has become a crucial element in the creation of business value<sup>14</sup>.

<sup>14</sup> Christophe Begue (IBM Business Consulting Services) - All together now: Supply chain collaboration in the electronics value chain - IBM Corporation 2002.

Waves of change have already washed across the relationships between business partners as electronics companies have restructured their procurement organisations to optimize cost savings from suppliers and experimented with bypassing their distribution partners and going directly to the customer. Now, the focus has to shift again, this time to smoothing and accelerating the operational and planning collaboration between enterprises. After a decade of strategic reorganisation, procurement transformation and supply chain management investment, **extended enterprise collaboration** (EEC) with customers and suppliers may appear more necessary.

### Collaboration with external supply chain partners remains low

Based on a detailed study of collaboration in the networking, computer, consumer electronics and instruments industries, Professor Naren Agrawal (Leavey School of Business, Santa Clara University), found that the level of collaboration with external supply chain partners was extremely low for most supply chain processes<sup>15</sup>. Furthermore, Professor Naren Agrawal demonstrated that the penetration of collaboration software solutions is also low. For most supply chain processes, most external partners have no direct access to the hub firms' IT systems: less than a third of the companies in the United States in his study allowed their partners direct access to their systems.

In the EU countries this rate seems particularly low when considering trends identified in the *e-Business Survey 2003* (cf. Exhibit 2-8). A way of measuring the sophistication of the sell-side e-commerce or buy-side activities is to consider whether the online sales system is in some way integrated with customers' IT system. A higher degree of integration means a higher degree of technological complexity and more costly implementation, but promises greater efficiency gains in the form of process cost savings due to automation of transactions. Exhibit 2-8 indicates that in the EU-5 the use of an IT system integrated with that of a supplier (for placing orders) and with that of a customer (for receiving orders) are both used by respectively 5% and 2% of sector enterprises. These numbers correspond to a large degree with the all-sector average.

Exhibit 2-8 also indicates that a much higher share of large enterprises than SMEs has engaged in integration efforts spanning beyond their own borders. Obviously, large enterprises with their high ordering volumes see much more cost-saving potential in automating purchasing or selling routines than their smaller counterparts. Moreover, large companies act as early adopters and drivers to impose complex SCM solutions to their smaller suppliers due to their market power. Finally, it becomes obvious that IT integration with business partners is still rather rare, except for larger companies.

Typical electronics companies spend between 65% and 85% of their revenues on procured materials (activities that depend on partners outside the firm)<sup>16</sup>. Despite this, industry analyst AMR Research found that although 96% of companies have collaborative relationships with customers, only 67% of transacted customer demand is supported by electronic means, 33% by information-sharing, and only 10% by joint planning and forecasting.<sup>17</sup> This represents a large gap between the business model and the supply chain reality.

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<sup>15</sup> Professor Naren Agrawal, Study of collaboration in the networking, computer, consumer electronics and instruments industries, Leavey School of Business, Santa Clara University, 2002.

<sup>16</sup> IBM Business Consulting Services analysis, 2002.

<sup>17</sup> Bacon, Allison, Larry Lapide and Janet Suleski. "Supply Chain Collaboration Today: It's a Tactic, Not a Strategy." AMR Research. September 2002.

*Exhibit 2-8: IT integration with suppliers and Business integration of online sales systems (2003)*

	IT system is integrated with that of a supplier for placing orders*	Use an SCM** (Supply Chain Management) system	IT system is integrated with that of a customer for receiving orders*
Sector total (EU-5)			
% of employment	12	11	3
% of enterprises	5	2	2
0-9 employees	5	0	1
10-49 employees	7	4	1
50-249 employees	4	7	3
250+ employees	19	14	5
All (9) Sectors (EU-5)			
% of employment	8	6	5
% of enterprises	6	2	3

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

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

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

This gap is also obvious from results of the *e-Business Survey 2003* (cf. Exhibit 2-9) on the level of automation of extended enterprise functions. The latter term means all activities that are neither purchasing nor selling, but still involve interaction, collaboration and exchange of information with people or organisations outside of the company itself (including activities such as collaborating with business partners to design new products, to forecast demand and manage capacities). Online collaboration with business partners to design new products and to negotiate contracts is conducted by 16% of enterprises in this sector. Using the Internet to manage capacities and forecast product demand is not yet very common (only 11% of enterprises in this sector make use of this application). 36% of enterprises in this sector in the EU-5 use online technologies other than free text e-mail (a less sophisticated activity) to exchange documents with customers.

*Exhibit 2-9: Use of online technologies (other than free text e-mail) for business processes between companies (2003)*

	Use of online technologies* to exchange documents with customers (1)	Collaborative product design (2)	Collaborative demand forecast (2)	Capacity / inventory management (2)
Sector total (EU-5)				
% of employment	42	20	17	20
% of enterprises	36	16	11	11
All (9) Sectors (EU-5)				
% of employment	33	17	12	14
% of enterprises	23	12	8	7

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

(2) Base: enterprises with Internet access. EU-5 = DE, ES, FR, IT, UK. N=502 for EU-5 sector total.

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

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

One reason might be that implementation of sophisticated systems is very complex and costly. This implies that a higher degree of sophistication is primarily attractive for large companies that have to carry out a high number of standardised transactions with a limited number of business partners. Nevertheless, in terms of online technologies usage for business processes between companies, the electronics and electrical machinery industries exhibit usage figures that are clearly above the all-sector average.

### Investment in establishing extended enterprise collaboration represents an important opportunity for firms

Several early adopters have proven that effective collaboration with business partners can create value. A large telecom original equipment manufacturer (OEM) used a common infrastructure to collaborate on forecast and orders with vendors; when it implemented a forecast collaboration process its order fill-rate increased by five points<sup>18</sup>.

A consumer electronics company deployed a forecast collaboration process and reduced planning cycles from four weeks to one<sup>19</sup>. The case study on ST Microelectronics also shows that the business case for investment in extended enterprise collaboration in electronics companies can lead to positive returns.

Thus success in synchronized value chains can accelerate time to market, generate higher margins, increase capital productivity and significantly lower costs. These results are not all guaranteed, however. Professor Naren Agrawal found that, although higher levels of collaboration have led to shorter product development times, they have not always translated into higher profit margins or uniformly superior supply chain performance<sup>20</sup>.

For more and more electronics companies, managing extended relations with a wide network of partners is at the core of their business process.<sup>21</sup> Investment in extended enterprise collaboration represents one of the key opportunities for companies to level the playing field with industry leaders. The competition is shifting from purely internal process optimisation to value chains that function well together.

For example, the Lake case study shows how a medium-sized enterprise was compelled to implement a new solution in order to stay competitive: the demand of Lake's most prestigious customer, BT, became a driving force in initiating LAKE's e-business migration path. BT, which accounts for over 30% of the company's business, requested tighter control of the supply chain process.

### Supply chain collaboration versus participation in e-marketplaces

As an alternative to company-specific e-procurement systems or to supply chain collaboration, firms can also participate in independent third-party or consortium-led online marketplaces. In a PWC survey<sup>22</sup> more than 100 marketplaces for the electronics industry

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<sup>18</sup> IBM Business Consulting Services, client project, 2001.

<sup>19</sup> IBM Business Consulting Services, client project, 2000.

<sup>20</sup> Professor Naren Agrawal, Study of collaboration in the networking, computer, consumer electronics and instruments industries, Leavey School of Business, Santa Clara University, 2002.

<sup>21</sup> Kapur, Vivek and Denis Mathias. "Collaboration: Using eHubs to Create Value in High-tech." IBM Business Consulting Services, 2002.

<sup>22</sup> PWC - PriceWaterhouseCoopers Unternehmensberatung GmbH (2002): "Elektronische Marktplätze: Chancen und Risiken für Betreiber und Teilnehmer", [www.pwcconsulting.de](http://www.pwcconsulting.de)

were evaluated based on different criteria. The main results of this study can be summarised as follows:

- The number of marketplaces in the electronics industry is higher than in other industries;
- Most marketplaces not only offer a trading platform, but also provide additional information and service; for example, E2open marketplace software solution includes components such as customisable inter-company workflows (to support key direct materials processes in supply chain management), document management, storage and normalisation of data flowing; E2open also offers a wide array of professional services (customer and process preparation, business partner preparation, testing support, etc).<sup>23</sup>
- The lack of integration of back-end-systems, such as inventory control systems, and of elements of users' supply chains, such as logistics, finance, insurance, etc., is a weakness of most e-marketplaces.

The limits and weaknesses of e-marketplaces raise the problem of their positioning towards B2B integration of supplier (or/and subcontractor) information systems<sup>24</sup>. We anticipate that marketplaces will probably not be exclusive from B2B supplier integration in the supply chain, but rather complementary. The result may possibly consist of the following dichotomy:

- First, a customisation of e-business relations in the case of key accounts, adapted to recurrent B2B relationships;
- Second, the use of marketplaces for standard relations, as some business partners will only be able to go through e-marketplaces.

As for the first case (customisation of e-business relations), sophisticated collaborative applications appear ideal, like the ones based on new XML standards, e.g. RosettaNet<sup>25</sup>. However the need to respond to all kind of demands and to adapt to new demands will, to some extent, require the use of less sophisticated applications such as e-marketplaces or Extranets.

### The adoption of collaboration solutions appears likely to continue and even accelerate

The trend towards increased supply chain complexity involving a greater number of critical business partners appears likely to continue and even accelerate in the coming years. The trend of companies focusing on core skills and areas of expertise, driven by the need to reduce costs, is likely to continue in the current economically uncertain landscape, resulting in a more efficient but also a more complex and interrelated electronics value chain.

As the evidence shows, the adoption of collaboration solutions appears to be accelerating throughout the electronics sector. The likelihood that electronics manufacturers' suppliers and customers collaborate with at least one of their other partners is increasing. As network supply chains become the norm, traditional success factors in supply chain management (SCM) will cease to provide a competitive edge. Optimisation of processes within the four walls of the enterprise is becoming an ever-smaller factor in corporate success. The ST Microelectronics case study clearly illustrates this point. This presents a new opportunity for electronics companies to reset their competitive positions by creating a solid collaboration strategy, leveraging the strength of their partners as well as their own, and closing the best-in-class performance gap.

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<sup>23</sup> See <http://www.e2open.com/products/sol/>

<sup>24</sup> See case study on ST Microelectronics for an example of sub-contractor integration in the supply chain.

<sup>25</sup> See following issue (The need for e-business standards in the electronics industry).

## CASE STUDY: LAKE COMMUNICATIONS

### Abstract

**Lake Communications, a medium-sized enterprise, radically streamlined the delivery process for its products. The automation of the supply chain system provided much more control over the whole process, from ordering to delivery to their end users. Lake is now in a position to guarantee delivery times to its customers and to make more accurate forecasts of demand levels.**

<b>Case characteristics</b>	
• Sector focus	Electronics (telecommunications)
• Business focus	Medium sized enterprise
• Geographical focus	Dublin (Ireland)
<b>Case objectives</b>	
• Supply chain control and integration	****
• EDI based ordering system	***
• CRM	*

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

### Background and objectives

LAKE is a private company with headquarters in Dublin and offices in the United Kingdom, the United States and Australia. It has over 120 employees, of which 60 dedicated to product development. LAKE is a supplier of wireless and wired communications products targeted to the residential and small office segments. Products are sold indirectly to end customers (consumer market) via its partnerships with major telecom operators (such as BT) and ISPs. The group has an exclusive manufacturing partnership with Welwyn Systems based in Newcastle, UK.

The company's history revealed the following problems:

- Escalating costs due to holding and storage of stock (contractual obligation to hold agreed levels of goods at their distributors' warehouse facility).
- A minimal degree of control over manufacturing and distribution (shipping of orders process): no automation existed. There was no electronic tie to their two major partners, Welwyn Systems and the distributor.
- Costly, repetitive administrative procedures: all orders needed to be manually entered into their ERP system. As the company grew, the task of monitoring stock levels and anticipating product demand became a labour-intensive and costly process.
- Accurate forecasting of demand levels for products became especially difficult.
- Little visibility with customers and no mechanism for online support.

The demand of LAKE's biggest customer, BT (accounting for over 30% of its business), became a driving force in initiating LAKE's e-business migration path, as BT requested tighter control of the supply chain process.

Lake's objectives when implementing an e-business solution were:

- **To create new products and services.** A dedicated B2B site providing facilities such as online customer support and auto notification of bug fixes.
- **To reach new international markets.** A B2C website to provide easily accessible information about LAKE and its portfolio of products.
- **To reduce costs** and make business processes more efficient, by integrating all the different parts of the supply chain (real-time access to suppliers' and customers' internal databases and systems, thus reducing inventory costs, lead times and procurement costs).
- **To improve communication and visibility with customers.** Collection of data about customer preferences and behaviour in order to drive online marketing and to help to accurately forecast demand.

## Activities

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### Implementation

The overall supply chain system required tight integration with three of LAKE's partners. The operational workflow process was precisely designed with the customer, from the first stage (customer would place their orders through their existing EDI system) until the last stage (deliver the parcel to the end customer). Once the system was up and running, the process of getting shipments to end customers would be completely automated. Now, instead of holding large volumes of stock at their distributors' warehouse, LAKE could work according to the "just in time" principle of manufacturing on-demand. The process would be as follows: a telecommunications company places an order with LAKE, with orders being batched and pushed to LAKE's system three times daily. The order would be sent to manufacturing which would fill the order and ship it to the distributor. The distributor would then ship it directly to the customer.

The customer would be offered a web interface to monitor or modify any of the orders it placed. If an amendment was required to a shipping address for instance, it could be altered up to two hours after an order was placed. Using this method, the customer would get assurance that items, if ordered before 5 p.m., would be shipped and delivered the next day.

In conjunction with its B2B site supporting LAKE's automated supply chain system, the company also developed a B2C site used primarily as a marketing tool to promote its products and services to a global market.

In all, the project took approximately two man-years to design, build, integrate and implement. The total budget amounted to 379,000 Euro (of which 127,000 Euro in public funding). Prior to the roll-out, the customer received training from LAKE on how to operate the web interface in order to query, monitor and amend orders. The ordering process experienced by the customer (15 BT branches at first) remained the same as before, with all orders coming via their EDI system.

### Outcome: benefits for customers

The new ordering feature gives the customer more control over the whole process, from ordering to delivery to their end users: if an end customer had problems with the delivery of a package, BT were now able to get online access to their order status from the LAKE web interface. As this interface connected directly to the distributor's systems, the customer was able to determine the exact status of the package.

The tight integration between the customer's ordering system and LAKE's ERP system resulted in no perceived change in ordering methods. However, now orders could be amended if changes were sent within two hours of having placed the order. LAKE's ERP system would now be able to issue invoices as soon as the package went off for distribution. This allowed the customer to have up-to-date account balances.

LAKE was now in the position to guarantee delivery times to their customers. With the new system, LAKE will now provide "next day delivery" provided the order is placed before 5 p.m.

### Outcome: benefits for the company

- The company's main customer, BT, was a driving force, demanding tighter levels of control over all processes. As BT is now fully integrated into the supply chain process, LAKE was assured of a continuation of business and orders.
- The implementation improved the quality of the customer service. The functionality offered by their web services endowed their customer with a high level of control over their own ordering process. In turn, they were able to offer a better service to their own end customers. Additionally, the online support services enabled a more timely method of dealing with customer issues and providing up to date information to engineering.
- LAKE re-used its existing internal IT infrastructure thus helping reduce the cost of implementing the project. In addition, LAKE implemented systems that helped to maximise the benefit of their current IT resources and invested in upgrading the IT skills level within the organisation.
- The system provided detailed information about customer orders volumes, product preferences and distribution demographics. This data puts LAKE in a position to make more accurate forecasts that allow a greater focus on target marketing and sales. In addition, LAKE now gets more visibility with their customer. As each customer now goes through the LAKE web interface the LAKE brand gets far more exposure.

Although hard to quantify in terms of monetary value, the automation of the supply chain system provided remarkable benefits for LAKE. Prior to the integration of processes into the new system, manual procedures accounted for the majority of clerical work in both sales and accounts. All invoices were issued manually from the ERP system, where now they are generated automatically as soon as the order is sent for distribution. All product requests were processed by sales staff and sent to the distributor's warehouse for picking and shipping. The order is now automatically sent to the manufacturing partner for assembly and shipping.

Using the new automated end-to-end system, the number of manual repetitive operations carried out between LAKE and its partners, has been reduced dramatically. This improves human resource efficiencies resulting in cost savings, as staff now enjoy

a more productive workday. They can now concentrate their efforts on more rewarding tasks.

One directly quantifiable reduction in costs is the shift from "build to stock" to "build on demand". The overhead of its distributor holding large volumes of stock at a warehousing facility was estimated to cost 1.3 million per annum. In addition, LAKE had to monitor and maintain stock levels using a manual process of checking sales orders and trying to anticipate demand. Migrating to a build-on-demand operation has removed the need to pay costly warehousing charges.

LAKE is now in a position to approach its other customers and offer the new services to them as well. LAKE's IT/IS departments can now draw on the two-year learning curve it undertook to achieve these project objectives. As the project with BT has been running smoothly since June 2001, the number of customers utilising these services could be expanded to the remaining customer base.

For the future, LAKE plans to roll out its system to its other telecommunications customers. Further, the company plans to promote new products and services on its B2C site to expose the LAKE brand to existing and emerging markets.

### Lessons learned

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One of the main challenges experienced by Lake Communications was related to the points of integration with partners' systems. These had to cover all file formats transmitted between the two parties, the protocols used and the timing of these transmissions. The main problem that arose was the reliance on third parties to fulfil their integration tasks in a set time frame. As there was no formal contractual agreement between each party with regard to the e-business project, the project time lines and milestones often slipped.

The whole process of integrating with both their manufacturers' and distributors' systems has improved relationships. Having a heightened understanding of each other's operations has allowed the companies to move forward with efficiency and cost savings.

### Sources and references

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- Interview with Mr Brian Kennedy, IT Manager, Lake Communications, May 2004.
- Website of Lake Communications (<http://www.lakecommunications.com>)
- [www.enterprise-ireland.com/practicalbusiness/Case\\_studies/lake](http://www.enterprise-ireland.com/practicalbusiness/Case_studies/lake)

## 2.5 The need for e-business standards in the electronics industry

### Standards are enablers of supply chain collaboration

In line with the previous issue (supply chain collaboration), although the end goal of any collaborative investment may be near real-time system-to-system integration with business partners, designing a collaborative supply chain is far simpler in theory than it is in reality. Responding to customer demand nearly always involves not only the manufacturer of the product itself, but also a whole chain of suppliers, subcontractors and their service providers.

Process change involves multiple organisations that both compete and collaborate, as well as multiple technology standards and business processes. Internal processes may seem much less complex after getting half a dozen major electronics companies to agree on a collaborative business process. The activities of this supply chain should be orchestrated, using Internet technologies for communication, through SCM and collaborative planning applications that are coming into more widespread use. As companies implement these tools, they soon discover that there are gaps forming an invisible barrier that limits their ability to act in concert and achieve their desired responsiveness. It is especially acute when dealing with multiple factories, physically separated and/or controlled by multiple enterprises<sup>26</sup>.

These challenges are going to grow as enterprises find themselves on the sending and receiving ends of numerous collaboration requests, each of which may run on a different schedule and use different formats or technical standards. Securing the agreement of all collaborators (including some which are also competitors) can be difficult<sup>27</sup> (in the case study on semiconductor manufacturer ST Microelectronics, subcontractors are also competitors).

Putting together a migration plan of increasing capability and understanding where business partners are headed is one of the first activities in a collaborative process. This plan lays the groundwork for a process of continuous improvement (establishing acceptable minimums and communicating future directions to business partners). Signalling commitment to emerging industry standards, such as RosettaNet, in roadmaps given to business partners can increase participation rates in collaboration initiatives. Business partners will have a greater expectation that their investments will be reusable with their other customers or suppliers.

By way of example: for a large Asian electronics company<sup>28</sup> the collaboration migration plan first called for a simple spreadsheet-based solution. After a validation period of a few months, a Web-based tool replaced this simple solution. Eventually, some of the most capable suppliers will migrate to a server-to-server type of collaboration architecture, while others will keep the Web-based solution. The latter case is presented in the ST Microelectronics case study below: the RosettaNet standard solution has been adopted by almost all ST's subcontractors, except by very small Chinese companies which do not have a sophisticated enough information system to be integrated directly in ST's systems.

The ST Microelectronics case study also presents the concept of "the virtual factory", i.e. viewing and managing multiple manufacturing plants, processes and companies as a "single

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<sup>26</sup> Virtual Factory - Pascal Bouquet, Conference ISA France -March 2002,

<sup>27</sup> Christophe Begue (IBM Business Consulting Services) - All together now: Supply chain collaboration in the electronics value chain - IBM Corporation 2002.

<sup>28</sup> IBM Business Consulting Services, client project, 2002.

factory”, a sophisticated and advanced degree of supply chain collaboration. Most enablers of the virtual factory are linked to standardisation issues: open standard (TCP/IP protocols), XML based standards (RosettaNet in this case) and other data standardisation initiatives.

#### Low adoption of electronics' new XML-based standards

Most electronics manufacturers use electronic business applications via Electronic Data Interchange (EDI), a standards-based mechanism for trading partners to electronically communicate with each other despite having disparate systems, software and architectures installed. In the past, EDI was considered expensive and difficult to implement. Much of the expense was attributed directly to transaction fees charged by value-added networks (VANs). Today, EDI is growing in popularity because transaction fees can be avoided by leveraging the Internet as the communications transport mechanism.

One the other hand, new XML-based standards (ebXML or RosettaNet, for instance) allow an optimised integration of components within a system, not only for marketplace purchase and supply but also for Content Management and Document Management (such as workflows) of technical information in electronics and electrical systems. The XML-based standards represent a major development for these industries, as they open new opportunities in the field of structured exchange of data, even if their adoption remains limited at present.

*Exhibit 2-10: Exchange of standardised data between companies (2003)*

	Companies using EDI based standards to exchange data with buyers/sellers	
	% of firms	% of empl.
Electronics - Sector total (EU-5)	10	28
<i>Office machinery and computers</i>	13	23
<i>Electrical machinery and apparatus</i>	5	28
<i>Radio, TV and communication equip.</i>	12	31
All (9) Sectors (EU-5)	5	18

	Any standards		Type of standard							
			EDI based		XML based		STEP		Proprietary standards	
	firms	empl.	firms	empl.	firms	empl.	firms	empl.	firms	empl.
FI Finland	51	94	12	65	13	19	1	8	13	26
SE Sweden	40	83	9	53	11	26	2	25	10	2
EE Estonia	13	33	1	12	3	4	0	0	7	20
HU Hungary	44	29	8	11	4	1	2	0	15	3
SK Slovakia	37	33	5	1	10	22	0	0	2	0

Base: all enterprises. N ~ 50-100 per country.

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

For example, for the large Asian electronics company mentioned above, in 2002 IBM found that although 100% of its suppliers had Internet connectivity, only 50% used materials resource planning (MRP), 22% had an advanced planning and scheduling (APS) system, and 0% used Extensible Markup Language (XML)<sup>29</sup>. This result is in line with the *e-Business*

<sup>29</sup> IBM Business Consulting Services, client project, 2002.

W@tch survey. Exhibit 2-10 indicates that EDI-based standards are the most often used, ahead of proprietary standards and XML based standards<sup>30</sup>.

Furthermore, as shown in Exhibit 2-11, Extranets, B2B Marketplaces and suppliers' websites are spread out as a distribution platform used for online purchases. EDI is, by comparison, little developed among companies in the electrical machinery (large number of SMEs) and electronics industries. The latter point underlines the very limited use of EDI for online purchases in the electronics sector (the same low rate of EDI use is obtained as for the selling side). Thus exchange of standardised data between companies remains limited on the whole in the electronics sector, although EDI is used more in the electronics sector than on average in all sectors.

*Exhibit 2-11: Distribution platforms and protocols used for online purchases in the electrical machinery and electronics industries (2003)*

	Website of suppliers	B2B Marketplaces	Extranet	EDI
Sector total (EU-5)				
% of employment	78	48	31	5
% of enterprises	84	30	36	1
All (9) Sectors (EU-5)				
% of employment	88	24	28	6
% of enterprises	85	21	22	3

Base: enterprises making online purchases. EU-5 = DE, ES, FR, IT, UK. N=295 for EU-5 sector total. Reporting period: March/November 2003.

Source: e-Business W@tch (2004)

### Process change is an opportunity to leverage emerging industry standards

For the electronics industry, process change is an opportunity to leverage emerging industry standards (such as RosettaNet) and, by doing so, converge on process definitions which business partners can easily integrate. The benefit of process standardisation is twofold:

- Firstly, it will increase business partners' acceptance of the collaboration as the proposed process will be more likely to fit their own processes.
- Secondly, it will greatly facilitate the ongoing maintenance of the collaboration solution because only a single process instance needs to be maintained and upgraded over time.

### New open standards decrease the cost of e-business technologies

The previous Sector Impact Study<sup>31</sup> demonstrated that the most important barrier to the development of e-business in the electronics is the size of the company. Even if SMEs do not fall far behind large companies in terms of e-business usage, large companies are in a better position to exploit opportunities of making business processes more efficient and cheaper by using ICT. Interoperability through the use of open standards is a way of reducing the cost of e-business application, and addressing SMEs' concrete needs. The growing use of open standards at reasonable prices could herald a new era of e-business software.

<sup>30</sup> These figures are not available for the electronics sector (thus only available for the All (9) Sectors (EU-5)), except for EDI.

<sup>31</sup> Sector Impact Study No. 03-I, May 2004.

In the electronics sub-sector, XML-based standard RosettaNet has brought standardisation of business processes to XML-based business information exchange over the Internet. The original goal of this standardisation was to reduce cost while allowing disparate trading partners to conduct electronic commerce in a mutually understood way (both syntactically and semantically).

Although RosettaNet has achieved relatively widespread adoption in large companies, the cost of implementing RosettaNet solutions has slowed adoption in small and medium-sized businesses. With the exception of SMEs with customers that require RosettaNet to conduct business, SMEs are reluctant to make a significant investment if the number of transactions is low, and if they cannot justify the return on investment<sup>32</sup>.

In order to face this challenge, RosettaNet is continuing to pursue the goal of reducing the cost of implementing and executing these business processes. In particular, making the specification of the business processes more machine interpretable results in fewer manual hours spent in reading and interpreting RosettaNet PIPs<sup>33</sup>. Increased automation further reduces errors and related costs. RosettaNet is currently working on the challenge of making the execution of the business processes more efficient. The goal of making automated B2B integration affordable and accessible to large numbers of SMEs is being addressed by the definition of a services framework, and by standardising even more aspects of B2B integration.

Fact-Box:

*RosettaNet*

*RosettaNet is a non-profit consortium of almost 500 of the world's leading Information Technology (IT), Electronic Components (EC), Semiconductor Manufacturing (SM), and Solution Provider (SP) companies collaborating to create, implement, and promote open Internet-based e-business process standards. The mission of RosettaNet is to establish a common language and standard processes for business-to-business (B2B) transactions. RosettaNet aims at aligning the electronic business interfaces between Supply Chain Networks Partners (Semiconductor Manufacturing, Electronic Components, Electronics Industry Segments).*

*RosettaNet industry consortium has defined a framework for how businesses work together. RosettaNet has defined over 100 Partner Interface Processes (PIPs) that cover the entire spectrum of partner interactions including catalogue distribution, inventory management, and purchase order automation.*

*RosettaNet was founded in February 1998 by 40 IT companies and joined by a collection of EC companies in mid-1999, SM companies in October 2000, and SP companies in June 2001. Today, the industries participating in the RosettaNet consortium represent more than 1 trillion USD in revenue.*

*Source: RosettaNet, [www.rosettanet.org](http://www.rosettanet.org)*

<sup>32</sup> B2B Integration over the Internet with XML – RosettaNet Successes and Challenges - Suresh Damodaran Chief Technologist, RosettaNet (<http://www.rosettanet.org>), May 17–22, 2004, New York, USA.

<sup>33</sup> Partner Interface Processes

## CASE STUDY: STMICROELECTRONICS (STM)

### Abstract

***Taking into account the increase of manufacturing subcontractor activity, the mission was to define a global solution integrating this subcontractor activity. The outputs were a strong improvement of real-time visibility of the manufacturing process, the automation of shipments and the improvement of data quality and productivity. STM's manufacturing foundries were integrated as STM "virtual factories" and a RosettaNet standard process has been adopted by almost all STM's foundries.***

<b>Case characteristics</b>	
• Sector focus	Semiconductors
• Business focus	Large enterprise
• Geographical focus	Worldwide
<b>Case objectives</b>	
• Sub-contractor integration in the supply chain	****
• B2B standardisation process (RosettaNet)	***
• Sub-contractor relation via STM Extranet Portal	**

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

### Background and objectives

STMicroelectronics (STM) is an IDM (Integrated Device Manufacturer) which designs, develops, manufactures and markets semiconductor integrated circuits (ICs) and discrete devices used in various microelectronics applications (telecommunications systems, computer systems, consumer products, etc). The subcontracting activity is composed of two categories: foundries specialised in the front-end of the process, and assembly and test subcontractors specialised in the back-end of the process. Foundries relation is linked with wafers' purchase; it must be distinguished from raw material suppliers, which are part of other activities within the group (the foundries are applying STM's design but have their own raw material suppliers).

With the emergence of the foundries over recent years, the wafer subcontracting activity has increased significantly and subcontracting now accounts for 15% of STM's activity. The ramp-up of this activity was realised in the year 2000 during a capacity shortage, and the non-existence of corporate systems to manage this foundry activity has led STM to manage it outside of corporate systems with limited integration. Whilst the ratio of the subcontracting activity should be stable in the coming years, if we consider the STM target sales growth for 2007, we can conclude that the subcontracting activity will grow substantially in the coming years (at least in volume).

Another driver was the improvement of IT systems, which were not designed from the start to integrate subcontractors' data, which needed to be manually entered into the STM's systems. And lastly, it very soon became crucial to provide to the increasing number of very small assembly and test subcontractors, equipped with poor transactional systems, with an Extranet Portal application to manage the business they were doing with STM.

Given the need for more agility, the RosettaNet Partner Interface Process (PIP) and the Virtual factory programme defining new standards of exchanges between IDM and subcontractors, a programme was started in early 2002 with the goal of integrating STM's manufacturing subcontractors as STM virtual factories, by providing flexible processes and visibility on manufacturing activities in order to meet customers' expectations.

The mission of this programme was the following: taking into account STM's vision for 2007 and the increase in manufacturing subcontractor activity, to define a complete "target architecture" to achieve a global solution for handling this subcontractor activity, with particular attention given to the following items:

- Integrate foundries, assembly and test subcontractors, taking into account their various levels of IT maturity, which implies:
  - Coverage of the main processes between STM and its subcontractors: Primary focus on planning, scheduling, manufacturing and logistics processes; other processes involved were purchasing and procurement, contract, document control.
  - Considering STM's existing IT and Information Systems architecture.
  - Considering standardisation of data exchanges, worldwide B2B standard (RosettaNet) and state of the art solutions.
- Propose functional evolution based on analyses and highlight organisational issues.
- Specify the complete STM solution, coordinate the development of the various modules, and deploy the modules within STM and its subcontractors' structures.

At the operational level, the system has to reflect reality in real time. This means, for example, that a shipment can be visualised in the system immediately after the start of the shipment, and that products can be sent directly from the back-end subcontractor to the STM final customer without transiting via STM (decrease of transit and inventory times). The system should also automate the processes to increase productivity (by eliminating manual data entries and error risks). The system should implement more flexible processes in order to manage the evolution and the variety of processes (RosettaNet or more traditional exchange of data files).

## Activities

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### **Project Inputs and process**

To summarise, the subcontractor integration project's process was the following:

1. Through a steering committee and workshops, definition of the processes to be implemented, of the key concerns and of the driving principles for the project. 6 projects were identified at the end of this phase. Cap Gemini supported STM during this phase.

2. Definition of the cartography of subcontractors, reviewing their Information Technology maturity, their size and the business STM was doing with them.
3. Next, each project was started with its own structure. A primary focus was given to the "subcontractor B2B project", as it was the key infrastructure for the project.
4. STM developed a WIP (Work In Progress) monitoring application, which was a solution that STM identified as missing in STM's portfolio, to cover the customers' needs. The solution is implemented for STM foundries and is accessible through STM's Intranet – STM employees' Portal.
5. STM has implemented a platform to ease the integration between applications and to automate business processes (e.g. automation of the Advanced Shipment Notification receipt from foundries).
6. The next step of the project is to integrate the back-end subcontractors (project in progress).

The input in human resources was equivalent to 8 people, full time, during 2 years.

### **Outputs (concrete results and outcomes)**

The operational results were the following:

- **A strong improvement of (real time) visibility of the manufacturing process** (WIP) follow-up: all events of the manufacturing process (WIP) have a 1 hour refresh rate, concrete global picture with a refresh every 8 hours.
- **The automation of shipments:** when a subcontractor sends a shipment, a RosettaNet message is automatically sent that creates the related transit information ("in transit"), then automatically generates the closing of the WIP and creates a goods reception note in the financial system. Previously the subcontractors' data needed to be manually entered into the STM's systems.

Thus, there is a complete follow-up and real time vision from manufacturing to delivery.

### **Impacts**

- Strong increase in productivity by eliminating manual data entries and reducing error rates in processing orders (alert if error on one pack): per operation, 20 minutes less of data processing time and a one day gain in inventory thanks to online integration.
- Reduction of time delay between information availability and input of the information into the IS (previously the information was often sent by e-mail to the information system administrators).
- Improvement of foundry data quality thanks to automatic checks implemented on WIP data received.

The implementation of qualitative indicators is in progress.

STM took advantage of this project to implement other standards and functionalities for the delivery of parts from the subcontractor sites to the STM sites. In particular, labelling standards have been established to process the subcontractor's parts in the same way as the STM parts (same bar codes). This too increased STM's productivity.

STM's manufacturing foundries are integrated as STM "**virtual factories**" by providing flexible processes and visibility on manufacturing activities in order to meet STM's

customers' expectations. There is no difference within the information system between an STM plant and a subcontractor (managing it as if it were a single factory).

The RosettaNet standard solution has been adopted and integrated in an exchange solution by almost all of STM's foundries. With the extension of the project to the assembly and test subcontractors, it appears that a particular category of subcontractors will not implement the RosettaNet standard. This category specifically involves very small Chinese companies whose information system is not sophisticated enough to be integrated directly into STM's systems, but whose know-how makes them essential to the process. For these subcontractors a multilingual Extranet Portal solution will be implemented in 2005 to allow them to fill in their information.

Thus one can distinguish two complementary approaches: one is a System-to-System exchange using a RosettaNet PIP to automate the information exchanges with STM's foundries; the other is a Human-to-System exchange based on STM's Extranet portal to provide a collaborative environment for information sharing and visibility.

### Lessons learned

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The competitive advantages brought by the adopted solutions derive from the very precise visibility of the manufacturing processes which:

- Provide STM with a tool for monitoring the subcontractors' performances;
- Provide a successful example of the way in which System-to-System integration enables the integration and synchronicity of all STM systems as soon as the subcontractor makes the manufacturing information available to STM.

This project also demonstrates that it was easier to "impose" an e-Business solution on a supplier (for STM as a customer) than to impose a solution on STM's customers which, themselves, have several suppliers.

### Sources and references

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- Interview with Pascal Bouquet, CCS/IT systems & solutions, Cross organization Manufacturing project Manager, STMicroelectronics, May 2004.
  - Virtual Factory - Pascal Bouquet, IT Project Manager, STMicroelectronics - Conference ISA France (The Instrumentation Systems and Automation Society) [www.isa-france.org/](http://www.isa-france.org/) SEE [www.see.asso.fr](http://www.see.asso.fr) -March 2002.
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### 3 Conclusions: Opportunities and challenges, drivers and barriers

The electronics industry is particularly well suited to e-business because of the high degree of standardisation of products, globalisation of production, and specialisation of firms along the value chain. In addition, this sub-sector is naturally IT-savvy and pre-destined to be open to experiment with new technology-driven management solutions. Consequently, the entire sub-sector is among the early e-business adopters and already advanced in the usage of e-business.

Within the sector, the electronics industry is clearly more advanced than the electrical engineering industry. Both sub-sectors have different dynamics, value chains, and market players. These structural differences have a major impact on the use of e-business applications within each sub-sector.

In the electronics sub-sector, the availability of efficient communication technologies (based on e-procurement platforms and SCM systems) will provide a favourable infrastructure for further exploration of outsourcing and cooperation possibilities. It is likely that the Internet and e-business solutions will further speed up the process of globalisation and specialisation of the electronics industry.

The evolution to additional sell-side activities in the electrical machinery industry is likely to be very slow in the coming years. The conservative (although not negative) attitude towards online transactions is clearly inhibiting the widespread use of internet-based sales solutions. Steering this industry towards more intensive use of transactional e-business constitutes a real challenge.

Issues such as globalisation, low margins, short product lifecycles, short time-to-market, the need for customer-specific products, and continuously decreasing prices have been around for decades, but have become more stringent in recent years. In this context, better management of supply chains ensure less time needed for product development and reduced costs. As the manufacturers' supply chain becomes more fragmented with manufacturing outsourcing, integration becomes more complex, and a collaborative supply chain becomes a crucial element in the creation of business value. Here, standardisation processes facilitate supply chain collaboration, mainly because they enable the production of lower cost e-business technologies.

### 3.1 Opportunities and challenges

*Exhibit 3-1: Overview of e-business opportunities and challenges in the electrical machinery and electronics sector*

Opportunities	Challenges
<ul style="list-style-type: none"> <li>• Creating a solid collaboration strategy for increased efficiency of business processes</li> <li>• Investment in extended enterprise collaboration (EEC)</li> <li>• Participation in e-marketplaces</li> <li>• Use of new XML-based standards</li> <li>• Access to online information</li> </ul>	<ul style="list-style-type: none"> <li>• Improving collaboration in the supply chain</li> <li>• Managing demand variability and attaining accurate forecasts</li> <li>• Achieving accurate demand and supply picture</li> <li>• Managing outsourcing without losing global visibility and control</li> <li>• Developing online delivery processes and selling online</li> </ul>

Source: e-Business W@tch (2004)

#### Opportunities

##### **Creating a solid collaboration strategy for increased efficiency of business processes**

The adoption of collaboration solutions appears likely to continue and even accelerate. As network supply chains become the norm, traditional success factors in supply chain management will cease to provide a competitive edge. Optimisation of processes within the four walls of the enterprise is becoming an ever-smaller factor in corporate success. The ST Microelectronics case study clearly illustrates this point. This presents a new opportunity for electronics companies to reset their competitive positions by creating a solid collaboration strategy, leveraging the strength of their partners as well as their own, and closing the best-in-class performance gap.

##### **Investment in extended enterprise collaboration**

After a decade of strategic reorganisation, procurement transformation and supply chain management investment, extended enterprise collaboration (EEC) with customers and suppliers may appear more necessary. As shown in this report, investment in establishing EEC represents an important opportunity for firms. Several early adopters have proved that effective collaboration with business partners, and investment in extended enterprise collaboration in electronics companies can generate positive results (faster time to market, higher margins, greater capital productivity and significantly lower costs, etc). The case studies presented<sup>34</sup> also show the other positive outcomes of EEC:

- A strong increase in productivity by eliminating manual data entry and reducing error rates in processing orders;
- A reduction of time delay between information availability and input of the information into the information system;
- A strong improvement of real time visibility of the manufacturing process;
- The automation of shipments, allowing a complete follow-up and real time viewing from manufacturing to delivery.

<sup>34</sup> Lake Communications and ST Microelectronics.

For more and more electronics companies, managing extended relations with a wide network of business partners is at the core of their businesses. Investment in extended enterprise collaboration represents one of the key opportunities for companies to level the playing field with industry leaders. The competition is shifting from purely internal process optimisation to value chains that function well together.

### **Participation in e-marketplaces**

As an alternative to company-specific e-procurement systems or to supply chain collaboration, firms also have the opportunity to participate in independent third-party or consortium-led online marketplaces. As observed in this report, the number of marketplaces in the electronics industry is higher than in other industries. Most marketplaces not only offer a trading platform, but also provide additional information and services. The *e-Business W@tch* report anticipates that marketplaces will probably not be exclusive from B2B supplier integration in the supply chain, but rather complementary.

The need to respond to all kind of demands and to adapt to new demands will, to some extent, require the use of less sophisticated applications than B2B supplier integration in the supply chain, such as e-marketplaces or Extranets. The result may possibly consist, on one side, in the use of marketplaces for standard relations and, on the other side, in a customisation of e-business relations (B2B supplier integration in the supply chain) in the case of key accounts.

### **Use of new XML-based standards**

For the electronics industry, process change is an opportunity to leverage emerging industry standards (such as RosettaNet) and, by doing so, converge on process definitions with which business partners can easily integrate. The benefit of process standardisation is twofold. First, it will increase business partners' acceptance of the collaboration, as the proposed process will be more likely to fit their own processes. Second, it will greatly facilitate the ongoing maintenance of the collaboration solution because only a single process instance needs to be maintained and upgraded over time. Furthermore, interoperability through the use of new open standards offers a way to reduce the cost of e-business applications and address SMEs' concrete needs. The growing use of open standards at reasonable prices could announce a new era of e-business software.

This challenge will grow as enterprises find themselves on the sending and receiving ends of numerous collaboration requests, each of which may run on a different schedule and use different formats or technical standards.

### **Access to online information**

E-technologies can also provide access to new resources, channels, and information that would otherwise not be available. Thus, they create opportunities for improving decision-making or expanding business opportunities. Examples are online B2B marketplaces, websites and online shops for reaching customers on a global scale. A good example of this opportunity is the Voltimum case study<sup>35</sup> regarding the electrical machinery sub-sector. Voltimum offers a shared platform for manufacturers and other industry partners for marketing and communication, a single entry point for marketing information (it is not a trading portal), and a rich product database for the electrical installation industry.

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<sup>35</sup> The Voltimum case study presents specific areas of online marketing (product information, e-training, e-support) in the field of low voltage products that are mainly distributed in the building industry.

## Challenges

### **Improving collaboration across the supply chain**

Whereas advantages can be gained from better collaboration with suppliers and customers, the *e-Business W@tch* report shows that online collaboration with external supply chain partners remains low. This challenge is particularly critical in the electronics sub-sector. Companies must manage end-to-end processes that extend outside of their company and across multiple tiers of their supply chain. Cutting edge products are now produced not by a single company but by a network of companies, each contributing a specialised, high-value element of the total solution.

As a consequence, the new challenge consists in combining strategic industry change (specialisation and the creation of extended enterprise networks) with the operational challenges of keeping inventories low (but not disrupting the continuous cycle of new product introductions). In order to do so, business partners have to work together more effectively in new ways: collaboration across the supply chain has become a crucial element in the creation of business value.

### **Managing demand variability and obtaining accurate forecasts**

Major issues related to collaboration across the supply chain are management of demand variability and obtaining of accurate forecasts. These challenges imply solutions that enable demand collaboration and improve forecast accuracy by enabling ubiquitous information sharing among players (semiconductor suppliers, OEMs, contract manufacturers) and allowing independent forecasting and consumption of optional components (demand planning, collaborative planning). This also implies solutions that leverage demand variability to precisely determine the levels of inventory investment required to meet the customer's service objectives at the lowest possible cost (inventory optimisation).

### **Achieving an accurate demand and supply picture**

Moreover, this study shows that Electronics manufacturers are looking for a single holistic supply chain plan that provides long-range aggregate planning across the whole value chain (semiconductor suppliers, contract manufacturers, OEMs, foundries, test and assembly houses, contract manufacturers, etc) as well as short-term detailed scheduling (Advanced Planning).

### **Managing outsourcing without losing global visibility and control**

The example of the virtual factory<sup>36</sup> raises several issues, of which the outsourcing management and its related flexibility. Managing outsourcing without losing global visibility and control constitutes a real challenge. The latter requires solutions that enable all types of electronics manufacturing business models (from completely manufactured in-house operations to completely outsourced manufacturing operations), that support the transition to the virtual manufacturing environment (the virtual factory) and that allow supplier drop-ship across multiple legal entities.

### **Developing online delivery processes and selling online**

As demonstrated in this study, enterprises actually selling online are still very rare, especially in the electrical machinery industry. Online marketing and e-commerce activities often remain limited to e-relations that include online information, promotional tools and order management (information on products, product availability, tariffs, orders). This is especially true in

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<sup>36</sup> See STM case study.

the electrical machinery industry where this type of platform does not currently include transactional functions (no invoice, no ordering online, etc); confining itself to the process of logistic flow of information,

The *e-Business W@tch* report predicts that the evolution to additional sell-side activities in the electrical machinery industry is likely to be very slow in the coming years. When devising a probable scenario for most countries, it appears that before online sales become a ubiquitous phenomenon, online delivery processes will first need to be developed. The latter are currently little developed in the electrical machinery industry since most of the countries are not yet ready. So, steering this industry to a more intensive use of transactional e-business constitutes a real challenge.

### 3.2 E-business drivers and barriers

The electronics sector is among the early adopters and already advanced in its use of e-business, although several hurdles inhibit the further development and adoption of e-business solutions.

*Exhibit 3-2: Overview of e-business enablers and barriers in the Electronics sector*

Enablers	Barriers
<ul style="list-style-type: none"> <li>• Sector's propensity for IT issues</li> <li>• Pressure to decrease costs</li> <li>• Good access to technology</li> <li>• More Widespread use of standards</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation costs</li> <li>• Return on investment issues</li> <li>• Backwardness of SMEs</li> <li>• Cultural barriers</li> </ul>

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

#### Enablers: factors that could drive e-business adoption

**Propensity for IT issues.** The electronics industry is naturally IT-savvy, has a high degree of IT competence, and is willing to experiment with new technology-driven problem solutions.

**Pressure to decrease costs.** Most electronics industry segments are only just emerging from a recession. The sector is now focused chiefly on increasing its revenues, following three years of stringent cost cutting programmes. A large number of companies are adopting e-business applications in a continued attempt to still reduce production costs and stay competitive. During these turbulent times, IT has proven to be an ally of the electronics industry. IT has allowed electronic manufacturers to create greater efficiencies in their organisations as a result of streamlining, and creating a more agile supply chain. Reduction of manufacturing costs has resulted in a tightening of operations, particularly those activities associated with the supply chain and manufacturing processes. Many electronics companies would agree that their business is now leaner and more efficient as a result of the past three years.

**Access to technology is not a problem.** Necessary IT infrastructures are widely implemented and used.

**More widespread use of standards.** If electronic standards are more widely used throughout the industry, this could further boost SMEs' use of electronic business solutions. The new XML-based standards (such as RosettaNet) help to reduce costs and enable dispersed trading partners to conduct electronic commerce in a mutually understood way. In

the long run, standards are also pivotal to the development of lower cost e-business solutions aimed at the SME market.

#### Barriers: factors that may inhibit e-business diffusion

**Gap between small firms and large companies.** The previous Sector Impact Study<sup>37</sup> demonstrated that the most important barrier to the development of the e-business in the electronics is the backwardness of the sector's small firms compared to larger players, while representing the vast majority of enterprises in Europe. The comparatively poor integration of SMEs' IT systems with their business partners, the lack of internal resources and the relatively high price of e-business solutions significantly limit the benefits that SMEs could expect from such solutions. Moreover, even if SMEs do not fall far behind large companies in terms of e-business usage, large companies are in a better position to exploit opportunities of making business processes more efficient and cheaper by using ICT, due to economies of scale.

**Implementation costs.** Costs are certainly the main barrier to e-business projects, especially for firms with very tight budgets.

**Return on investment issues.** Investments in e-business initiatives have to be justified by positive ROIs. On the other hand, businesses that rely purely on cost saving arguments often underestimate the initiative's potential soft factor benefits (such as customer satisfaction, or greater ease of performing tasks) and thereby slow down e-business adoption.

**Cultural barriers.** The conservative (although not negative) attitude of the electrical machinery industry towards online transactions greatly inhibits the widespread adoption of online selling solutions.

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<sup>37</sup> Sector Impact Study No. 03-I, May 2004.

## 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.<sup>38</sup>

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.<sup>39</sup> Also, six of the former Member States currently face Court action for failing to put in place the new rules on electronic communications. Thus, regulatory challenges are not unique to the new Member States.

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

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<sup>38</sup> [http://europa.eu.int/information\\_society/topics/ecommm/all\\_about/implementation\\_enforcement/index\\_en.htm](http://europa.eu.int/information_society/topics/ecommm/all_about/implementation_enforcement/index_en.htm);  
Further information on the current initiatives of the European Commission can be found at  
[http://europa.eu.int/information\\_society/topics/ecommm/index\\_en.htm](http://europa.eu.int/information_society/topics/ecommm/index_en.htm)

<sup>39</sup> 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.

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

#### 4.1.4 Role model of the public sector

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

An excellent example is the case of Estonia. The Estonian government played a very active role in promoting the development and usage of Internet infrastructures. For example, the Estonian Parliament approved a proposal in February 2000 to guarantee Internet access to each of its citizens<sup>41</sup> 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.<sup>42</sup> 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 25<sup>th</sup> 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.

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<sup>40</sup> cf. CVTS2; Statistisches Bundesamt, 2002

<sup>41</sup> ebusinessforum, 2001

<sup>42</sup> Wired News, 21. April 2003

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".<sup>43</sup>

### 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",<sup>44</sup> 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

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<sup>43</sup> COM(2003) 148 final

<sup>44</sup> COM(2001) 136 final

5. Monitoring the implementation of the policy targets

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

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

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

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

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

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

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

whether and to what extent policy objectives can be translated into concrete (measurable) targets or not. This debate has not yet ebbed away, but has rather increased, in particular in the context of the eEurope benchmarking which shows all the difficulties and challenges that are inevitably connected with this approach. The first challenge is that the stakeholders involved have to agree on targets and on adequate indicators to measure the achievement of a target. The second challenge is whether the required data can be collected in a comparable and reliable way, and – an important aspect with all data collection activities – with a reasonable economic effort.

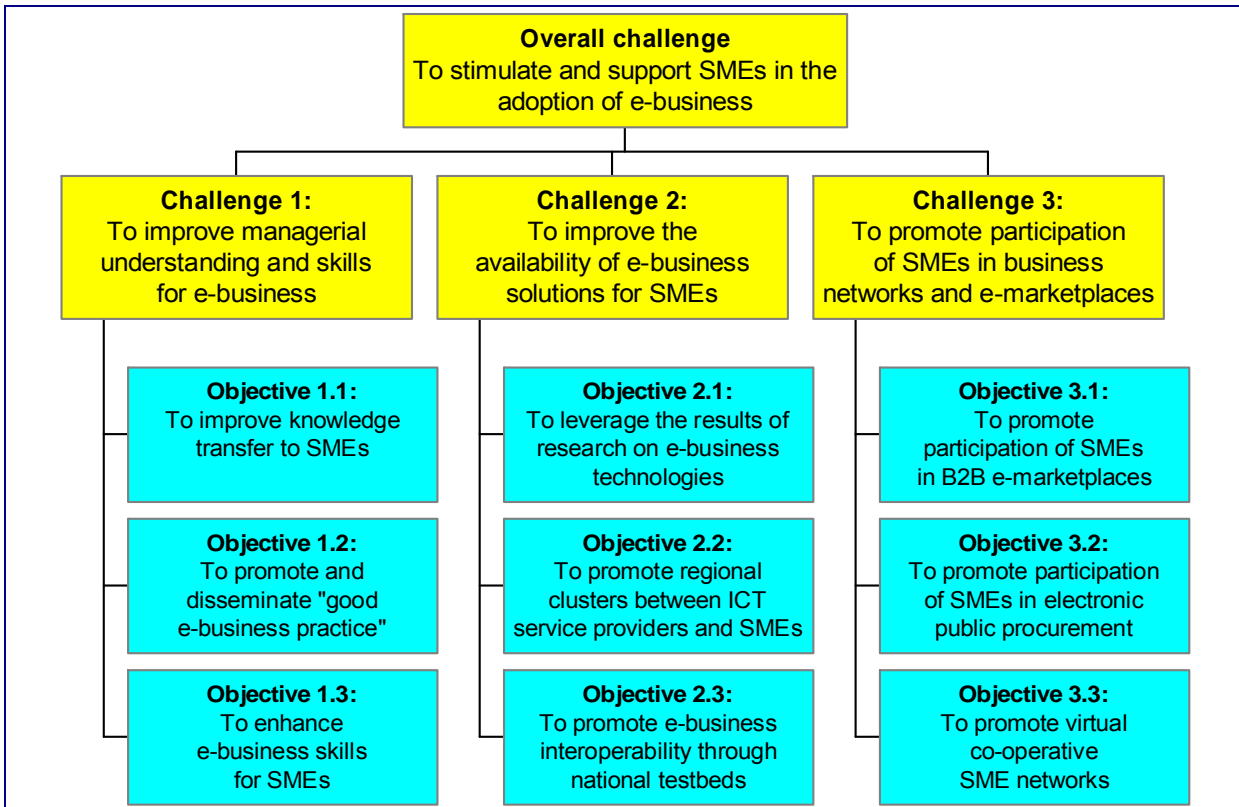
In this context, it must be considered that most e-business policies are implemented on a regional or national level. Therefore, when it comes to setting targets for these policies, the European Commission can only act as a promoter and catalyst, but cannot enforce any targets for regional or national governments. To stimulate the debate in this area, and as "food for thought", the Commission issued in March 2003 the Communication "Adapting e-business policies in a changing environment: The lessons of the Go Digital initiative and the challenges ahead" (COM(2003) 148 final). This Communication, which proposed a further elaborated framework for e-business policies, attracted considerable attention and was praised for its clarity and practical applicability. The European Economic and Social Committee, for example, believes that "the European Commission has produced an excellent proposal document on the need for Member States and regions to re-orient e-business policies" and welcomed "the highly practical approach".<sup>45</sup>

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.

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<sup>45</sup> 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

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](http://www.e-bsn.org)) will play an important role. The portal already provides a valuable overview of e-business policies and best practices across the European Union, with links to related resources.

#### 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.<sup>46</sup> Policy measures to stimulate the

<sup>46</sup> 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.

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](http://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.

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

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

Source: e-Business W@tch (2004)

### 4.3 Sector specific policy challenges

The business implications for individual enterprises in Electronics as well as those for the entire sector lead to some issues that could be relevant for sector specific policy actions. The *e-Business W@tch* proposes two areas that would require specific attention and appropriate policy measures.

#### Interventions in favour of the electrical machinery sub-sector

As outlined before, one can observe a dichotomy between the two (sub-)sectors aggregated for the purposes of this study: the manufacture of electronics (NACE 30 and NACE 32) on one side, and the electrical machinery and apparatus industries (NACE 31) on the other side. The latter appear to be the more traditional industry (sub-)sector. It is characterised firstly by the fact that companies' activities are mainly based on their domestic market, due to national product standardisation, and secondly by the dominant role of a large number of local SMEs.

Considering these characteristics and the (relative) backwardness of the electrical machinery sub-sector in the use of e-business technologies, this industry seems particularly in need of public intervention. Public intervention would further encourage standardisation and awareness actions at a European level to favour interoperability between electrical systems. Standardisation processes on the European level are an important prerequisite for a large e-business adoption in this sub-sector. Furthermore, companies will have to change their conservative attitude with respect to business process innovation.

The *e-Business W@tch*, therefore, suggests that public policy should give priority to the electrical machinery sub-sector. This could be achieved through the promotion of e-business applications mainly towards SMEs. This promotion should mainly rely on trade associations and national and regional standardisation bodies in the field of electrical machinery.

#### Encourage the use of online selling and other e-business applications through support of standardisation efforts in the sector

While purchasing online is currently the most widely adopted e-business application in the electronics and electrical machinery sector, selling online is not yet widely diffused. However, encouraging electronic marketing and sales strategies could become an important asset of firms in a globalized competitive environment. The *e-Business W@tch* therefore suggests considering initiatives to stimulate the uptake in this area.

One of the actions to encourage such activities could be the promotion of "open" e-business standards used in the more advanced forms of e-commerce. New standards, such as XML, allow an optimised integration of components within a system, not only for purchasing and selling on marketplaces, but also for Content Management and Document Management (such as workflows) of technical information – a feature of particular interest for electronics and electrical systems. XML based standards<sup>47</sup> are a major development for these industries, as they open new opportunities in the field of structured exchange of data.

To stimulate this evolution, we suggest that the responsible national and European public authorities support standardisation processes in this field as best they can, bearing in mind that standardisation is a rather voluntary process.

Furthermore, best practices of purchasing online in the sector could also be used to stimulate e-marketing and e-commerce activities (sell-side) as well. One action could be the

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<sup>47</sup> As in particular RosettaNet, cf. chapter 2.5 *The need for e-business standards in the electronics*.

publication of a promotion document addressed to European enterprises and especially to SMEs. This document could demonstrate the practical benefits of purchasing and selling online and could include standardisation issues and case studies.

## References

- B2B Integration over the Internet with XML – RosettaNet Successes and Challenges - Suresh Damodaran Chief Technologist, RosettaNet - <http://www.rosettanet.org> - May 17–22, 2004, New York, USA. [www.enterprise-ireland.com/practicalebusiness/Case\\_studies](http://www.enterprise-ireland.com/practicalebusiness/Case_studies)
- Bacon, Allison, Larry Lapide and Janet Suleski - Supply Chain Collaboration Today: It's a Tactic, Not a Strategy, AMR Research. September 2002.
- Bowersocks, Donald J. and David J. Cross. Logistical Management The Integrated Supply Chain Process, McGraw-Hill/Irwin, January 30, 1996. pp 471 - 473.
- Carr, Nicholas G.: "IT Doesn't Matter", in: Harvard Business Review, May 2003. Smith, Howard / Fingar, Peter (2003): IT Doesn't Matter – Business Processes Do. A Critical Analysis of Nicholas Carr's IT Article in the Harvard Business Review. Meghan-Kiffer Press, Tampa, USA.
- Christian Seider (IBM Business Consulting Services)- Reinventing the electronics industry through enterprise collaboration - IBM Global Services / IBM Corporation 2003. [www.ibm.com](http://www.ibm.com)
- Christophe Begue (IBM Business Consulting Services) - All together now: Supply chain collaboration in the electronics value chain - IBM Corporation 2002. [www.ibm.com](http://www.ibm.com)
- Cooper, Robert G. Winning at New Products, Perseus Publishing, Cambridge (MA), 2001.
- Diana Farrell - The Real New Economy. Harvard Business review, October 2003.
- Dirk Pilat. The impacts of ICT on Economic growth – An overview. OECD, 2003.
- 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* (May 2003). Impact study No. 10/II: The statistical picture: facts & figures (full document and summary). <http://www.ebusiness-watch.org>
- e-Business W@tch* (October 2002). Impact study No. 10/I: Background, issues and key figures on e-business (full document and summary). <http://www.ebusiness-watch.org>
- e-Business W@tch*: Outsourcing beyond EU in the ICT industries, Internal Briefing No 02/2004, 27 February 2004.
- Electronics Industry Brief, IBM Corporation, 2002. [www.ibm.com](http://www.ibm.com)
- European Commission (2001): "Helping SMEs to Go Digital", Communication from the European Commission [COM(2001)136 final]
- European Commission (2003): Benchmarking national and regional e-business policies for SMEs, Final report of the e-Business Policy Group, 28 June 2002.
- European Commission (2004): The Go Digital Awareness Campaign 2001-2003: The main lessons to be learnt. EC, Enterprise Directorate General, February 2004.
- European Communication "Adapting e-business policies in a changing environment: The lessons of the Go Digital initiative and the challenges ahead" Communication from the European Commission [COM(2003) 148 final].
- Kapur, Vivek and Denis Mathias. "Collaboration: Using eHubs to Create Value in High-tech." IBM BusinessConsulting Services, 2002.
- Mary O'Mahony\* / Bart van Ark\*\* - EU Productivity and Competitiveness: An industry Perspective, Can Europe resume the catching-up process? - \*National Institute of Economic and Social Research, London - \*\*Groningen Growth and Development Centre, University of Groningen and The Conference Board, 2003.
- Professor Naren Agrawal, Study of collaboration in the networking, computer, consumer electronics and instruments industries, Leavey School of Business, Santa Clara University, 2002.

- PWC – Price Waterhouse Coopers Unternehmensberatung GmbH (2002): “Elektronische Marktplätze: Chancen und Risiken für Betreiber und Teilnehmer”, <http://www.pwcconsulting.de>
- The Yearbook of World Electronics Data 2004. Volume 1 (West Europe), Reed Electronics Research, December 2003.
- Virtual Factory - Pascal Bouquet, IT Project Manager, ST Microelectronics - Conference ISA France (The Instrumentation Systems and Automation Society) [www.isa-france.org/](http://www.isa-france.org/) SEE [www.see.asso.fr](http://www.see.asso.fr) -March 2002.

## Annex I: Glossary of technical terms

Term	Definition
<b>Access</b>	The ability to retrieve information and to communicate online through the use of digital information and communication technologies.
<b>B2B</b>	Business to Business. Electronic transactions between companies.
<b>B2B e-marketplace</b>	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.
<b>B2C</b>	Business to Consumer. Electronic business processes between companies and consumers.
<b>Bandwidth</b>	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).
<b>Broadband</b>	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.
<b>Channel</b>	In communications, a physical or logical path allowing the transmission of information; the path connecting a data source and a receiver.
<b>CRM</b>	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.
<b>Dial-up</b>	The process of establishing a temporary connection (to the Internet) via the switched telephone network.
<b>DSL</b>	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.
<b>E-business</b>	Electronic business. The <i>e-Business W@tch</i> uses the term "e-business" in the broad sense, relating both to external and to company internal processes. This includes external communication and transaction functions, but also ICT supported flows of information within the company, for example, between departments, subsidiaries and branches.
<b>E-commerce</b>	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.
<b>EDI</b>	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.
<b>E-readiness</b>	Readiness for e-business is defined as the capability to engage in electronic transactions. This comprises appropriate network access (including sufficient bandwidth), internal hardware and software solutions as well as the procedural and managerial readiness to deal with online transactions from simple web presence through to fulfilment of customer orders and related after sales services.

<b>ERP</b>	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.
<b>Extranet</b>	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.
<b>ICT</b>	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.
<b>Information security</b>	Measures taken to protect information systems against unauthorised use and attacks
<b>Internet</b>	The world's largest computer communication system, with an estimated 700 million users worldwide. <sup>48</sup> 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.
<b>Interoperability</b>	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.
<b>Intranet</b>	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.
<b>ISDN</b>	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).
<b>LAN</b>	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.
<b>Leased line</b>	A private communication channel leased from the common carrier. It is usually a dedicated fixed-route link (e.g. point-to-point frame relay).
<b>M-commerce</b>	Mobile commerce. E-commerce that takes place using mobile connection devices and through data transmission via technical standards for mobile communication.
<b>Micro enterprise</b>	A company with less than 10 employees.
<b>Modem</b>	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.
<b>MRO goods</b>	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.
<b>Processes</b>	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.
<b>Remote access</b>	The ability of a company computer network's transmission points to gain access to a

<sup>48</sup> Cf. Global Internet Statistics by Global Reach, [www.gltreach.com](http://www.gltreach.com)

	computer at a different location.
<b>SCM</b>	Supply Chain Management. Software that helps businesses to match supply and demand through integrated and collaborative planning tools.
<b>Sector</b>	Sectors of the economy with comparable business activities. These constitute the main research unit of the <i>e-Business W@rch</i> . Aggregated information at the industry level is used to document the diffusion of activities within the industries as well as the overall importance of the observed phenomena for changes in the economy as a whole. The definition of sectors follows NACE Rev.1 classifications.
<b>SME</b>	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.
<b>Transaction</b>	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.
<b>Value added</b>	Gross output minus intermediate inputs. It is valued at producers' prices and includes all indirect taxes but excludes VAT and subsidies.
<b>WAN</b>	Wide Area Network. A network allowing the interconnection and intercommunication of a group of computers over a long distance.
<b>WAP</b>	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.
<b>Website</b>	A related collection of World Wide Web files that includes a beginning file called a home page.
<b>Wi-Fi</b>	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.
<b>W-LAN</b>	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.
<b>WWW</b>	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 mrobi, Blackrock, Co. Dublin 2	Lithuania	BALTIC SURVEYS, 6A Šermukšnių str., Vilnius LT-2001, Lithuania
Italy	Ipsos-Explorer, Via Mauro Macchi 61, 20124 Milano	Latvia	TNS – baltic data house, Kronvalda Blvd. 3 – 2, Riga LV-1010, Latvia
Netherlands	INRA in Belgium, Avenue de la Couronne 159-165, 1050 Brussels	Malta	MISCO – Market Intelligence Services Co. Ltd., Valetta
Austria	Spectra Marktforschung: Brucknerstr. 3-5/4, 4020 Linz	Poland	CASE Consumer Attitudes & Social Enquiry, ul. Nowy Świat 64, PL 00-357 Warsaw
Portugal	Ipsos Portugal, Rua Joaquim António de Alguiar 43-5.º, 1070-15 Lisbon	Slovenia	CATI – Marketing, Media and Social Research & Consulting, Tržaška 2, 1000 Ljubljana
Finland	Taloustutkimus Oy, Lemuntie 9, 00510 Helsinki	Slovakia	NFO AISA s.r.o., Slezská 113, 130 00 Praha 3, Česká republika
Sweden	GfK Sverige, Box 401, 221 00 Lund		

### Interview method

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

### Population coverage and sampling

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

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

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

Population coverage of the e-Business Survey (2003)			
No.	NACE Rev. 1		Sector Name
	Section	Division/Group	
01	D	17, 18, 19	Manufacture of textiles and textile products, leather and leather products
02	D	24, 25	Manufacture of chemicals and chemical products
03	D	30, 31 (except 31.3 - 31.6), 32	Manufacture of Electrical machinery and electronics
04	D	34, 35	Manufacture of transport equipment
05	D	Parts of (17-19), 20, (30-32), (34-35), 36, 45	Crafts And Trade: In addition to companies from sub-sections covered by other sectors: Manufacture of wood products; manufacture of furniture; construction and site preparation. Only enterprises with 0-49 employees.
06	G	52.11, 52.12, 52.4	Retail
07	H / I / O	55.1, 55.2, 62.1, 63.3, 92.33, 92.52, 92.53	Tourism
08	K	74	Business services
09	I / K	64.2, 72	Telecommunications and computer-related services
10	N	85.11, 85.12, 85.3	Health and social services

Country	Directory / Database	Country	Directory / Database
Austria	Herold BUSINESS MARKETING database	UK	Dun & Bradstreet
Belgium	Dun & Bradstreet	Norway	Dun & Bradstreet
Denmark	KOB (Købmandsstændens Oplysnings Bureau)	Cyprus	Census of economic activity
Germany	Heins und Partner Business Pool	Czech Republic	Merit – CDF, Meritum Software, Enterprises database 2003
Finland	Blue Book - TDC Hakernistot OY	Estonia	Estonian statistical bureau + Kredinfo (register of taxpayers)
France	IDATA, based on INSEE Siren file (the National Institute of Statistics) and other directories	Hungary	Company Information Data Store, provided by Hungarian Central Statistical office
Greece	ICAP directory (the major database for Greece)	Lithuania	Department of Statistics and National Register at Ministry of Economics
Ireland	Bill Moss	Latvia	Business Register of Republic of Latvia
Italy	Dun & Bradstreet	Malta	National Statistics Office, Employment and training corporation
Netherlands	Dun & Bradstreet	Poland	REGON (GUS) data (National register of business)
Portugal	MOPE database	Slovenia	IPIS directory, published by Noviforum (list of active Slovenian enterprises)
Spain	Dun & Bradstreet	Slovakia	Albertina, Albertina Data, Enterprises database 2003
Sweden	Swedish Post 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
<b>TOTAL</b>	<b>502</b>	<b>1021</b>	<b>992</b>	<b>1044</b>	<b>1082</b>	<b>729</b>	<b>1193</b>	<b>1138</b>	<b>993</b>	<b>1014</b>	<b>1109</b>	<b>10817</b>

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

### Problems encountered

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

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

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

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

### Weighting principles

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

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

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

### Variables - indicators

The set of ICT and e-business indicators for which data were collected in this survey was organised into the following modules:

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

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

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

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

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