

Sector Report No. 05-II (September 2005)

ICT and Electronic Business in the

Machinery & Equipment Industry

ICT adoption and e-business activity in 2005

e-business
w@tch



European
Commission

Enterprise & Industry Directorate General

The e-Business W@tch

The European Commission, Enterprise & Industry 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, EEA and Accession countries. Since January 2002 the *e-Business W@tch* has analysed e-business developments and impacts in manufacturing, financial and service sectors. Results are available on the internet and can be accessed or ordered via the Europa server or directly at the *e Business W@tch* website (www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm or www.ebusiness-watch.org).

This report is the second Sector Impact Study on electronic business in the machinery and equipment sector published by the *e-Business W@tch* in the 2005 period. It presents the results of the e-Business Survey 2005. More than 5200 companies from seven EU countries were interviewed about their use of ICT and e-business in early 2005. The results offer a comprehensive overview of the current state of e-business activity in the sector. This quantitative report is complementary to the earlier study (July 2005), which features a qualitative assessment of current developments and cases of e-business activity in individual enterprises.

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Contact

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

 <p>DIW Berlin German Institute for Economic Research</p> <p>DIW Berlin Königin-Luise-Str. 5 DE-14195 Berlin, Germany</p> <p>Fax: (49-30) 89789-103 pkoeLLinger@diw.de</p>	 <p>e-Business W@tch c/o empirica GmbH Oxfordstr. 2 D-53111 Bonn Germany</p> <p>Fax: (49-228) 98530-12 info@ebusiness-watch.org</p>	 <p>European Commission Enterprise & Industry Directorate- General Technology for Innovation / ICT Industries and e-Business</p> <p>Fax: (32-2) 2967019 entr-innov-ict-ebiz@cec.eu.int</p>
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Introduction to the e-Business W@tch

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

The European Commission's *e-Business W@tch* monitors the adoption, development and impact of electronic business practices in different sectors of the economy in the enlarged European Union. The background of this initiative was the eEurope 2002 Action Plan, which 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 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. The objective of this initiative is to provide sectoral analysis based on empirical research, including representative enterprise surveys in countries of the European Union, the EEA and Accession States, with special emphasis on the implications for small and medium-sized enterprises (SMEs).

Since its launch, the *e-Business W@tch* has published more than 60 e-Business Sector Studies on 17 different sectors of the European economy, three comprehensive synthesis reports about the status of electronic business in the European Union, three statistical pocketbooks and various other resources (newsletters, special issue reports, etc). These are all available on the website at www.ebusiness-watch.org ('resources').

The quantitative analysis about the diffusion of ICT and e-business is based to a large extent on regular representative surveys among decision-makers in European enterprises. The e-Business Survey 2005 covers more than 5000 enterprises from 10 different sectors across 7 EU member states. In addition, more than 70 case studies on e-business activity in enterprises from all EU, EEA and Accession countries are carried out, to complement the statistical picture by a more detailed analysis of current e-business practices.

Survey results of the previous years have confirmed 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, rather than its location, are the main determinants of its e-business activity. 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), document the 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: 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 proposes a definition of e-business 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. Hence, it becomes practically impossible to cover in depth all areas and facets of e-business in one study. Thus, study scope needs to be carefully defined.

The *e-Business W@tch* Sector Studies apply a wide-angle perspective and zoom into selected aspects of electronic business only. In general, studies with a wide-angle approach allow for a wider range of issues to be covered and investigated at the same time. This, however, necessarily limits the level of detail in which each single issue is 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

In addition to the analysis of e-business developments, the *e-Business W@tch* Sector Studies also provide some background information on the respective sector. Following the configuration of the sector (on the basis of NACE Rev. 1.1 classification) at the introduction of each study, this overview includes some basic industry statistics, as well as information about the latest trends and challenges concerning the specific sector. Readers should not mistake this background information, however, as the main topic of analysis. An *e-Business W@tch* "sector report" is not a piece of economic research on the sector itself, but **a study focusing on the use of ICT and e-business** in that particular sector. The introduction to the sector is neither intended to be, nor could it be a substitute for more detailed and specific industrial analysis.

The data presented in each sector's overview are mainly derived from official statistics prepared by Eurostat, but are processed and refined by DIW Berlin. The purpose is to close the many gaps that occur in the official statistics, with missing data being imputed on the basis of extrapolations and own calculations.

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 *e-Business W@tch*. In 2005, the sample consists of ten sectors. Their configuration and definition are based on the NACE Rev. 1.1 classification of business activities.

The rather broad aggregation of different business activities into sectors in 2002-2004 made it possible to cover a broad spectrum of the economy, but also caused some challenges for the analysis of e-business developments. For instance, it was hardly possible to focus on individual sub-sectors in much detail within a single sector report. The selection and definition of sectors proposed for 2005

reflect these concerns. Six out of the ten sectors proposed are sub-sectors that were part of (aggregated) sectors analysed in 2002-2004. The rationale for "zooming in" on former sub-sectors is that the broad picture for the whole sector is now available from previous sector studies, and that this seems to be the right time within the prospective life-cycle of the *e-Business W@tch* to focus the analysis on more specific business activities.

The 10 sectors covered in 2005 were selected on the basis of the following considerations:

- The current dynamics of electronic business in the sector and the impact of ICT and electronic business, as derived from earlier *e-Business W@tch* sector studies.
- Interest articulated by the industry in previous years on studies of this type.
- Policy relevance of the sector from the perspective of DG Enterprise & Industry.
- Roll-out strategy of 2003: New sectors (not covered in 2002/03 and/or 2003/04) have been added, as well as specific industries which have only been covered as part of a larger sector in the past

In 2005, the *e-Business W@tch* will also deliver four cross-sector studies. These Special Reports will focus on a particular e-business topic of interest across different sectors rather than on a single sector.

The 10 sectors and 4 topics analysed in 2005

The 10 sectors which are being monitored and studied in 2004/05 include seven manufacturing, construction and two service sectors. Four of these sectors (namely food and beverages, textile, machinery and equipment and tourism) were also covered in the previous years of implementation, while the other six were covered as part of (aggregated) sectors analysed during 2002-2004.

Exhibit: Sectors and topics covered by *e-Business W@tch* in 2005

	Sector Studies	NACE Rev. 1	Publication date(s) *	
1	Food and beverages	15	July 2005	Sep. 2005
2	Textile industry	17, 18	July 2005	
3	Publishing and printing	22	July 2005	Sep. 2005
4	Pharmaceutical industry	24.4	July 2005	Sep. 2005
5	Machinery and equipment	29	July 2005	Sep. 2005
6	Automotive industry	34	July 2005	
7	Aerospace	35.3	Sep. 2005	
8	Construction	45	July 2005	Sep. 2005
9	Tourism	55, 62.1+3, 92.3+5	Sep. 2005	
10	IT services	72	July 2005	Sep. 2005
Special Topic Reports				
A	A User's Guide to ICT Indicators: Definitions, sources, data collection		July 2005	
B	Overview of International e-Business Developments		July 2005	
C	e-Business Standards and Interoperability Issues		Sep. 2005	
D	ICT Security and Electronic Payments		Sep. 2005	

* There will be 1 report (in 2005) on 4 of the 10 sectors, and 2 reports on the other six.

Executive Summary

Sector definition

According to the NACE Rev. 1 classification of business activities, the manufacture of machinery and equipment is defined under Division DM 29. This study focuses on the NACE groups 29.1 – 29.5, which are mainly producing machinery for other businesses. The sub-sectors "weapons and ammunitions" (29.6) and "domestic appliances" (29.7) are not included, as these industries mainly produce for government agencies (29.6) or end consumers (29.7) and thus differ from the other sub-sectors.

ICT and e-business activity in 2005

Firms in this industry continue to make progress in their usage of Information and Communication Technology (ICT) and in understanding the strategic scope of e-business initiatives. Numerous innovative and interesting examples of e-business usage among firms in this sector suggest that the potentials of ICT to improve the competitive position of firms are far from being exhausted yet. According to the new survey results, the machinery and equipment (M&E) sector exhibits an average usage of ICT compared to other sectors. It is neither a late nor an early adopter of most e-business solutions.

Many firms in the M&E sector focus their e-business initiatives on innovative ways to support traditional business functions with simple, user friendly ICT systems.

The outsourcing of ICT solutions is currently an important sector-specific trend. Outsourcing is one way for firms in this industry to cope with potential shortages of in-house ICT experts and a lack of ICT know-how among employees.

A digital divide between SMEs and large companies remains visible and there is no clear indication yet that this gap will be overcome soon. Yet, many concrete examples show how small and medium-sized enterprises (SMEs) can benefit from implementing e-business solutions. Thus, there are still numerous opportunities for SMEs to benefit from investments into e-business and ICT.

Standards for codifying product-related information remain an important issue for e-business development in this sector. A lack of standards and their application seems to slow down e-procurement related activities of firms in this sector.

ICT infrastructure and internal business processes

Firms in the M&E industry show a high endowment with basic ICT infrastructure like internet access (95% of firms) and Local Area Networks (LAN) (49% of firms), but a slightly below the weighted average usage of advanced infrastructure technologies like Wireless LAN (WLAN) (10% of firms) and Virtual Private Networks VPNs (7% of firms).

The digital integration of internal information flows and processes is an important issue in the M&E sector. This is reflected in an above average endowment of firms with Enterprise Resource Planning (ERP) systems (58% of firms in the industry) and other specialised ICT solutions that support internal processes, such as Engineering Data Management (EDM) systems (14% of firms). In fact, the diffusion of ERP is almost twice as high in the M&E sector than on weighted average for 10 sectors covered by the e-Business Survey 2005. Yet, there remain pronounced size-class specific differences: While almost all large companies in the sector use ERP systems (85%), only 11% of micro-enterprises do.

Electronic procurement and supply chain integration

The new survey data support previous evidence that purchasing online remains one of the most popular applications of ICT and the internet in the M&E sector. More than one third of all firms in the sector currently purchase online. Large firms are more prone to e-procurement than small firms, but small firms that actually do purchase online procure higher shares of their total purchasing volume via online channels. Compared to other sectors, however, purchasing online is not as common in the M&E industry as on average. Also, firms in this sector primarily use simple technologies to purchase online (instead of specialised e-procurement solutions) and support rather traditional procurement processes, such as finding suppliers and running Request for Quotations (RfQs) or Request for Proposals (RfPs), instead of online auctions, for example. In addition, total online purchasing volumes remain rather small.

Electronic marketing and sales

An above average share of firms in the M&E sector has a website (61% of firms, representing 88% of employees in the sector). Yet, the sector continues to show low usage rates for online sales and e-marketplaces. 5% of firms in the sector sell online, compared to 15% on weighted average for 10 sectors. The majority of firms that sell online rely on simple sale-side e-commerce activities rather than complex, sophisticated systems. This complies with the insight that there are limits to the usefulness of the internet as a sales channel for the mostly customised, capital-intensive products of this sector that do not easily lend themselves to be sold to an anonymous mass market. Yet, several business examples show that there are potentials in this industry to use customer-facing e-business solutions to improve productivity and customer service.

Anticipated implications of e-business for the industry

By increasing market transparency and the geographical outreach of companies, the further development and application of e-business could increase the degree of rivalry in some market segments of the industry. Yet, early movers in this development might be able to capture competitive advantages. Also, for those companies that consider the negotiation power of their suppliers or customers as an important aspect, the further development of e-business could significantly influence the "balance of power" between closely integrated business partners.

Policy implications

Measures to promote e-business applications are starting to take effect in the M&E industries. Awareness programmes have contributed to lower barriers for SMEs and to the perception of the potential benefits of e-business.

However, disseminating information does not seem to be enough. Companies need to translate general information into their own business cases; they need to filter relevant material from the inscrutable and sometimes contradictory supply of information. Hence, to overcome fears and to reduce the risk involved in e-business projects, concrete advice that accompanies individual implementation processes looks like a promising approach. Local and regional e-business competence centres could be the organisational form for the provision of such a service, and some are already operating to this end. A lack of ICT skills among SMEs in this sector remains an important issue for public policy.

Public-private-partnerships could be formed to support the compilation of comprehensive product classifications. Extensive engineering knowledge from practitioners is needed to accomplish the task. Industry associations or public bodies could guarantee the neutrality of procedures and outcomes.

Electronic Business in the Machinery and Equipment Manufacturing Industry

1 Introduction

1.1 Objectives and scope of the study

Objectives

This study explores the current state of ICT adoption and electronic business activity in the M&E industry. Results are predominantly based on the e-Business Survey 2005 by the *e-Business W@tch*. In January and February 2005, more than 5,200 companies from ten sectors and seven EU countries were interviewed about their use of ICT and e-business. The results of this representative survey offer a comprehensive overview of the current state of play in electronic business in the European Union. This report features key indicators, puts the figures into perspective and draws conclusions on e-business implications for the industry and for policy. This report is complementary to an earlier study on the sector published by the *e-Business W@tch* in July 2005, which features a qualitative assessment of current developments and cases of e-business activity in individual enterprises.

Sector definition

The M&E sector as defined by the NACE Rev. 1 classification of business activities¹ comprises seven sub-sectors. This report focuses on NACE Rev. 1 categories 29.1 to 29.5, which are more closely related in their business activities than the remaining two sub-sectors. The weapons and ammunitions sub-sector (NACE Rev. 1 29.6) as well as the domestic appliances industries (NACE Rev. 1 29.7) are not included in this report. These latter two industries mainly produce for government agencies (29.6) or end consumers (29.7). Therefore, the characteristics of their markets, their sales strategies and channels differ considerably from those of the other industries in the sector, and their e-business activities cannot be compared with those of the other NACE 29 industries.²

Exhibit 1-1: Business activities covered by this study (NACE Rev. 1.1)

NACE Rev. 1.1	Business Activity
DM 29	Manufacture of machinery and equipment
29.1	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines
29.2	Manufacture of other general purpose machinery
29.3	Manufacture of agricultural and forestry machinery
29.4	Manufacture of machine-tools
29.5	Manufacture of other special purpose machinery

¹ NACE Rev. 1 is a 4-digit activity classification which was drawn up in 1990. It is a revision of the "General Industrial Classification of Economic Activities within the European Communities", known by the acronym NACE and originally published by Eurostat in 1970.

² Cf. *e-Business W@tch* Sector Impact Study on Machinery and Equipment, October 2002 (available at www.ebusiness-watch.org, 'resources').

In 2002, the five sub-sectors included in this report had a production value of 418 billion euros and employed 3.2 million people in the EU-25 (*e-Business W@tch* 2005, Sector Report on M&E, July 2005). With regards to the total sector (29.1-29.7), the new Member States have contributed about 3.65% of the production value and 9.02% of employment. The manufacture of general purpose machinery (29.2) was the largest sub-sector, followed by the manufacture of other special purpose machinery (29.5). Overall, firms in the M&E sector are relatively small. 92% of the enterprises in the whole sector (29.1-29.7) have less than 50 employees.

Despite the small share of the new Member States in total production in the EU-25, the EU enlargement can lead to significant re-arrangements in the division of labour between countries in the EU. Productivity in terms of value added per person employed varies considerably between countries. To a certain extent, productivity differentials are compensated by differences in the cost of labour. Relative to productivity, labour costs are highest in Lithuania and Slovenia, and lowest in Malta and Latvia. The EU-15 States take a middle position. Quite dramatic changes in the overall level of productivity in the new Member States hint at catching-up processes.

The preceding Sector Report on the machinery and equipment industry (July 2005) contains a more detailed analysis of the industry background statistics and an overview of general trends and challenges that are currently important for the industry.

1.2 The e-Business Survey 2005

e-Business W@tch collects data on the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2005, which was the third survey after those of 2002 and 2003, had a scope of 5,218 telephone interviews with decision-makers in enterprises from seven EU countries (the **EU-7**, i.e. Czech Republic, France, Germany, Italy, Poland, Spain and the UK), which account for roughly 75% of the EU-25 population and GDP.

The survey was carried out as an enterprise survey: data collection and reporting focus on the enterprise, defined as a business organisation (legal unit) with one or more establishments. Interviews were carried out in January and February 2005. Except for the aeronautics industry, where only 163 company interviews could be realised due to the small universe of firms in this sector in the EU-7, about **560 interviews per sector** were conducted.³

In contrast to the e-Business Surveys 2002 and 2003, the survey of 2005 considered only **companies that used computers**. Thus, the highest level of the population ("base") was the set of all computer-using enterprises that were active within the national territory of one of the respective countries, and that had their primary business activity in one of the sectors specified by NACE Rev. 1.1 categories. Therefore it makes a difference if a figure represents a percentage of "*all companies*" (as in 2003) or a percentage of "*companies using computers*" (as in 2005). Differences are much less pronounced, though, when figures have been weighted by employment.⁴ The second important difference between the 2003 and 2005 surveys concerns the configuration of sectors. Three very large sectors (retail, health, business services) that had a major impact on aggregate results in 2003 were not continued in 2005. Instead, another huge sector (construction) was introduced. For these reasons,

³ The survey was conducted using computer-aided telephone interview (CATI) technology. Field-work was coordinated by the German branch of Ipsos GmbH (www.ipsos.de) and conducted in co-operation with local partner organisations.

⁴ Employment-weighted figures should be read as "*enterprises comprising x% of employees*" in the respective sector (or country). Employment weighting is useful because, due to the significantly greater number of micro- than non-micro-enterprises, un-weighted figures would effectively represent mainly the smallest sizes of firms.

direct comparisons of aggregate results should be cautiously made and only with explicit reference to these differences.

More detailed information about the survey methodology, including information about sampling and the business directories used, the number of interviews conducted in each country and sector, and data on non-response rates, are available in **Annex I** and on the website of the *e-Business W@tch*.⁵

⁵ See www.ebusiness-watch.org/about/methodology.htm

2 Adoption of ICT and e-Business Activity in 2005

2.1 Review: main results of the first report⁶

The M&E sector was not among the early adopters of advanced ICT. Yet, the sector recently made advances in the usage of e-business: Companies have begun to develop e-business strategies that are suitable to their specific needs, and many current e-business projects are planned with a conscious understanding of the scope and targeted benefits. The transition from e-business as a technical ICT tool to 'e-business as a strategic concept' is a major distinguishing factor in this recent phase. It marks a decisive step in realising sustainable e-business models.

The preceding Sector Report (July 2005) focused on case studies and qualitative evidence on e-business developments in the M&E industries. Case studies presented in this report indicated that e-business offers a whole variety of options to introduce new services and to improve the quality of existing ones. In most of these case studies, companies stated that e-business has improved their competitiveness – by reducing costs and by enhancing the attractiveness of their products and services. In particular, evidence was presented on how SMEs successfully introduced e-business applications to enhance their competitiveness (e.g. Digital Parts Transfer/Netherlands). In some of these cases, support by public policy initiatives was crucial for starting and completing e-business projects (e.g. Telschig/Germany or Köhler and Hörter/Germany).

Some key features emerged in the case studies that appear to be of general importance for the success of e-business projects in the M&E sector:

- Linking external e-business applications with internal procedures is not only a problem of integrating ICT systems, but one of reflecting the e-business strategy in other departments of the company. Thus, defining a comprehensive e-business strategy is an essential prerequisite for success.
- Companies should not underestimate the efforts needed to achieve viable solutions beyond the test phase. Especially organisational re-structuring, training, and learning phases have to be taken into account.
- Stakeholder involvement is crucial: Customers, employees, suppliers, production, and marketing departments that are affected by the new solution and processes need to be able to influence the shape of the system. In particular, user friendliness of systems is important since many e-business applications are supposed to involve actors with different backgrounds.
- A strategic decision whether to run parallel systems (ICT-based along with traditional procedures) is needed. Longer transition periods are a financial burden, quick transitions to 'online only' systems might drive customers away. Trading off these two aspects should be considered during the specification of an e-business strategy.
- Service quality is important: Transparency, trust building measures, personal feedback, and back-office support are essential to achieve commitment from all stakeholders when making the switch to an e-business supported process or business model.

The previous sector study (July 2005) also included an analysis of the role of e-marketplaces and their current potentials in the M&E sector. It was found that e-marketplaces that serve

⁶ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

the M&E sector currently offer a wide variety of services. Functions range from mere contact brokerage to the organisation of auctions and sales procedures. The variety of markets makes it possible to move beyond the trade of standard parts to more sophisticated products and services. On the one hand, it remains an essential challenge for market operators to gain a critical mass of trade in order to attract customers and suppliers. On the other hand, it is not easy for potential market participants to select the right e-market because such a decision requires information on the functionality, the operators, and their reliability, as well as on size and scope of electronic markets. This information is not always easy to obtain.

The case studies presented in the previous report (July 2005) emphasised that standardisation remains a major prerequisite for doing e-business in this industry. Achieving commonly accepted descriptions and definitions requires coordination among suppliers and initiatives that govern the process from a neutral position. Industry associations and publicly supported programmes cooperate in this task.

This Sector Study complements the previous, qualitative findings by presenting the results of the representative enterprise survey on e-business usage carried out in January / February 2005 by the *e-Business W@tch*. Together, the quantitative and qualitative findings provide an up-to-date overview of the current state of e-business development in the M&E sector.

2.2 Basic ICT infrastructure and skills development

2.2.1 ICT network infrastructure and access

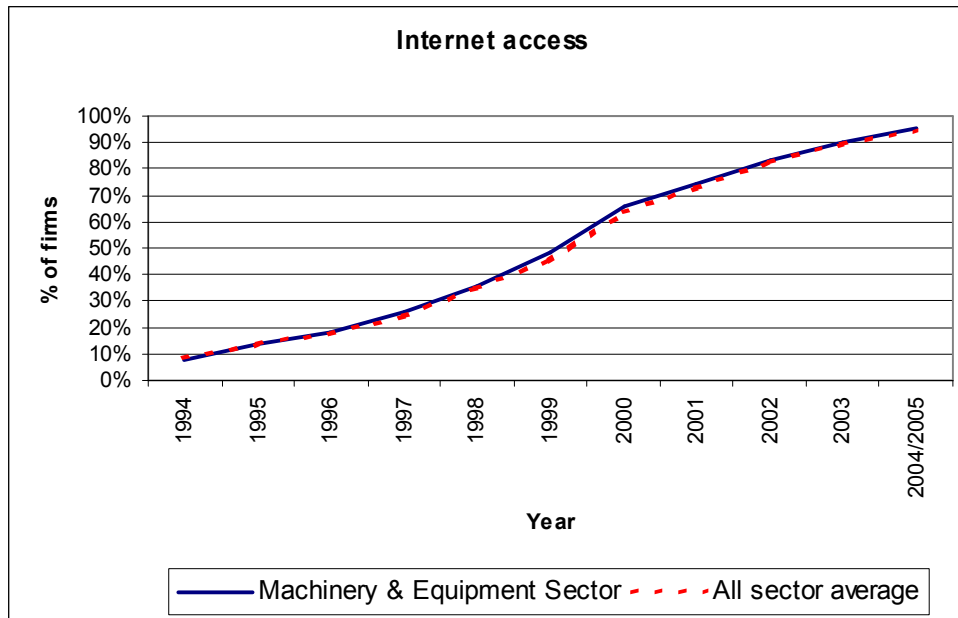
Sophisticated, modern ICT infrastructures are a basic requirement for the success of most e-business projects. Consistent with previous findings (2002/03)⁷, firms in the M&E sector are now almost all endowed with internet access (Exhibit 2-1).⁸ The diffusion of **internet usage** in the sector has steadily increased since the early 1990's. In 1999, 50% of firms already used the internet. This number increased to slightly more than 90% in 2003 and has since increased to 95% in 2005, almost reaching the saturation level now. Compared to the weighted average of all sectors included in the sample, firms in the M&E sector were neither particularly slow nor fast in adopting the internet, they were actually very close to the average figures.

According to the detailed breakdown in Exhibit 2-2, even 94% of micro-enterprises (i.e. those with less than 10 employees) currently have access to the internet. The high general penetration of internet usage is observed across companies from all countries included in the sample, with the exception of France where companies slightly fall behind (only 77% of all firms in France). Interestingly, internet penetration rates are higher among companies in the Czech Republic and Poland than in France.

⁷ e-Business Sector Studies on the Machinery and Equipment Industry, Oct. 2002, May 2003. www.ebusiness-watch.org ('resources').

⁸ Survey results reported in this Study are based on all companies in the sector that use computers. According to the previous Survey (Sector Report No. 10-II, 2003), 96% of enterprises used computers in the machinery and equipment industry (figure for EU-4, comprising companies in DE, FR, IT and the UK). Thus, there is only a negligible share of firms in this sector that do not use computers yet.

Exhibit 2-1: Firms having internet access 1994-2005



Percentage of firms having access to the Internet. Base: "All" = companies using computers in 2005. Enterprise weighted results. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7). In % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

Firm-internal network infrastructures, like LAN and WLAN, are also widely used, in particular among large companies. Almost 100% of enterprises with more than 50 employees have a LAN, and 52% of enterprises with more than 250 employees have a wireless LAN. Not surprisingly, the diffusion of firm-internal networks is less advanced among SMEs. Yet, compared to the other sectors surveyed in January and February 2005, the M&E industries exhibit an above average degree of basic ICT diffusion.

7% of all firms in the sector have **broadband** internet access (>2Mbit/s). The share of companies having fast internet connections is higher among large enterprises and in Germany. Virtual Private Networks (VPN) are currently used by 7% of all firms in the sector. Again, VPNs as a more sophisticated ICT infrastructure are more common among large enterprises (74% among firms with >250 empl.) than among SMEs (only 1% among micro-enterprises).

The diffusion of **more sophisticated infrastructure** and access technologies (WLAN, broadband and VPN) is slightly less advanced in the M&E sector compared to the weighted average for the 10 sectors covered in 2005. In particular, compared to the most advanced industry (the ICT services sector), firms in the M&E sector are less frequently endowed with these more advanced technologies. Yet, compared with other manufacturing sectors, the M&E sector appears well-endowed with ICT infrastructure.

Exhibit 2-2: ICT network infrastructure and access

Weighting:	LAN		Wireless LAN		Internet access		Broadband access ¹⁾ (> 2Mbit/s)		VPN	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	88	49	34	10	99	95	20	7	45	7
1-9 empl.		38		7		94		5		1
10-49 empl.		74		16		99		9		15
50-249 empl.		97		27		100		15		36
250+ empl.		100		52		100		32		74
Germany	93	57	50	17	100	95	19	14	62	11
Spain	79	64	30	16	97	97	25	6	36	4
France	82	34	15	4	97	77	28	8	38	5
Italy	83	50	17	9	100	100	16	4	35	5
United Kingdom	95	59	42	10	100	97	23	4	49	14
Czech Republic	92	48	17	9	98	94	8	7	20	5
Poland	76	33	26	11	100	100	17	7	12	5
Total (10 sectors, EU-7)	70	44	26	14	96	92	19	9	30	9
Food & beverages	73	36	26	4	95	83	14	5	27	4
Textile	76	37	26	9	98	93	14	4	29	5
Publishing & printing	83	57	21	12	100	98	32	13	41	7
Pharmaceutical	96	60	34	14	100	96	33	11	57	16
Automotive	97	50	45	11	100	92	40	12	62	12
Aeronautics	99	63	38	16	100	99	41	13	55	20
Construction	58	36	13	8	95	91	10	7	17	4
Tourism	57	40	27	17	92	90	16	9	20	9
IT services	94	87	46	36	100	100	39	20	59	32
Base (100%)	all		all		all		all		all	

Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7),
¹⁾ N = 549 (M&E, EU-7), N = 5016 (Total, EU-7).
"% of employment" = firms representing ...% of employment in the sector(s) / country
"% of firms" = % of firms as legal units, irrespective of their size
LAN = Local Area Network; VPN = Virtual Private Networks

Source: *e-Business W@tch* (e-Business Survey 2005)

A more detailed view on the type of **internet connection** used in this sector is presented in Exhibit 2-3. The majority of firms use either DSL (43%) or ISDN (34%) connections. A minority of mostly micro-enterprises still uses the outdated analogue modem technology to access the internet. On the other hand, a high percentage of large firms also use high capability broadband connections such as T1 lines or cable modems (59% of enterprises with >250 employees). Generally, small enterprises make more often use of slower access technologies, while large enterprises prefer fast broadband connections. Although this discrepancy puts limits on the usefulness of some online applications for SMEs, part of the gap in broadband usage between small and large enterprises can be explained by the higher number of potential internet users in large enterprises: A higher number of firm-internal internet users means that firms need to invest in fast connections to enable all users to have acceptable connection speeds.

Exhibit 2-3: Type of internet connection used

Weighting:	Analogue modem		ISDN		DSL		Other broadband		Other	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	4	18	21	34	46	43	36	9	5	2
1-9 empl.		23		37		39		7		1
10-49 empl.		7		30		52		8		3
50-249 empl.		3		17		55		26		3
250+ empl.		0		14		40		59		8
Total (10 sectors, EU-7)	11	19	21	25	43	45	26	11	4	2
Base (100%)	Companies with internet access									
Base: N = 549 (M&E, EU-7), N = 5016 (Total, EU-7).										
"% of employment" = firms representing ...% of employment in the sector(s) / country										
"% of firms" = % of firms as legal units, irrespective of their size										
ISDN = Integrated Services Digital Network; DSL = Digital Subscriber Line										

Source: e-Business W@tch (e-Business Survey 2005)

Another aspect of indicating the **degree of sophistication** of ICT infrastructures is whether they support remote access to the company's computer network. One advantage for firms having remote access is that it enables traveling employees, sales agents, or home workers to have up-to-date access to relevant information and to work from "out of office". Also, work procedures can be organised in virtual team rooms or workflows that are independent of the physical location of the participating employees, enabling a new degree of flexibility.

An interesting example of remote access was presented in the previous sector study (July 2005)⁹ (see the case study on Palfinger/Austria). The company implemented a paperless electronic warranty system for a better and quicker handling of warranty registrations and warranty claims. The dealer or area representative who sells one of Palfinger's products enters information about the equipment sold and the customer remotely into Palfinger's computer system, and the warranty becomes immediately effective. This saves time and increases customer satisfaction compared to the old process, where warranty forms were filled out on paper and sent to Palfinger by fax or mail, where the paper document was entered into the warranty database.

According to Exhibit 2-4, the M&E sector shows an average degree of remote access usage compared to the other sectors covered by the e-Business Survey 2005. 20% of firms in the industry have remote access to the computer network, and an additional 5% plan to enable remote access in the near future. These numbers indicate that a substantial share of firms in the M&E sector already take advantage of some of the features remote access can enable. Large firms are much more often equipped with remote access technologies than small firms: While 88% of large enterprises have remote access, this only applies to 14% of micro-enterprises.

Currently, the most popular technology for remote access of computer networks are fixed line connections. 64% of enterprises in the sector that have remote access use fixed line connections. 51% use mobile networks and 24% of firms use wireless LAN.

⁹ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

Exhibit 2-4: Remote access to the company's computer network

Weighting:	Enable remote access		Have planned to enable remote access		Remote access via fixed line connection ¹⁾		Remote access via W-LAN ¹⁾		Remote access via mobile networks ¹⁾	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	60	20	5	5	73	64	30	24	70	51
1-9 empl.		14		5		71		20		48
10-49 empl.		32		4		49		29		47
50-249 empl.		53		11		69		21		58
250+ empl.		88		1		76		34		79
Total (10 sectors, EU-7)	40	19	6	5	69	66	29	26	52	41
Base (100%)	all		all		Companies with remote access					
Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7), ¹⁾ N = 206 (M&E, EU-7), ¹⁾ N = 1845 (Total, EU-7). "% of employment" = firms representing ...% of employment in the sector(s) / country "% of firms" = % of firms as legal units, irrespective of their size W-LAN = Wireless Local Area Network										

Source: *e-Business W@tch* (e-Business Survey 2005)

2.2.2 ICT skills development & outsourcing

The availability of qualified employees is a crucial prerequisite for firms to engage in e-business. In addition, a lack of ICT skills among the users of particular e-business solutions (e.g. customers or suppliers) can slow down the implementation of ICT systems that could increase productivity levels. The importance of an adequate level of ICT skills among the employees and the users of e-business systems was emphasised in the case study in the previous sector report (July 2005) on Palfinger/Austria: While implementing their paperless warranty system, the company had to consider that many users of the system, e.g. mechanics in workshops, are not accustomed to the use of office PCs with devices like a mouse. Therefore, their system had to be made usable by keyboard alone, without mouse support, which was an additional challenge in the completion of the project that was originally not foreseen.

In recent years, there has been an intense discussion about ICT skills shortages in Europe. In general, firms that face an ICT skill shortage have three basic alternatives: They can either invest in ICT training measures for their existing employees, recruit new personnel, or outsource ICT development and maintenance to specialised providers.

Exhibit 2-5 shows evidence for ICT training efforts and ICT staff recruiting activities in the machinery sector¹⁰. 8% of enterprises in the industry have made efforts to **recruit ICT specialists** in the 12 months prior to the survey. Large companies were slightly more active in the recruiting of ICT specialists than SMEs. Of those companies that made recruiting efforts, 65% experienced difficulties in finding qualified staff. In particular, 72% of micro-enterprises reported difficulties, compared to only 7% of large enterprises with more than 250 employees. This suggests that SMEs face a disadvantage in attracting ICT specialists, which

¹⁰ Please note that the results are based on a relatively small number of cases (52 machinery and equipment manufacturers across Europe). Thus, findings may be not representative in a strict statistical sense. Some questions have been asked to a sub-sample of companies only using a filter. For example, questions on the share of online purchases in total purchases have only been asked to firms purchasing online. This reduces the number of cases for some variables considerably.

could slow down their e-business development and eventually limit their ability to remain competitive.

In fact, the share of firms reporting difficulties in finding qualified ICT staff is higher in this sector than in all other sectors included in the e-Business Survey 2005. In addition, there are pronounced differences across countries: While less than 10% of firms trying to recruit ICT staff experienced difficulties in Spain and the UK, more than 90% experienced difficulties in France and Italy, indicating that the shortage of ICT personnel could be a highly region-specific issue. However, in this survey the number of responses for this question was too low to verify this thesis on statistically solid ground.

Exhibit 2-5: ICT skills development & outsourcing

Weighting:	Have made efforts to re-recruit ICT specialists in past 12 mon.		Experienced difficulties in finding qualified staff ¹⁾		Regular ICT training of employees		Have outsourced ICT services		Have outsourced services to national providers	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	16	8	16	65	36	11	79	60	77	59
1-9 empl.		8		72		8		53		52
10-49 empl.		4		68		11		79		78
50-249 empl.		11		25		31		85		79
250+ empl.		27		7		58		81		81
Germany	23	9	3	13	49	19	86	58	85	55
Spain	14	1	22	8	24	8	73	43	65	30
France	3	3	58	94	24	15	69	47	66	47
Italy	15	10	48	96	30	7	85	75	85	75
United Kingdom	12	5	14	9	32	6	78	53	73	52
Czech Republic	13	5	8	67	37	16	75	54	70	54
Poland	17	14	24	48	24	11	47	50	44	47
Total (10 sectors, EU-7)	15	7	27	41	26	15	65	52	61	50
Food & beverages	16	3	28	40	28	9	70	53	68	52
Textile	12	5	21	48	26	13	78	57	74	56
Publishing & printing	23	10	33	27	33	15	78	57	75	54
Pharmaceutical	22	9	20	7	49	17	80	69	76	66
Automotive	31	7	8	31	42	14	66	63	52	59
Aeronautics	31	7	1	32	39	15	88	59	82	57
Construction	6	4	40	14	16	12	55	48	53	46
Tourism	13	7	28	48	20	14	66	54	63	52
IT services	40	23	39	55	52	35	57	61	50	53
Base (100%)	all		Companies having recruited		all		all		all	

Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7),
¹⁾ N = 52 (M&E, EU-7), ¹⁾ N = 675 (Total, EU-7). Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.
 "% of employment" = firms representing ...% of employment in the sector(s) / country
 "% of firms" = % of firms as legal units, irrespective of their size

Source: e-Business W@tch (e-Business Survey 2005)

Only 11% of firms in the M&E industry offer regular **ICT training** to employees. This is the second lowest figure among all sectors included in the e-Business Survey 2005. Also, SMEs

report much lower figures for ICT training efforts than larger companies, which suggests that smaller companies either lack the necessary resources or ignore the importance of training measures in their firm. Small firms may have problems to afford giving their employees time off for qualification, because certain tasks for which no substitute is available would be neglected. In larger firms, colleagues can help each other out, and with a larger number of employees, organisational arrangements for times in which employees engage in qualification courses are easier.

Exhibit 2-5 also provides evidence for the **outsourcing** activities of firms. Interestingly, 60% of enterprises in the M&E sector say that they have outsourced some ICT services, almost all of them to national service providers. This finding is interesting in two aspects:

- First, the share of companies that have outsourced ICT services is higher in this sector than on weighted average for 10 sectors. This makes sense since the maintenance and the development of ICT applications and infrastructures is not a classical core competence of enterprises in the manufacture of machinery and equipment. Also, outsourcing is one way to cope with possible shortages of in-house ICT specialists. Consequently, the share of SMEs that have outsourced ICT services is not significantly smaller than the share of large enterprises.
- Second, the high percentage of firms that rely on national providers shows that offshore-outsourcing of ICT services is currently not an important trend in this industry.

2.2.3 Investments in ICT

The average level of gross capital investment in ICT hardware and software in the M&E sector in 2004 was € 70,000, the median was € 5,000. These values are close to the all-sector average of € 65,000, and the all-sector median of € 5,000 is identical to the result for the M&E sector.¹¹ Thus, on average, firms in the M&E sector did neither spend particularly much nor little on ICT hard- and software last year, compared to the other sectors in the sample.

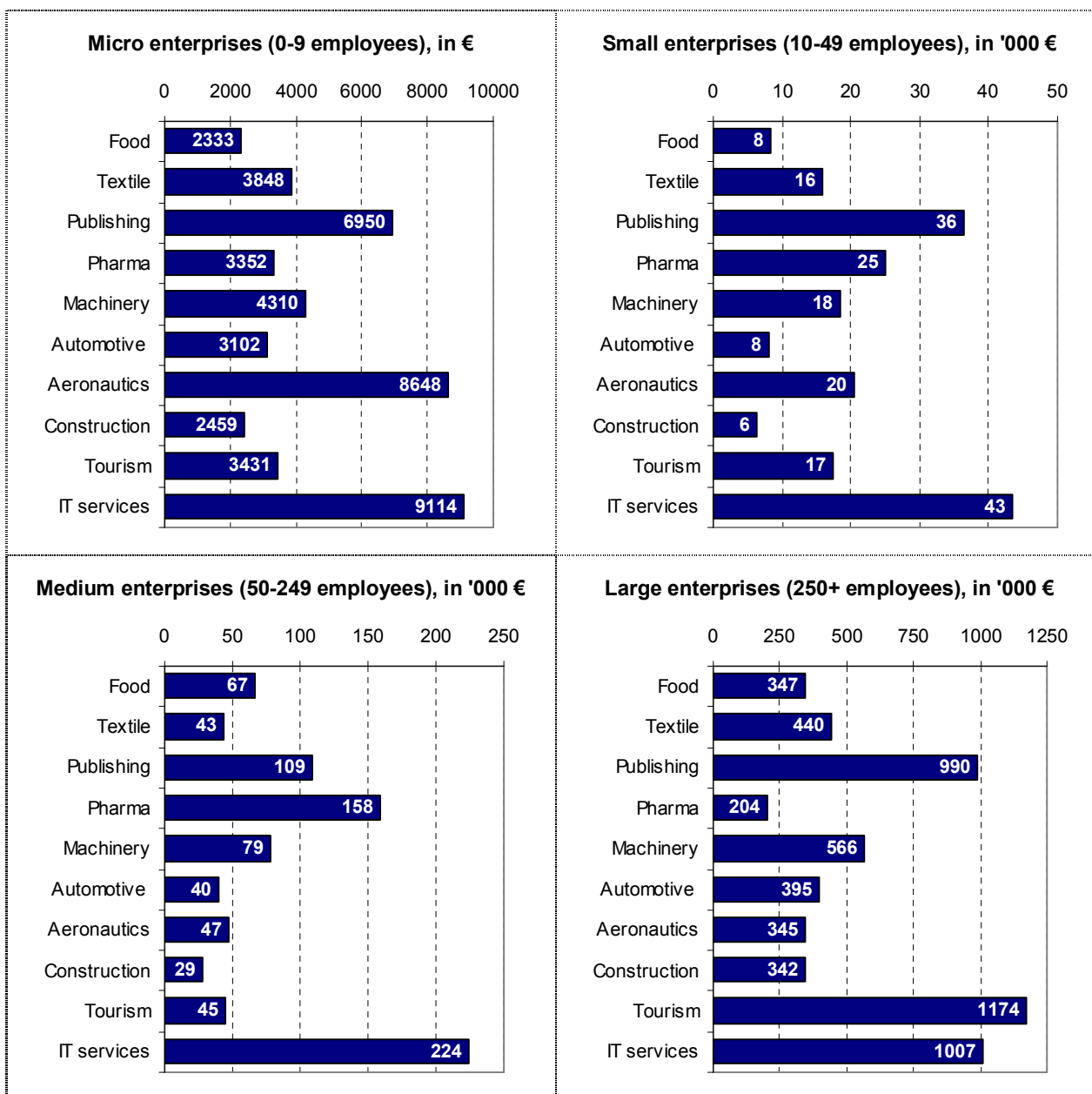
Obviously, there are pronounced size-class specific differences in the overall level of ICT investments (see Exhibit 2-6). SMEs typically have much smaller investment budgets than larger enterprises. This is also reflected in the large difference between the average and the median value of ICT investments across all sectors (the average value is sensitive to outliers, i.e. high investments of some large enterprises, whereas the median value is not). The highest ICT spending for 2004 reported in the sample for the M&E sector was € 2.5 million (by a large enterprise), the lowest was zero (by some micro-enterprises).

Exhibit 2-7 shows the ICT investment trend for 2005. 26% of firms in the M&E sector plan to increase their ICT investments in 2005 compared to 2004. 60% plan to maintain their current investment levels, while only 14% plan to decrease their ICT spending. Large firms in the sector are slightly more likely to increase their ICT budgets in 2005, which could imply that the ICT gap between large firms and SMEs will not decrease in the near future.

Compared to the other sectors covered in the sample, the ICT investment trend in the M&E sector is slightly less positive than on average. The all sector average shows a marginally higher share of firms that plan to increase their ICT investments, and a lower share of firms planning to decrease their ICT spending for 2005. Yet, the differences in reported ICT investment trends between the M&E sector and the all sector average are not large enough to draw strong conclusions from them.

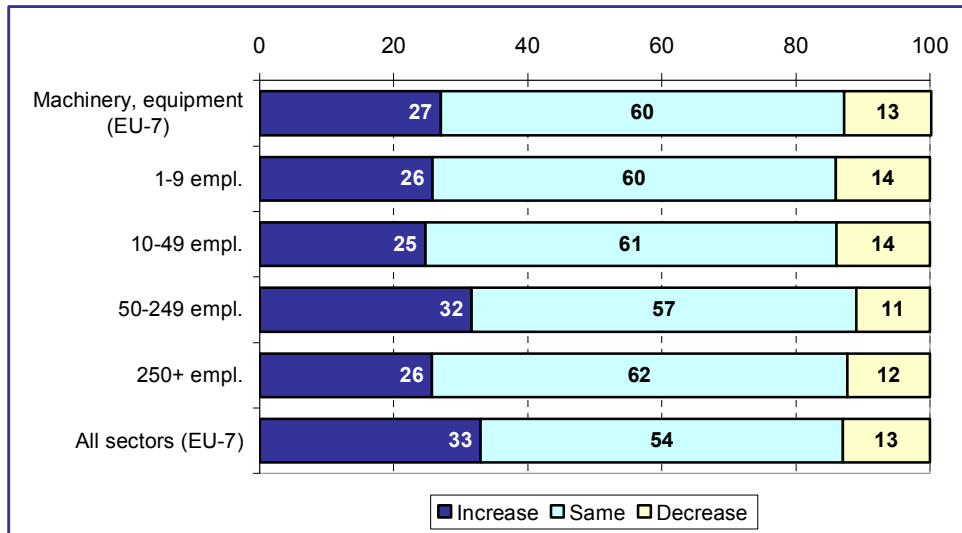
¹¹ e-Business Survey 2005, unweighted results for companies located in France, Germany, Italy and Spain.

Exhibit 2-6: Average investment in ICT infrastructure and software by firm size in 2004 (in euros)



Base (100%): All Companies using computers (excl. "Don't know") and actually reporting money amount invested.
 N = 1304 (micro firms, EU-7). N = 902 (small firms, EU-7). N = 887 (medium firms, EU-7). N = 278 (large firms, EU-7).

Source: e-Business W@tch (e-Business Survey 2005)

Exhibit 2-7: ICT investment trend for next 12 months

Percentage of firms intending to increase, remain the same level of, decrease their ICT expenditure in next 12 months. Base: "All excl. DK" = companies using computers exclusive "don't know". N = 545 (M&E, EU-7), N = 4966 (Total, EU-7). Figures for sector total and all sectors are weighted by employment. Figures for size-bands in % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

Summary**Key messages from the analyses in section 2.2**

- Almost **all** firms in the M&E sector are endowed with **internet** access.
- Firm-internal network infrastructures, like **LAN and WLAN**, are also **widely used**, in particular among large companies. Almost 100% of enterprises with more than 50 employees have a LAN.
- The diffusion of **more sophisticated infrastructure** and access technologies (WLAN, broadband and VPN) is slightly **less advanced** in the M&E sector compared to the all-sectors average.
- 20% of firms in the industry have **remote access** to the computer network, and an additional 5% plan to enable remote access in the near future.
- **Only 11%** of firms in the M&E industry **offer regular ICT training** to employees. This is the second lowest figure among the ten sectors included in the e-Business Survey 2005.
- The average level of gross capital investment in ICT hardware and software in the M&E sector in 2004 was €70,000, the median was €5,000. Thus, average **investments are comparable** to those made by firms from other sectors in the sample.

2.3 Integration of internal processes and cooperation with business partners

One of the advantages of modern ICT and e-business solutions is the possibility to link, aggregate, disseminate and process information from various parts of the company in an efficient way. A classic example are Enterprise Resource Planning (ERP) systems that enable linking and processing information from supply, production, ordering, delivery and billing processes.

Another example are Intranets that enable to disseminate company-internal information to employees in an efficient manner, for example by providing easy access to standardised forms and directories. Obviously, many of these ICT and e-business solutions that are primarily used in-house are subject to economies of scale, i.e. they provide higher value to firms with many employees, departments, and complex structures and processes. This sub-chapter provides evidence from the recent survey on the usage of such in-house systems in the M&E manufacturing sector.

Information and knowledge management

The sector currently shows an average endowment with ICT for sharing information and knowledge among employees, compared to all other sectors. According to Exhibit 2-8, 22% of companies in the industry currently have an intranet, 9% use an e-learning application, and only 6% use a knowledge management solution. Intranets are very common among large enterprises, but only rarely used in micro-enterprises with less than 10 employees.

This reflects the fact that the value of an intranet increases with the number of employees using the intranet (increasing returns to scale). Knowledge management systems are only used by a very small share of micro-enterprises (4%). 12% of the enterprises from the remaining size classes are endowed with a knowledge management solution. Size-class effects are also found for e-learning applications, which are far more common among large enterprises (27%) than among micro-enterprises (8%). Although e-learning applications can be useful for SMEs as well (Köllinger and Ross 2003), the low share of SMEs using e-learning partially reflects the lower commitment of SMEs to employee training measures in general (see Exhibit 2-5).

Exhibit 2-8: Use of ICT for sharing information and knowledge among employees

Weighting:	Intranet		Knowledge management		E-learning applications	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	54	22	11	6	19	9
1-9 empl.		14		4		8
10-49 empl.		34		12		11
50-249 empl.		71		12		17
250+ empl.		62		11		27
Total (10 sectors, EU-7)	47	19	13	5	18	9
Base (100%)	all		all		all	
Base: "All" = companies using computers.						
N = 565 (M&E, EU-7), N = 5218 (Total, EU-7).						
"% of employment" = firms representing ...% of employment in the sector(s) / country						
"% of firms" = % of firms as legal units, irrespective of their size						

Source: e-Business W@tch (e-Business Survey 2005)

Digital integration of internal processes

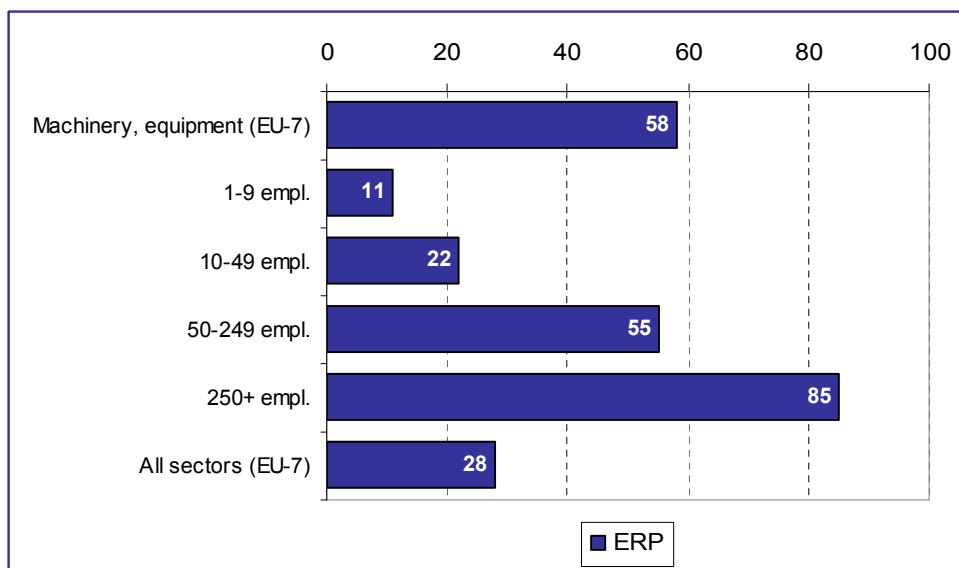
The digital integration of internal information flows and processes is an important issue in all manufacturing sectors, including the M&E industries. ERP systems play a key role in this. Often, the ERP system is the “backbone” of all production- and product-related ICT systems.

The case studies in the previous sector report (July 2005) emphasised the importance of ERP systems in many companies and for many e-business projects. For example, the project management system at Köhler and Hörter GmbH, a small company in Germany, is connected to their ERP system. This was necessary because the project management system is supposed to provide customers with online information about the status quo of their projects. Hence, information about orders, prices, spare and wear parts and delivery times had to be synchronised with the ERP system. In fact, Köhler and Hörter had to implement a new ERP system in order to successfully launch the project management system because their old ERP system turned out to be incompatible.

Exhibit 2-9 shows the current adoption levels of ERP systems in the industry. 58% of firms in the M&E sector currently use an ERP system. This figure is clearly above the weighted average for 10 sectors. In fact, it is almost twice as high, emphasising the importance of ERP systems in this industry.

Yet, there are still pronounced size-class specific differences in ERP usage. While the vast majority of large companies in this sector have an ERP system (85%), only 11% of micro-enterprises do. Of course, part of this gap stems from the fact that ERP systems provide higher value in large firms where many processes and information have to be aggregated and coordinated. Nevertheless, the low level of ERP usage in small enterprises points out that an important element of ICT infrastructure, which is a prerequisite for many other possible e-business applications, is still missing.

Exhibit 2-9: Use of Enterprise Resource Planning (ERP) systems by size-class



Percentage of firms using an ERP system. Base: “All” = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7). Figures for sector total and all sectors are weighted by employment. Figures for size-bands in % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

In addition to ERP systems, which are often very extensive solutions that cover and connect a variety of processes within a firm, there are other, specialised ICT solutions that help to optimise specific firm-internal tasks. Often, these specialised solutions can be integrated or connected to ERP systems. Some of these solutions are presented in Exhibit 2-10. For

example, EDM can help firms to comply with regulatory documentation requirements and they can increase the flexibility and efficiency of firms. The case study on the implementation of a quality management system in Fire Eater A/S from Denmark (Sector Report 05-I, 2005) showed how EDM can improve the efficiency of business processes, help to comply with regulatory requirements, and improve customer service. Currently, 14% of enterprises in the M&E sector use an EDM system. This is slightly more than the weighted average reported for all sectors (9%).

Special ICT solutions to manage capacities and inventories online are used by 13% of enterprises in this sector, compared to 9% on weighted average for 10 sectors covered in 2005. Also, ICT solutions that help to track working hours of staff online are used by 11% of companies in the M&E industries, compared to 8% on average. Although these specialised solutions are not very widely used yet (and probably not every company in the sector needs them), they are more frequently used in this sector than in others, emphasising the importance of ICT tools for internal process optimisation in the M&E sector.

All three e-business applications listed in Exhibit 2-10 show size-class specific characteristics: They are all less frequently used in SMEs than in large companies. Given the argument from above that in-house solutions often exhibit increasing returns to scale, this finding is not surprising.

Exhibit 2-10: E-integration of internal business processes

Weighting:	EDM system		Manage capacity / inventories online		Tracking working hours online	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	23	14	28	13	28	11
1-9 empl.		12		10		8
10-49 empl.		19		14		18
50-249 empl.		18		32		29
250+ empl.		31		37		37
Total (10 sectors, EU-7)	15	9	22	9	19	8
Base (100%)	all		all		all	
Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7).						
"% of employment" = firms representing ...% of employment in the sector(s) / country						
"% of firms" = % of firms as legal units, irrespective of their size						
EDM = Electronic Data Management						

Source: *e-Business W@tch* (e-Business Survey 2005)

The following business example illustrates the role of ERP systems as the backbone of many e-business applications. It describes the interplay of several ICT systems and the importance of connecting them with the ERP system in a large German enterprise that produces pumps and pump systems.

Business example:**IT and e-business at Wilo AG**

Wilo AG is one of the world market leaders in pumps and pump systems. Its headquarters are located in Dortmund, Germany, and its history goes back to the year 1872. With almost 4,000 employees worldwide (more than 1,600 in Germany) in 2004, the company's revenue amounted to 660.8 million euros. About two thirds of Wilo's revenues are attributed to pumps and pump systems for heating, refrigeration, and air-conditioning applications. In addition, the company is producing pumps for water supply and sewage lifting.

Wilo is very active in the field of e-business. For instance, the company is providing individual websites for 26 different countries and a standard website in English for the other countries. In addition, Wilo is offering an online catalogue for its spare parts as well as an internet shop (in German and English) where customers can order spare parts online.

The company's IT technology is based on different systems built around an SAP R/3 system. In 2005, it acquired a SAP Web Application Server (WAS) from the EnNo Consulting AG, which offers the infrastructure in order to provide information from ERP systems systems on the internet and to receive data from external partners via the internet. Thus, it represents the prerequisite in order to connect the ERP system with the internet shop.

In addition, ADICOM, a subsidiary of the IT service provider Freudenberg IT has recently provided Wilo with its ADICOM® Software Suite. This application is compatible with the company's SAP inventory system. It will help Wilo to improve its production transparency by systematically collecting company and machine data such as operational status, downtimes, error codes, or quantities. This method of machine data collection will enable Wilo to analyse more precisely its manufacturing process and to better evaluate company data.

Source: www.wilo.com, www.f-it.de, www.enno.de, [www.ruhrpakt.de/das neue ruhrgebiet/erfolgsstorys/](http://www.ruhrpakt.de/das_neue_ruhrgebiet/erfolgsstorys/) (July 7, 2005)

Use of ICT for collaborative work processes

Additional specialised ICT solutions that enable to optimise in-house processes and to improve collaboration with business partners are shown in Exhibit 2-11. 21% of firms in the sector have ICT solutions (such as Lotus Notes) that enable employees to share documents online and to conduct collaborative work online. This is a slightly higher share of enterprises than on weighted average across all sectors (18%). 15% of enterprises in the M&E sector have an ICT solution that enables them to conduct product design processes online in a collaborative way, often in a joint system together with customers or suppliers. Again, this is slightly more than on weighted average for 10 sectors (11%). Finally, 7% of firms in this sector (compared to 9% on average) use ICT tools to forecast product demand in a collaborative way, together with suppliers or customers. For all three types of applications, large enterprises show the highest adoption rates, which are also significantly higher than the respective averages, while SMEs lag behind but lie again above the all sectors average except for collaborative forecasting of demand.

In summary, the importance of ERP systems and ICT-tools to optimise product-related, internal processes that was found in the case studies in the previous report (July 2005)¹² is emphasised and supported by the survey results. The M&E sector shows an above average endowment with ERP systems and other specialised ICT solutions that support internal processes and the collaboration with business partners.

Exhibit 2-11: Use of ICT for collaborative work processes

	Sharing documents online		Collaborative design processes		Collaborative forecasting of demand	
	Weighting: % of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	37	21	22	15	15	7
1-9 empl.		18		15		8
10-49 empl.		26		14		4
50-249 empl.		28		14		5
250+ empl.		51		32		27
Total (10 sectors, EU-7)	30	18	16	11	13	9
Base (100%)	all		all		all	
Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7).						
"% of employment" = firms representing ...% of employment in the sector(s) / country						
"% of firms" = % of firms as legal units, irrespective of their size						

Source: e-Business W@tch (e-Business Survey 2005)

Summary

Key messages from the analyses in section 2.3

- The **importance of ERP systems** and ICT-tools to optimise product-related, internal processes that was found in the case studies in the previous report (July 2005) is emphasised and supported by the survey results.
- Adoption levels of ERP in particular systems are high in M&E manufacturing compared to other sectors, but there are still **pronounced differences by size-band**.
- Special ICT solutions to **manage capacities and inventories online** are used by 13% of enterprises in this sector, compared to 9% on average.
- The sector currently shows an **average endowment with ICT for sharing information** and knowledge among employees, compared to the other 9 sectors surveyed.

¹² e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

2.4 Electronic procurement and supply-chain-integration

Online purchasing and use of special e-procurement systems

e-Business W@tch (2004) finds that purchasing online remains one of the most popular e-business applications across industries. In the M&E sector, potential benefits of purchasing online include

- automated purchasing of standard components and products,
- aggregation of orders from various departments to achieve bulk rebates,
- closer cooperation with preferred suppliers and joint process cost savings, and
- general cost savings potentials compared to traditional ordering procedures.

Although these potential benefits seem to be well known, firms differ substantially in their intensity of using the internet to purchase goods and services. They also differ in the degree of sophistication of purchasing online, ranging from infrequent orders on some e-marketplaces via a simple web-browser to the usage of customised e-procurement software systems that forecast and aggregate demand from various departments and automatically trigger orders with integrated suppliers.

According to Exhibit 2-12, 36% of firms in the M&E sector currently purchase online. This is slightly less than the weighted average for 10 sectors of 44%. Noticeably, large firms are more likely to purchase online than SMEs, although already 32% of micro-enterprises make use of online channels for procurement purposes. Compared to the weighted average of the 10 sectors covered by the e-Business Survey 2005, firms in the M&E sector purchase relatively small shares of their overall supplies online. Only 50% of firms purchase more than 5% of their supplies online (58% all-sectors total), and only 11% of firms purchase more than 25% of their supplies (23% all-sectors total). Although SMEs are less frequently engaged in online purchasing than large firms, those SMEs that buy online procure relatively higher volumes via the internet than their larger counterparts.

Exhibit 2-12 also shows some country-specific variation in the intensity of online purchasing. Firms in the UK and Germany are on average more advanced in online purchasing than firms from other countries. Firms in Italy mark the taillight, while firms in the Czech Republic and Poland are head-to-head with firms in Spain and France.

Only 10% of firms in the sector use a specific ICT solution for e-procurement, compared to 11% on average across all sectors in the sample. This implies that the majority of firms that purchase online use rather simple technologies for this purpose (e.g. just a web-browser) and do not frequently use the internet as a supply channel.

An interesting example of a small firm from the M&E sector that uses a sophisticated online procurement software is the case study on Köhler and Hörter Compressor Systems / Germany, presented in the previous sector study (July 2005)¹³. They use ordering software that automatically generates the demand for all kinds of products and components. Basic and standardised components which are repeatedly purchased are ordered online from suppliers that have online shops and comply with the eCI@ss standard.¹⁴

¹³ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

¹⁴ [eCI@ss](http://www.eCI@ss.com/) is a classification code for products and services developed by a consortium of enterprises with the support of Ministries and e-business competence centres in Germany. See <http://www.eCI@ss.com/>. [eCI@ss](http://www.eCI@ss.com/) is organised as a not-for-profit registered society.

Exhibit 2-12: Online purchasing and use of ICT for e-procurement

Weighting:	Make online purchases		Buy more than 5% of supplies online ¹⁾		Buy more than 25% of supplies online ¹⁾		Use specific ICT solutions for e-procurement	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	54	36	41	50	9	11	18	10
1-9 empl.		32		52		10		8
10-49 empl.		44		46		12		15
50-249 empl.		52		45		9		26
250+ empl.		63		36		9		16
Germany	62	47	31	55	4	14	20	17
Spain	39	35	66	60	3	1	14	9
France	53	33	64	56	7	23	19	10
Italy	30	26	30	52	8	4	17	11
United Kingdom	71	57	56	46	23	6	17	8
Czech Republic	68	42	55	42	13	17	19	11
Poland	45	35	20	27	15	18	11	4
Total (10 sectors, EU-7)	51	44	53	58	19	23	19	11
Food & beverages	43	22	38	33	9	5	18	5
Textile	44	30	35	38	7	8	14	8
Publishing & printing	57	48	56	60	17	18	16	8
Pharmaceutical	48	38	60	50	16	18	32	14
Automotive	60	41	56	42	4	12	39	13
Aeronautics	43	65	89	56	4	17	63	16
Construction	43	36	41	47	9	7	16	9
Tourism	57	49	63	60	30	28	14	14
IT services	76	81	78	79	49	54	29	19
Base (100%)	all		Firms buying online		Firms buying online		all	
Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7), ¹⁾ N = 248 (M&E, EU-7), N = 2417 (Total, EU-7),								
"% of employment" = firms representing ...% of employment in the sector(s) / country								
"% of firms" = % of firms as legal units, irrespective of their size								

Source: e-Business W@tch (e-Business Survey 2005)

Although these purchases account for only 10% of Köhler and Hörter's total procurement volume, the e-procurement software helps to save time, which makes purchasing processes more efficient. Thus, the small company plans to extend its e-procurement activities as soon as more suppliers offer online shops and conform to the eCl@ss standard. This example illustrates that online purchasing can be attractive even for small companies with highly specialised demand. Also, it emphasises the importance of standards for online transactions in the M&E sector.

Exhibit 2-13 shows that the majority of firms that purchase online buy mainly from national suppliers (79%). The importance of regional and international suppliers seems to be rather limited. Only 11% of firms that purchase online buy mainly from regional or international suppliers, respectively. Compared to other sectors, firms in the M&E industry express a stronger preference to buy mainly from national suppliers. The weighted average for 10 sectors reports higher values for purchases from regional suppliers (18%) and international suppliers (13%) than the M&E sector. Unfortunately, these numbers do not allow any conclusions about whether the structure of suppliers has changed due to the use of internet-based technologies to support purchasing procedures. It could be that the majority of firms

use e-procurement technologies mainly to make transactions with established suppliers more efficient, and only rarely use the internet to search for and to conduct business with new suppliers.

Purchasing online has changed the supplier base in almost half of the companies in the sample. 42% of firms report that the number of suppliers they buy from has increased. Only in 2% of the cases a decrease has been observed. Interestingly the number of suppliers has increased much more often in the smaller firms than in the larger ones. 45% of micro enterprises (1 to 9 employees) and only 19% of large enterprises (more than 250 employees) have broadened their supplier base as a consequence of online purchasing (see Exhibit 2-14).

Exhibit 2-13: Main location of suppliers from which companies buy online

	Mainly from regional suppliers		Mainly from national suppliers		Mainly from international suppliers			
	Weighting:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	
M&E (EU-7)		13	11	71	79	17	11	
1-9 empl.			12		81		8	
10-49 empl.			7		76		18	
50-249 empl.			12		74		15	
250+ empl.			14		66		20	
Total (10 sectors, EU-7)		16	18	70	69	15	13	
Base (100%)	Companies buying online							
Base: "All" = companies using computers. N = 252 (M&E, EU-7), N = 2455 (Total, EU-7).								
"% of employment" = firms representing ...% of employment in the sector(s) / country								
"% of firms" = % of firms as legal units, irrespective of their size								

Source: e-Business W@tch (e-Business Survey 2005)

Exhibit 2-14: Impact of e-sourcing

	Increased number of suppliers		Number of suppliers stayed the same		Decreased number of suppliers			
	Weighting:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	
M&E (EU-7)		28	42	54	50	9	2	
1-9 empl.			45		50		0	
10-49 empl.			44		49		4	
50-249 empl.			29		53		8	
250+ empl.			19		56		13	
Total (10 sectors (EU-7))		22	36	59	52	12	4	
Base (100%)	Companies using ICT systems for e-procurement							
Base: N = 81 (M&E, EU-7), N = 784 (Total, EU-7). Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.								
"% of employment" = firms representing ...% of employment in the sector(s) / country								
"% of firms" = % of firms as legal units, irrespective of their size								

Source: e-Business W@tch (e-Business Survey 2005)

ICT solutions used for e-procurement and processes supported

According to Exhibit 2-15, the majority of firms that purchase online use ICT solutions and the internet to find suppliers in the market (78%), to run requests for proposals or quotes (74%), and to order supply goods directly online (78%). Only a small share of firms in the M&E sector run online auctions (19%). This shows that the majority of firms primarily use ICT to make traditional procurement processes more efficient, instead of using online auctions to cut purchasing costs. 42% of firms that purchase online also use ICT solutions and the internet to pay suppliers' invoices.

Compared to the weighted average for 10 sectors covered in 2005, online auctions are slightly less popular in the M&E sector (19% versus 28%). Also, the all-sectors average reports a higher share of firms that support billing processes with their e-procurement solutions (54% on average versus 42% in this sector). Yet, the M&E sector compares favourably with the weighted average for the more traditional procurement processes (finding suppliers, running RfQs/RfPs).

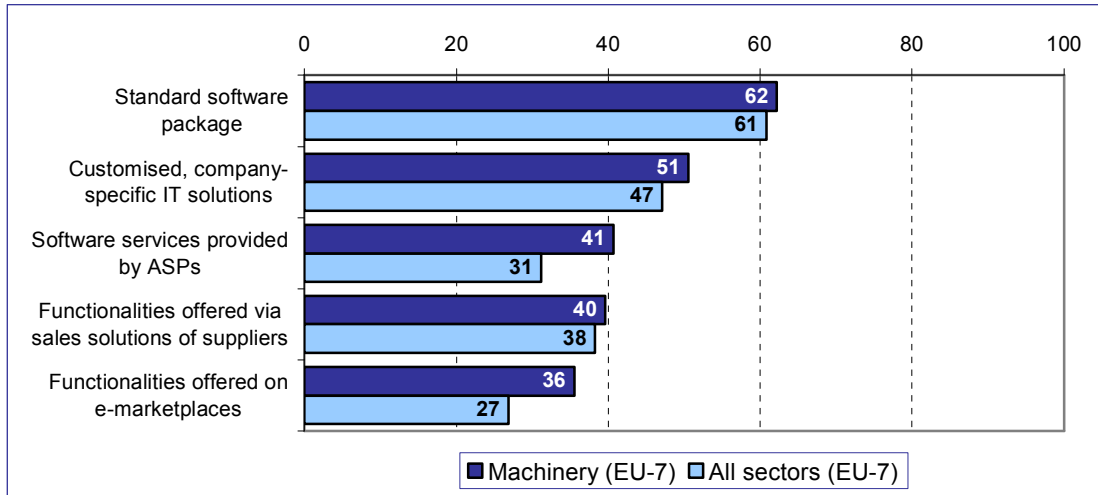
Among those companies that use special ICT solutions for e-procurement purposes (10% of all firms in the sector), 62% take advantage of standard software packages, while 51% use customised, company-specific solutions (Exhibit 2-16). This suggests that the majority of firms in this sector that use a specialised e-procurement software rely on standard solutions that are often customised to make them suitable to company-specific requirements. Also, 41% of these special e-procurement solutions are hosted and maintained by Application Service Providers (ASPs). 40% of firms that use special ICT solutions for e-procurement say that they use functionalities offered via the sales solutions of their suppliers, while 36% use functionalities offered on e-marketplaces. Overall, the responses on these questions in the M&E sector are close to the weighted average for 10 sectors. The slightly higher share of firms in this sector that use ASPs and e-marketplaces complies with the argument that ICT maintenance and development is not the core competence of most firms in this sector. Hence, outsourcing some of the more sophisticated applications and using ICT functions offered by third parties seems to make sense to them.

Exhibit 2-15: Processes supported by ICT solutions for e-procurement

	Find suppliers in the market		Run RfQs / RfPs		Order supply goods online		Run online auctions		Billing suppliers' invoices	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	74	78	60	74	86	78	27	19	44	42
Total (10 sectors, EU-7)	67	78	64	64	81	83	22	28	49	54
Base (100%)	Companies using ICT systems for e-procurement									
Base: N = 81 (M&E, EU-7), N = 784 (Total, EU-7).										
Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.										
"% of employment" = firms representing ...% of employment in the sector(s) / country										
"% of firms" = % of firms as legal units, irrespective of their size										
RfQ = Request for Quotation; RfP = Request for Proposal										

Source: e-Business W@tch (e-Business Survey 2005)

Exhibit 2-16: Types of ICT solutions used for e-procurement



Percentage of companies that support procurement processes by specific ICT solutions. Multiple responses possible. Base: "All" = companies using computers. N = 81 (M&E, EU-7), N = 784 (Total, EU-7). In % of firms. Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.

ASP = Application Service Provider

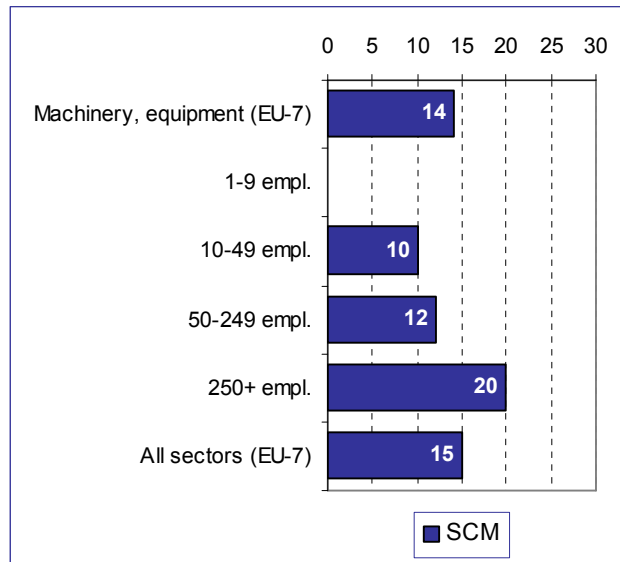
Source: *e-Business W@tch* (e-Business Survey 2005)

Supply Chain Management

Supply Chain Management (SCM) is arguably the most advanced form of purchasing management and supplier integration. It requires the coordination of information and material flows among various firms along the supply chain. Ideally, production and delivery processes at one end of the supply chain are directly triggered by incoming orders or projected requirements at the other end of the supply chain. In the M&E sector, already 14% of all firms say that they use a Supply Chain Management system (Exhibit 2-17). This figure is very close to the all-sectors average of 15%. Noticeably, SCM solutions are more common among large enterprises (20%). Only one of the micro-enterprises in our sample (0.2%) reported to use an SCM system. Yet, this does not imply that none of the micro-enterprises is integrated in the SCM system of one of the larger enterprises. It could be that some of the SMEs are participating in the SCM functions of their customers, while not having a SCM system of their own.

In summary, the new survey data emphasise that purchasing online remains one of the most popular applications of ICT and the internet in the M&E sector. More than one third of all firms in the sector already purchase online. Large firms are more prone to e-procurement than small firms, but those small firms that actually do purchase online procure higher shares of their total purchasing volume via online channels. In addition, there remain pronounced differences in the degree of sophistication among those firms that purchase online. In general, total online purchasing volumes are rather small, and only a few companies in the sector use sophisticated ICT solutions that specifically support procurement processes. The case studies in the previous Report (July 2005)¹⁵ suggest that a lack of standards (to codify product-related information) is one factor that slows down the adoption and use of e-procurement tools in this sector.

¹⁵ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

Exhibit 2-17: Supply Chain Management

Percentage of firms using a SCM system. Base: "All" = companies using computers.
N = 565 (M&E, EU-7), N = 5218 (Total, EU-7). Figures for sector total and all sectors are weighted by employment. Figures for size-bands in % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

Summary**Key messages from the analyses in section 2.4**

- The 2005 survey results support previous evidence that **purchasing online remains one of the most popular applications** of ICT and the internet in the M&E sector. More than one third of all firms in the sector currently purchase online.
- **Large firms are more prone to e-procurement** than small firms, but small firms that actually do purchase online procure higher shares of their total purchasing volume via online channels.
- Total online purchasing **volumes are still rather small**, however, if measured as % of total supplies purchased.
- Among those companies that use special **ICT solutions for e-procurement** purposes (10% of all firms in the sector), 62% take advantage of standard software packages, while 51% use customised, company-specific solutions.
- 14% of all firms say that they use a **Supply Chain Management** system. This figure is very close to the average of 15% among the 10 sectors studied.

2.5 Customer-facing e-business activities

An earlier sector report by *e-Business W@tch* (May 2003) pointed out that the potentials and the adoption of sale-side e-business solutions is limited in the M&E sector. Many firms in the sector are engaged in producing capital intensive and complex equipment that requires technical negotiations with customers. Often, products are completely custom-made, or at least customised and/or bundled with service and maintenance contracts that are suitable to the individual client. Naturally, these kinds of products do not lend themselves easily to be sold via the internet. Also, customer relationships are often well established and products are not sold to anonymous mass markets. Thus, some of the key advantages of selling online (e.g. easily reaching a high number of customers regardless of location, process cost saving through automatic handling of mass orders) do not apply to many firms in the M&E sector. Nevertheless, these general limitations do not imply that there are no interesting and beneficial sale-side e-business applications available that could provide benefits to firms in the M&E sector.

The previous sector report (July 2005)¹⁶ featured two interesting case studies that presented examples of how firms in this industry can benefit from implementing online sales solutions. Bonfiglioli Riduttori Spa, a large Italian-based manufacturer of power transmissions, has implemented a product configuration portal that allows customers to configure their products online. Furthermore, the company has established a sales documentation portal, which facilitates client relations further by simplifying both technological and administrative issues, helping to improve customer service. The system proved useful to Bonfiglioli Riduttori Spa because, as a large company, they are engaged in a high number of customer relationships and transactions.

Online sales initiatives can also provide benefits to small companies in this sector, as the example of the Telschig GmbH showed. Telschig has implemented an online shop for the distribution of spare and wear parts to their customers. Although Telschig's products (individual solutions for bulk handling) are highly specialised and most of the customers buy only one or a few machines, 40% of Telschig's sales are for spare and wear parts that are sold later on. The online sales solution is implemented with a view to help the company to save time and costs for the distribution of spare and wear parts. In particular, lengthy negotiations with customers have been reduced to "the push of a button".

The following business example reports the current developments at Telschig, half a year after the previous case study was conducted.

Business example:

Current developments at the Telschig GmbH

The preceding Sector Report on M&E (July 2005) contained a case study on the Telschig Process Engineering GmbH which is located in Murrhardt in Baden-Wuerttemberg, Germany. The company employs 20 persons and provides specialised, individual production lines in the fields of grinding, emptying, pneumatic conveying, mixing and spray mixing, as well as engineering consulting services and spare parts.

In early 2003, Telschig became part of the PROZEUS transfer project¹⁾ which is organised by the Cologne Institute of Business Research in cooperation with the Centrale for Coorganisation GmbH (CCG) with support from the German Federal Ministry of Economics and Labour. The project aims at demonstrating

¹⁶ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

the potential of standard e-business applications and at transferring approved solutions to other SMEs.

Telschig has been an example for the difficulties and challenges that SMEs have to overcome when starting to implement and deal with e-business. Half a year after the previous status report on the company and after the termination of the PROZEUS project for Telschig, the e-business project manager summarised the results of the e-business initiative (implementation of an ERP system and an online shop for spare parts) as well as the remaining challenges as follows: The system collects data about tenders, purchases, sales, stock, deadlines, and the like, and has structured Telschig's business processes. For example, when the company was recently providing a tender to a customer in Libya, an employee on the spot was able to log on to the company's ERP system via the internet and to retrieve all product data and the prices of all components, and thus to immediately provide the client with a comprehensive tender. In addition, the system retrieves and files internal know-how. The e-business project manager estimated that the new system will save Telschig 20% of project processing time and will lead to savings of 5% in accounting.

However, these savings cannot yet be realised since the employees are still working for the ERP system and the online shop to become a success. That requires the revision and the activation of the master data of all components. Since this process has turned out to be very time-consuming and long-lasting due the enormous amount of products to be entered, the company now expects this will take another 2 years. This is also the main hurdle for the online shop. Even though more and more customers are interested in Telschig's online shop since the company is promising discount rates for online purchases, Telschig still has to restrict the shop to reference customers since customers would not yet be able to find all of their potential spare products clearly laid out. The company does not intend to provide its customers with direct access to 45,000 different products but to provide them with a customer ID and a project ID in order for them to find the products they have already purchased. These products will then be visualised for the customers to enable them to find the spare parts they are looking for easily. However, it is another time-consuming process to enter pictures of all previous plants into the system. Furthermore, when Telschig recently tested its English version of the online shop with a customer abroad, the company learned that the online shop has to accommodate all kinds of internet connections including very slow ones. Thus, Telschig is now planning to change its online shop again. Pictures will be re-edited in order for the websites to take less time to load.

In conclusion, the e-business project manager summarised that the PROZEUS project has, in terms of e-business, catapulted Telschig from the stone age to the future and Telschig is now trying to paddle back to the presence. Nevertheless, even though this process takes longer than expected, it is going to provide Telschig with a competitive advantage.

Source: Presentation of Mr. Kannegiesser, purchaser and e-business project manager from Telschig, at an informational seminar "E-business in practice: the proper usage of standards and processes" in Stuttgart (July 8, 2005)

¹⁾ The 'PROZEUS transfer project' promotes the diffusion of processes and standards for e-business (see: www.prozeus.de)

Online marketing and sales activities

Customer-targeted e-business initiatives do not even need to be particularly complex to be beneficial. In many cases, just having a well-designed, informative website that is well-positioned in search engines and industry-specific catalogues and marketplaces can help to attract new customers and increase sales. According to the new survey results (Exhibit 2-18), 61% of firms in the M&E sector currently have a website. Almost all companies in the

sector with more than 50 employees do have a website by now. However, the figures for smaller companies are still somewhat lower: Only 55% of micro-enterprises currently have a website. In many cases, those companies that do not have a website yet are losing potential business opportunities. The costs of setting up a website can hardly be considered a serious barrier since the implementation and maintenance of a website is usually not very expensive and affordable even for small companies and private persons. Noticeably, there remain large country-specific differences: While only 32% of firms in France have a website in this sector, it is already 85% of firms in Poland. Compared to other sectors, the M&E sector shows a high endowment with basic websites: Only the ICT services sector shows a significantly higher number of firms having a website.

Exhibit 2-18: Online marketing and sales activity

Weighting:	Have a website		Use a CMS to update the website ¹⁾		Make online sales		Sell more than 5% of goods online ²⁾		Use specific ICT solutions for online marketing / sales	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	88	61	32	17	11	5	39	34	17	8
1-9 empl.		55		12		4		33		7
10-49 empl.		72		25		4		41		5
50-249 empl.		94		27		8		26		24
250+ empl.		98		40		17		43		21
Germany	94	62	33	14	16	4	43	38	22	9
Spain	77	54	40	28	3	2	42	14	22	5
France	80	32	35	36	4	2	50	50	16	8
Italy	80	64	29	17	6	3	20	5	8	9
United Kingdom	91	69	31	11	17	7	30	82	29	5
Czech Republic	93	60	30	25	9	8	72	47	3	3
Poland	92	85	24	9	5	13	37	26	7	8
Total (10 sectors, EU-7)	69	48	35	30	17	15	57	65	17	9
Food & beverages	65	33	28	24	12	8	33	26	15	6
Textile	71	52	28	26	14	10	27	56	14	7
Publishing & printing	81	54	44	32	37	18	47	57	27	9
Pharmaceutical	85	68	37	34	18	13	46	46	26	12
Automotive	89	62	41	29	6	11	27	51	24	9
Aeronautics	63	66	15	28	8	12	28	87	6	15
Construction	49	32	29	19	4	3	39	37	8	3
Tourism	77	62	36	35	36	31	72	70	19	12
IT services	92	81	54	39	26	25	55	74	40	23
Base (100%)	all		Firms having a website		all		Firms selling online		all	

Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7),

¹⁾ N = 428 (M&E, EU-7), N = 3742 (Total, EU-7), ²⁾ N = 35 (M&E, EU-7, all firms selling online), N = 781 (Total, EU-7, all firms selling online).

Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.

"% of employment" = firms representing ...% of employment in the sector(s) / country

"% of firms" = % of firms as legal units, irrespective of their size.

CMS = Content Management System

Source: *e-Business W@tch* (e-Business Survey 2005)

Yet, only 17% of firms in the M&E sector that have a website use a content management system (CMS) to update contents. This suggests that the vast majority of firm websites in this sector are rather simple, providing static and basic information only. Surprisingly, firms with a website in France are more likely to use a CMS (36%) than in most other countries. Poland marks the tailight with just 9%.

Corresponding to previous evidence¹⁷, the results of the e-Business Survey 2005 indicate that only a small share of firms in the M&E sector make online sales (5%). The share of large companies selling online is higher (17%) than the share of small companies (4%). Compared to other sectors, the M&E industries remain well below the weighted average for the 10 sectors in their adoption of online sales solutions (all sector average 15%). Only the construction sector reports an even lower number of firms selling online (3%) than the M&E industries.

Also, those firms selling online report that only small shares of their total sales are conducted online. In fact 34% of firms selling online in this industry say that they sell more than 5% of goods over the internet. This is a much lower figure than the all-sectors average of 65%. Only the food and beverages sector is an even less intensive user of the internet as a sales channel than the M&E industry.

Among those firms selling online, the majority sells primarily to national customers (Exhibit 2-19). Firms selling primarily to regional (21%) or international customers (14%) online are less frequent. Compared to the weighted average for 10 sectors, a larger share of firms in the M&E sector is focusing on national customers. Together with the evidence presented in Exhibit 2-13, this suggests that firms in this industry are generally more often active on their national home market than firms in other industries.

Exhibit 2-19: Main location of customers which order online

	Mainly regional customers		Mainly national customers		Mainly international customers	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Weighting:						
M&E (EU-7)	25	21	26	65	50	14
Total (10 sectors, EU-7)	18	21	52	48	30	31
Base (100%)	Companies selling online					
Base: N = 36 (M&E, EU-7, firms selling online), N = 826 (Total, EU-7, firms selling online)						
Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.						
"% of employment" = firms representing ...% of employment in the sector(s) / country						
"% of firms" = % of firms as legal units, irrespective of their size.						

Source: e-Business W@tch (e-Business Survey 2005)

¹⁷ e-Business Survey of 2002 and related sector report on the machinery and equipment industry (May 2003), see www.ebusiness-watch.org ('resources')

ICT solutions used for e-commerce and processes supported

Among the 8% of firms that use specific ICT solutions for online marketing and sales purposes (Exhibit 2-18), the most frequently ICT-supported process in this sector is publishing offers to customers. This can be done via online product catalogues, product descriptions or sophisticated online shops that enable the customisation and tracking of orders. 73% of firms that use specific ICT applications for marketing and sales purposes in this sector use ICT to publish their offers to customers on the internet. Furthermore, firms in this sector frequently use ICT solutions to receive their customers' orders online (59%) and to answer RfQs and RfPs (53%). Billing and invoicing processes are supported by the ICT solutions of 56% of firms using particular ICT systems for marketing and sales purposes in this sector.

In addition, 21% of firms in the sector that use ICT for marketing and sales purposes report that they use e-marketplace functionalities. This corresponds to 2% of all firms in the M&E sector, a very low figure. Thus, it supports earlier evidence provided by the *e-Business W@tch* that B2B markets do not play a strong role in the M&E sector.¹⁸

The last Sector Report (05-I, 2005) argued that a possible lack of awareness of appropriate e-marketplaces could be a factor that slows down the use of such services in the M&E sector, especially among SMEs. This report identified a number of interesting e-marketplaces for this sector and summarised some of their offered functionalities¹⁹. The case study of the German VDMA e-Market showed that e-markets can be an efficient and attractive source of information for companies trying to find a suitable supplier. Such a marketplace can also help registered members to increase their customer base and revenues. Thus, although the e-marketplace usage is still very low in this sector, there are a number of e-marketplaces available that can provide benefits to their users.

Those firms that use specific ICT solutions for online marketing and sales purposes primarily rely on standard software packages to support these processes (47% of firms in the sector according to Exhibit 2-20). 32% rely on customised ICT solutions or on solutions provided by buyers. 29% report that their solutions are hosted and provided by an Application Service Provider (ASP). 21% of these enterprises say that they use online trading platforms (which reconfirms the figure on e-marketplaces in Exhibit 2-21). Compared to the all-sectors average, firms in the M&E sector are more likely to rely on the solutions provided by their buyers, and less likely to use standard software packages and customised ICT solutions.

This supports the evidence provided in Exhibit 2-16 for e-procurement, generating the impression that firms in the M&E sector do take advantage of specific ICT solutions that are offered, hosted, and maintained by third parties, but are less prone to develop and implement such solutions in-house. Again, taking into account that the development and maintenance of ICT tools is not the core competence of firms in this industry, this is probably a good strategy for most of them.

In summary, an above average share of firms in the M&E sector have a website. Yet, the sector continues to show low usage rates for online sales and e-marketplaces. Compared to other industries, firms in the M&E sector show an above average preference to use ICT solutions that are developed, maintained and hosted by third parties, such as ASPs and buyers. The majority of firms relies on simple sale-side e-business activities. This complies with the insight that there are limits to the usefulness of the internet as a sales channel for

¹⁸ Cf. e-Business Sector Study on the Machinery and Equipment Industry, May 2003. www.ebusiness-watch.org ('resources').

¹⁹ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

the mostly customised products of this sector that do not easily lend themselves to be sold to an anonymous mass-market.

Exhibit 2-20: Types of ICT solutions used for customer facing e-commerce

Weighting:	Standard software package		Customised ICT solutions		Services provided by ASPs		Solutions provided by buyers		Online trading platforms	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	68	47	65	32	16	29	8	32	20	21
Total (10 sectors, EU-7)	67	65	64	58	23	31	16	12	20	26
Base (100%)		Companies using ICT systems for e-marketing / e-sales								
Base: N = 66 (M&E, EU-7), N = 801 (Total, EU-7).										
Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.										
"% of employment" = firms representing ...% of employment in the sector(s) / country										
"% of firms" = % of firms as legal units, irrespective of their size										
ASP = Application Service Provider										

Source: e-Business W@tch (e-Business Survey 2005)

Exhibit 2-21: Processes supported by ICT solutions for customer facing e-commerce

Weighting:	Publish offers to customers		Answer RfQs / RfPs		Receive orders online		Billing and invoicing		Use of e-marketplace functionalities	
	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
M&E (EU-7)	78	73	73	53	63	59	65	56	20	21
Total (10 sectors, EU-7)	67	73	65	64	69	76	56	44	20	26
Base (100%)		Companies using ICT systems for e-marketing / e-sales								
Base: N = 66 (M&E, EU-7), N = 801 (Total, EU-7).										
Please note that results should be interpreted with caution, as the sample size is too small to generate statistically representative results.										
"% of employment" = firms representing ...% of employment in the sector(s) / country										
"% of firms" = % of firms as legal units, irrespective of their size										
RfQ = Request for Quotation; RfP = Request for Proposal										

Source: e-Business W@tch (e-Business Survey 2005)

Yet, the business examples and case studies presented in the previous sector study (of July 2005²⁰) show that there are potentials in this industry to use customer-facing e-business solutions to improve productivity and customer service. Presumably, these business opportunities have not yet been completely realised by a large share of firms in the sector, suggesting that there is further development potential for the future. A possible matter of concern is the low rate of micro-enterprises having a website (55% of firms with less than 10 employees). Having an informative website is both an easy and an effective way for companies to advertise their products and services, and a technical prerequisite for more advanced customer-facing e-business applications. Probably, a lack of skills, interest and awareness among micro-enterprises in this sector contributes to the slow uptake of websites.

²⁰ e-Business Sector Study on the Machinery and Equipment Industry, July 2005. www.ebusiness-watch.org ('resources').

7% of firms (employing 28% of employees in the sector) use CRM systems. About one quarter of these firms holds that CRM is 'very helpful' to increase the effectiveness of marketing, almost 60% find it 'rather helpful'. The results are a little bit less positive for the development of new products: 16% of firms see CRM as a 'very helpful' tool, 55% as a 'rather helpful' one. However, more than half of the enterprises consider CRM as 'very helpful' for customer service, more than a quarter as 'rather helpful'²¹.

Summary

Key messages from the analyses in section 2.5

- The M&E industry continues to show **low usage rates for online sales** and e-marketplaces. 5% of firms in the sector sell online, compared to 15% on average across all sectors.
- The majority of firms that sell online rely on **simple sale-side e-commerce activities**, rather than complex, sophisticated systems. This is not surprising since M&E products are often highly customized and do not easily lend themselves to be sold via the Internet.
- Yet, business examples and case studies show that there is **potential** in this industry to use customer-facing e-business solutions to improve productivity and customer service. Presumably, these business opportunities have not yet been completely realised by a large share of firms in the sector.
- 7% of firms (employing 28% of employees in the sector) use **CRM systems**. About one quarter of these firms reports that CRM proves to be '*very helpful*' to increase the effectiveness of marketing, almost 60% find it '*rather helpful*'.

²¹ Source: *e-Business W@tch* (e-Business Survey 2005). Base: All companies in the M&E sector (N=565) and all companies using CRM (N=82).

2.6 Summary

Adoption of e-business – the main trends in 2005

The M&E sector was originally not an early adopter of e-business. Yet, many firms in the industry have recently made advances and begin to see e-business as a strategic concept. They started various e-business projects and investments that are suitable to their specific needs, realising that e-business tools offer a variety of options to introduce new services and to improve the efficiency and quality of existing processes and offers. This general trend is supported by the new survey results.

Firms in the M&E industry show a high endowment with basic ICT infrastructure like internet access (95% of firms) and LAN (49% of firms), but a slightly below average usage of advanced infrastructure technologies like WLAN (10% of firms) and VPNs (7% of firms). Outsourcing of ICT services and usage of ICT functionalities provided by third parties is an important trend in this industry. According to the survey, firms in the M&E sector show an above average tendency to use the services of ASPs or to rely on purchasing or sales functionalities offered by the ICT systems of their customers and suppliers. This trend towards outsourcing of ICT intuitively makes sense because the development and maintenance of ICT applications and infrastructures is not a classical core competence of firms in the M&E sector. Also, outsourcing such activities is one way to cope with a possible lack of in-house ICT specialists and ICT know-how among employees.

The digital integration of internal information flows and processes is an important issue in the M&E sector. This is reflected in an above average endowment of firms with ERP systems (58% of firms in the industry) and other specialised ICT solutions that support internal processes, such as EDM systems (14% of firms). In fact, the diffusion of ERP is almost twice as high in the M&E sector than on weighted average for 10 sectors covered in 2005. Yet, there remain pronounced size-class specific differences: While almost all large companies in the sector use ERP systems (85%), only 11% of micro-enterprises do. Part of this gap stems from the fact that ERP systems provide higher value in large firms where many processes and information have to be aggregated and coordinated. Nevertheless, ERP systems are often the “backbone” of all production- and product-related ICT systems and a prerequisite for more advanced and specialised e-business applications. In this respect, the low level of ERP usage in SMEs points out that an important element of ICT infrastructure is still missing in many SMEs.

The new survey data (2005) support previous evidence that purchasing online remains one of the most popular applications of ICT and the internet in the M&E sector. More than one third of all firms in the sector currently purchase online. Large firms are again more prone to e-procurement than small firms, but small firms that actually do purchase online procure higher shares of their total purchasing volume via online channels. Compared to other sectors, however, purchasing online is not so common in the M&E industry than on average. Also, firms in this sector primarily use simple technologies to purchase online (instead of specialised e-procurement solutions) and support rather traditional procurement processes, such as finding suppliers and running RfQs/RfPs (instead of online auctions). In addition, total online purchasing volumes are rather small. The case studies of the previous report (July 2005) suggest that a lack of standards to codify product-related information and a low usage of existing standards among firms (such as eCl@ss) are somewhat slowing down the adoption and use of e-procurement in this sector.

An above average share of firms in the M&E sector has a website (61% of firms, representing 88% of employees in the sector). Yet, the sector continues to show low usage rates for online sales and e-marketplaces. 5% of firms in the sector sell online, compared to 15% on weighted average for 10 sectors. The majority of firms that sell online rely on simple

sale-side e-commerce activities, rather than complex, sophisticated systems. This is not surprising since machinery and equipment products are often highly customized and do not easily lend themselves to be sold via the Internet. Yet, the business examples and case studies presented in the previous report (July 2005) show that there are potentials in this industry to use customer-facing e-business solutions to improve productivity and customer service. Presumably, these business opportunities have not yet been completely realised by a large share of firms in the sector, suggesting that there is further development potential for the future.

The average level of gross capital investment in ICT hardware and software in this sector is very close to the all-sectors average. On average in 2004, firms in this industry spent € 70,000 on ICT. The median value was € 5,000, reflecting the significantly smaller ICT budgets of the majority of small firms in this sector. The investment trend for 2005 in the M&E sector is quite positive: 26% of firms plan to increase their investment levels, while only 14% plan to decrease it. 60% plan to maintain their budgets at the 2004 level. Large firms in the sector are slightly more likely to increase their ICT budgets in 2005, which could imply that the ICT gap between large firms and SMEs will not decrease in the near future.

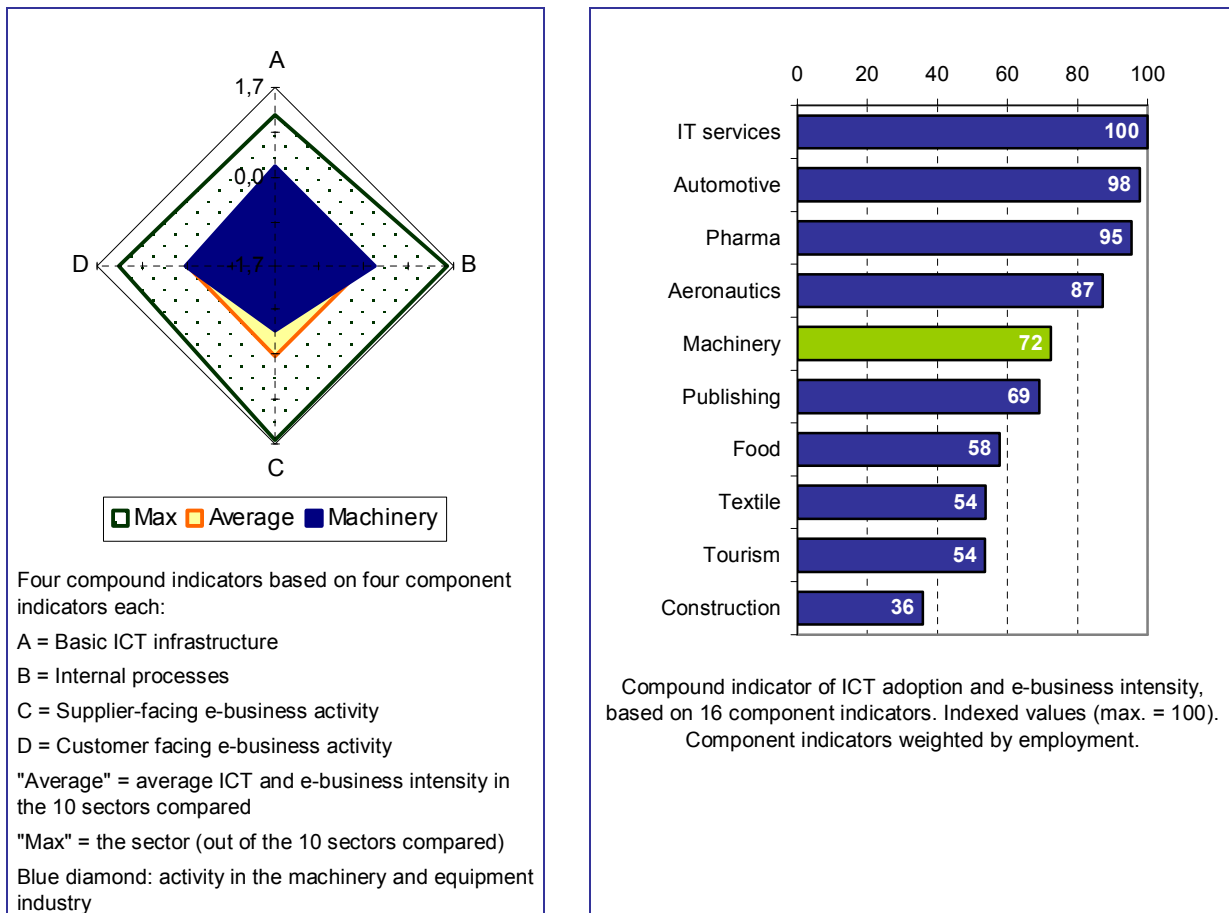
e-Business Scoreboard 2005

The sector-scoreboard of e-business activities (Exhibit 2-22) correctly summarises and represents the current level of ICT development in the machinery and equipment sector. Concurrent with the above presented evidence, the sector is neither particularly advanced nor significantly lagging behind in most ICT indicators compared to other industries included in the e-Business Survey 2005.²²

Based on an average endowment with basic ICT infrastructure, companies engage in e-business projects to support various functions of the firm, with a certain focus on the support of firm-internal processes (especially among large firms). The use of procurement solutions is also very popular in this sector, but slightly less common than on average, partially due to a lack of standards to codify product-related information. Overall, the sector takes a middle position in the ranking of ICT-intensity of the sectors covered by the survey in 2005.

²² For more information about the Scoreboard, and for a comparison with other sectors, see **Annex II**.

Exhibit 2-22: E-Business Scoreboard 2005 – ICT and e-business intensity in the machinery and equipment industry compared to other sectors



Source: e-Business W@tch (e-Business Survey 2005)

3 Conclusions

3.1 Summary of main findings

The two Sector Reports compiled by the *e-Business W@tch* in 2005 on the M&E sector reveal a number of new insights into the current status of e-business development in this sector in Europe. Based on the empirical evidence and the presented case studies, the main findings for the M&E sector are:

- The M&E sector exhibits an average usage of ICT compared to other sectors. It is neither a late nor an early adopter of most e-business solutions.
- Firms in this industry continue to make progress in their usage of ICT and in understanding the strategic scope of e-business initiatives. Numerous innovative and interesting examples of e-business usage among firms in this sector suggest that the potential of ICT to improve the competitive position of firms are yet to be exhausted.
- The sector features a high endowment with basic ICT solutions like internet access, website presence and ERP, indicating a high “e-readiness” for further progress in the future.
- Many firms in the M&E sector focus their e-business initiatives on innovative ways to support traditional business functions with simple, user friendly ICT systems.
- The outsourcing of ICT solutions is a sector-specific trend. Outsourcing ICT solutions is one way for firms in this industry to cope with potential shortages of in-house ICT experts and a lack of ICT know-how among employees.
- A digital divide between SMEs and large companies remains visible and there is no clear indication yet that this gap will be overcome soon. Yet, many concrete examples show how SMEs can benefit from implementing e-business solutions. Thus, there are still numerous opportunities for SMEs to benefit from investments into e-business and ICT.
- Standards for codifying product-related information remain an important issue for e-business development in this sector. A lack of standards and their application seems to slow down e-procurement related activities of firms in this sector.

Exhibit 3-1 provides an overview of the case studies presented in this and the previous sector report (July 2005). Some of the cases provide interesting examples that demonstrate how SMEs can benefit from e-business solutions in this sector (Digital Parts Transfer, Telschig, Köhler and Hörter, Fire Eater). In two cases, policy initiatives helped the small companies to realise their e-business solutions (Telschig, Köhler and Hörter). These two examples demonstrate that certain public, government-sponsored initiatives can positively affect the uptake of e-business in SMEs in this sector.

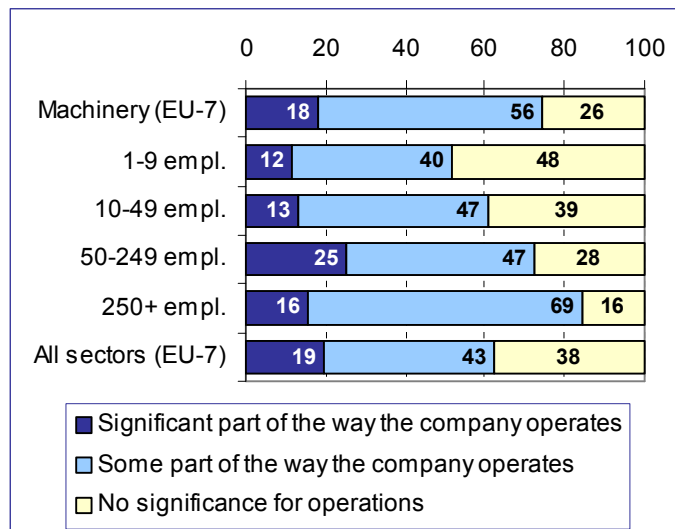
Exhibit 3-1: Examples of e-business applications – an overview

Report	Title	Scope of the Company	Purpose
July 2005	An Extranet Application for Warranty Handling at Palfinger , Austria	Manufacturer of hydraulic lifting, loading and handling systems	Outlines the implementation of an electronic system for an easy handling of warranty registrations and claims in order to strengthen the quality of customer service.
July 2005	Digital Parts Transfer , Netherlands	Broker of machinery blue prints and production capacity	Analyses a supply service for physical products. DPT is an intermediary that links partners in the global product ownership, production, and distribution, by digitally storing, managing, distributing, and processing electronic product definitions.
July 2005	Establishment of an ERP-System and a Webshop at Telschig , Germany	Manufacturer of bulk handling machinery	Documents the implementation of an ERP system and an online shop for the distribution of spare and wear parts in a small company. The e-business project was financially supported by PROZEUS.
July 2005	Project Management and E-procurement at Köhler and Hörter Compressor Systems , Germany	Manufacturer of customer-tailored compressors	Focuses on the efforts and challenges of a small compressor manufacturer associated with the establishment of a project management system for the production of complex and custom-tailored products.
July 2005	Implementation of Quality Management System in Fire Eater A/S – Denmark	Manufacturer of fire prevention tools and fire fighting equipment	Provides a detailed analysis of a Quality Management application . The system allows for the organisation, provision, and distribution of information, for project management, as well as for quick communication.
July 2005	Mosaico Service at Bonfiglioli Riduttori Spa , Italy	Supplier of speed reducers, gear motors and inverters	Outlines the implementation of a Customer Relationship Management system, and documents the launch of a sales documentation and product configuration portal.
July 2005	The VDMA-e-Market , Germany	Electronic marketplace for machinery and equipment manufacturers	Provides details on the development of the VDMA e-market as an information platform for the M&E manufacturing industry.
Sep. 2005	IT and e-business at the Wilo AG , Germany	Manufacturer of pumps and pump systems	Provides an insight into the company's IT applications including an ERP system, a Web Application Server, and an internet shop
Sep. 2005	Current developments at the Telschig GmbH , Germany	Manufacturer of bulk handling machinery	Based on the case study in the previous report (July 2005), this business example provides new details about the development of Telschig's ERP system and its online shop for spare and wear parts.
Sep. 2005	Small Business Service (SBS) , UK – A collection of detailed Information on IT and e-commerce	Information platform sponsored by the UK government	Outlines the efforts of an executive agency of the UK government to provide SMEs with structured and comprehensive information for implementing e-business.
Sep. 2005	ACAMAS – A French initiative for SMEs in the industry of mechanical engineering	Project of the French Association of Mechanical Industries and the Technical Centre of the Mechanical Industries	Outlines a joint approach of two French organisations to promote the integration of e-business technologies at SMEs in the French M&E manufacturing industry. ACAMAS targets common and individual problems of several companies from a market cluster in one region.

A general assessment – the significance of electronic business for M&E companies in 2005

E-business continues to change the way firms operate in the M&E sector. 74% of employees in the sector work in firms where e-business is part of the way the company currently operates (Exhibit 3-2). The perceived level of significance of e-business is higher among large companies, which is not surprising provided that large companies exhibit higher usage rates for most ICT indicators. Yet, the outreach and impact of e-business is not entirely restricted to the large players in the industry: Already 40% of firms with less than 10 employees say that e-business is part of their everyday business. An additional 12% even say that e-business is a significant part of the way their company operates. Compared to the weighted average for 10 sectors, an even larger share of employees in the M&E industry work in companies where e-business is already part of everyday routines. This emphasises the impression that the M&E sector is not a late mover in e-business development.

Exhibit 3-2: Perceived significance of e-business in 2005 (company perspective)



Percentage of firms saying that e-business constitutes a significant part, some part of, no significance for their operations. Base: "All excl. DK" = companies using computers exclusive "don't know". N = 561 (M&E, EU-7), N = 5146 (Total, EU-7). Figures for sectors and totals are weighted by employment. Figures for size-bands in % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

ICT as an enabler of innovation

ICT maintains its strategic relevance because it enables innovation (Köllinger 2005). The purchase of a new technology alone does not immediately lead to efficiency gains or other positive impacts. The new technology must be implemented in the firm, which often requires a re-organisation of routines and processes, i.e. process innovations. E-business tools might also be used to improve customer service or to offer new services or products to customers. Case Studies presented in the last Sector Report provided detailed real-life examples of how e-business technologies can be used to conduct innovations in various parts of a company. Successful innovations can enable firms to gain strategic advantages over their rivals and improve the probability of surviving in business.

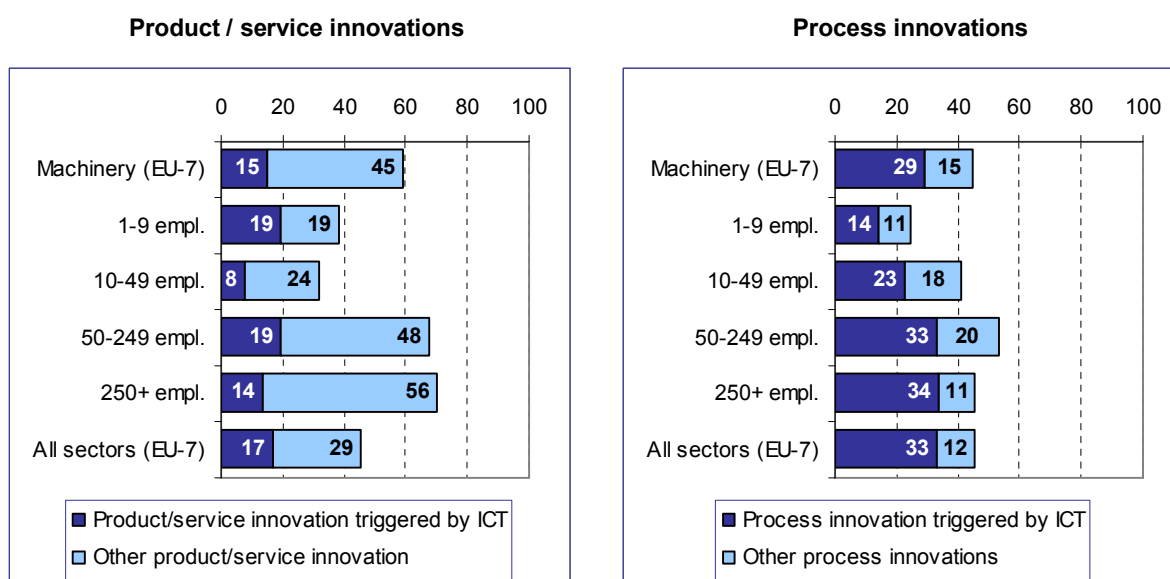
Exhibit 3-3 gives an overview of the current level of innovative activity in the M&E sector and the extent to which firms use ICT to conduct innovations. Overall, 60% of firms in the sector introduced substantially improved products or services to their customers in 2004, compared to 46% on average across all sectors. 15% of firms in the M&E sector said that ICT was directly related to or enabled some of these innovations, 45% of firms conducted solely

product and service innovations that were not related to ICT. Thus, every fourth firm in the sector that conducted product or service innovations relied in some way on ICT as an innovation enabler.

ICT is even more important for process innovations: Overall, 44% of firms in this industry conducted process innovations and two out of three firms conducting process innovations relied on ICT as an innovation enabler in some way. This emphasises the strategic importance of ICT for the sector. Yet, compared to the weighted average for 10 sectors covered by the e-Business Survey 2005, the tendency of firms to use ICT to innovate is marginally below average in the M&E sector. This implies that other sectors could be relying even more strongly on ICT as an innovation enabler than the M&E industry.

Apparently, large firms are more prone to conduct innovations than small firms. A possible reason for this is that large firms have some advantages because they have the financial resources to carry out capital-intensive, risky innovation projects and they can leverage the risks of various innovative projects. Yet, the share of companies that use ICT to innovate is almost constant across size classes. This suggests that the availability of ICT as a possible enabler of innovation does not *per se* put SMEs at a disadvantage.

Exhibit 3-3: Innovation activity in the M&E industry



Percentage of firms which have launched new products / processes during the past 12 months.
 Base: "All" = companies using computers. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7). Figures for sectors and totals are weighted by employment. Figures for size-bands in % of firms.

Source: e-Business W@tch (e-Business Survey 2005)

Drivers of electronic business activity

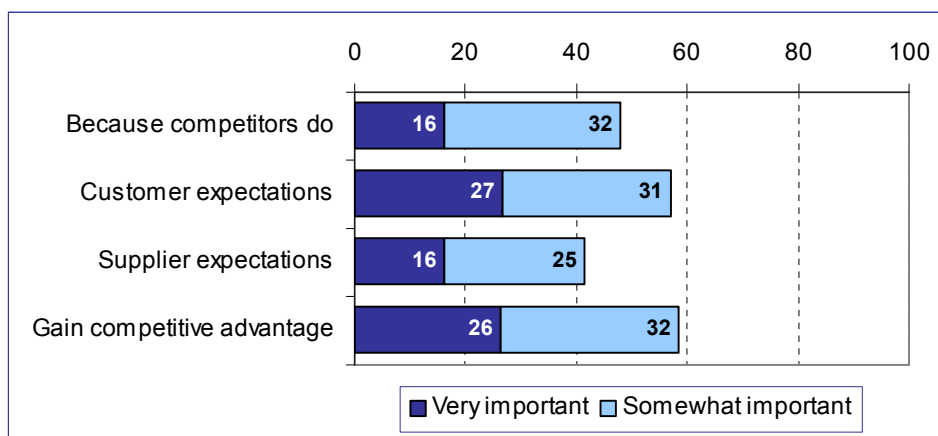
There are various motivations for companies to engage in e-business activities. Early movers and firms that realise the strategic aspects of ICT adoption are striving to gain competitive advantages. Alternatively, firms that take a more reactive and imitative approach to e-business follow the initiatives of their competitors, copying only those initiatives that appear successful. In addition, the expectations of customers and suppliers might also influence the e-business strategy of firms. Exhibit 3-4 provides evidence on the relative importance of these different motivations to engage in e-business, based on the statements of those companies that consider e-business to be a part of the way they operate (74% of enterprises according to Exhibit 3-2).

The strive for strategic advantages turns out to be a primary motivation for firms in the M&E sector for doing e-business: 58% of companies consider this motivation as important or very important. Interestingly, customer expectations also turn out to be a very important motive. In fact, also 58% of firms consider this as an important or very important reason for engaging in e-business. It appears that many of the companies that consider this reason as important were encouraged or even forced to invest in particular e-business applications to remain in business with their major clients.

Pressure from suppliers appears less frequently as a reason to engage in e-business, 41% of firms consider supplier expectations as an important or very important motivation. Finally, 48% of firms say that they follow an imitation strategy: They engage in e-business because their competitors do and because they do not want to lose out in the competition.

In summary, it appears that the two most important reasons for firms in this sector to engage in e-business are the strive to **gain competitive advantage and expectations from their customers**.

Exhibit 3-4: Reasons for doing e-business in the M&E industry



Percentage of enterprises saying that e-business constitutes a significant or some part of the way the company operates.

Base : "All excl. DK" = companies using computers exclusive "don't know".

N = 331 (M&E, EU-7), N = 3115 (Total, EU-7). In % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

Barriers for electronic business activity

The reasons for not engaging in e-business activities can be manifold. In the survey, those companies that expressed that e-business does not play a role in their operation (26% of enterprises according to Exhibit 3-2) were asked to rate the importance of a number of possible barriers to e-business. Exhibit 3-5 summarises the results. Interestingly, the perceived barriers to adopting e-business appear to be generally somewhat lower in the M&E sector than in the weighted average for 10 sectors.

The most frequently stated barrier to adoption is that the respective company is perceived as being too small to profit from e-business. 58% of those firms that do not yet consider e-business as part of their operations agree to this barrier. This corresponds to the argument that many ICT solutions and e-business applications are subject to increasing returns to scale, making them primarily attractive to large companies.

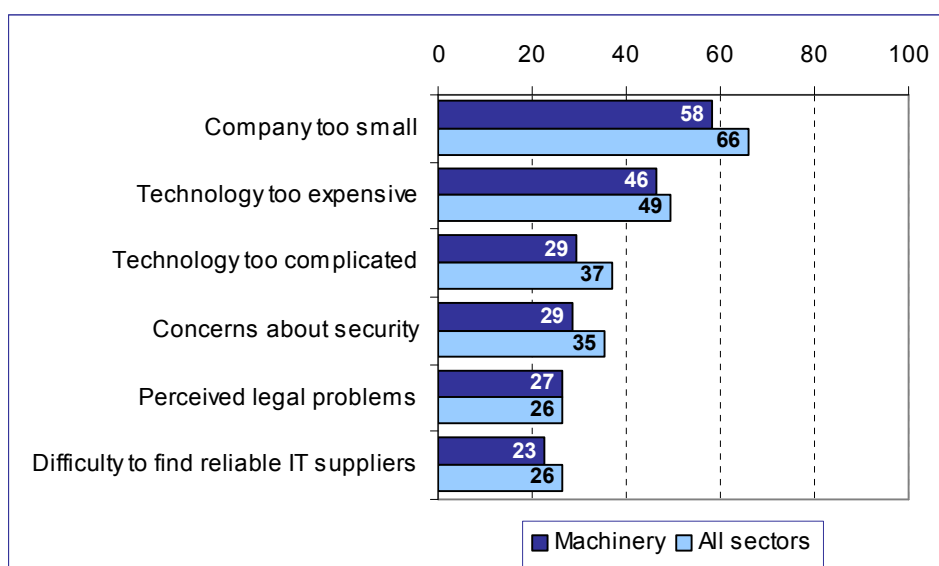
The second most frequently named barrier is that technologies are too expensive (46%). This reflects the budget constraints of firms to invest into new technologies and innovative activities.

29% have concerns about security or find the technology too complicated. To some extent, these barriers reflect a lack of knowledge or awareness on how to overcome such problems. 27% perceive legal barriers. Finally, the least important barrier to e-business adoption is difficulties to find reliable ICT suppliers (23%). Thus, it appears that potential problems on the supply-side of ICT products and services are not significantly slowing down the adoption of e-business.

Overall, the ranking of perceived barriers to adoption is the same in the M&E sector as for the all-sectors average. This implies that across sectors, economies of scale of ICT and e-business solutions are currently the most prominent reason why some (primarily small) firms still do not engage in e-business activities.

Although 27% of all non-users of e-business stated that ‘legal barriers’ were a major obstacle for engaging in e-business, rather few of the adopters actually reported problems with legal issues. These were mainly related with the recognition of electronic documents and with cross-border transactions²³.

Exhibit 3-5: Barriers for adopting e-business in the M&E industry



Percentage of enterprises which say that e-business is not relevant for them.

Base : "All excl. DK" = companies using computers exclusive "don't know". N = 234 (M&E, EU-7), N = 2103 (Total, EU-7). In % of firms.

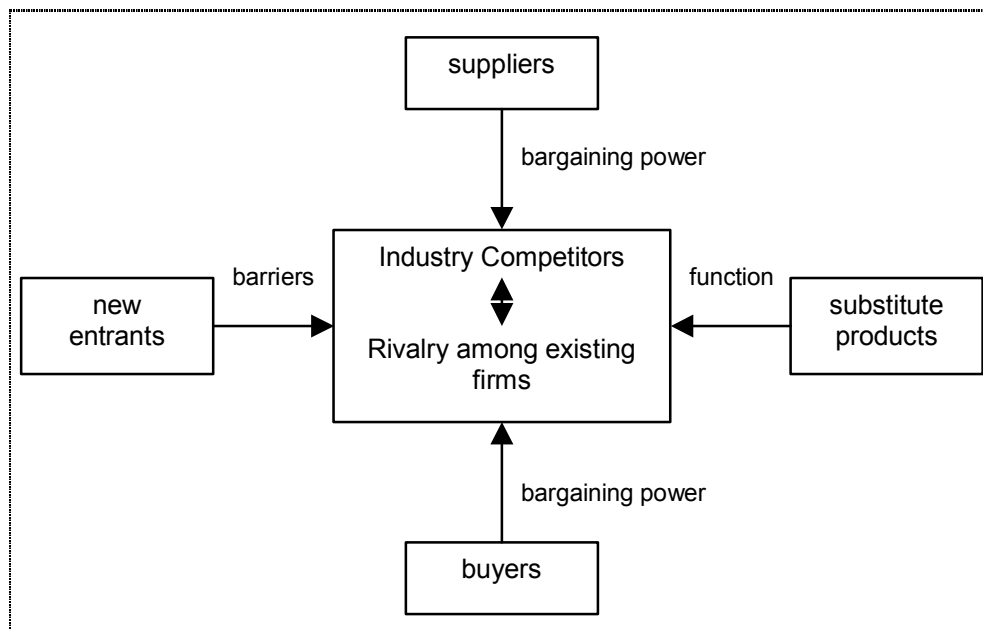
Source: e-Business W@tch (e-Business Survey 2005)

²³ See also Special Report by e-Business W@tch on ICT and security (forthcoming September 2005). <http://www.ebusiness-watch.org/resources/special.htm>.

3.2 Major implications for the industry

The use of e-business technologies in the M&E industry affects the dynamics of competition in various ways. Following Michael E. Porter's "Five Forces Model"²⁴, this section discusses the major implications of e-business for competition in this sector. Exhibit 3-6 provides a concise overview.

Exhibit 3-5: The Five Competitive Forces by Porter (1980)



Excerpt: Michael E. Porter's Five-Forces Model

The 'Five Competitive Forces' model was developed by Michael E. Porter in his book „Competitive Strategy: Techniques for Analysing Industries and Competitors“ in 1980. Since that time it has become an important tool for analysing industrial structure, competition and strategic options of players. Porters model is based on the insight that a corporate strategy should meet the opportunities and threats in the organisations external environment.

Porter has identified five competitive forces that shape every industry and every market. These forces determine the intensity of competition and, hence, the profitability and attractiveness of an industry. The objective of corporate strategy should be to modify these competitive forces in a way that improves the position of the organisation. Porters model helps to identify the main driving forces in an industry. Based on the information derived from the Five Forces Analysis, companies can decide how to influence or to exploit particular characteristics of their industry.

Michael E. Porter is the Bishop William Lawrence University Professor at Harvard Business School.

²⁴ See Porter 1980.

Exhibit 3-6: Impact of e-business on the M&E industry, based on the "Five Forces" model by Michael E. Porter

Five forces shaping industry structure	General importance in the sector	Impact of e-business	Main arguments
New entrants	<u>Low:</u> <ul style="list-style-type: none"> Mature industry with a majority of established, highly specialised firms that act mainly on national markets 	I I	<ul style="list-style-type: none"> In this sector, e-business is mainly a tool for already existing firms to increase efficiency and to improve customer service The availability and wide-spread diffusion of ICT in the sector provides little additional incentives for new firms to enter the market, the potentials for mainly internet-based business models in this sector are limited
Substitution of products / services	<u>Medium:</u> <ul style="list-style-type: none"> Most firms are highly specialised, which limits the ability to substitute products / services 	I I	<ul style="list-style-type: none"> E-business offers numerous opportunities to offer customised products / services, thus potential to make imitation more difficult Standardisation increases transparency and comparability, and could therefore increase the degree of substitution
Negotiation power of suppliers	<u>Medium:</u> <ul style="list-style-type: none"> Strongly varies among different market segments 	I I	<ul style="list-style-type: none"> E-business strategy of some firms is influenced by their suppliers Commitment to common standards and integrative ICT solutions yields strategic partnerships with potentials for lock-in scenarios and hold-up problems, which can limit competition and create barriers to invest Higher market transparency can increase negotiation power vis-à-vis suppliers of standard components and products
Negotiation power of customers	<u>Medium to high:</u> <ul style="list-style-type: none"> Strongly varies among different market segments 	I I (I)	<ul style="list-style-type: none"> E-business strategy of many firms is influenced by their customers Commitment to common standards and integrative ICT solutions yields strategic partnerships with potentials for lock-in scenarios and hold-up problems, which can limit competition and create barriers to invest Some large customers can force their suppliers to use particular e-business solutions in order to stay in business with them ("take IT or leave it") Higher market transparency on the customers' side can increase their negotiation power vis-à-vis manufacturers of standard components and products
Rivalry in the market	<u>Medium:</u> <ul style="list-style-type: none"> Strongly varies among different market segments 	I I	<ul style="list-style-type: none"> Increased market transparency Potential to internationalise production and sales, new competitors from other countries. Yet, most firms still active on regional or national markets only.
I = low impact; I I I I = high impact			

Source: e-Business W@tch (2005)

New entrants

In the M&E sector, e-business tools are primarily used to increase the efficiency of processes in established firms or to improve and introduce new service offers for customers. Compared to other sectors (e.g. retail, banking), the potentials for mainly internet-based business models seems limited in this sector. Thus, the availability and wide-spread use of ICT in the sector provides little additional opportunities and incentives for new firms to enter the market. In addition, since the M&E sector is a mature industry, with a majority of established and highly specialised firms, entry and exit rates seem comparatively low compared to other industries. Thus, new entrants are a comparatively low strategic threat for most firms in the sector. Overall, this implies that *e-business will only have minor impacts for competition in this sector due to new market entry dynamics.*

Substitution of products / services

The degree to which products and services are substitutable in an industry is a key element of competitive dynamics. If products are close substitutes, competition will be mainly based on prices, providing advantages to those producers with the most favourable cost structures. Often, in markets with economies of scale, the winners of competition will be a few big players. However, if products and services are targeted at niche markets or if they can be substantially differentiated from competitors' offers (e.g. via brand names, quality, superior customer service, technological capability or durability), this can limit price competition somewhat, shifting competitive dynamics towards product attributes and service offers. In such markets, specialised small firms can have good business opportunities.

In the M&E sector, the degree to which products and services are standardised and substitutable varies among sub-sectors. In many sub-sectors, machines and equipment are highly customised or build to order and they require special engineering know-how and experience that is hard to copy. In such markets, competition focuses more on innovativeness and quality than on prices.

Against this backdrop, e-business technologies can have varying impacts on competition. On the one hand, e-business provides numerous opportunities for companies to offer customised products or services, which limits the degree to which offers are substitutable. On the other hand, on-going standardisation initiatives (like eCl@ss) are expected to make products and components more comparable among different suppliers, thus increasing market transparency, but also increasing the degree to which such products are substitutable among different suppliers. Thus, *the net impact of e-business on competition due to the substitution of products or services can vary among different sub-sectors of the machinery and equipment industry.*

Negotiation power of suppliers

The negotiation power of suppliers influences the allocation of rents and profits in an industry. The degree to which suppliers can "dictate" the rules of the game varies among different sub-markets in the M&E sector. Exhibit 3-4 provides evidence that some firms in the industry are influenced by their suppliers in their e-business strategies, which implies that suppliers have negotiation power vis-à-vis some firms.

The introduction of e-business solutions can affect the distribution of power between suppliers and customers. On the one hand, if two or more firms make a commitment to common standards and an integrated ICT solution (such as SCM), this yields a strategic partnership that can be subject to lock-in effects which can limit competition and increase the dependence of the partners on each other. In particular, firms might get "locked in" to a particular supplier. Depending on the distribution of power among the partners and their outside options, making relationship-specific investments may expose a firm to the risk of being blackmailed by its business partner. Because SMEs usually have limited bargaining

power, such “hold-up” problems are of particular importance for SMEs. In addition, the anticipation of the possibility to be black-mailed by a business partner may prevent firms to invest into such relationship-specific technologies in the first place.

On the other hand, investments into e-business technologies that are not relationship-specific and accompanied by standardisation initiatives to classify products and components may lead to higher market transparency and increase the negotiation power of firms vis-à-vis the suppliers of standard components and products.

Nevertheless, the preceding empirical analysis and the case studies of the previous report (July 2005) did not contain specific evidence that these strategic considerations are currently an important issue among firms in the M&E sector. Also, the negotiation power of suppliers does not seem to be a major issue for most firms in the sector either. However, to the extent that suppliers have some degree of negotiation power, the *dynamics and considerations outlined above could become more important in the future when e-business solutions in this sector reach a higher degree of sophistication.*

Negotiation power of customers

Similar arguments as above apply with respect to the strategic implications of e-business on the distribution of power between firms in the M&E sector and their customers. The degree to which customers have negotiation power also varies greatly among sub-sectors of the industry. For example, firms that primarily and frequently serve a small number of large companies (such as car manufacturers) will be confronted with a substantial amount of negotiation power of their customers, whereas others will not.

The numbers presented in Exhibit 3-4 suggest that the power of customers is a concern for a higher share of companies in this sector than the power of suppliers. Large customers with significant negotiation power could force their suppliers to use particular e-business solutions in order to stay in business with them (“take IT or leave it”). The commitment to such relationship-specific investments into ICT can result in lock-in scenarios and hold-up problems, as argued above. Yet, our case study evidence and desk research did not indicate that these “battles of power” are currently an important matter of concern for firms in the M&E sector. Nevertheless, the issue could gain importance in the future when firms in this industry begin to adopt more advanced e-business solutions that integrate business processes across company borders.

Another way how e-business tools could affect the bargaining power of customers has quite an opposite effect: Firms in the M&E sector could use customer-oriented e-business solutions as an instrument to tie customers to their business, thus using e-business to build long-lasting relationships with clients that improve the competitive position of the enterprise. Thus, depending on the specific market firms are operating in and the type of customers firms are primarily dealing with, relationship-specific ICT and e-business investments can either improve or deteriorate the negotiation position of companies. In addition, those e-business initiatives that are not relationship-specific can lead to higher market transparency for standardised products and components, which increases the negotiation power of customers.

In summary, for those companies that consider the negotiation power of customers as an important aspect, the *further development of e-business could significantly affect the “balance of power” between the producers of machinery and equipment and their customers.*

Rivalry in the market

By increasing market transparency and the geographical outreach of companies, the further development and application of e-business could increase the degree of rivalry in some market segments (e.g. those with low barriers to entry). in the M&E sector. In particular, it opens up new opportunities to outsource specific production activities to other countries and

to increase the sales area of companies. In the previous report (July 2005), the case studies on Digital Parts Transfers and Fire Eater A/S provided real-life examples how e-business solutions can facilitate the geographic expansion and internationalisation of firms in this industry. However, these developments also need to be put in perspective to the overall nature of the sector: To a large extent, the majority of firms in the M&E sector are mostly small, specialised firms that primarily serve their home markets and rely on long-standing relationships with their clients. Although e-business can affect these traditional structures in some ways, it seems unlikely that it could cause radical changes in the degree of rivalry in the M&E sector.

3.3 Implications for small and medium-sized firms

Previous reports of the *e-Business W@tch* have shown that SMEs are more reluctant to engage in e-business than large companies. According to the new survey, the “digital divide” between SMEs and large companies still exists, in particular for those ICT solutions that are primarily used in-house and are subject to increasing returns to scale.

The simple insight that some ICT solutions are simply inappropriate for SMEs and not needed there because they primarily solve problems that only exist in large companies with many employees and complex processes explains some of this gap. In addition, however, there is still a lack of awareness of benefits, and a lack of financial and human resources to plan and implement appropriate applications that slows down the e-business development in some SMEs. These factors obviously limit the extent to which these SMEs can benefit from the opportunities e-business offers.

From a macro perspective, the “digital divide” among SMEs and large companies can lead to competitive disadvantages of the small industry players and to an increase of industry concentration, which potentially limits competition.

Following this reasoning, many governments in Europe have recognised the specific need to support SMEs in e-business uptake, for example by either developing very informative and detailed websites (see the policy example below about Small Business Services, an information platform fathered by the British government) or by establishing e-business competence centres that both offer information and advice to SMEs that plan to implement e-business applications. One example from Germany is the PROZEUS programme which is supported by the German Federal Ministry of Economics and Labour. As it was outlined in the case study and the business example on Telschig, as well as in the case study on the Köhler and Hörter GmbH (Sector Report on M&E, July 2005), PROZEUS aims at promoting e-business competence among SMEs by helping them to adopt integrated processes and standards. ACAMAS is a similar initiative in France that provides financial and advisory assistance for small and medium-sized companies with less than 250 employees that are planning to introduce e-business applications. This project has been initiated by the French association of mechanical engineering (FIM).²⁵

²⁵ The initiative is presented in more detail in the next chapter of this report

Policy example:**Small Business Service (SBS) – A collection of detailed Information on IT and e-commerce**

SBS is an executive agency of the UK Department of Trade and Industry (DTI). Its goal is to make the UK the best place in the world to start and grow a business which is particularly interesting for enterprises in the machinery and equipment manufacturing sector. In order to accomplish this ambition, the SBS manages Business Link, a network of advice centres run by local providers for small business around the UK which provides independent and impartial business support, information and other services to help small businesses and start-ups. This service is complemented by an easy to use website which offers very detailed information on all aspects relevant for entrepreneurs.

Information on ICT and e-commerce is one section in this extensive information base. It provides introductory information on ICT (e.g. basics on ICT terminology, hardware, software, networks, and the internet) and on how to choose and manage ICT suppliers. Furthermore, it goes into details on doing business online, such as e-commerce and online filing, i.e. doing transactions with the government online. In addition, very precise information on data protection and on risk management is also available. Other points of interest address the basics on databases as well as software issues (for example accounting software, CRM, and SCM), and communications (e.g. mobile or wireless technology, networking, using broadband). Finally, the Business Link website also provides information on ICT security, on issues concerning staff and ICT (e.g. details on potential internet and e-mail policies, e-learning) and on legal issues such as details on e-commerce contracts or intellectual property rights.

In addition to all these information, the website offers various interactive tools in order to, for instance, find out what kind of website would be best for the respective business. Furthermore, it also provides personal checklists, links to local and national events which deal with respective topics as well as links to potential grants or support schemes related to a topic or to training courses. Finally, (potential) entrepreneurs may contact the Business Link Helpline regarding remaining questions.

In conclusion, this website is an excellent example for precise, detailed, and easy to use information and associated tools for entrepreneur in the UK in order to learn about IT and e-commerce as well as other entrepreneurial issues.

Source: www.businesslink.gov.uk, www.sbs.gov.uk (July 6, 2005)

Opportunities

The internet and various e-business applications provide companies with numerous opportunities to expand their geographical markets and to reach new customers. In the previous report (July 2005), the case studies on Digital Parts Transfers and Fire Eater A/S provided two real-life examples. Electronic marketplaces could be the ideal instrument to open up new markets also for SMEs, since they diminish search and transaction costs. However, the use of e-markets is still very rare in this sector.

E-business tools can also be used to improve customer service and to offer new product-related services to customers. For example, the case study on Telschig (Sector Report on M&E, July 2005) showed how the implementation of an online shop has helped the company to improve the delivery of spare and wear parts for machines to its customers. Machinery and equipment manufacturers increasingly pay attention to customer services. This growing

service orientation helps SMEs to diversify their output and to mitigate vulnerability to competition in mass markets. Close individual customer relationships make it easier to accommodate the service requirements of customers in SMEs than in larger firms where major marketing activities have to be launched to shape services according to customer needs. The involvement of stakeholders (internally and externally) in e-business projects can be achieved via informal lines of communication. It speeds up processes and helps to react directly to feedback from people that are actually working with the new systems. Direct and short lines of communication are a distinct advantage in this respect.

Often, e-business solutions do not even need to be particularly complex to be beneficial. In many cases, setting up an informative, up-to-date website and listing the website in search engines and industry catalogues can be an efficient way for SMEs to advertise their products and services, as has been demonstrated convincingly by WILO (see business example in chapter 2.3).

In addition, even SMEs can benefit from e-business tools that increase the efficiency of processes and help to save costs. The project management tool implemented by Köhler and Hörter and the establishment of a quality management system at Fire Eater A/S are examples for this (Sector Report on M&E, July 2005). SMEs have the advantage that the organisational re-structuring that is crucial for the success of larger e-business projects is less complex and takes less time for preparation.

Risks

The new survey results show that many firms that still are not engaged in e-business activities believe that their company is too small to benefit from e-business. To a certain extent, this reflects the fact that the financial dimensions of e-business projects are often substantial. Also, there is initial uncertainty about the eventual success of e-business projects and a risk that users might not actually accept the system. Some of these issues also appeared in the case studies in the previous report (July 2005). For example, Köhler and Hörter as well as Telschig underestimated the costs and the implementation time of their e-business projects.

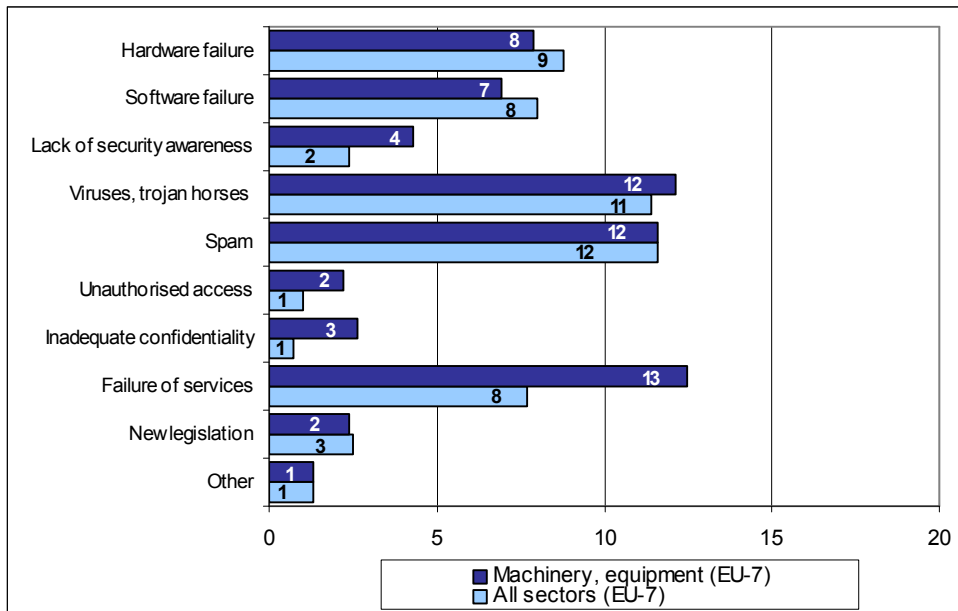
These situations hit SMEs much harder than large firms, because they do not possess the strategic reserves to lead such projects to a successful end. Also, SMEs often do not have the possibility to leverage the risks of various investment projects simultaneously. As a consequence, projects that run into problems are either abandoned or take much longer than planned. In the latter case, the competitive advantage aimed for may not be realised because other companies are quicker to launch their e-business applications. In addition, given the scarce financial resources of SMEs, there are opportunity costs involved in every investment, including e-business technologies. Financial resources that are attributed to e-business investments are not available for alternative investment opportunities, e.g. to develop a new product. E-business investments are not necessarily superior to other investments, so firms have to make a careful strategic decision about how to allocate their resources.

In addition, SMEs rarely possess strong bargaining positions vis-à-vis their customers or their suppliers. Hence, they are more at risk than large companies to be forced to invest in and to use certain e-business tools, which might lead to lock-in scenarios and hold-up problems. However, this latter risk has not been confirmed by the case studies presented in the last Report (July 2005). Yet, it could be an emerging issue as companies in this sector make further advances in their e-business development and continue to implement complex tools that integrated the processes and information flows between companies.

Security problems manifested themselves most often in the form of 'failure of services' in this sector. This problem occurred more often here than in the weighted average of 10 sectors, covered in 2005. Other security incidents that were reported quite frequently were 'viruses

and Trojan horses' as well as 'spam'. Most problems were found by a slightly larger share of companies in the M&E sector than in the others on average (see Exhibit 3-7).

Exhibit 3-7: IT security incidents in the M&E industry



Percentage of firms having experienced significant impacts from ...
Base: "All" = companies using computers. In % of firms. N = 565 (M&E, EU-7), N = 5218 (Total, EU-7)

Source: e-Business W@tch (e-Business Survey 2005)

Exhibit 3-8: E-business opportunities and risks for SMEs in the M&E industry

Opportunities	Risks
<ul style="list-style-type: none"> Benefit from market expansion: Use of e-markets to enter new geographic territories. Introduce e-business supported product-related services. Use of organisational flexibility to realise changes necessary for successful e-business applications. Direct communication lines facilitate stakeholder involvement. Use the internet to advertise products and services via informative website and listings in search engines and industry catalogues. Realise efficiency gains and cost savings from automating routine procedures. 	<ul style="list-style-type: none"> Financial dimensions of e-business projects are often underestimated. Price based strategies can be risky. Initial uncertainty about return on investments <ul style="list-style-type: none"> Implementation risk Acceptance Opportunity costs Potential lock-in to a specific technology, standard or customer / supplier

4 Policy Implications

Policy measures promoting e-business either target specific firm categories (SMEs), firms in certain regions (e-business competence centres), or a distinct sector of the economy (or combinations of these). Exhibit 4-1 lists the fields to be addressed by e-business policies:

Exhibit 4-1: Policy measures

Policy objective	Suggestions for policy	Potential initiators
Raising level of awareness	<ul style="list-style-type: none"> switch from general information dissemination to individual consulting promote accessibility of best practice cases emphasise advice on organisational change information and dissemination efforts should target the critical mass problem prize awards and competitions raise awareness and promote the conceptualisation of projects 	<ul style="list-style-type: none"> e-Business competence centres Ministries in charge of technology diffusion and innovation
Easing financial constraints	<ul style="list-style-type: none"> solid information about the costs involved with e-business projects support of financial planning as projects should be economically efficient, direct financial support is not adequate 	<ul style="list-style-type: none"> e-Business competence centres Ministries in charge of technology diffusion and innovation
Standardisation	<ul style="list-style-type: none"> interested parties should be supported in generating appropriate standards public governance of standardisation projects in order to defend interests of SMEs Public Private Partnerships can be an adequate solution 	<ul style="list-style-type: none"> e-Business competence centres Ministries in charge of technology diffusion and innovation Industry associations
ICT skills	<ul style="list-style-type: none"> support ICT training for employees in SMEs 	<ul style="list-style-type: none"> Ministries responsible for education

Raising level of awareness

- The general catching-up process for the usage of basic ICT in some new Member States and in small enterprises does not need specific policy support.*
- The actual policy challenge is the promotion of diffusion of e-business adoptions*

The programmes launched by government bodies and industry associations to support e-business diffusion in the M&E sector are starting to take effect. Most firms have basic ICT infrastructures and internet access (Exhibit 2-1 and Exhibit 2-2) The policy challenge is to help firms to fully exploit the potential of e-business applications in order to improve their competitiveness and to induce companies to move on to more sophisticated applications. It can be expected that it will emerge from network effects and the integration in markets that are increasingly based on ICT services. Price reductions for user equipment and for telecommunication services (mainly resulting from deregulation processes and from technical progress) as well as further development of infrastructures will accelerate this process.

E-business applications, however, are still not common in the sector (see relatively low usage of e-procurement and e-sales reported in chapters 2.4 and 2.5) . One reason is that these applications do not emerge automatically from the purchase of a hardware or software

tool, but need specific knowledge for successful implementation. Often it is not the technology that causes problems, but the organisational change involved in the introduction of e-business, especially in comprehensive value chain concepts.

- *Policy measures should address the dissemination of applications in order to support the building-up of critical mass*

A major problem, hence, is the dissemination of applications, which have already been tested in pilot projects, to a larger community. In networked systems this is a particularly crucial step: Only if a critical mass can be generated, sustainable e-business supported value chains will be established. Furthermore, documenting and disseminating examples of successful e-business applications helps e-business managers to calculate the risk and optimise financial planning of e-business projects (see case study ACAMAS below).

More general information and support programmes in the Member States which have been organised by central, regional, or local governments, but also at the EU level, stimulate e-business activities of firms regardless of the industry to which they belong. These initiatives focus on various ICT related topics that can all contribute to promoting e-business in the more narrow sense. For example, the BREAD (Broadband for All) project supports the spread of broadband technology in the EU, an instrument which clearly facilitates e-business activities.²⁶

In contrast, more specific programmes for M&E manufacturers and their e-business activities are rare. They are either initiated by industry associations or by regional governments with a strong presence of M&E firms in their territory. This, for example, has been the case of initiatives like "Multimedia im Maschinenbau (multimedia applications in M&E industries)" which was launched by the Ministry of Economics of North-Rhine-Westfalia in Germany, or the ACAMAS initiative in France.

- *Information on e-business adoptions need to be individualised and shaped to a company's needs*
- *General information campaign could be substituted by locally or regionally organised consultancy projects*

The European e-Business Support Network (eBSN)²⁷ together with the project called "Supporting the Exchange of Best Practice e-Business Policies for SMEs"²⁸ are initiatives that aim at **raising e-business awareness in the EU**, and in particular in the new Member States. However, experience with running awareness programmes has shown that although companies are increasingly well informed about the features of e-business applications, they still hesitate to implement them in their own company.

One reason for this is the paradoxical situation of simultaneously having information overflow and lack of information which is typical for firms that wish to implement e-business applications. It shows the limits of programmes that provide information at a general level, such a seminars, brochures, reports or lists of e-business service providers. *What seems to be needed at the current state of e-business awareness is **direct support for the individual company**, such as partial subsidies or tax incentives for ICT consulting projects in SMEs.*

²⁶ See http://www.ist-bread.org/about_bread.asp (7 March 2005).

²⁷ The eBSN has been launched by the European Commission, DG Enterprise & Industry, to bring together policy makers from many European countries, regions and sectors. At present it has about 170 members. For further information on the eBSN, its activities and members, see <http://www.e-bsn.org/portal/home.do>.

²⁸ See DG Enterprise & Industry Grant Programme 2005, Action 5 (http://europa.eu.int/comm/enterprise/funding/grants/themes_2005/calls_prop_2005.htm).

CASE STUDY: ACAMAS – A FRENCH INITIATIVE FROM THE INDUSTRY OF MECHANICAL ENGINEERING

Abstract

ACAMAS is a French support programme for small and medium-sized companies which has been launched for the course of three years (2005-2007). The project has been initiated by two French organisations from the mechanical industry, FIM and CETIM, which both pursue the mission of continuously providing information and assistance to SMEs in their markets.

ACAMAS aims at supporting SMEs in getting adapted to the structural changes within the mechanical industry. It thereby promotes the integration of e-business technologies in an extended enterprise strategic approach for competitive SMEs in the French M&E manufacturing industry.

Case Characteristics	
Location of the organisation	France
Target group	SMEs from M&E manufacturing and other related industries
E-Business Focus	
Basic and advanced IT applications	****
e-business standardisation	***
* = some relevance; **** = high relevance	

Background and objectives

ACAMAS is a French initiative that pursues the goal to support small and medium-sized enterprises from the machinery sector as well as from other related industries. These SMEs require comprehensive assistance in order to adapt to the market structure and conditions of a globalised world: They are being confronted with industrial changes as well as breakthrough changes in the economical models, and with increasing demands on the part of their customers. In that context, it is not enough for SMEs to cut their costs and to increase productivity, but they also have to be innovative and to think within a wider production community.

ACAMAS focuses on three major topics: First of all, the enterprises have to refine their corporate and their entrepreneurial strategy in order to respond to current and future demands and expectations of the market and the companies' customers. Secondly, the SMEs are supported in anticipating the upcoming technological evolutions as well as the knowledge evolution and in translating these evolutions into joint actions. Finally, the third axis of the ACAMAS programme concerns the companies' IT and e-business development. The challenge here is to promote the diffusion of IT applications that enable the professional electronic exchange within and between companies, such as online team work, electronic catalogues, and reverse auctions.

ACAMAS is a joint project of two organisations from the mechanical industry in France: FIM (Fédération des Industries Mécaniques – Association of Mechanical Industries) and CETIM (Centre Technique des Industries Mécaniques – Technical Centre of the Mechanical Industries). Both pursue the mission of continuously providing information and assistance to SMEs in their markets. Within ACAMAS, FIM is the political initiator that is responsible for the strategic side of the project, while CETIM, due to its mission

in the field of research and development, is intervening in the technical aspects of ACAMAS.

This initiative is named after a Greek soldier who fought in the Trojan war and who was known for his brilliance in strategy. The project was launched in 2004. It is temporary with an envisaged duration from 2005 to 2007.

Activities

ACAMAS works on both, the national and the regional level. On the national level, the coordination and the supervision of actions and players is organised. That work is currently completed by three employees that have been appointed for the ACAMAS initiative. On the regional level, the actions eventually take place.

The initiators follow an extended enterprise approach, i.e. ACAMAS is targeting groups of companies which provide a common thing and which are related to the mechanical sector, no matter whether they predominantly work for the automobile industry, the aeronautics industry, railway construction, the food or the chemical industry.

Furthermore, ACAMAS is pursuing a bottom-up approach, region by region: In each region, they start working with an industry committee and analyse the market situation and the company conditions in order to detect problems in certain industrial clusters. For instance, cooperation activities (e-business practices) between companies are evaluated as well as logistics aspects. Initially, first-level subcontractors are targeted since they represent the link between the large manufacturers and the suppliers. They are the first to receive pressure from the manufacturers but are usually able to deal with new challenges. However, the small and medium-sized machinery manufacturers and suppliers down the line are the ones who cannot afford implementing various e-business standards for all their customers. Among others, ACAMAS thus works on establishing state of the art collaborative platforms and on determining what solution fits best to what company. In that context, ACAMAS is also partnering various standardisation initiatives, such as ALFA (fathered by GALIA) in the automotive sector, as well as BOOST-AERO and e-PME (fathered by AFNeT) in the aeronautics industry.²⁹ After common problems have been detected in a region and the companies affected are identified, an action package is applied. The duration of an action package in one region is about 24 months.

At first, each company involved in the regional project individually works with local consultants for two days in order to get a general idea about the challenges the company has to meet. Local consultants are selected on the basis of their ground experience and their local know-how. Afterwards, regional seminars are conducted with the company leaders and consultants where the common and individual challenges are raised and discussed. Examples for such challenges are the introduction of e-business standards, working at the international level, or the delocalisation of production. After a general orientation has been agreed upon at the seminars, an individual company diagnosis is completed and a future work plan is developed at the last stage. During these final 10 to 15 days of consulting, projects are initiated and partly implemented which intend to provide benefits to the individual company, to the region as a whole, and to the specific cluster of the market.

The ACAMAS initiative is financed by FIM and CETIM. ACAMAS project managers work without any costs for the region. The respective region only has to sign an agreement where it affirms that it is going to conduct the actions envisaged by

²⁹ *e-Business W@tch* Sector Studies on the Automotive Industry (July 2005) and on the Aeronautics Industry (Sep. 2005), available at www.ebusiness-watch.org ('resources')

ACAMAS. The costs for the individual actions and for the consultants are paid by the companies (minimum 20%) and the respective region (maximum 80%). Further expenses for collective actions are borne by regional public instances. The ACAMAS project manager is preparing the proposals with the regional partners for the government in order to apply for funding.

During its first six months, ACAMAS has initiated projects in four French regions which consist of 20-50 companies each. Examples are pilot projects such as one in the region Ile de France (around Paris) which comprises 40 enterprises, and another project in Alsace with 30 companies. The actions agreed upon within the circle of these companies are finally implemented in the whole region. In case companies are closely working together with international partners or partners from other regions, ACAMAS also takes potential synergies into account and may also provide assistance to the partners.

Lessons learned

In conclusion, ACAMAS is an initiative which aims at promoting the integration of e-business technologies in an extended enterprise strategic approach for competitive SMEs in the French M&E manufacturing industry. It thereby pursues a holistic approach in that ACAMAS targets the common and individual problems of several companies from a market cluster in one region. For the course of three years, the project has been initiated by two French organisations from the mechanical industry, FIM and CETIM, that both pursue the mission of continuously providing information and assistance to SMEs in their markets.

Sources and references

This case study was conducted by Katrin Meder, DIW Berlin, Germany, on behalf of the *e-Business W@tch*.

References:

- Interview with Mr. Djeapragache (CETIM, France) and with Mr. Mousset (project manager of ACAMAS) on June 29, 2005.
 - Press release on ACAMAS: "ACAMAS: Programme d'accompagnement des Pme mécaniciennes dans une démarche d'anticipation et de changement", 19 May 2005.
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Another initiative that addresses the same problem is the portal on electronic markets for industrial sectors provided by eMarket Services and supported by DG Enterprise and Industry (www.emarketservices.com). Here companies are assisted in their search for sector-specific electronic markets and do not have to look for appropriate suppliers in the anonymity of the internet.

Easing financial constraints

- *Programmes targeting SMEs should emphasise the need for sound financial planning.*
- *SMEs should have access to support for the conception of financial plans and for monitoring financial risks throughout the implementation phase of e-business projects*

In most programmes there is a strong focus on SMEs because it is assumed that the larger companies will introduce e-business without the need for specific policy measures as part of their competition, innovation, and productivity strategies. It is not quite clear whether priorities should be rather on providing information that facilitates e-business implementation or on financial support (for SMEs). Whereas some firms claim that their reluctance to engage in e-business is due to the fact that they cannot see how this could be implemented in their company (a clear awareness problem), some fear the high costs and the lack of visible returns on investment (see Exhibit 3-5). If policy aims to increase the use of e-business among SMEs, financial support in the form of free consultancy and training programmes are appropriate tools.

The cost of technology has been mentioned by a large number of firms as a major barrier for adopting e-business (see Exhibit 3-5). However, as e-business projects should be economically viable and profitable, direct subsidies to cover the costs of the system should not be central in e-business projects. They could result in a waste of resources, if economically inefficient projects are subsidised. Grants to overcome initial financial bottlenecks need to be checked against the long-run viability of e-business projects.

As information and awareness programmes can also help to reduce the costs of introduction and operation of e-business applications, the two strategies complement each other. Moderate financial support can be given in the form of **prizes** rewarded for competitions featuring innovative e-business applications.

The main scope of competition is not to grant financial support to the winners. They aim at stimulating innovative activities and to launch pilot projects in promising applications. In the cases of Telschig as well as Köhler and Hörter (Sector Report 05-I, 2005), these programmes were connected with financial support for implementation, but also with the participation in important key projects, such as classification exercises. For the winners, this reduces implementation barriers substantially, while the challenge remains to spread the innovative applications to more reluctant enterprises.

Standardisation

- *Standardisation initiatives are crucial for e-business success.*
- *However, they should be handled by industry. Policy makers should have an initiating, networking and guiding role.*

Standardisation which has typical 'public good' characteristics is also a major bottleneck. Accordingly, there is a public interest in promoting it. However, the conceptualisation and

adoption of standardised product categorisations need to be based on voluntary action of private companies. Although public support can be useful, the definition and up-dating of standards is industry-specific and should be guided by experts in the field. Hence, it is no surprise that some of the major initiatives are governed by associations of large firms (see, for example, the German eCl@ss initiative³⁰). As suppliers and customers that do business electronically benefit most from precise and complete product classifications, it is in their interest to organise appropriate classification projects. Often, however, these projects are promoted and supported by public entities. An advantage of the involvement of public entities is that in merely private initiatives, there is a danger of dominating partners that impose their standards on other participants, whereas public governance can guarantee a more neutral approach. Hence, public-private-partnerships seem like an appropriate organisational platform for standardisation initiatives.

The availability of adequate **classifications** for electronically traded goods has two dimensions: the compilation of unambiguous product descriptions and the conversion of firms' individual or obsolete classifications into the new standards. The first part is supported by public projects or in public-private-partnerships. The second is usually left to the individual firm. Especially small firms might perceive this as a major barrier for introducing e-business. However, in some case studies, support from public e-business promotion programmes helped to achieve the conversion.

Improving ICT competence and skills

- *Skill enhancing programmes have to comprise technical knowledge as well as organisational knowledge and expertise on business processes.*
- *This is particularly relevant in the new Member States*

In the **new Member States**, the investment in ICT infrastructures has a high priority. Important challenges, however, lie in the organisational management of e-business applications, not so much on the technical side. Joint ventures with more advanced firms in the former EU-15 countries might help to realise successful e-business systems. Policy measures that facilitate the contact and co-operation between firms from different countries can address this problem.

- *The ICT skills problem is particularly virulent in the M&E sector.*
- *Hence, besides measures to be adopted in the general education system, industry specific activities are needed.*
- *Industry associations might be the right institution to take up the challenge.*
- *Financial support for SMEs should not only address the cost of training courses, but also the cost of substituting the employee attending skill improving courses.*

Finally, **ICT skills** shortages, particularly among SMEs in this sector, remain a policy challenge. The new survey results (Exhibit 2-5) suggest that SMEs face a disadvantage in attracting ICT specialists, which could slow down their e-business development and eventually limit their ability to remain competitive. Also, the share of firms reporting difficulties in finding qualified ICT staff is higher in this sector than in all other sectors included in the survey. In addition, there are pronounced differences across countries: While less than 10% of firms trying to recruit ICT staff experienced difficulties in Spain and the UK, more than 90%

³⁰ See <http://www.eclass.de/> (29 April 2005).

experienced difficulties in France and Italy, indicating that the shortage of ICT personnel might be a region-specific issue.

In addition, only 11% of firms in the M&E industry offer regular **ICT training** to employees. This is the second lowest figure among all sectors included in the survey. Also, SMEs report much lower figures for ICT training efforts than larger companies, which suggests that smaller companies either lack the necessary resources or ignore the importance of training measures in their firm. Government-sponsored training programmes or financial assistance for SMEs that offer ICT training to their employees might be appropriate measures in this respect.

This suggests that policy action might be required to help SMEs and their employees to participate in regular ICT training efforts, particularly in those countries and regions where ICT skill shortages seem especially pronounced (e.g. France and Italy). Government-sponsored training programmes or financial assistance for SMEs that offer ICT training to their employees might be appropriate measures in this respect.

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Annex I: The e-Business Survey 2005 – Methodology Report

The *e-Business W@tch* collects data on the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2005, which was the third survey after those of 2002 and 2003, had a scope of 5,218 telephone interviews with decision-makers in enterprises from seven EU countries (Czech Republic, France, Germany, Italy, Poland, Spain and the UK).³¹ Interviews were carried out in January and February 2005, using computer-aided telephone interview (CATI) technology.

Questionnaire

The general design of the questionnaire builds on the ones used in the previous surveys of 2002 and 2003 in order to ensure a basic continuity of the research approach. However, new modules on security and interoperability have been added, while other modules have been reduced (mostly the ones on perceived impacts of e-business, where little new evidence was to be expected compared to the findings of 2003).

New questions were also introduced in the e-commerce related modules, reflecting the developments in electronic business and changing perspectives in research, in particular the emphasis on electronic business processes. An important focus of the 2005 survey was on the use of ICT systems to support e-procurement and online sales processes. These questions complement the previously used questions on online purchasing and selling activity.

The questionnaires of all three surveys (2002, 2003, 2005) can be downloaded from the *e-Business W@tch* website at www.ebusiness-watch.org/about/methodology.htm.

Population

In contrast to the surveys of 2002 and 2003, the 2005 survey considered only **companies that used computers**. Thus, the highest level of the population was the set of all computer-using enterprises which were active within the national territory of one of the 7 countries covered, and which had their primary business activity in one of the 10 sectors specified on the basis of NACE Rev. 1.1 categories.

Evidence from previous surveys shows that this does not make a noticeable difference for medium-sized and large firms, as the share of firms that use computers can be expected to be 99% or more in all sectors and countries covered. Differences are relevant, however, for micro and small enterprises, in particular in the food and beverages industry, the textile industry, construction and tourism. In these four sectors, 10-30% of micro enterprises and 4-15% of small firms (depending on the country and sector) do not use a computer.³² Therefore it makes a difference if a figure represents a percentage of "all companies" (as in 2003) or a percentage of "companies using computers" (as in 2005). Differences are much less pronounced, though, when figures have been weighted by employment.

The 10 sectors that have been selected for the 2005 survey are extremely heterogeneous in terms of their size. Construction is by far the largest with about 2.3 million enterprises in the EU-25. At the other end of the range are the aerospace and pharmaceutical industries with only about 2,200 and 3,900 firms respectively in the EU-25. This is a factor of about 100 between the largest and smallest sector. This imbalance has clearly implications for the achievement of survey quota and the impact of weighting on sector data and on aggregate results.

³¹ These seven countries are frequently referred to as the "EU-7" in this report. They account for roughly 75% of the EU-25 population and GDP.

³² Non-computer users include typically small craft firms (textile, construction), bars, restaurants or pensions (in tourism), and small food producing companies.

Table 1: Population coverage of the e-Business Survey (2005)

No.	NACE Rev. 1.1		Sector name (as used by <i>e-Business W@tch</i>)
	Section	Division / Group	
01	DA	15	Manufacture of food products and beverages
02	DB	17, 18	Manufacture of textiles (17), wearing apparel; dressing & dyeing of fur (18)
03	DE	22	Publishing, printing and reproduction of recorded media
04	DG	24.4, 24.5	Manufacture of pharmaceuticals (24.4), soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (24.5)
05	DK	29.1 – 29.5	Manufacture of machinery and equipment (not included: Manufacture of weapons and ammunition, domestic appliances)
06	DM	34	Manufacture of motor vehicles, trailers and semi-trailers
07	DM	35.3	Manufacture of aircraft and spacecraft
08	F	45	Construction
09	H, I, O	55, 62.1, 63.3, 92.3+5	Tourism, including hotels and restaurants (55), parts of air transport (62), travel agencies and tour operators (63.3), and parts of recreational, cultural and sporting activities (92)
10	K	72	Computer and related activities

Sampling frame and method

No cut-off was made in terms of minimum size of firms. The sample drawn was a random sample of companies from the respective sector population in each of the seven countries, with the objective of fulfilling minimum strata with respect to company size class per country-sector cell. Strata were to include a 10% share of large companies (250+ employees), 30% of medium sized enterprises (50-249 employees), 25% of small enterprises (10-49 employees) and up to 35% of micro enterprises with less than 10 employees. Samples were drawn locally by fieldwork organisations based on widely recognized business directories and databases (see Table 2).

Table 2: Directories from which samples were drawn (2005)

Country	Directory / database
CZ	Czech Republic Albertina Business Database (database of economic subjects with >1m entries)
DE	Germany Heins und Partner Business Pool
ES	Spain Dun & Bradstreet
FR	France SIREN file from INSEE (the French National Statistics Institute)
IT	Italy Dun & Bradstreet
PL	Poland Kompass Polska
UK	United Kingdom Dun & Bradstreet

The survey was carried out as an enterprise survey: data collection and reporting focus on the enterprise, defined as a business organisation (legal unit) with one or more establishments. In some of the sectors, target quota in the larger enterprise size-bands could not be accomplished in each of the countries. In these cases, interviews were shifted to the next largest size-band (from large to medium-sized, from medium-sized to small).

Fieldwork

Fieldwork was coordinated by the German branch of Ipsos GmbH (www.ipsos.de) and conducted in cooperation with its local partner organisations (see Table 3) on behalf of *e-Business W@tch*. Pilot interviews prior to the regular fieldwork were conducted with 12 companies in Germany in December 2004, in order to test the questionnaire (structure, comprehensibility of questions). The survey had a scope of 5,218 interviews, evenly spread across the seven countries covered. About 565 interviews per sector were conducted (see Table 4), except for the aeronautics and the pharmaceutical industry. Due to the small population of firms in these sectors, it was not possible to achieve the target quota. In the aerospace industry, only 163 company interviews could be realised in the seven countries covered. In this sector, practically the entire population of companies was contacted.

Table 3: Market research companies having conducted the fieldwork in the e-Business Survey 2005

Country	Fieldwork organisation
CZ	Czech Republic Ipsos Czech Republic, Skolska 32/694, 110 00 Praha 1
DE	Germany Ipsos GmbH, Papenkamp 2-6, 23879 Mölln
ES	Spain Ipsos ECO Consulting, Avda. de Burgos, 12.-8 ^a , 28036 Madrid
FR	France Ipsos Insight Marketing, 99, rue de l'Abbé Groult, 75739 Paris Cedex 15
IT	Italy Demoskopoea S.p.A., Via Salaria 290/ Via Rubicone 41, 00199 Rome
PL	Poland Ipsos, ul. Pulawska 39, 02-508 Warsaw
UK	United Kingdom Continental Research, 132-140 Goswell Road, EC1V 7DY London

Table 4: Number of interviews conducted by sector and country (2005)

Sector	CZ	DE	ES	FR	IT	PL	UK	TOTAL
Food and beverages	85	80	82	80	86	83	75	571
Textiles and clothing	85	76	81	80	81	83	75	561
Publishing and printing	84	80	82	80	79	83	75	563
Pharmaceutical industry	54	83	81	76	81	82	75	532
Machinery and equipment	85	80	81	77	84	83	75	565
Automotive industry	85	80	81	80	81	83	75	565
Aerospace industry	20	38	15	39	23	3	25	163
Construction	84	81	83	80	80	83	75	566
Tourism	84	80	82	80	82	83	76	567
Computer related services	84	80	82	78	82	84	75	565
TOTAL	750	758	750	750	759	750	701	5218

Table 5: Interview contact protocol: completion rates and non-response reasons (2005)

		CZ	DE	ES	FR	IT	PL	UK	Total
1	Sample (gross)	2632	7247	8796	10123	5082	7825	13104	54809
1.1	Telephone number does not exist	126	880	680	373	340	959	870	4228
1.2	Not a company (e.g. private household)	42	130	220	200	44	214	115	965
1.3	Fax machine / modem	40	56	10	0	359	248	116	829
1.4	Quota completed > address not used	191	361	3357	1623	351	1161	3856	10900
1.5	No target person in company	57	344	186	98	72	109	691	1557
1.6	Language problems	2	16	14	14	1	0	0	47
1.7	No answer on no. of employees	10	8	3	1	0	0	8	30
1.8	Company does not use computers	11	80	194	332	41	30	567	1255
	Sum 1.1 – 1.8	479	1875	4664	2641	1208	2721	6223	19811
2	Sample (net)	2153	5372	4132	7482	3874	5104	6881	34998
2.1	Nobody picks up phone	212	366	335	892	1080	1333	6	4224
2.2	Line busy, engaged	60	52	6	68	60	438	0	684
2.3	Answering machine	42	133	20	1208	79	137	463	2082
2.4	Contact person refuses (refusal at reception, switchboard)	472	931	2010	2024	755	1613	1695	9500
2.5	Target person refuses	388	2125	184	693	142	122	2591	6245
2.6	No appointment during fieldwork period	42	13	395	202	0	261	298	1211
2.7	Open appointment	77	935	363	1584	968	371	1008	5306
2.8	Target person is ill / not available	10	3	47	0	2	0	0	62
2.9	Interview abandoned	91	56	22	57	28	79	119	452
2.10	Interview error, cannot be used	9	0	0	4	1	0	0	14
	Sum 2.1 – 2.10	1403	4614	3382	6732	3115	4354	6180	29780
3	Successful interviews	750	758	750	750	759	750	701	5218
	Completion rate (= [3] / [2])	34.8%	14.1%	18.2%	10.0%	19.6%	14.7%	10.2%	14.9%
	Average interview time (min : sec)	17:07	19:06	17:29	17:15	20:51	21:15	19:53	19:00

Non response: In a voluntary telephone survey, in order to achieve the targeted interview totals, it is always necessary to contact more companies than just the number equal to the target. In addition to refusals, or eligible respondents being unavailable, any sample contains a proportion of "wrong" businesses (e.g., from another sector), and wrong and/or unobtainable telephone numbers. Table 5 shows the completion rate by country (completed interviews as percentage of contacts made) and reasons for non-completion of interviews. Higher refusal rates in some countries, sectors or size bands (especially among large businesses) inevitably raises questions about a possible refusal bias. That is, the possibility that respondents differ in their characteristics from those that refuse to participate. However, this effect cannot be avoided in any voluntary survey (be it telephone- or paper-based).

Feedback on the fieldwork

No major problems were reported from the fieldwork with respect to interviewing (comprehensibility of the questionnaire, logical structure). The overall feedback from the survey organisations was that fieldwork ran smoothly and that the questionnaire was well understood by most respondents. The main challenge was the fulfilment of the quotas, which was difficult or impossible in some of the sectors, in particular among the larger size-bands. Specific remarks from fieldwork organisations, however, point at some differences in the local situation (see Table 6).

Table 6: Comments by national fieldwork companies on their experience (2005)

Country		Comments
CZ	Czech Republic	<ul style="list-style-type: none"> It was more difficult to complete interviews with very small companies. They were less willing to participate in an interview. Respondents often felt that questions about a firm's profit or turnover are not adequate. The interviewers mentioned that these questions were several times a cause of abandoning the interview.
DE	Germany	<ul style="list-style-type: none"> In total fieldwork ran smoothly and the questionnaire was easy to understand and interesting for most of respondents. Answering the question about turnover as well as the investment on ICT was often problematic for the respondents and yielded a high proportion of non-replies. Respondents of small companies often had difficulty in answering questions related to specific technical terms and application. In cases where they used only one or few computers, some questions (e.g. regarding networks) were not relevant for them. Positive resonance comes from the respondents when they know that the survey is being done on behalf of the European Commission. The reference to the website at the end of the interview was welcome and helpful.
ES	Spain	<ul style="list-style-type: none"> Interviews in very small companies were more difficult to complete due to the lack of knowledge about ICT. On the other hand, the participation of respondents in big companies was difficult to achieve. Generally the questionnaire was easy to understand. About a quarter of the firms contacted have subcontracted most of their ICT tasks, which made it difficult for the respondents to answer specific technical questions. Questions regarding the turnover and investments were difficult to answer for the respondents and yielded a high proportion of don't know responses. This is also often experienced in other B2B surveys.
FR	France	<ul style="list-style-type: none"> Small companies often do not have much ICT equipment. Respondents therefore sometimes had difficulty in answering some of the questions, since the questionnaire was not adapted to these companies. Small companies often answered "don't know" to more detailed questions. Respondents from larger companies had difficulty answering questions concerning turnover, benefits and other financial issues. These questions would be better put to somebody from the financial department. As more and more companies outsource their IT department, it is difficult to identify a responsible person within the company to answer the questions.

IT	Italy	<ul style="list-style-type: none"> • The questionnaire was considered long, but quite easy to answer. • However, a few sections (mainly D and E) were considered more complicated than others. In particular technical terms that referred to security and to online services were difficult to understand. • Interviews were carried out without any problems in medium-sized enterprises where it is easier to identify and contact an IT manager. Those respondents had the best grasp of what was being talked about in the interview. • The financial questions were difficult to answer for most of the respondents, especially the question on ICT investments.
PL	Poland	<ul style="list-style-type: none"> • Respondents from small companies often had difficulties in answering questions related to specific technical applications. • Companies are quite reluctant to provide financial information, so respondents often answer DK to the financial questions. • In many companies, IT people are not allowed to say anything about internal matters of the company. • Many companies outsource their IT department and its activities.
UK	United Kingdom	<ul style="list-style-type: none"> • As with previous surveys carried out in the context of the <i>e-Business W@tch</i> programme, fieldwork ran relatively smoothly. • However, the anticipated strike-rate was severely affected by the substantial length of the interview (20 minutes). • Gathering turnover and investment details again yielded a high proportion of don't know responses. • As a final point, it is becoming increasingly difficult to secure interviews with IT/DP professionals, and we suspect that this situation will only worsen in the future.

Weighting schemes

Due to stratified sampling, the sample size in each size-band is not proportional to the population numbers. If proportional allocation had been used, the sample sizes in the 250+ size-band would have been extremely small, not allowing any reasonable presentation of results. Thus, weighting is required so that results adequately reflect the structure and distribution of enterprises in the population of the respective sector or geographic area. *e-Business W@tch* applies two different weighting schemes: weighting by employment and by the number of enterprises.³³

- Weighting by employment: Values that are reported as employment-weighted figures should be read as "enterprises comprising x% of employees" (in the respective sector or country). The reason for using employment weighting is that there are many more micro-enterprises than any other firms. If the weights did not take into account the economic importance of businesses of different sizes in some way, the results would be dominated by the percentages observed in the micro size-band.
- Weighting by the number of enterprises: Values that are reported as "x% of enterprises" show the share of firms irrespective of their size, i.e. a micro-company with a few employees and a large company with thousands of employees both count equally.

The use of filter questions in interviews

In the interviews, not all questions were asked to all companies. The use of filter questions is a common method in standardised questionnaire surveys to make the interview more efficient. For example, questions on the type of Internet access used were only asked to those companies that had replied to have Internet access. Thus, the question whether a company has Internet access or not serves as a filter for follow-up questions.

³³ In the tables of this report, data are normally presented in both ways, except for data by size-bands. These are shown in % of firms within a size-band, where employment-weighting is implicit.

The results for filtered questions can be computed on the base of only those enterprises that were actually asked the question (e.g. "in % of enterprises with Internet access"), but can also be computed on the base of "all companies". In this report, both methods are used, depending on the indicator. The base (as specified in footnotes of tables and charts) is therefore not necessarily identical to the set of companies that were actually asked the underlying question.

Statistical accuracy of the survey: confidence intervals

Statistics vary in their accuracy, depending on the kind of data and sources. A "confidence interval" is a measure that helps to assess the accuracy that can be expected from data. The confidence interval is the estimated range of values on a certain level of significance. Confidence intervals for estimates of a population fraction (percentages) depend on the sample size, the probability of error, and the survey result (value of the percentage) itself. Further to this, variance of the weighting factors has negative effects on confidence intervals.

Table 7 gives some indication about the level of accuracy that can be expected for industry totals (EU7 totals based on all respondents) depending on the weighting scheme applied. For totals of all-sectors, an accuracy of +/- 2 percentage points can be expected for most values that are expressed as "% of firms", and of +/- 3 percentage points for values that are weighted by employment. The confidence interval for industry totals (EU-7) is about +/- 5 percentage points (in both weighting schemes). Employment-weighted results for the pharmaceutical, the automotive and the aeronautics industry have higher confidence intervals, because these sectors are more sensitive to weights due to their structure (i.e. the dominance of large firms in a comparatively small population). In the aeronautics industry, employment-weighted figures should not be used.

The calculation of confidence intervals is based on the assumption of (quasi-) infinite population universes. In practice, however, in some industries and in some countries the complete population of businesses consists of only several hundred or even a few dozen of enterprises. In some cases, literally each and every enterprise within a country-industry and size-band cell was contacted and asked to participate in the survey. This means that it is practically impossible to achieve a higher confidence interval through representative enterprise surveys in which participation is not obligatory. This should be borne in mind when comparing the confidence intervals of *e-Business W@tch* surveys to those commonly found in general population surveys.

Table 7: Confidence intervals for all-sector and sector totals (EU-7)

	Survey result	Confidence interval		
		Weighted by employment	Weighted as "% of firms"	Unweighted
All sectors (aggregate), EU-7	10%	8.1% - 12.2%	8.7% - 11.5%	9.3% - 10.7%
Food and beverages	10%	7.2% - 13.8%	6.9% - 14.3%	8.1% - 12.3%
Textile industries	10%	7.4% - 13.3%	6.9% - 14.3%	8.1% - 12.3%
Publishing and printing	10%	7.2% - 13.7%	7.2% - 13.8%	8.1% - 12.3%
Manufacture of pharmaceuticals	10%	5.3% - 18.0%	7.5% - 13.1%	8.1% - 12.4%
Manufacture of machinery and equipment	10%	6.5% - 15.1%	7.1% - 13.9%	8.1% - 12.3%
Automotive industry	10%	4.6% - 20.2%	7.7% - 12.8%	8.1% - 12.3%
Aerospace industry	10%	1.7% - 41.3%	5.7% - 16.9%	6.8% - 14.6%
Construction	10%	7.7% - 12.8%	7.0% - 14.1%	8.1% - 12.3%
Tourism	10%	7.2% - 13.8%	6.9% - 14.3%	8.1% - 12.3%
IT services	10%	7.3% - 13.6%	6.5% - 15.2%	8.1% - 12.3%
All sectors (aggregate), EU-7	30%	27.0% - 33.2%	27.9% - 32.2%	29.0% - 31.1%
Food and beverages	30%	25.2% - 35.2%	24.7% - 35.9%	26.9% - 33.3%
Textile industries	30%	25.7% - 34.6%	24.7% - 35.8%	26.9% - 33.3%
Publishing and printing	30%	25.3% - 35.1%	25.3% - 35.2%	26.9% - 33.3%
Manufacture of pharmaceuticals	30%	21.5% - 40.2%	25.9% - 34.4%	26.8% - 33.4%
Manufacture of machinery and equipment	30%	23.9% - 36.9%	25.1% - 35.4%	26.9% - 33.3%
Automotive industry	30%	19.9% - 42.6%	26.3% - 34.0%	26.9% - 33.3%
Aerospace industry	30%	10.5% - 61.0%	22.3% - 39.0%	24.4% - 36.2%
Construction	30%	26.3% - 34.0%	24.9% - 35.7%	26.9% - 33.3%
Tourism	30%	25.2% - 35.2%	24.7% - 35.9%	26.9% - 33.3%
IT services	30%	25.5% - 35.0%	23.9% - 36.9%	26.9% - 33.3%
All sectors (aggregate), EU-7	50%	46.6% - 53.4%	47.7% - 52.3%	48.9% - 51.1%
Food and beverages	50%	44.6% - 55.4%	43.9% - 56.1%	46.6% - 53.4%
Textile industries	50%	45.2% - 54.8%	44.0% - 56.0%	46.5% - 53.5%
Publishing and printing	50%	44.7% - 55.3%	44.6% - 55.4%	46.5% - 53.5%
Manufacture of pharmaceuticals	50%	39.8% - 60.2%	45.4% - 54.6%	46.4% - 53.6%
Manufacture of machinery and equipment	50%	42.9% - 57.1%	44.4% - 55.6%	46.5% - 53.5%
Automotive industry	50%	37.7% - 62.3%	45.8% - 54.2%	46.5% - 53.5%
Aerospace industry	50%	23.2% - 76.8%	40.9% - 59.1%	43.6% - 56.4%
Construction	50%	45.8% - 54.2%	44.1% - 55.9%	46.5% - 53.5%
Tourism	50%	44.5% - 55.5%	43.9% - 56.1%	46.5% - 53.5%
IT services	50%	44.8% - 55.2%	42.9% - 57.1%	46.5% - 53.5%
All sectors (aggregate), EU-7	70%	66.8% - 73.0%	67.8% - 72.1%	68.9% - 71.0%
Food and beverages	70%	64.8% - 74.8%	64.1% - 75.3%	66.7% - 73.1%
Textile industries	70%	65.4% - 74.3%	64.2% - 75.3%	66.7% - 73.1%
Publishing and printing	70%	64.9% - 74.7%	64.8% - 74.7%	66.7% - 73.1%
Manufacture of pharmaceuticals	70%	59.8% - 78.5%	65.6% - 74.1%	66.6% - 73.2%
Manufacture of machinery and equipment	70%	63.1% - 76.1%	64.6% - 74.9%	66.7% - 73.1%
Automotive industry	70%	57.4% - 80.1%	66.0% - 73.7%	66.7% - 73.1%
Aerospace industry	70%	39.0% - 89.5%	61.0% - 77.7%	63.8% - 75.6%
Construction	70%	66.0% - 73.7%	64.3% - 75.1%	66.7% - 73.1%
Tourism	70%	64.8% - 74.8%	64.1% - 75.3%	66.7% - 73.1%
IT services	70%	65.0% - 74.5%	63.1% - 76.1%	66.7% - 73.1%
All sectors (aggregate), EU-7	90%	87.8% - 91.9%	88.5% - 91.3%	89.3% - 90.7%
Food and beverages	90%	86.2% - 92.8%	85.7% - 93.1%	87.7% - 91.9%
Textile industries	90%	86.7% - 92.6%	85.7% - 93.1%	87.7% - 91.9%
Publishing and printing	90%	86.3% - 92.8%	86.2% - 92.8%	87.7% - 91.9%
Manufacture of pharmaceuticals	90%	82.0% - 94.7%	86.9% - 92.5%	87.6% - 91.9%
Manufacture of machinery and equipment	90%	84.9% - 93.5%	86.1% - 92.9%	87.7% - 91.9%
Automotive industry	90%	79.8% - 95.4%	87.2% - 92.3%	87.7% - 91.9%
Aerospace industry	90%	58.7% - 98.3%	83.1% - 94.3%	85.4% - 93.2%
Construction	90%	87.2% - 92.3%	85.9% - 93.0%	87.7% - 91.9%
Tourism	90%	86.2% - 92.8%	85.7% - 93.1%	87.7% - 91.9%
IT services	90%	86.4% - 92.7%	84.8% - 93.5%	87.7% - 91.9%

confidence intervals at $\alpha=.90$

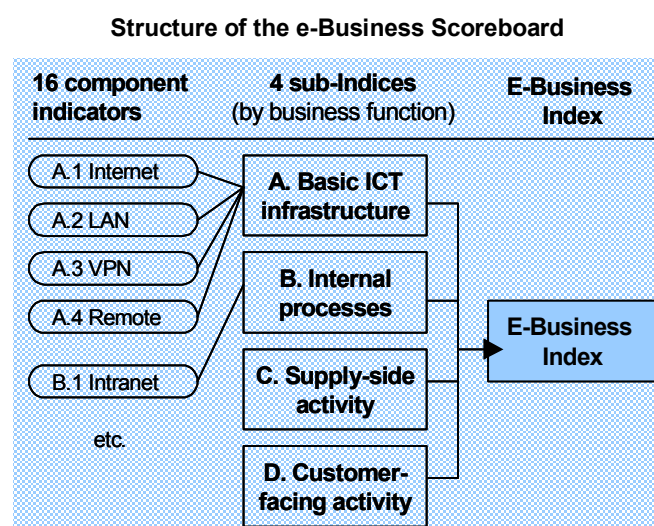
Annex II: The e-Business Scoreboard 2005

Introduction

The e-Business Scoreboard approach was developed by the *e-Business W@tch* in 2004. It is an instrument to compare and visualize the intensity of e-business activity across different sectors, countries or size-bands, in different areas of business activity. Conceptually, the Scoreboard owes to the Balanced Scorecard (BSC) approach, which suggests that an organisation should be viewed from four perspectives, and that metrics (and targets) are to be defined for each perspective. Similarly, the e-Business Scoreboard looks at ICT use by enterprises from four (inter-related) perspectives. Component indicators represent the metrics for these perspectives.

The Scoreboard is composed of component indicators which are taken from the e-Business Survey 2005 by the *e-Business W@tch*. These indicators can be aggregated on two levels:

- 16 component indicators are, in a first step, aggregated into four sub-indices that represent major application areas of e-business. The diamond charts on the following pages show these four dimensions of e-business activity.
- The four sub-indices can then be aggregated into the (overall) e-Business Index.



The E-Business Scoreboard takes into account the percentages (diffusion rates) from all sectors and show how a specific sector differs from the all-sector-average. An index value is based on mean values and standard deviations.³⁴ Thus, index values express the multiple of the standard deviation (1 or (-1)) for a specific sector and the selected indicator. 0 equals the mean value for all sectors.

Indexes simplify multi-dimensional concepts. To correctly assess the validity and shortcomings of the Scoreboard and its e-Business Index, the following notes are important to be taken into account:

- **Weighting:** Results are influenced by the selection of the underlying weighting scheme. In the computation presented in this chapter, employment-weighted figures were used. This emphasizes e-business activity in large firms and has an impact on the Index for sectors with dominant large players (for instance the automotive and pharmaceutical industry).
- **Component indicators:** The selection of component indicators may have a bias towards manufacturing activities, as some indicators in dimension B ("internal process") are more relevant for manufacturing than for service sectors (e.g. ERP). The full list of component indicators and their definition is given in Annex II.
- **Relative comparison:** The e-Business Index and the Scoreboards do not represent absolute measures of e-business activity. The Scoreboard results depend on the respective set of sectors (or countries etc.) that are compared to each other, as figures are derived from computing standard deviations from the average of the respective set.

³⁴ Constituting values are z-values, i.e. $z = (x - \text{mean}(x))/\text{stddev}(x)$. This procedure results in a distribution with $\text{mean}(z)=0$ and $\text{stddev}(z)=1$.

Component indicators of the Scoreboard 2005

A. ICT infrastructure and basic connectivity		
A.1	Enterprises connecting computers with a LAN	= the percentage of employees from a sector working in enterprises that have connected computers with a Local Area Network (LAN).
A.2	Internet connectivity	= the percentage of employees working in enterprises that are connected to the internet, with a supplementary indicator for the type of internet connection in terms of bandwidth. The percentage of employees working in enterprises that are connected with a bandwidth of less than 2 Mbit/s is computed with a factor of 0.5, enterprises connected with at least 2 Mbit/s bandwidth with a factor of 1.0. The maximum value of 100 would be returned if all employees from a sector work in enterprises connected to the internet with more than 2 Mbit/s bandwidth.
A.3	Remote access to the company network	= the percentage of employees from a sector working in enterprises where it is possible to access data from the company's computer system from a remote location.
A.4	Enterprises with a VPN	= the percentage of employees from a sector working in enterprises that use a Virtual Private Network (VPN)
B. Internal business process automation		
B.1	Use of an intranet	= the percentage of employees working in enterprises that use an intranet.
B.2	Use of online technology to track working hours and/or production time	= the percentage of employees working in enterprises that use online technologies (other than e-mail) to track working hours and/or production times
B.3	Use of EDM systems	= the percentage of employees working in enterprises that use an Enterprise Document Management system
B.4	Use of ERP systems	= the percentage of employees working in enterprises that have implemented an ERP (enterprise resource planning) system
C. Procurement and supply chain integration		
C.1	Enterprises purchasing at least 5% of their supplies online	= the percentage of employees working in enterprises saying that they purchase at least 5% of their supplies online via the internet or other computer-mediated networks (for example via EDI based connections to their suppliers)
C.2	Use of specific IT solutions for e-procurement	= the percentage of employees working in enterprises that use specific IT solutions to support the selection of their suppliers and/or procurement processes
C.3	Use of SCM systems	= the percentage of employees working in enterprises that use an SCM (supply chain management) system
C.4	Online management of capacity and inventory	= the percentage of employees working in enterprises that use technologies to manage capacity and inventory online
D. Marketing and sales processes		
D.1	Enterprises maintaining a website with a CMS	= the percentage of employees working in enterprises that have a website and use a content management system to maintain and update the website
D.2	Use of CRM software systems	= the percentage of employees working in enterprises that use a CRM (customer relationship management) software to organise data about their customers electronically
D.3	Enterprises selling at least 5% of their goods & services online	= the percentage of employees working in enterprises saying that online sales via the internet or other online networks (for example via an extranet) constitute at least 5% of their total sales volume
D.4	Use of specific IT solutions for marketing and sales processes	= the percentage of employees working in enterprises that uses specific IT solutions to support marketing and sales processes

Results: sectors in comparison

The e-Business Scoreboards visualize that the nature and impact of electronic business differs widely between sectors, particularly between manufacturing and service sectors. There are several underlying reasons; for example, the nature of e-business activities depends on whether the focus is on B2B or B2C.

Manufacturing

- Among the 7 manufacturing sectors surveyed, electronic business activity has reached the highest level of intensity in the **automotive**, **pharmaceutical** and **aeronautics** industries. The rapid development in these sectors is mostly driven by the large international companies. Supply-chain integration and the streamlining of procurement processes are common objectives in these industries for which e-business solutions are attractive. In the **machinery and equipment** industry, electronic business activity has not yet reached the same level of intensity. At first sight, this confirms the findings of the Survey 2003. However, developments in this sector have been quite dynamic since then. For example, e-business is increasingly recognized as a useful means of providing customer service.
- The **publishing and printing** industry has a different e-business profile, as major segments of this sector operate in B2C markets. ICT has a considerable impact on production and internal work processes. Furthermore, customer-facing activities (online publishing, marketing, advertising) are critical. On the other hand, processes with a high e-business potential such as inventory and supply-chain-management are less critical in this sector.
- The **food and beverages** sector, and the **textile and clothing** industry, are late adopters of ICT compared to the other manufacturing sectors studied. However, in the food and beverages industry, there are signs of increasing e-business activity, mainly in response to structural changes and new requirements. Important issues that promote e-business are food safety and the digital integration of the value chain. RFID (Radio Frequency Identification) based technologies could play an important role in these areas.

Construction

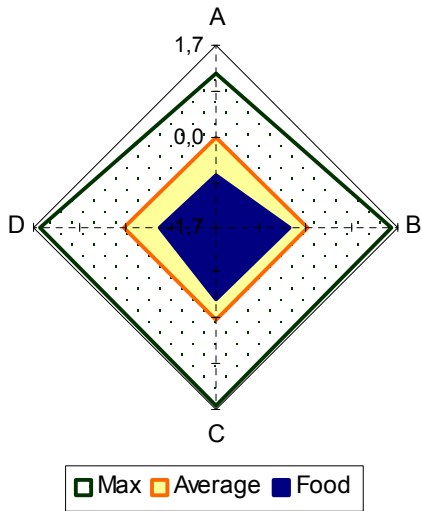
- ICT adoption and e-business activity in construction companies appears to be very limited compared to most manufacturing sectors. The structure of the industry, which includes many small craft companies, cannot fully explain this gap. An industry with a multitude of standards, technical specifications, labels, and certification marks is not an optimal forum for drawing benefits from electronic business. However, e-business tools have the potential to benefit complex construction projects where there is a need to coordinate a large number of sub-contractors.

Service sectors

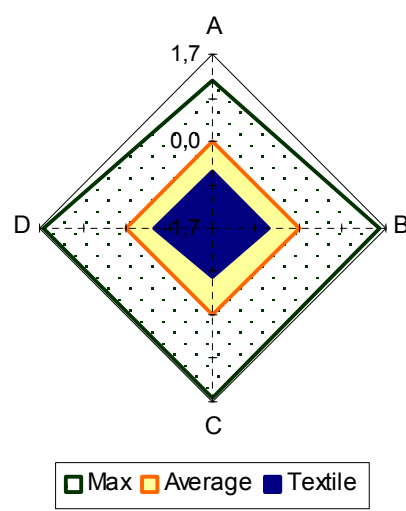
- The **computer related services** sector is a special case with regard to e-business. Although companies in this sector have Information Technology and e-business as their end product, ICT also plays a significant role in the way that this product is produced, promoted and provided. This specific way of using ICT distinguishes the IT services industry from the other sectors analysed by the *e-Business W@tch*. Here, in this sector the use of ICT and the production of related services are difficult to separate from each other.
- The IT services sector shares a common feature with **tourism**: in both industries, online channels have become key tools for marketing, communication and interaction with customers. In tourism, online booking and reservation services have been widely accepted among consumers and business travellers, and "e-tourism" has truly taken off. However, the great importance of ICT in this sector is not properly reflected in the e-Business Index. The main reason is that e-business normally does not have the same significance in supply-side activities and internal work processes (for example in hotels), as in manufacturing sectors.

e-Business Scoreboards for 10 sectors (2005)

Food and beverages



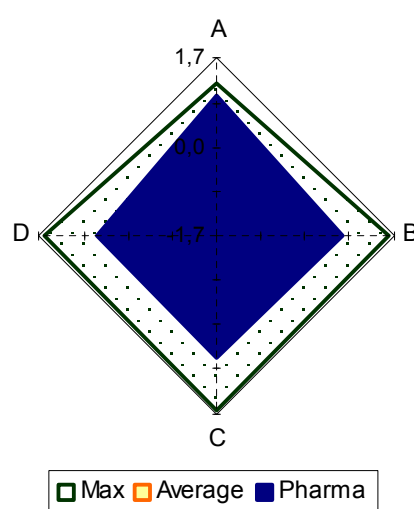
Textile and clothing industry



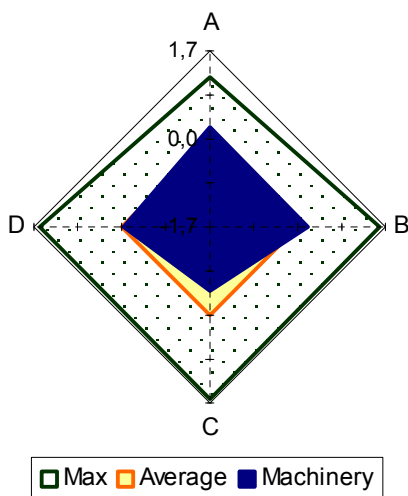
Publishing and printing



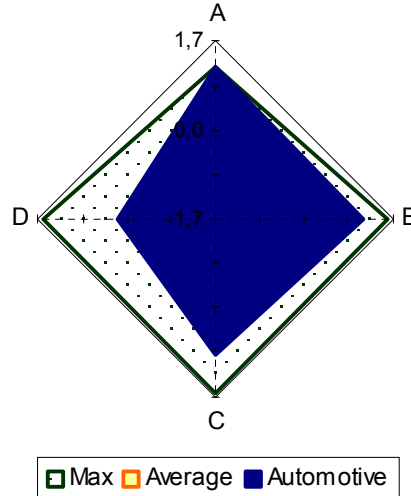
Pharmaceutical industry

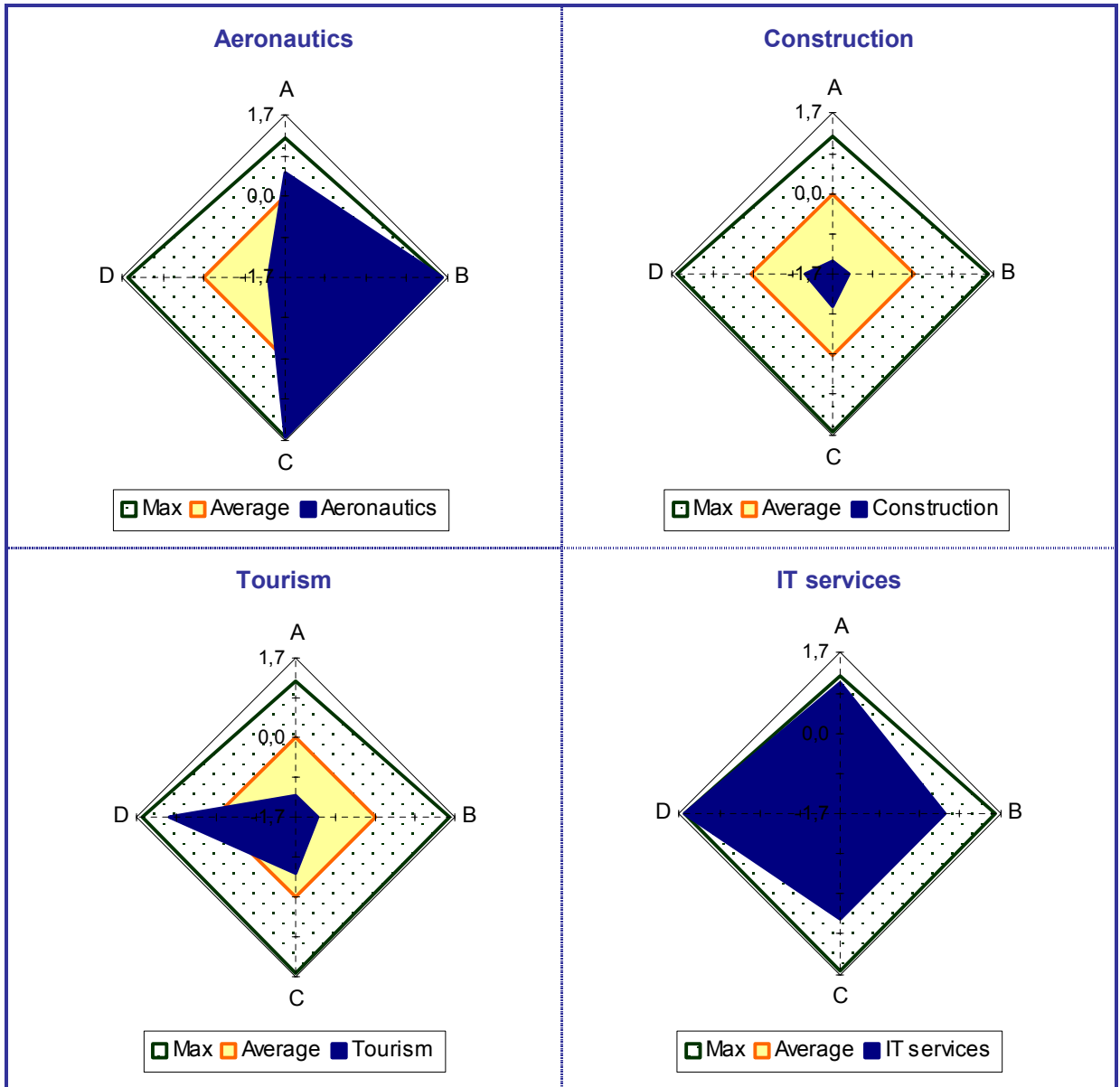


Machinery and equipment



Automotive industry



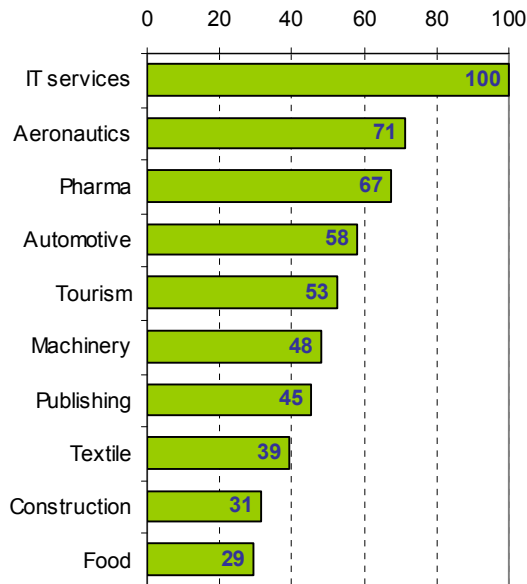


Source: e-Business W@tch (e-Business Survey 2005)

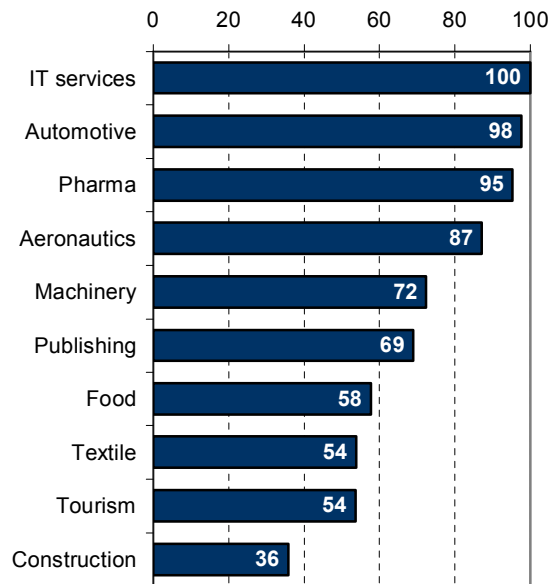
e-Business Index for 10 sectors (2005)

(Compound Index of 16 component indicators)

Benchmark based on **firm-weighted data** ¹⁾
(indexed values: highest score = 100)



Benchmark based on **employment-weighted data** ²⁾
(indexed values: highest score = 100)



- 1) **Firm-weighted** data express e-business adoption as "*% of firms in a sector with a certain activity*", irrespective of the size of the companies (i.e. small companies and large ones count equally). Results are mainly determined by the situation in small firms, as there are many more small companies than large ones in the population of enterprises.
- 2) **Employment-weighted** data express e-business adoption as "*activity in firms comprising ...% of employment in a sector*", thus emphasising the situation in larger companies.