The European e-Business Report

2006/07 edition

A portrait of e-business in 10 sectors of the EU economy

5th Synthesis Report of the e-Business W@tch

e-business w@tch





January 2007

European Commission

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The European Commission's Directorate General for Enterprise and Industry launched the *e-Business W@tch* to monitor the growing maturity of electronic business across different sectors of the economy in the enlarged European Union and in EEA countries. Since late 2001 the *e-Business W@tch* has analysed e-business developments and impacts in 20 manufacturing, financial and service sectors. All publications of the *e-Business W@tch* – including this report – are available in electronic format on the internet either via the Europa server or directly at the *e-Business W@tch* website: (http://ec.europa.eu/comm/enterprise/ict/policy/watch/index.htm, www.ebusiness-watch.org).

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Copies can be requested, free of charge, from info@ebusiness-watch.org. The report is also available in electronic format and can be downloaded from the "resources" section of the *e-Business W@tch* website (www.ebusiness-watch.org).

A great deal of additional information on the European Union is available on the internet.
It can be accessed through the Europa server (http://ec.europa.eu).

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Foreword

The European Commission has long recognised and emphasised the importance of information and communication technologies (ICT) for the European economy to thrive. First, the ICT producing industry itself is a major contributor to growth, with an annual average growth rate of about 6% until 2008. Second, as this report clearly demonstrates, companies from all sectors are increasingly using ICT for doing business. "e-Business" has become a critical factor for competitiveness and productivity growth.

However, we need to make a focused effort in Europe in order to allow the positive effects of ICT to fully unfold. The agenda is challenging. It requires close cooperation between policy makers and the private sector to accomplish the many-sided tasks that have to be tackled.

On the policy side, we need to create a favourable framework for our companies as they compete in a global business environment. This includes cutting "red tape", fostering innovation and – more specifically with regard to ICT – counteracting shortages in e-skills and promoting systems inter-operability.

Above all, companies need to demonstrate a positive attitude toward innovation and toward the broad use of ICT as a tool. I am glad to see that this has been confirmed by the *e-Business W@tch* special study on ICT impact, which finds that "positive effects of ICT on productivity are more likely to occur in firms that conduct innovations and that are advanced users of ICT."

The European Commission is fully committed to support the wide adoption of ICT among enterprises, in particular in small and medium sized enterprises (SMEs). A high-level ICT Task Force was commissioned in 2006 to look in detail at ICT uptake and skills requirements, and to make policy recommendations. We are determined to take these recommendations seriously. All actions will be embedded in the renewed Lisbon Strategy for Growth and Jobs in Europe. We also know that sector-specific requirements have to be taken into account, as stated in the "new industrial policy" communication.

With its focus on sectors, SMEs and the study of ICT use and impact in business, *e-Business W@tch* has taken a central position in this policy context. It has become an influential source of unbiased information. This is why the initiative will be renewed until at least 2008. I place great expectations in the "new" *e-Business W@tch* as a vehicle to stimulate debate and to inform policymakers and industry about relevant developments.

Günter Verheugen
Vice-President of the European Commission

1. "eEurope 2005: An information society for all". Communication from the Commission, COM(2002) 263 final, 28 May 2002, chapter 3.1.2
2. "Implementing the Community Lisbon Programme: A Policy Framework to Strengthen EU Manufacturing - towards a more integrated approach for Industrial Policy." Communication from the Commission, COM(2005) 474 final, 5.10.2005
3. The Final Report is available at http://ec.europa.eu/enterprise/ict/policy/doc/icttf_report.pdf (download: Dec. 2006).

Introduction to the e-Business W@tch

Policy background

The European Commission launched *e-Business W@tch* in late 2001 to monitor the adoption, development and impact of electronic business practices in different sectors of the economy in the European Union and beyond.

The initiative is rooted in the eEurope Action Plans of 2002 and 2005. The 2005 Action Plan set 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".[1] *e-Business W@tch* has been an important instrument for the European Commission to assess the developments and progress in this field.

In 2005, as a response to globalisation and intense international competition, the European Commission launched a new industrial policy[2] to create better framework conditions for manufacturing industries in the coming years. Some of the policy strands described have direct links to ICT and e-business developments. One of the initiatives covered by the policy was the assignment of a Taskforce on information and communication technologies (ICT) competitiveness in 2006. The taskforce, with stakeholder representatives, focused on identifying and proposing measures to remove obstacles that inhibit ICT take-up among enterprises. It issued its final report with recommendations in November 2006, many of which reflect arguments and conclusions drawn from *e-Business W@tch* studies.[3]

Focus and scope

Within this broader policy context, two further important facets regarding the mission of the initiative are relevant. First, the focus of *e-Business W@tch* studies is sectors (and not countries). Second, special emphasis is placed on developments and implications for small and medium-sized enterprises (SMEs).

Since its launch, *e-Business W@tch* has published studies on more than 20 sectors of the European economy, five comprehensive synthesis reports about the state-of-play in e-business in the European Union, statistical pocketbooks, and various other resources such as newsletters and special issue reports. All publications are available at www.ebusiness-watch.org ('resources').

e-Business W@tch presents a 'wide-angle' perspective on the adoption and use of ICT in the sectors studied. The topic is not restricted to the measurement of e-commerce transactions (the volume of goods and services traded online), but also includes an assessment of the degree to which business processes, including intra-firm processes, are electronically linked to each other and have become digitally integrated.

However, it becomes practically impossible to cover in detail all areas and facets of e-business in a single sector study. Each study therefore focuses on a few specific issues, allowing the reader to zoom into these topics in more detail.

The ***mission*** of *e-Business W@tch* is to monitor, analyse and compare the development and impact 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 will trigger the interest of policy-makers, researchers, and other e-business stakeholders for more in depth analyses or statistical surveys.

e-Business W@tch has adopted a "wide-angle" perspective in its ***approach***. The necessary trade-offs are transparently depicted in each of its deliverables.

Methodology

e-Business W@tch combines quantitative and qualitative research elements. The quantitative analysis of ICT and e-business adoption by firms is based to a large extent on representative surveys among decision-makers in European enterprises ("e-Business Survey"). Interviews are conducted by telephone, based on a standardised and computer supported questionnaire (CATI[4] method). The most recent survey (conducted in April/May 2006) covered more than 14,000 enterprises from 10 sectors in all EU Member States and most EEA and Acceding and Candidate Countries.[5]

The *e-Business W@tch* Surveys have won recognition from the international research community as a useful instrument for piloting new e-business metrics. The experience gained from this piloting is used, for example, by Eurostat for planning and developing its own survey of ICT use by businesses.

4. *Computer Assisted Telephone Interviews, a widely used method in representative household or decision-maker surveys.*
5. *The EEA (European Economic Area) includes, in addition to EU Member States, Iceland, Liechtenstein and Norway. Candidate Countries for accession into the EU include (as of December 2006) Croatia and Turkey. Bulgaria and Romania were Acceding Countries in 2006. See Annex III for more detailed information about the survey methodology.*

e-Business W@tch complements the statistical picture with a more detailed presentation of concrete e-business activity in individual enterprises from the sectors covered, mainly in the form of brief case studies. About 75 case studies were conducted in 2006, adding to more than 100 case studies conducted in previous years. Evidence from the survey and case studies is backed up by desk research and interviews with industry representatives and e-business experts.

The importance of networking and debate

e-Business W@tch has increasingly developed from a market observatory into a think-tank and intermediary, stimulating debate among stakeholders at international level about the economic and policy implications of e-business. The positive feed-back and wide uptake for the various publications and statistics provided by the *e-Business W@tch*, for example their exploitation by various research institutions, reflects the demand for sectoral e-business analysis and discussion on related issues.

e-Business W@tch uses several mechanisms for debate and networking with stakeholders. An important platform for this is the website (www.ebusiness-watch.org), where all reports and survey data are published. Furthermore, results are presented and discussed with industry at workshops, within and via the Advisory Board, and, lastly, through the participation of study team members in other events, such as conferences, workshops and working groups organised by third parties.

The definition of sectors and the adequate level of aggregation

Economic sectors constitute the main level of analysis for *e-Business W@tch*. The 2006 studies cover sub-sets of ten different sectors whose configuration and definition are based on the NACE Rev. 1.1 classification of business activities.[6] Over the years since its initial implementation in late 2001, *e-Business W@tch* followed a roll-out plan in the coverage of different sectors.[7] In each new period, some new sectors (not covered in previous years) were added.

The aggregation of various business activities into sectors in earlier implementation periods (2002-2004) made it possible to cover a broad spectrum of the economy, but also posed challenges for the analysis of e-business developments. In cases where heterogeneous sub-sectors were aggregated, it was sometimes difficult to make general observations or draw conclusions for "the sector" at stake. It also turned out that industry has a clear preference for narrower sector definitions.

The approach for selecting and defining sectors which was used in 2005 and 2006 reflects these concerns. Many of the sectors studied since 2005 are sub-sectors that had been part of larger aggregations in 2002-2004. A further argument for "zooming in" on former sub-sectors is that the broad picture for whole sectors is already available from earlier *e-Business W@tch* studies. The selection of sectors in 2006 has been made on the basis of the following considerations:

- The roll-out plan of 2003.
- Policy relevance of the sector from the Commission's perspective.
- Interest articulated by the industry in previous years on studies of this type.
- The current dynamics of e-business in the sector and the impact of ICT and electronic business, as derived from earlier *e-Business W@tch* sector studies.

6. *NACE Rev. 1.1 is a 4-digit classification of business activities. 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.*
7. *See website: "selection of sectors" (www.ebusiness-watch.org/about/sector_selection.htm)*

Executive Summary

The overly pessimistic and hesitant attitude towards ICT that the burst of the new economy bubble provoked in many companies is now a thing of the past. e-Business has gained new momentum in the EU and in other advanced economies of the world. The cost-saving potential of ICT has been broadly recognised by companies. Efficiency and productivity gains have been a key driver for growth in ICT investments. Large firms, and increasingly the public sector, are spearheading this development. However, in parallel to the continued search for cost-cutting potential, companies are become more creative in using ICT for new forms of customer service.

Key e-Business trends observed in 2006

>> *Supply chain integration is key:*
Increasingly, competition occurs not only within a company's value system, but between entire networks. Optimising the supply chain by means of ICT, e.g. by integrating with distribution networks, is a key factor in achieving competitive advantage.

>> *Better solutions for SMEs:*
Until recently, the ICT industry was often criticised for failing to provide adequate e-business solutions for small and medium-sized firms. This is changing. Driven by market requirements, and enabled by technological advances, ICT companies are increasingly addressing the SME market. They are developing affordable, smaller-sized solutions (e.g. ERP and CRM suites) that can be connected with the more powerful systems of large firms.

>> *ICT for customer service:*
e-Business is not just about cutting costs: service companies have always used ICT for marketing purposes and customer service. Now, manufacturing companies are increasingly devoting attention to using e-business for better service to their customers, with the strategic goal of creating sustained relationships with them.

>> *Growing maturity of new technologies:*
Applications based on RFID technology, the use of Voice-over-IP, and mobile e-business applications using wireless technology have gained maturity. Although still not widely diffused, these emerging technologies have started to influence e-business.

W@tch out: new trends & issues ahead

>> *The "missing link":*
e-Business activities of large companies are maturing. They understand the benefits, and are steadily improving ICT tools to their own advantage. They have connected their systems to many of their major tier-1 suppliers for e-business. But supply chain integration often comes to a halt at that point: many of the small supply firms still cannot cope with system require ments, and they risk exclusion from the value network. Policy and industry initiatives are increasingly addressing this issue.

>> *ICT outsourcing, out-tasking etc:*
Spectacular, large-scale ICT outsourcing projects will be the exception in the future. New and more flexible arrangements with external service providers (e.g. for specific tasks, or for maintenance services) will often be preferred.

>> *Open source and software as a service:*
Business models for software service provision could change in the future. Rather than just selling a product, the service component is becoming increasingly important. Growth in the use of open source (OS) software components is reinforcing this trend. These changes can be a challenge for business advisors; the range of products and service models from which companies can choose has increased.

>> *Information management:*
The role of information management (IM) in companies may further increase in importance. IM will take on the role of intermediaries between the traditional ICT department, the management and the operational departments of a company (i.e. the internal ICT users).

Sectoral e-business differences – manufacturing, construction, services

The intensity, focus and impact of electronic business depend on the business activity of companies, and on the configuration of the value system in which these companies operate. In manufacturing sectors, companies focus on procurement processes, optimising supply chain management, and integrating with retail and distribution. In a project-oriented business such as construction, applications supporting project management have a high potential. In tourism, online information and reservation services have become a commonplace. In telecommunications, it is hardly possible to make a clear distinction between the use of e-business by telecom firms themselves and the provision of related services to (business) customers. Hospitals aim at improving the efficiency of their internal processes as well as document exchanges within the health system by means of ICT, thus cutting costs.

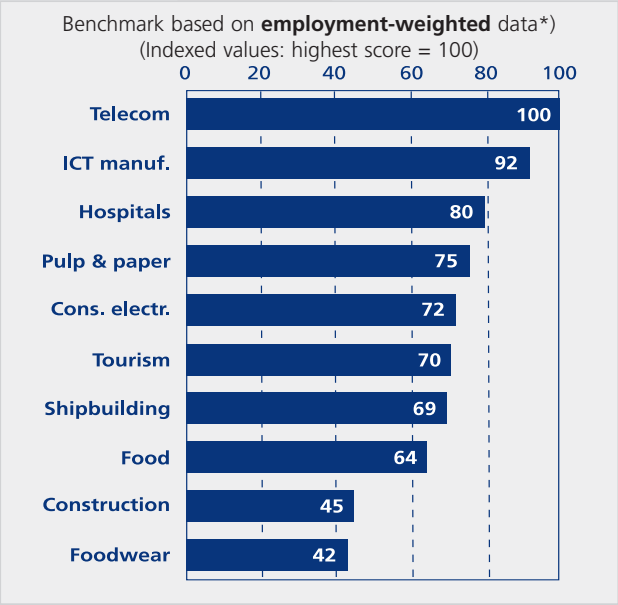
Exhibit E-1: The relevance of ICT and e-business in 10 sectors in 2006
(overall assessment based on survey results, desk research and case studies)

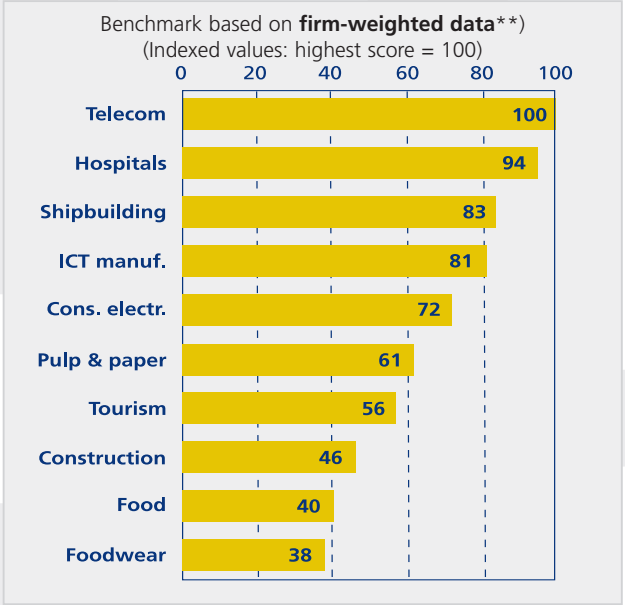
Application / Sector	e-Sourcing & procurement	e-Logistics/ SCM	e-Design & planning	e-Marketing & sales	ICT use for innovation	Perceived ICT significance
Food & beverage	●●	●●●●	●●	●●	●●	●●
Footwear	●	●	●	●●	●●	●
Pulp & paper	●●●	●●●	●●	●●●	●●	●●
ICT manufacturing	●●●●	●●●	●●●	●●●	●●●●	●●●
Cons. electronics	●●●●	●●●	●●●	●●●	●●●●	●●●
Shipbuilding	●●	●●	●●●●	●	●●	●●
Construction	●●	●●	●●●	●	●●●	●●
Tourism	●●●	●●●	●●	●●●●	●●	●●●
Telecoms	●●●●	●●	●●●	●●●●	●●●●	●●●●
Hospital activities	●●●	●●	●●	●	●●●	●●●

● = below average relevance / diffusion; ●● = average relevance / diffusion; ●●● = above average relevance /diffusion; ●●●● = high relevance / diffusion; ● = applies only for some sub-sectors / types of firms

Source: e-Business W@tch (2006) – based on analysis from the respective Sector Studies

Exhibit E-2: e-Business Index 2006 for 10 sectors (EU-10 data) [9]





**) Employment-weighted data express e-business adoption as "activity in firms comprising …% of employment in a sector", thus emphasizing the situation in larger firms.*

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

9. *The e-Business Index is based on 16 component indicators. It can be used for benchmarking the intensity of ICT use in companies from different industries or countries. However, it is a simplified, aggregated view; results depend on the choice of indicators and the weighting of underlying data (for more information, see Annex III - Methodology).*

Manufacturing

In general, large companies drive e-business development in manufacturing industries. Supply-chain integration is a key objective for many e-business initiatives. In parallel, innovative ICT-based forms of customer service are rapidly gaining momentum, even in B2B oriented sectors. However, the 'digital divide' between large and small companies is still very pronounced, for example in the food & beverage, pulp & paper and shipbuilding & repair industries.

Among the six manufacturing sectors surveyed in 2006, electronic business activity has reached the highest level of intensity in the ICT-related industries, i.e. in **ICT manufacturing** and **consumer electronics**. In these industries, the prevalence of large companies, intense competition, frequent product changes and production dispersion drive e-business adoption. More than in other industries, companies feel a major impact from ICT on relations with business partners and on the entire value chain.

By contrast, in the **footwear** industry, ICT usage appears to be much lower than in other manufacturing industries. This applies even to larger firms from the sector. To some extent, the delayed ICT adoption in this industry could be a case of a 'chicken-and-egg' dilemma: on the one hand, the crisis of the footwear (and textile) industries in Europe makes companies feel that e-business is a secondary goal, as there are more pressing issues to be dealt with. On the other hand, a low level of investment in new technology creates opportunity costs, e.g. in form of lower productivity growth. This means it will be even more difficult for firms in Europe to compete with low-wage countries.

In the **pulp and paper** industry, the main impact of ICT is as a driver and enabler of process innovation in supply chain management and B2B trading processes. Large companies from the sector use ICT quite intensively in all application areas along the value chain: for procurement processes, in production, inbound and outbound logistics, and in marketing and customer service.

In the **food and beverages** industry, supply chain management is likely to remain a key point of focus for the leading players in the future. The objective is not only to reduce costs. The globalisation of supply chain sourcing and intensified safety concerns have added important new links to the supply chain: the issues of food supply safety and traceability.

A key application area for ICT in the **shipbuilding and repair** industry is the integration of engineering and production processes along the value chain. This integration has effects on the competitiveness of individual shipyards, as well as on the industry as a whole.

Construction

At first sight, e-business activity in the **construction** industry appears not to have the same intensity as in advanced manufacturing sectors. However, as the questionnaire of the *e-Business W@tch* survey is geared principally toward ICT use in manufacturing, statistical results may not fully reflect some of the emerging trends in construction. For example, project-oriented technologies such as project web and 3D visualisation tools carry significant economic potential for this industry. Although they are not yet widely deployed in the sector, there are examples demonstrating that companies can benefit from using these technologies.

Service sectors

e-Tourism is one of the most dynamic areas of e-business, with a major impact for nearly all players involved. ICT usage enables service providers to interact directly with customers, which puts severe pressure on traditional intermediaries such as travel agencies and tour operators.

Telecommunications companies have a forerunner position as intensive users of ICT and e-business in almost all application areas. Moreover, the wide diffusion of e-business technologies among smaller enterprises too distinguishes this sector from most other industries studied by *e-Business W@tch*.

Almost all European **hospitals** have at least an electronic system for patient data and financial administration. However, few of them use more sophisticated systems, and departmental information systems are often not integrated with each other. Core drivers of e-business in hospitals include cost containment, improvement of quality of care, and state regulations, for example the implementation of Diagnosis-Related Groups.

Geographic disparities in ICT use for business

In international comparisons, EU enterprises are – on average – level with their counterparts in other advanced economies in their use of ICT. There are differences within the EU, however, particularly with regard to the average ICT maturity of smaller companies. In general, firms in Northern European countries are more advanced than companies in Southern European countries and from most of the new Member States in linking their business processes internally and with business partners.

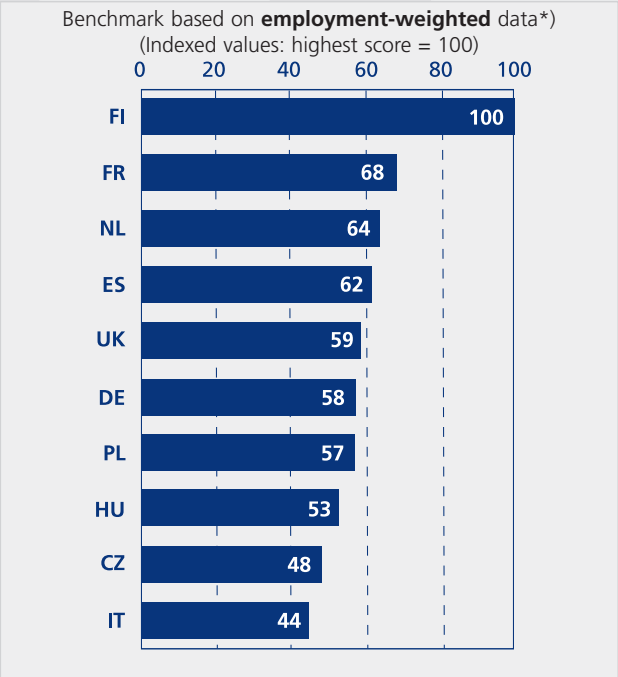
The e-Business Index 2006, composed of 16 indicators, shows Finland as the e-business benchmark in a comparison of eight EU countries (see Exhibits). Companies from France, the Netherlands, the UK and Germany are very similar in their use of ICT, particularly if emphasis is laid on the larger companies (see employment-weighted Scoreboard). Firms from the new Member States (Czech Republic and Hungary), although taking the lower ranks in this benchmarking exercise, are not far behind in their use of ICT.

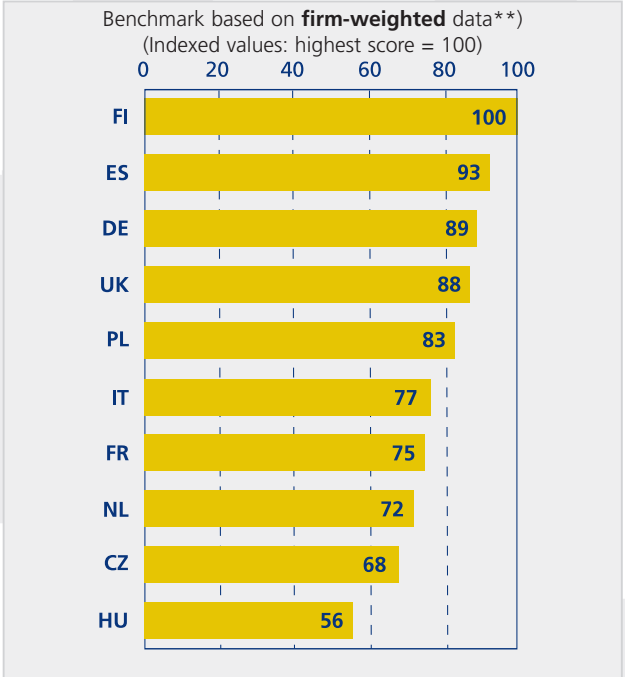
Impact of industry structure – challenges for comparisons by country

With the possible exception of the Nordic countries, the location of a company is by no means a reliable predictor of its level of e-business activity. This may be due to structural characteristics. In Italy, for example, sectors dominated by small firms are much more prevalent than in other countries. Since large firms are more advanced in electronic business, aggregated data may point at a lower level of e-business activity in Italy. This reflects, at least to some extent, the structure of the economy rather than the overall e-maturity of firms.

In contrast to Italy, the relative performance of French and Dutch companies is significantly better if the emphasis is on larger firms. These benchmarking results suggest a pronounced digital divide between small and large firms in these countries.

Exhibit E-3: e-Business Index 2006 for 10 EU countries





**) Employment-weighted data express e-business adoption as "activity in firms comprising …% of employment in a sector", thus emphasizing the situation in larger firms.*

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

Source: e-Business W@tch (2006)

Opportunities and challenges for small companies

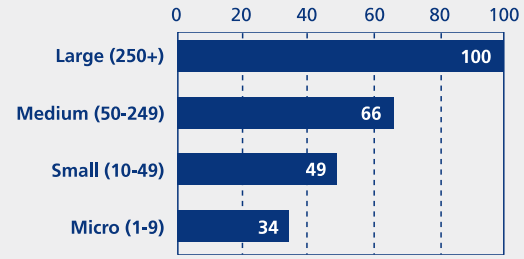
e-Business activities of large companies are rapidly maturing. These companies have powerful ICT systems for linking business processes, understand their benefits and possess the necessary know-how to steadily improve these systems to their advantage. Many smaller companies, by contrast, still struggle with the requirements of getting digitally connected with their suppliers and customers. If they cannot cope with requirements of the digital economy, they risk being eliminated from the value systems that tend to be orchestrated by large firms.

Exhibit E-4: The e-Business Index 2006 by firm size

	A	B	C	D
Micro (0-9)	41	23	34	40
Small (10-49)	60	39	43	54
Medium (50-249)	84	56	56	67
Large (250+)	100	100	100	100

A = Sub-Index "ICT networks"
B = Sub-Index "e-Integration of internal processes"
C = Sub-Index "e-Procurement and supply chain integration"
D = Sub-Index "e-Marketing and sales"

Overall Index (based on firm-weighted data*)



** Firm-weighted data express e-business adoption as "% of firms within a size-band with a certain activity".*

Source: e-Business W@tch (2006)

ICT implications for SMEs are ambivalent. On the one hand, ICT may offer increased economies of scale. Large enterprises can afford powerful ICT systems at proportionally lower cost than SMEs have to meet for their comparatively simple infrastructure. The e-Business Index 2006 confirms that the diffusion of ICT systems for internal and external process integration increases in a linear fashion according to firm size.

On the other hand, it is debatable whether small companies really need the same powerful solutions as large firms in order to achieve the same benefits. In a small company, information management and e-business can possibly also be effectively and efficiently achieved by the use of less sophisticated and less expensive systems.

e-Business Opportunities for Small Firms

>> **ICT usage facilitates cooperation:**
SMEs need to cooperate, for example by building networks. ICT usage facilitates cooperation in many ways (e.g. through project management tools, or online collaboration tools for design).

>> **The SME potential of new technologies:**
Current technological developments hold some promise for small companies, for example Voice-over-IP telephony and mobile e-business solutions. Moreover, ICT companies are increasingly addressing the SME market by developing affordable, smaller-sized solutions (e.g. ERP and CRM suits).

>> **Metcalfe's Law:**
The value of any communication technology is proportional to the square of the number of users of the system. Large companies have recognised that they need to get their small business partners "on board" in order to reap the full benefits of e-business. Policy is also focusing on the integration of small firms in their "digital eco-systems".

>> **Going international:**
Many SMEs are forced to expand their market area. e-Commerce can be an opportunity (if not the only way) for them to achieve this goal.

e-Business Challenges for Small Firms

>> **Complying with ICT requirements of large firms:**
Large companies use their power to impose ICT standards and systems upon small supply companies. Small firms risk being forced to comply with different systems in parallel.

>> **Lack of ICT strategy and skills:**
Smaller firms often lack a coherent ICT investment strategy or the related skills - partly because most SMEs cannot afford to employ ICT practitioners: According to the e-Business Survey 2006, only about 15% of small firms and 30% of medium-sized firms employ ICT practitioners, i.e. have their own ICT department. Thus, ICT strategy and implementation critically depends on respective skills of the management.

>> **Shift of power:**
Large companies' e-procurement schemes tend mainly to benefit the buyer, due to increased price transparency. Effects are similar to those of price finders and auction platforms in the consumer market. This development can lead to erosion of profit margins for SME suppliers.

ICT impact on firms

A special study conducted by *e-Business W@tch* in 2006 (see also Section 1.9) found that advanced users of ICT are more likely to exhibit increases in employment. Furthermore, firms that conduct product innovations are more likely to increase employment. Only 22% of non-innovative firms report an increase in employment, compared to 34% of firms that carried out non-ICT-enabled product innovations and even 43% of firms that had ICT-enabled product innovations. The data suggest a similarly positive pattern for process innovations.

ICT matters for employment and productivity growth

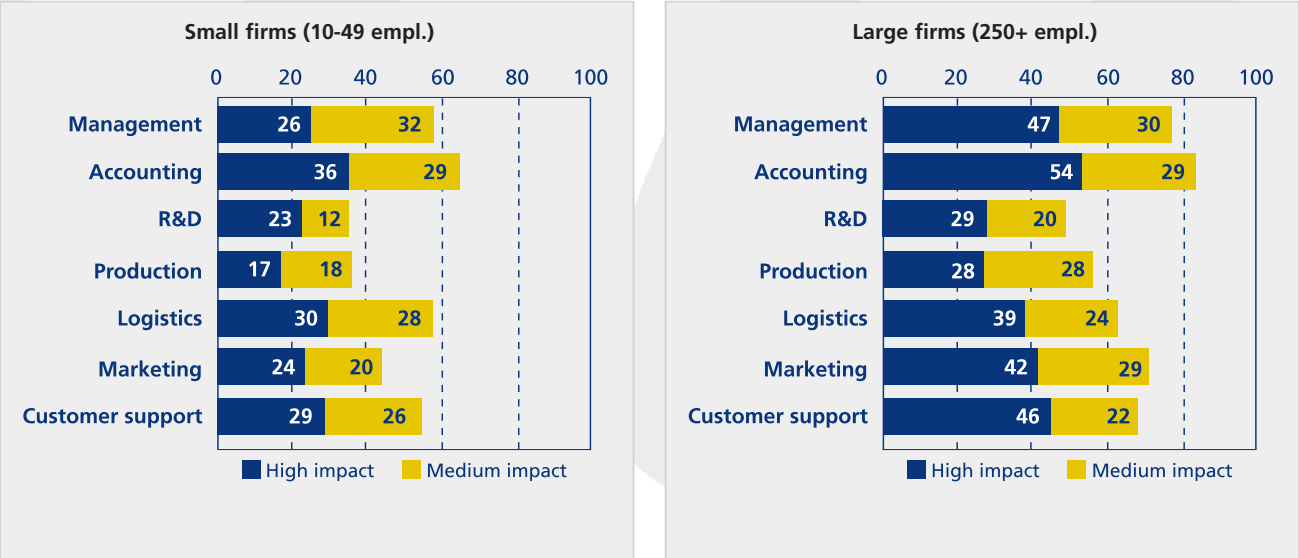
More advanced users of ICT and innovative firms were also found to be more likely to exhibit productivity increases than non-innovative firms at all stages of ICT development. Moreover, the share of firms with increased turnover was significantly higher among the innovators. 70% of firms that conducted ICT-enabled innovations report turnover growth, compared to 44% of non-innovators.

Anticipated future impact of ICT

Firms expect that ICT will continue to have a significant impact on how they do their business in the future. In particular, they believe that ICT will become even more important as a tool to support planning, decision making and controlling. Without doubt, management and controlling functions in an enterprise depend critically on ICT systems. They provide information faster, more flexibly and more concisely than would otherwise be possible. In larger enterprises, many of the regular management reports (e.g. from controlling) are automatically generated from ICT based information systems.

It is interesting that marketing and customer support have overtaken production and logistics as primary application areas for ICT in the scenario of large firms (see Exhibit E-5). This applies not only to service sectors such as tourism and telecommunications (obvious for these industries), but increasingly also to manufacturing sectors.

Exhibit E-5: Percentage of companies expecting that ICT will have a high / medium impact on ... in the future



Base (100%): Companies with computers, EU-10, 10 sectors. N = 2159 (small firms) / 670 (large firms).
In % of firms. Survey question: Do you expect that ICT will have a high / medium / low impact or no impact on <business function> in your company in the future?"

Source: e-Business W@tch (2006)

Policy implications of e-business

e-Business developments can have implications for several policy areas., Relevant considerations in this context can be grouped around two main objectives: promoting ICT adoption and counteracting ICT-induced flaws or market failure.

Promote ICT adoption:
Policies aiming at accelerating the adoption of ICT and e-business practices among companies, particularly among SMEs. This is based on the assumption that ICT is a key driver of productivity and competitiveness. This includes, for example, the following policy areas and types of initiatives:

- **Innovation and technology policy:** creating incentives and a favourable environment for enterprises to innovate; stimulating the development of ICT tools (e.g. for SMEs); promoting interoperability and standardisation processes (and advocating attention to the requirements of SMEs in this context);
- **Education and labour market policies:** ensuring an adequate supply of e-skills in the market, enhancing the managerial understanding of e-business issues in SMEs, supporting employee training and train-the-trainer measures;
- **Role model of the public sector:** recognising the role model of the public sector in ICT adoption, e.g. by using public e-procurement;
- **Awareness raising policies:** initiatives directly promoting ICT uptake, e.g. the organisation of SME workshops, the collection and dissemination of best practice examples, and the facilitation of working with business advisors;
- **Industrial policy:** initiatives to encourage cooperation among SMEs, the formation of networks and clusters;

Counteract ICT-induced 'flaws' or market failure:
Policy interventions to counteract undesirable effects on the aggregate level from deployment of ICT in business. This includes a broad range of policy areas, for example competition policy (with the objective of counteracting market concentration).

The following table summarises policy implications from e-business developments that have been identified in *e-Business W@tch* sector studies in 2006. While some of the goals and types of initiatives proposed are relevant for specific sectors only, others are valid for most sectors (e.g. promoting interoperability).

In the e-Business Report of 2005, two objectives were seen as particularly important: the improvement of **e-skills** among smaller companies, and the advancement of **interoperability** and standards. This assessment remains valid for 2006, in full recognition of the many efforts that have been started at regional, national and European levels to address these goals.

Exhibit E-6: Policy implications arising from e-business

Policy objective	*Suggested actions*	*Possible initiators*
Improve the skills base in SMEs and ensure supply of e-skills in the market	• Promote the managerial understanding of e-business in small enterprises, recognising that only about 15-30% of SMEs actuallyemploy ICT practitioners • Help SMEs to better understand organisational aspects of e-business, not just to focus on technology • Provide unbiased information on how to assess cost-benefits of e-business, e.g. by benchmarking ICT solutions for SMEs • Counteract e-business skill-shortages in the market, e.g. by promoting multi-stakeholder partnerships in ICT training programmes • Facilitate knowledge transfer between research centres and enterprises • Provide incentives for ICT training of employees • Create opportunities for dialogue between SMEs and ICT service providers	• Business support agencies • Competence centres • Chambers of commerce • Other intermediaries • Member States (via their e-business programmes)
Promote inter-operability and standardisation within and between sectors	• Launch projects to improve standards for e-business processes, with a particular focus on SME requirements • Support research projects on interoperable solutions • Promote relevant industry initiatives • Encourage adequate representation of SMEs in standardisation processes • Assess the suitability of industry-specific standards for cross-sector interoperability	• International/national standardisation bodies • European Commission • Member States • Industry associations
Encourage networking and cooperation among SMEs	• Encourage initiatives for networking and cooperation, e.g. through competence centres • Stimulate the participation of SMEs in business networks and clusters	• Sector associations • Business intermediaries • Competence centres
Create a favourable regulatory environment	• Address legal uncertainties with regard to cross-border e-invoicing • Facilitate compliance with quality and safety issues (in particular in the food industry)	• European Commission • Member States
Recognise the role model of the public sector	• Use public e-procurement and e-invoicing to stimulate the adoption of these applications among companies which are suppliers to the public sector	• European Commission • Member States • Regional governments
Innovation and technology policy	• Create incentives for innovation, recognising the specific role of ICT in this context • Promote the development of "SME friendly" e-business applications • Enhance security and knowledge protection in e-business transactions • Promote the exchange of companies' experience with emerging technologies, such as RFID	• European Commission • Member States • Regional governments • Business intermediaries
Competition policy	• Ensure competition in the ICT industry in order to enhance the development of affordable ICT solutions for SMEs • Monitor implications of e-business on concentration, e.g. among tourism intermediaries	• European Commission

e-business w@tch

Chart Report: Benchmarking e-Business Activity in 10 Sectors of the European Union

Contents

Chart I-1:

e-Business Index 2006 by sector
Based on 16 ICT indicators
(weighted by employment),
aggregated into two sub-indices
(= axes A, B).

Population: Firms using computers
from 10 EU countries
(CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK)

Size of the bubble:
persons employed in a sector
(in relation to other sectors)
Blue: manufacturing
Red: services
Yellow: construction

Source: e-Business Survey 2006

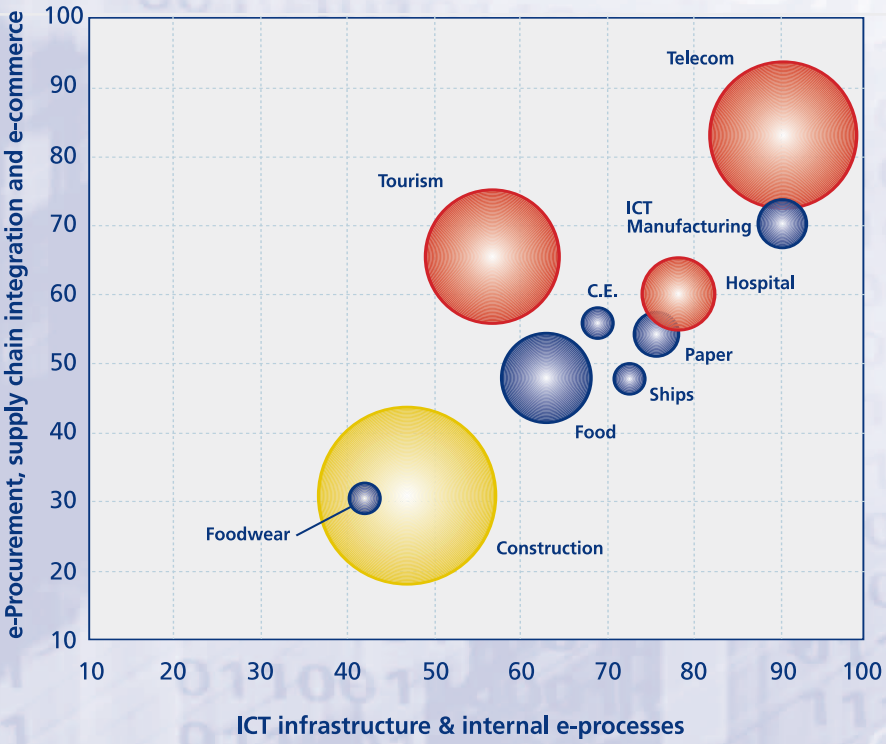
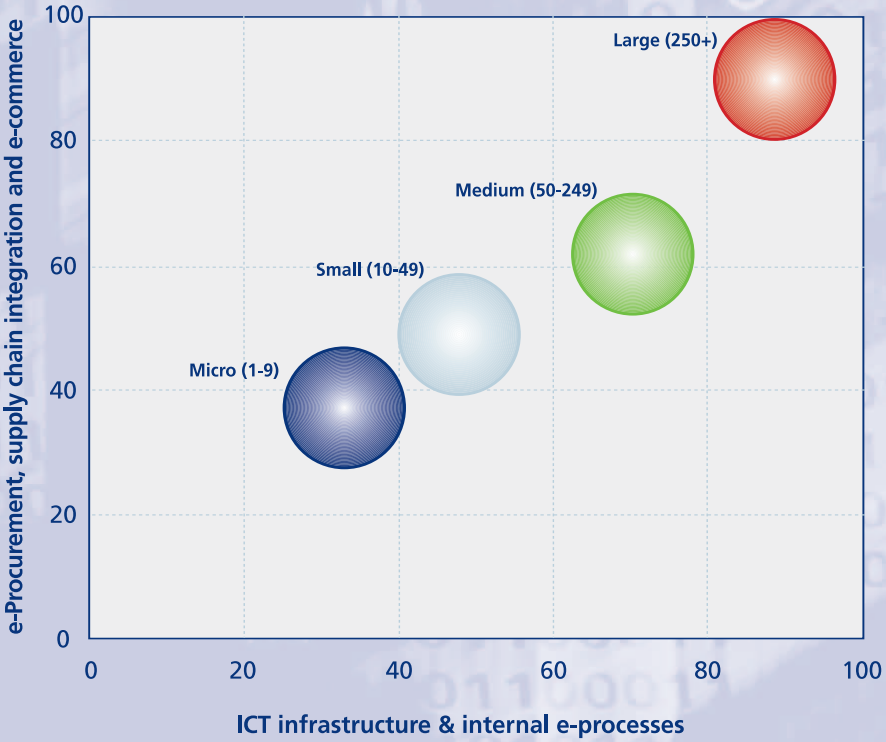


Chart I-2:

e-Business Index 2006 by size-band
Based on 16 ICT indicators
(in % of firms from a country),
aggregated into two sub-indices.

Population: firms using computers from
10 sectors (see Chart I-1)

Source: e-Business Survey 2006



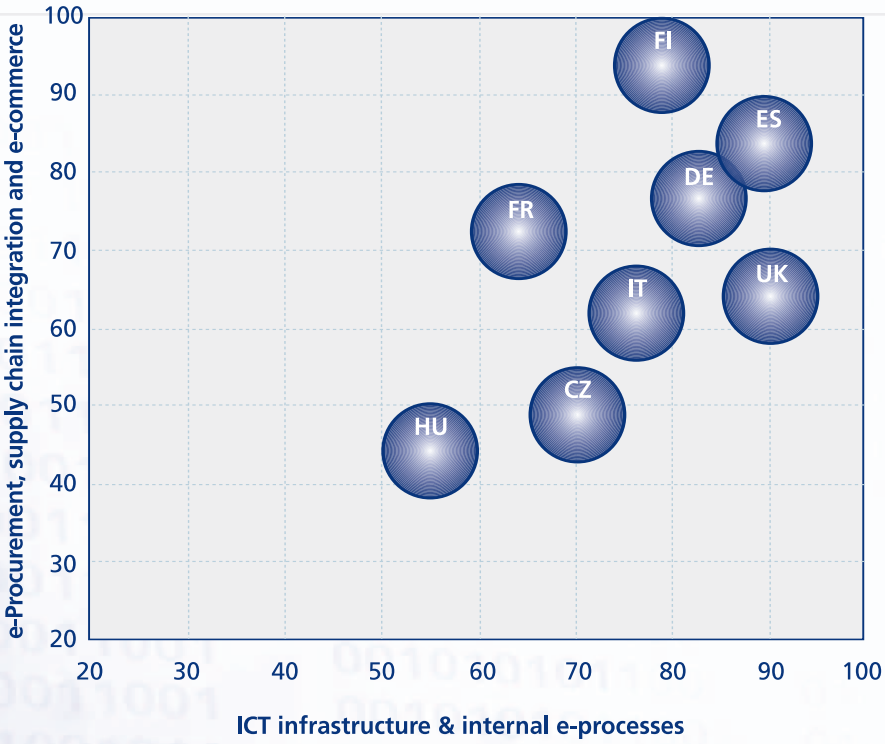
Scales are indexed (100 = maximum). A score of 100 would mean that a sector (or country, size-band) has the highest value for all 8 component indicators that are aggregated within the respective axis.

Chart I-3:

e-Business Index 2006 by country
Based on 16 ICT indicators
(in % of firms from a country),
aggregated into two sub-indices.

Population: firms using computers from 10 sectors (see Chart I-1)

Source: e-Business Survey 2006



Among the 10 sectors surveyed in 2006, companies from ICT-related industries (telecommunications, ICT manufacturing) tend to have the most advanced ICT infrastructure and to make the most intensive use of e-business (see Chart I-1).

In manufacturing, e-business developments have become synchronised across most sectors. Supply-chain integration is a common e-business objective for these sectors, and many of the ICT requirements and applications used are therefore quite similar. The footwear industry is a possible exception – e-business is not as widely used as in other manufacturing sectors.

The development is mostly driven by the large companies, particularly in manufacturing (see Chart I-2). While this is uncontested, results for medium-sized enterprises raise a question mark; the survey of 2005 had indicated that they had caught up with large firms in their e-business activity; the benchmarking scoreboard of 2006 shows a wider gap. However, there are some differences between 2005 and 2006 in the sample of sectors and the choice of component indicators for building the index.

From a country-perspective, companies from the Nordic countries appear to be the most active users of e-business (see Chart I-3), particularly among the SMEs. For many of the other countries covered, however, differences are not very pronounced and do not show a clear pattern (e.g. data for France, Germany, Italy, Spain and the UK). Benchmarking ICT adoption by country is quite complex, as results partly reflect other factors such as industry structure (e.g. the absence of large companies or the dominance of micro and small firms can explain for a comparatively lower level of ICT adoption).

Chart II-1: Enterprises with broadband internet access

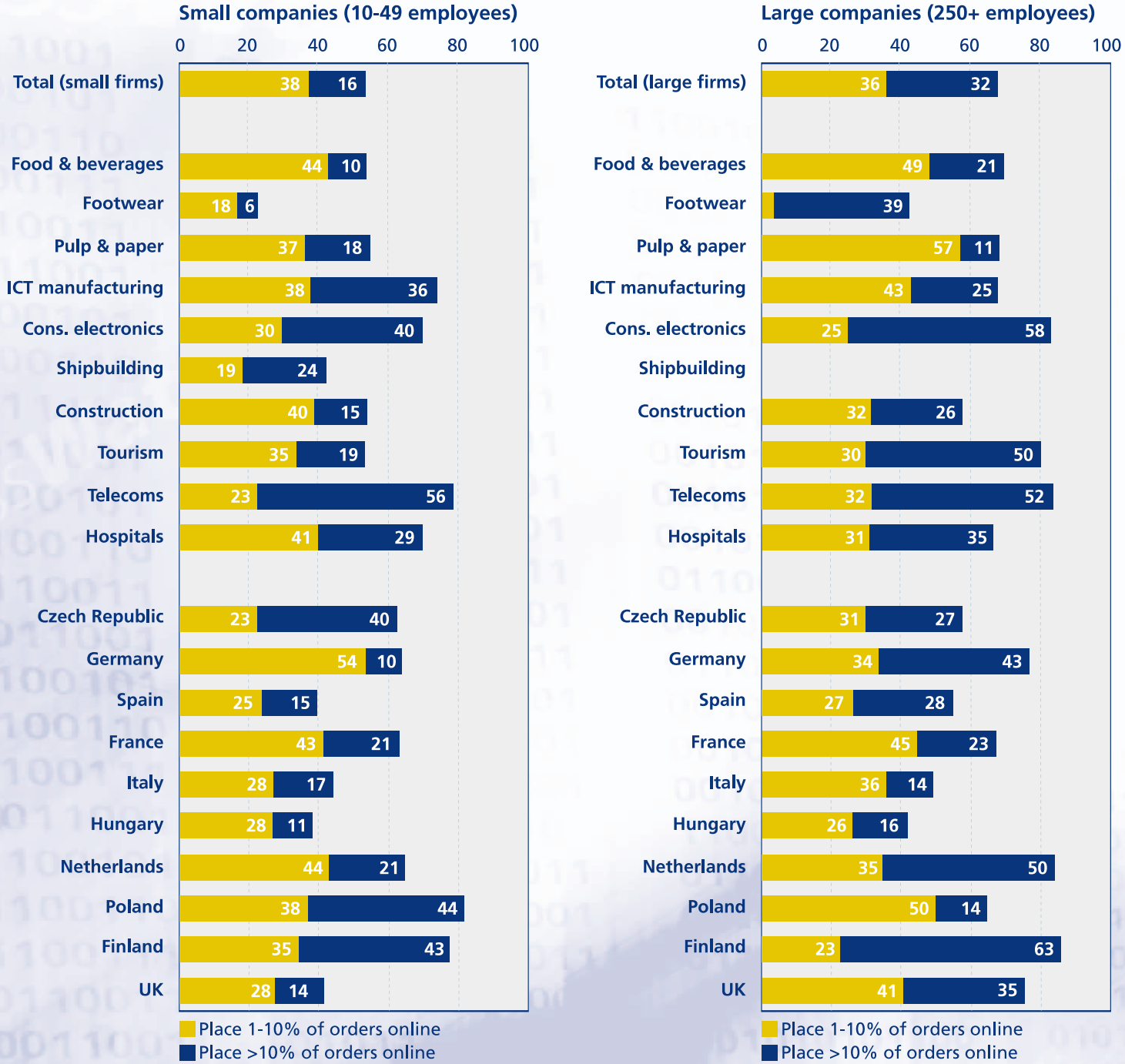
Base: Enterprises using computers. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2159 (Total, small firms) / 670 (Total, large firms). Data in % of firms.
"Broadband" is defined as internet access either by DSL, cable, direct fibre connection or by a wireless broadband connection

Survey question: A1, A3).

Reading example: "62% of small companies in the food & beverage industry have broadband internet access."

Data source: e-Business Survey 2006

Chart II-2: Enterprises placing orders to suppliers online



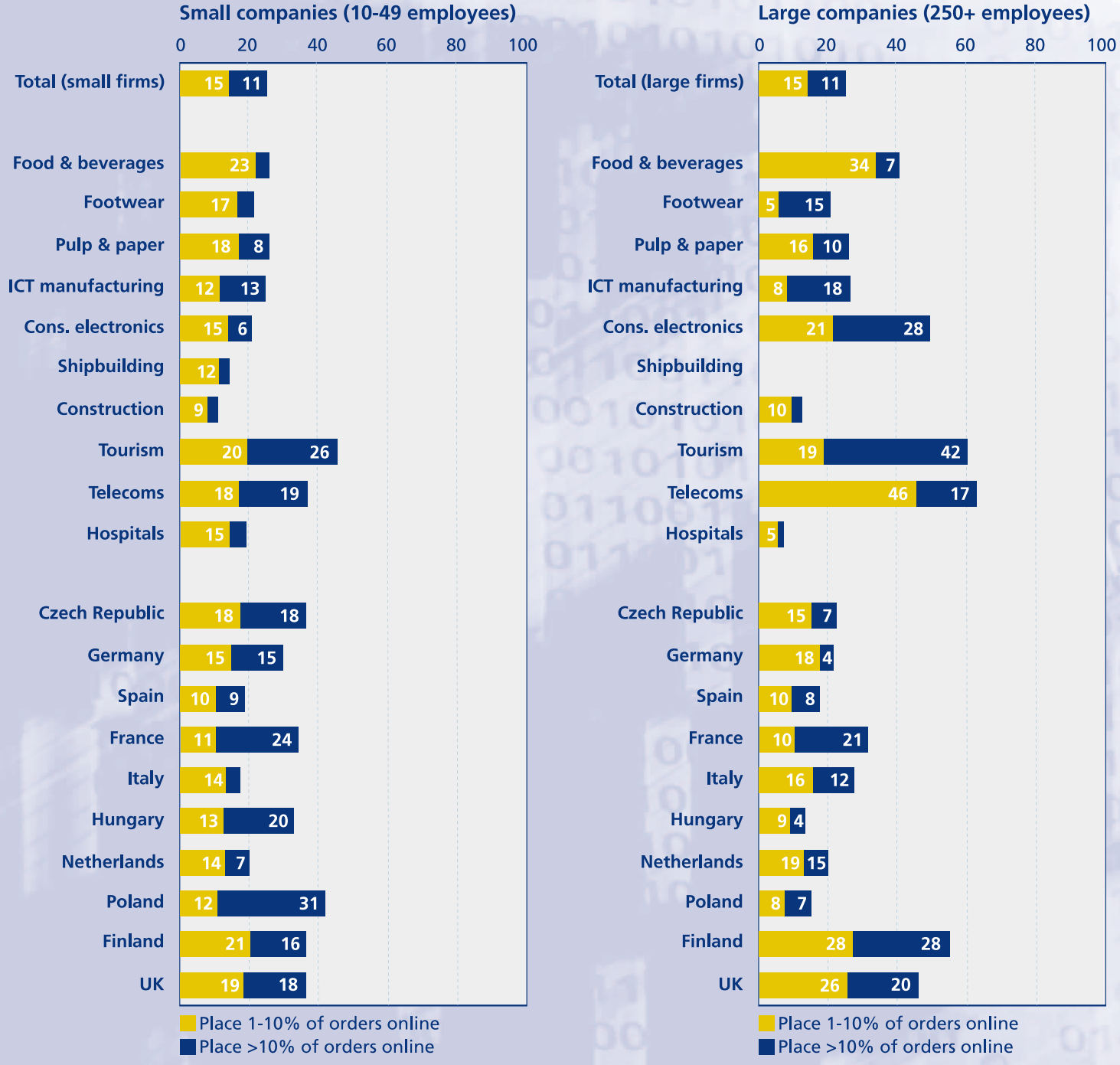
Base: Enterprises using computers. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2159 (Total, small firms) / 670 (Total, large firms). Data in % of firms.

Survey question: E1, E3.

Reading example: "54% of small companies in the food & beverage industry place orders for supply goods or services online. 44% order up to 10% of goods/services online, 10% order more than 10% online."

Data source: e-Business Survey 2006

Chart II-3: Enterprises receiving orders from customers online



Base: Enterprises using computers. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2159 (Total, small firms) / 670 (Total, large firms). Data in % of firms.

Survey question: F4, F6.

Reading example: "41% of large companies in the food & beverage industry receive orders from customers online.
34% receive up to 10% of orders online, 7% receive more than 10% of orders online."

Data source: e-Business Survey 2006

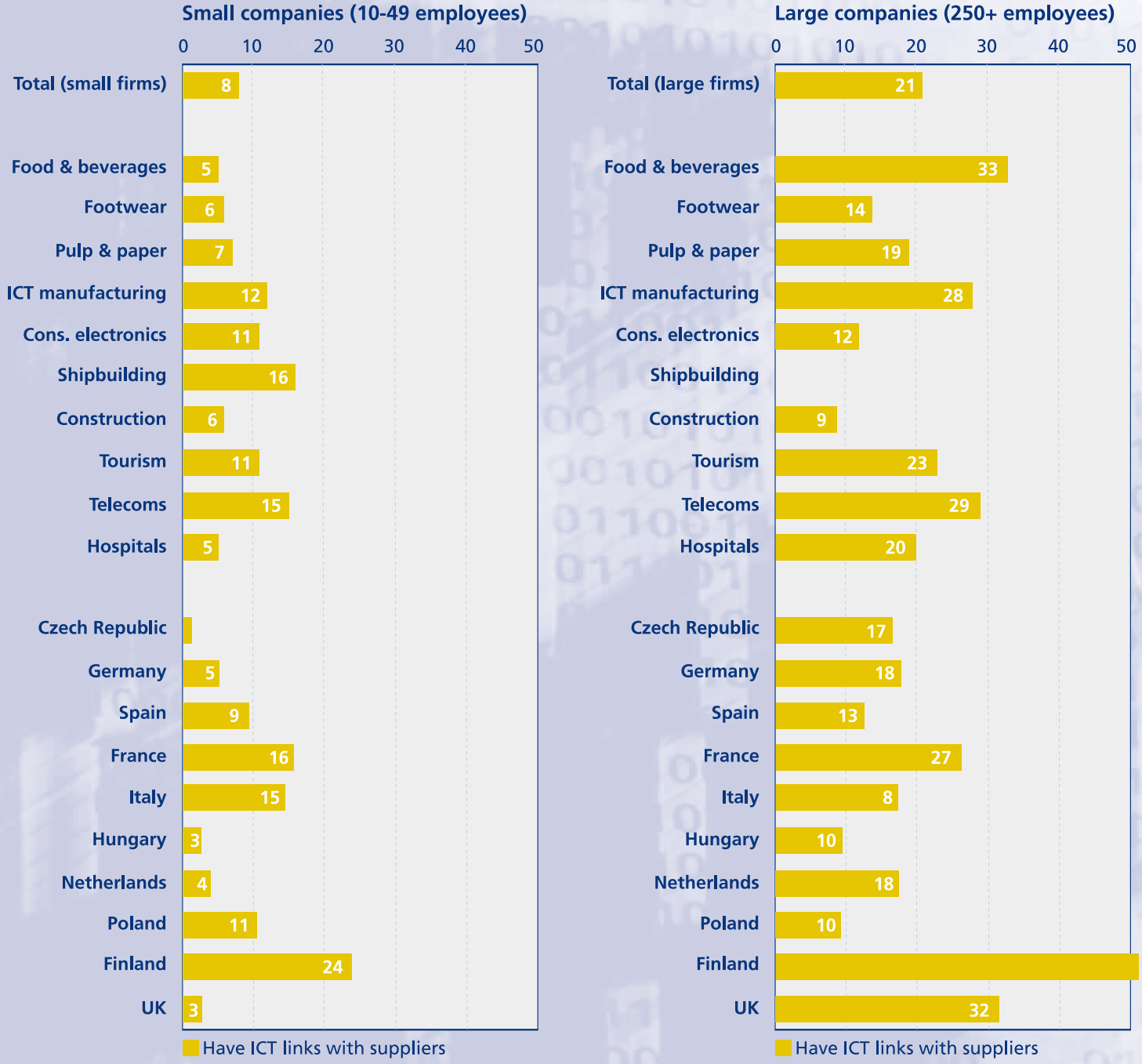
Chart II-4: Enterprises tracking working hours / production time online

Base: Enterprises with internet access. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2112 (Total, small firms) / 667 (Total, large firms). Data in % of firms.

Survey question: D5b: "Does your company use online applications other than e-mail, for example special software, to track working hours or production time?"

Data source: e-Business Survey 2006

Chart II-5: Enterprises having linked their ICT system with suppliers

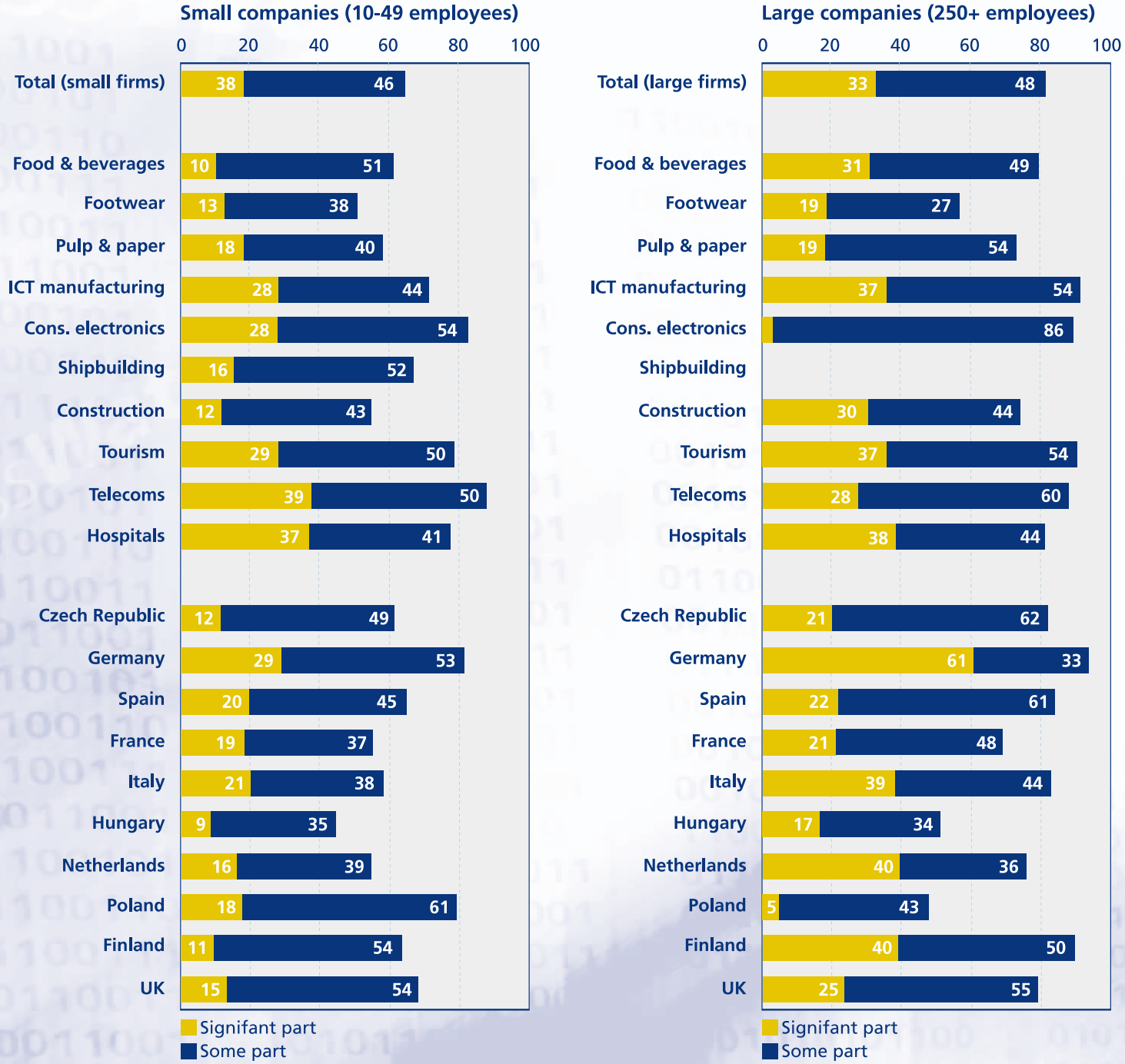


Base: Enterprises using computers. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2159 (Total, small firms) / 670 (Total, large firms). Data in % of firms.

Survey question: F13a: "Is your company's ICT system linked to the ICT system of suppliers?"

Data source: e-Business Survey 2006

Chart II-6: Enterprises saying that e-business constitutes a part of the way they operate

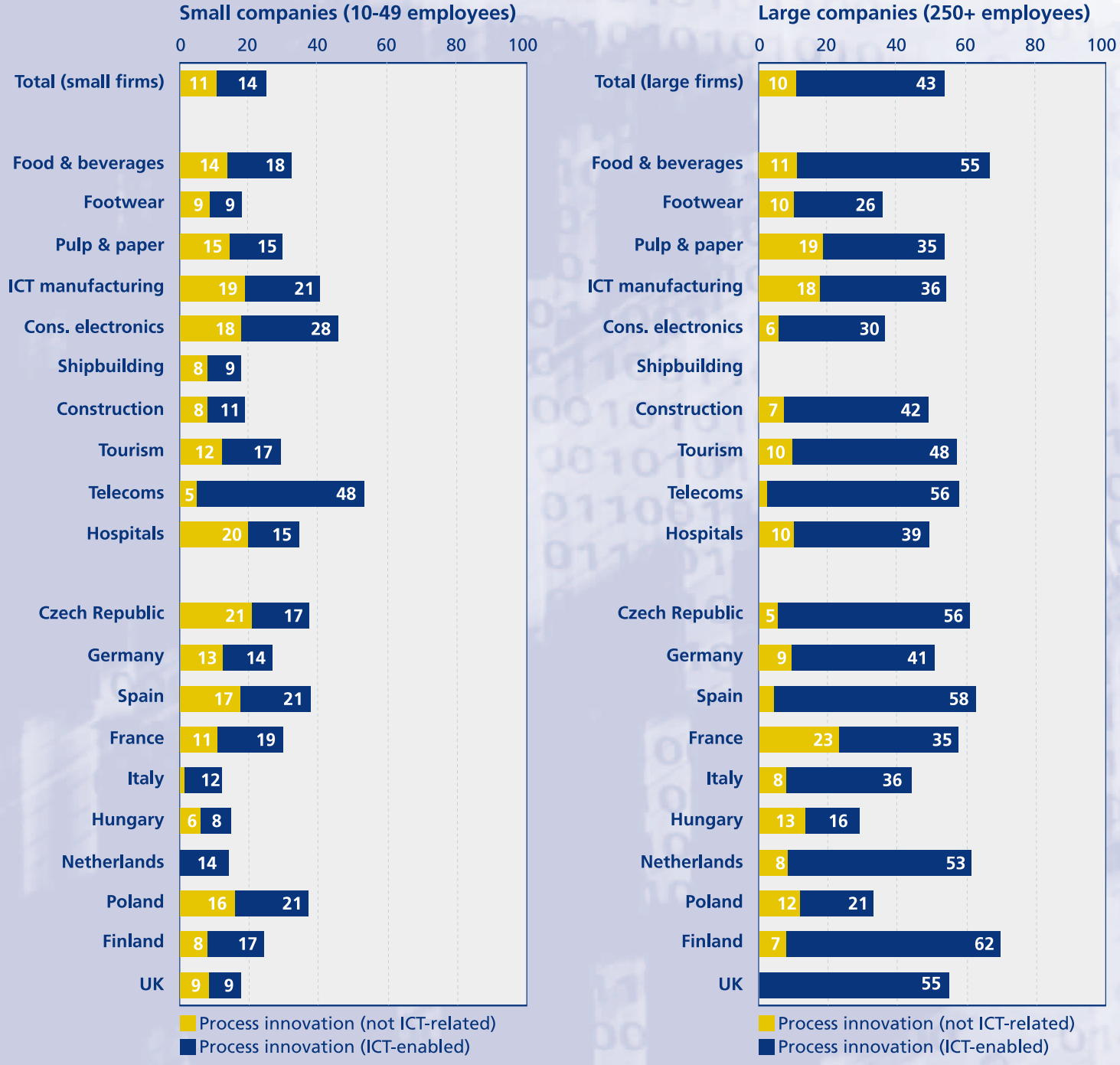


Base: Enterprises using computers (excluding "don't know" replies). "Total" includes enterprises from the 10 sectors and 10 EU countries listed. N = 2133 (Total, small firms) / 655 (Total, large firms). Data in % of firms.

Survey question: H1: "In summary, and according to the overall experience of your company / hospital, would you say that e-business constitutes a significant part of the way your company / hospital operates, or some part or none at all?"

Data source: e-Business Survey 2006

Chart II-7: Enterprises having introduced processes innovation(s) in 2005

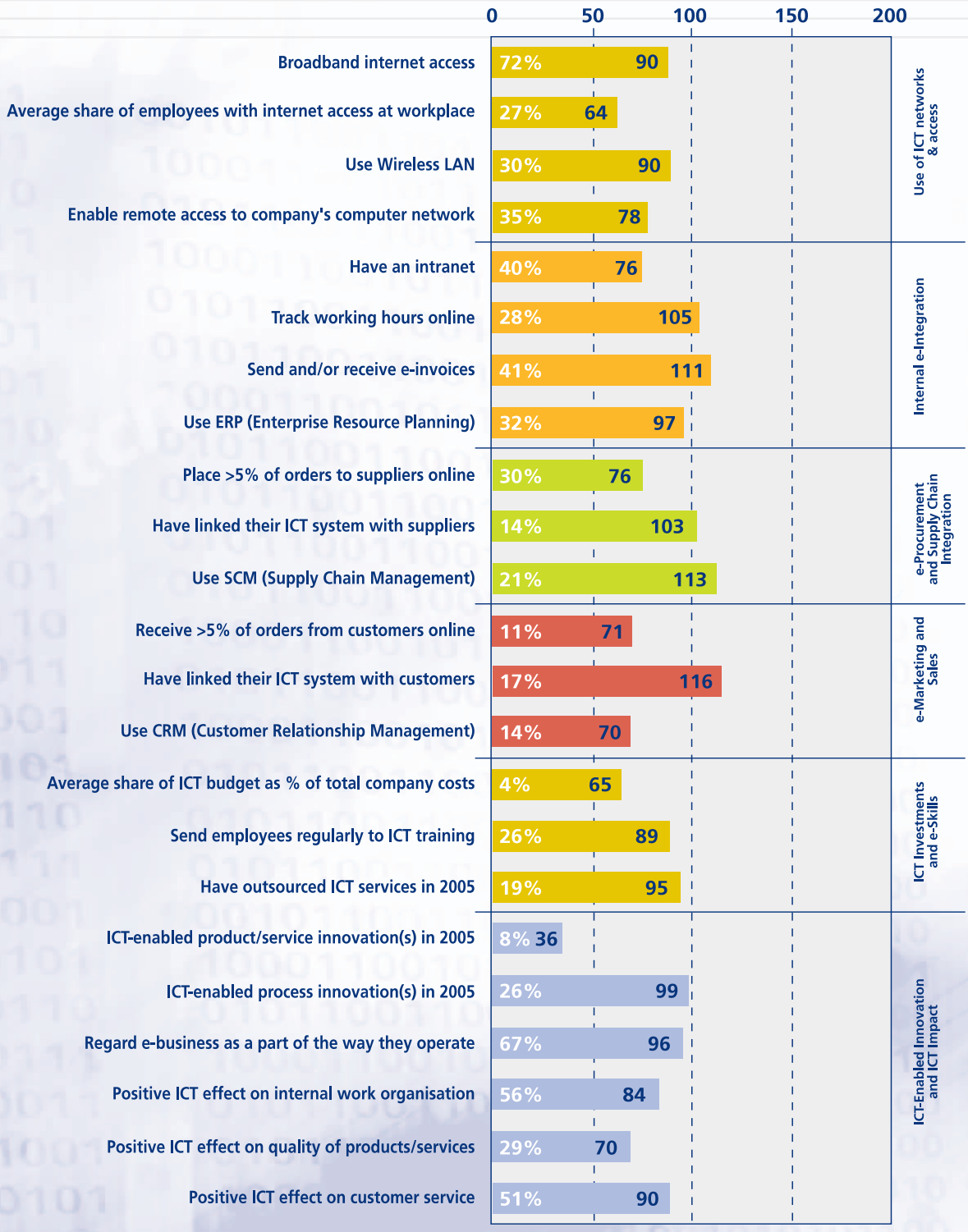


Base: Enterprises using computers. "Total" includes enterprises from the 10 sectors and 10 EU countries listed.
N = 2159 (Total, small firms) / 670 (Total, large firms). Data in % of firms.

Survey question: I3, I4: "During the past 12 months, has your company / hospital introduced any new or significantly improved internal processes, for example for producing or supplying goods and services?" (If so: "Have any of these process innovations been directly related to or enabled by information or communication technology?")

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Food and Beverages



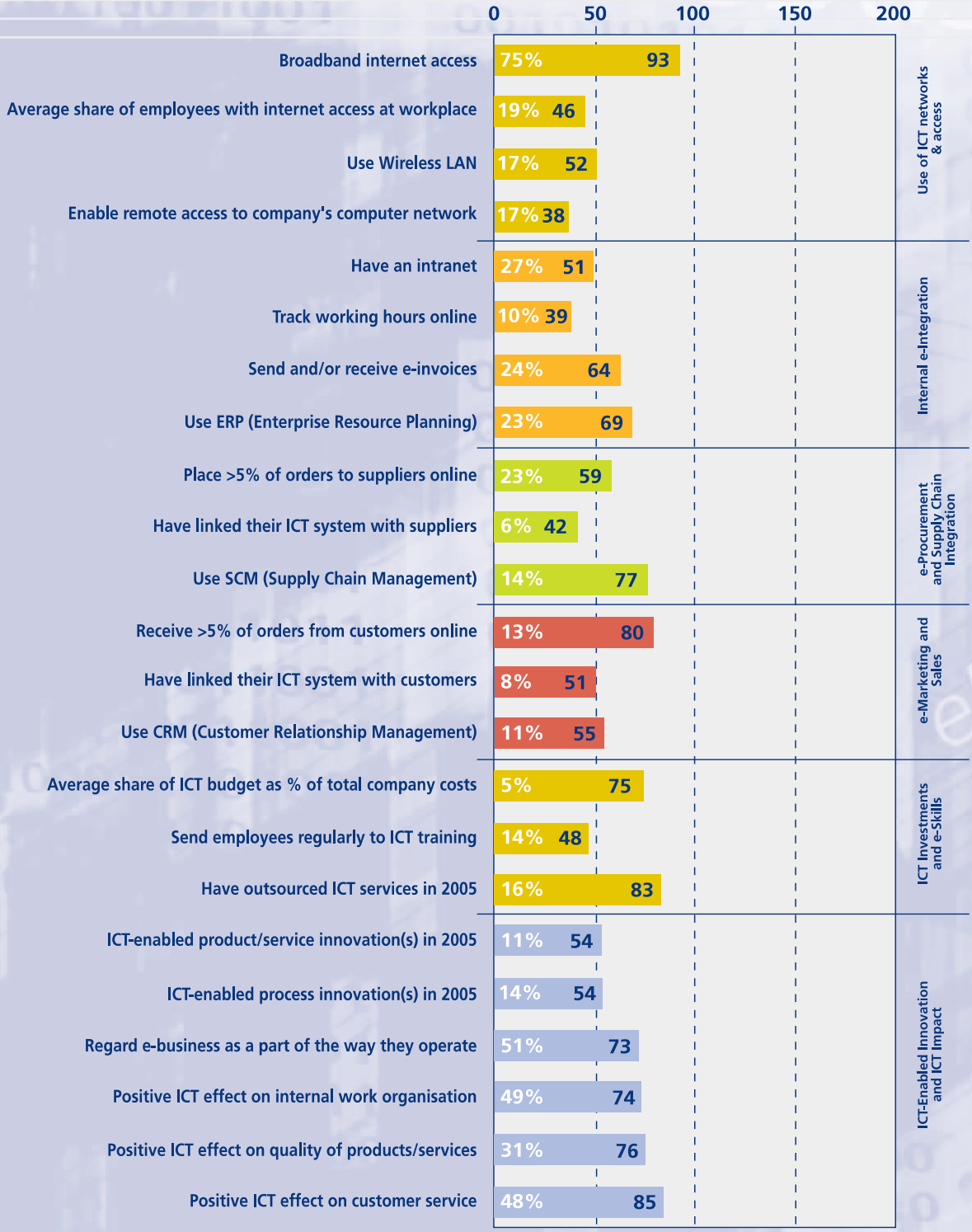
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 72% of employment in the food and beverage industry said they had broadband internet access in 2006. This deviates by 10% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Footwear



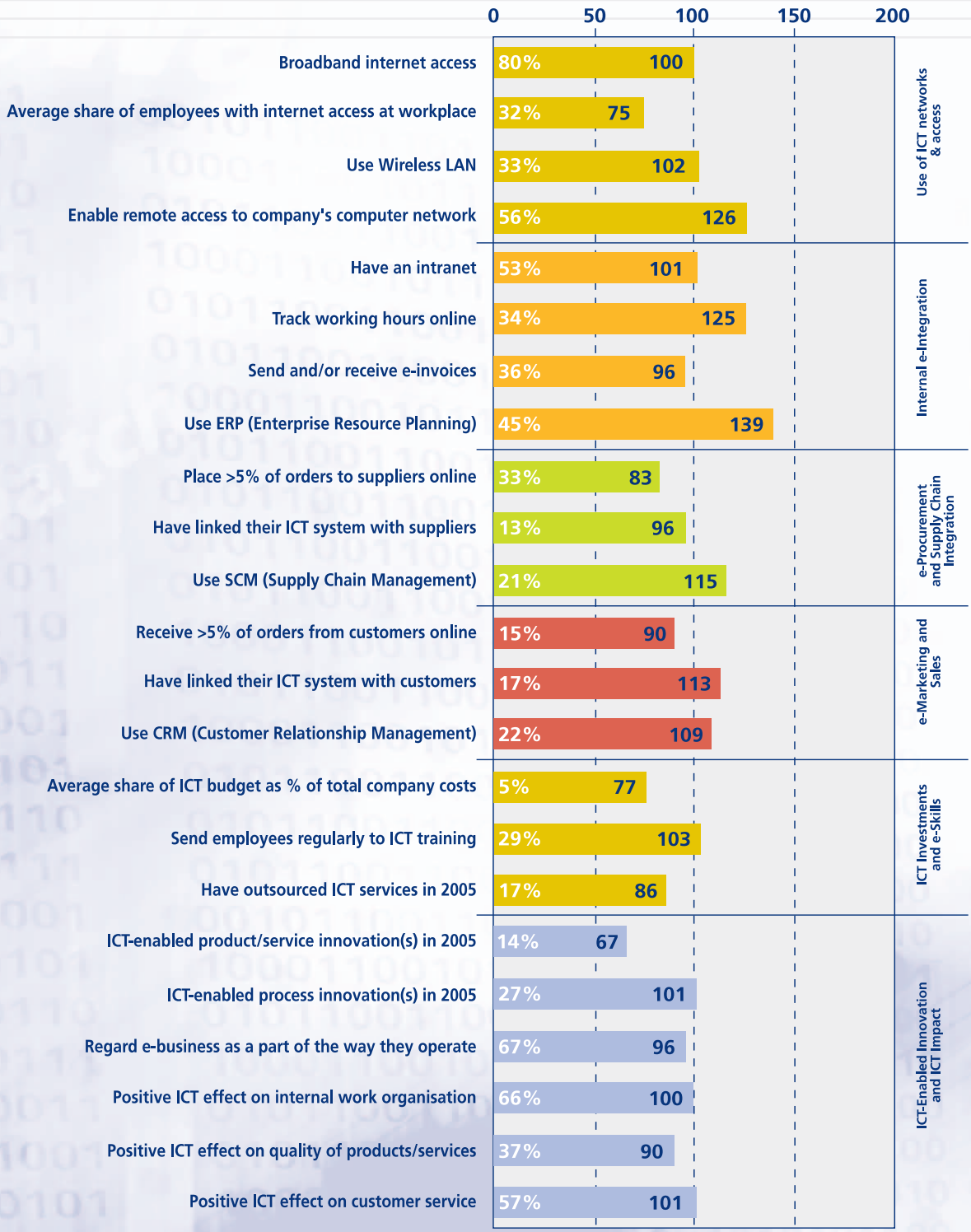
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 75% of employment in the footwear industry said they had broadband internet access in 2006. This deviates by 7% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Pulp & Paper



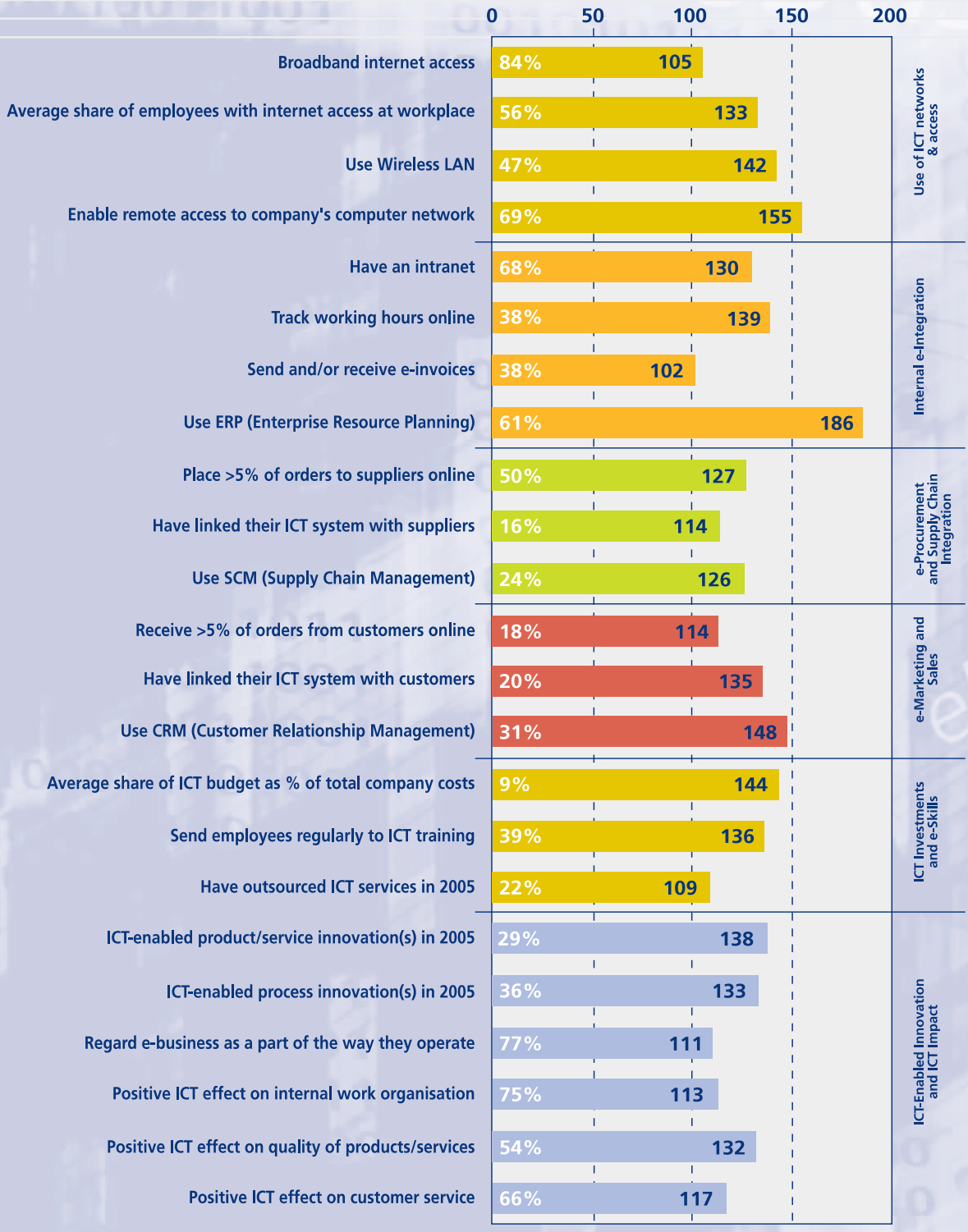
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 80% of employment in the pulp & paper industry said they had broadband internet access in 2006. This deviates by 0% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: ICT Manufacturing



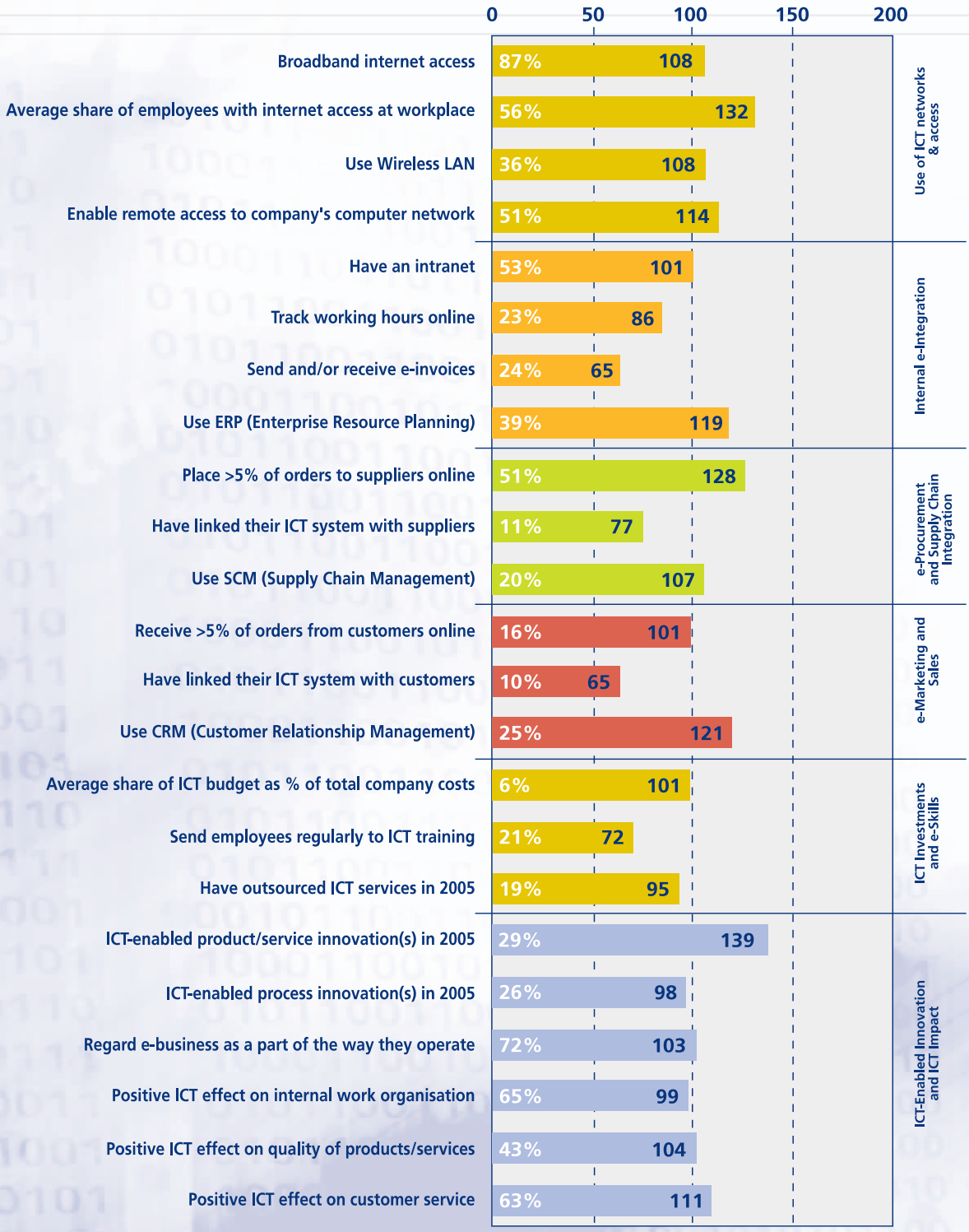
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 84% of employment in the ICT manufacturing industry said they had broadband internet access in 2006. This deviates by 5% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Consumer Electronics



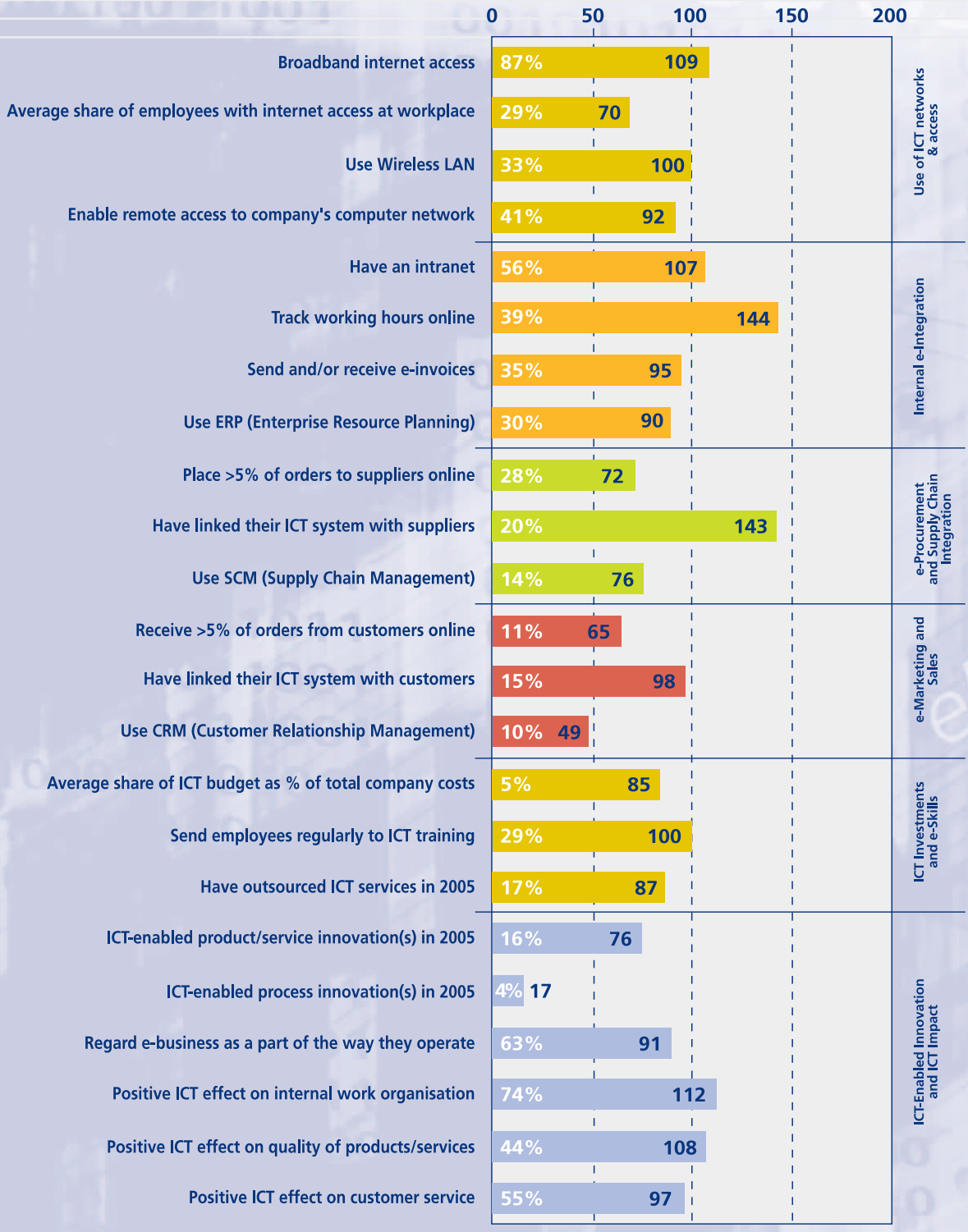
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 87% of employment in the consumer electronics industry said they had broadband internet access in 2006. This deviates by 8% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Shipbuilding & Repair



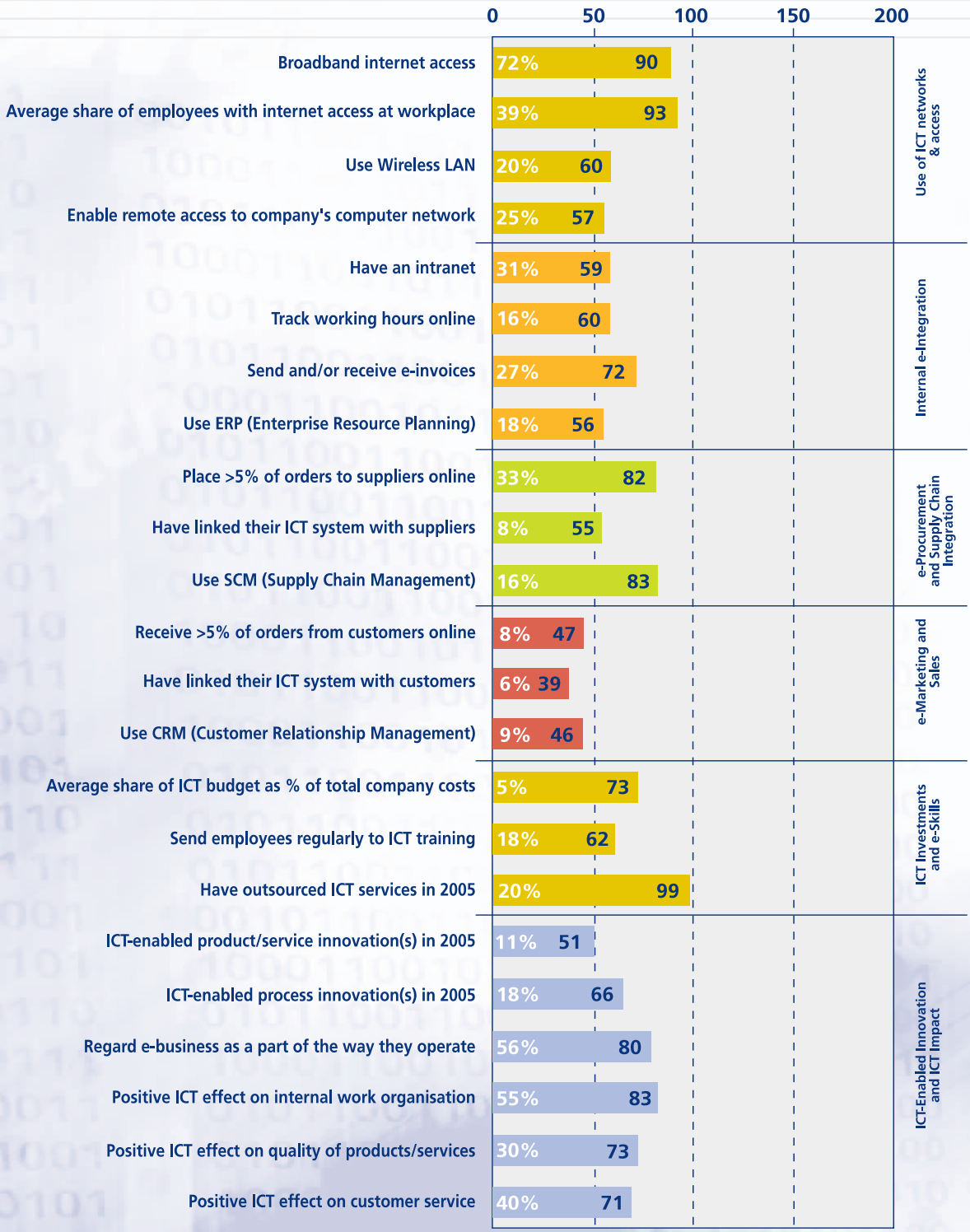
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 87% of employment in the shipbuilding & repair industry said they had broadband internet access in 2006. This deviates by 9% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Construction



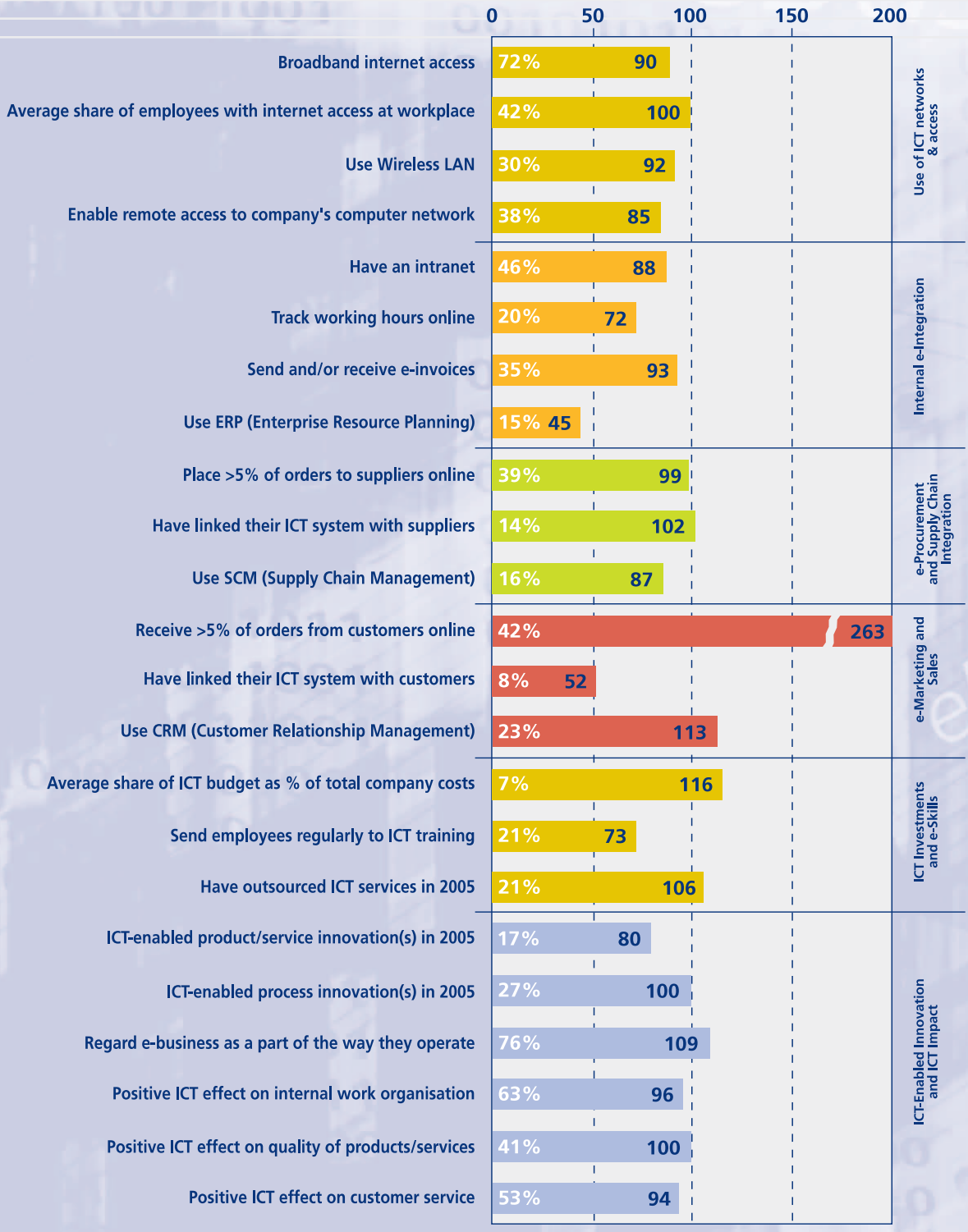
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 72% of employment in the construction industry said they had broadband internet access in 2006. This deviates by 10% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Tourism



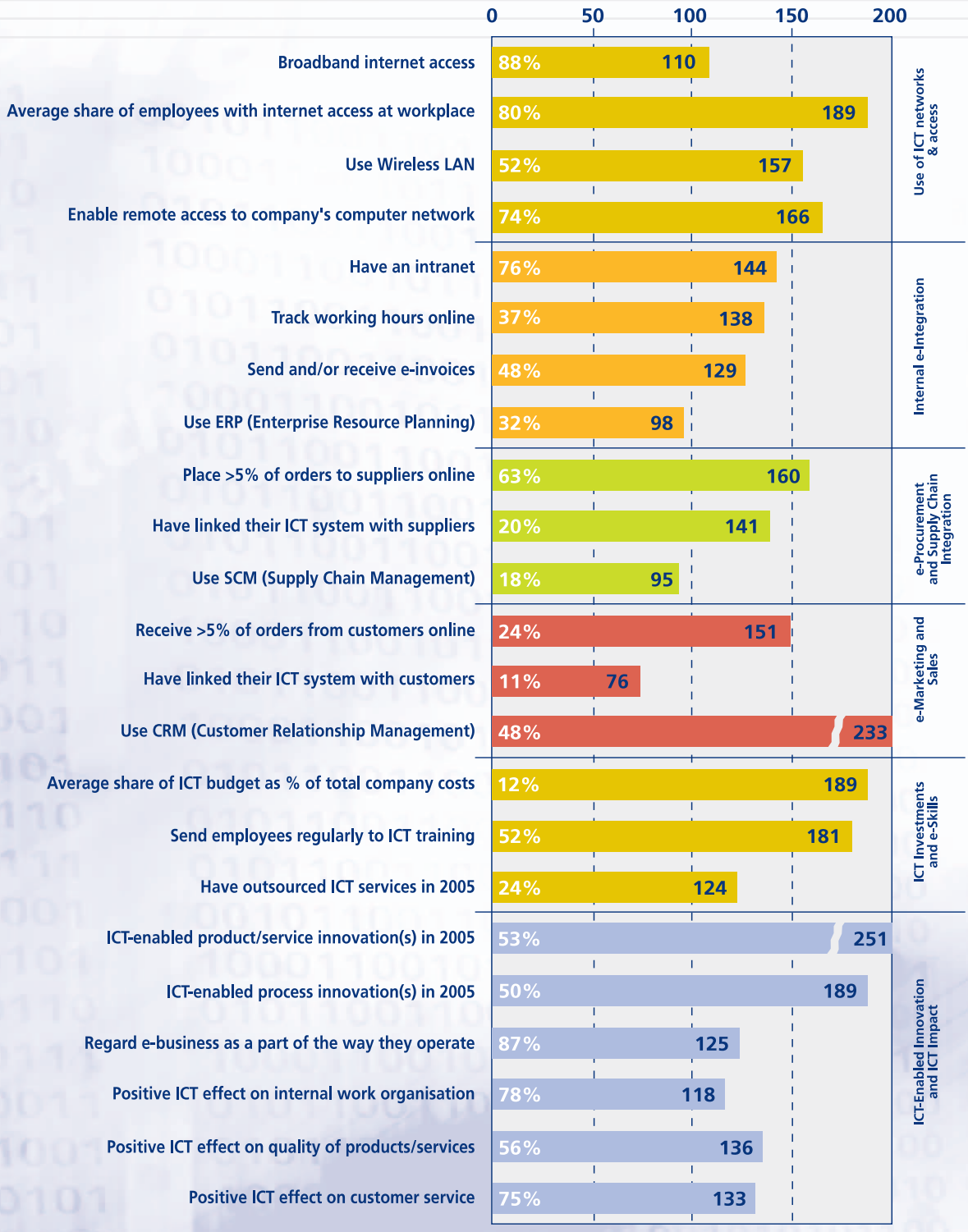
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 72% of employment in the tourism industry said they had broadband internet access in 2006. This deviates by 10% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Telecommunications



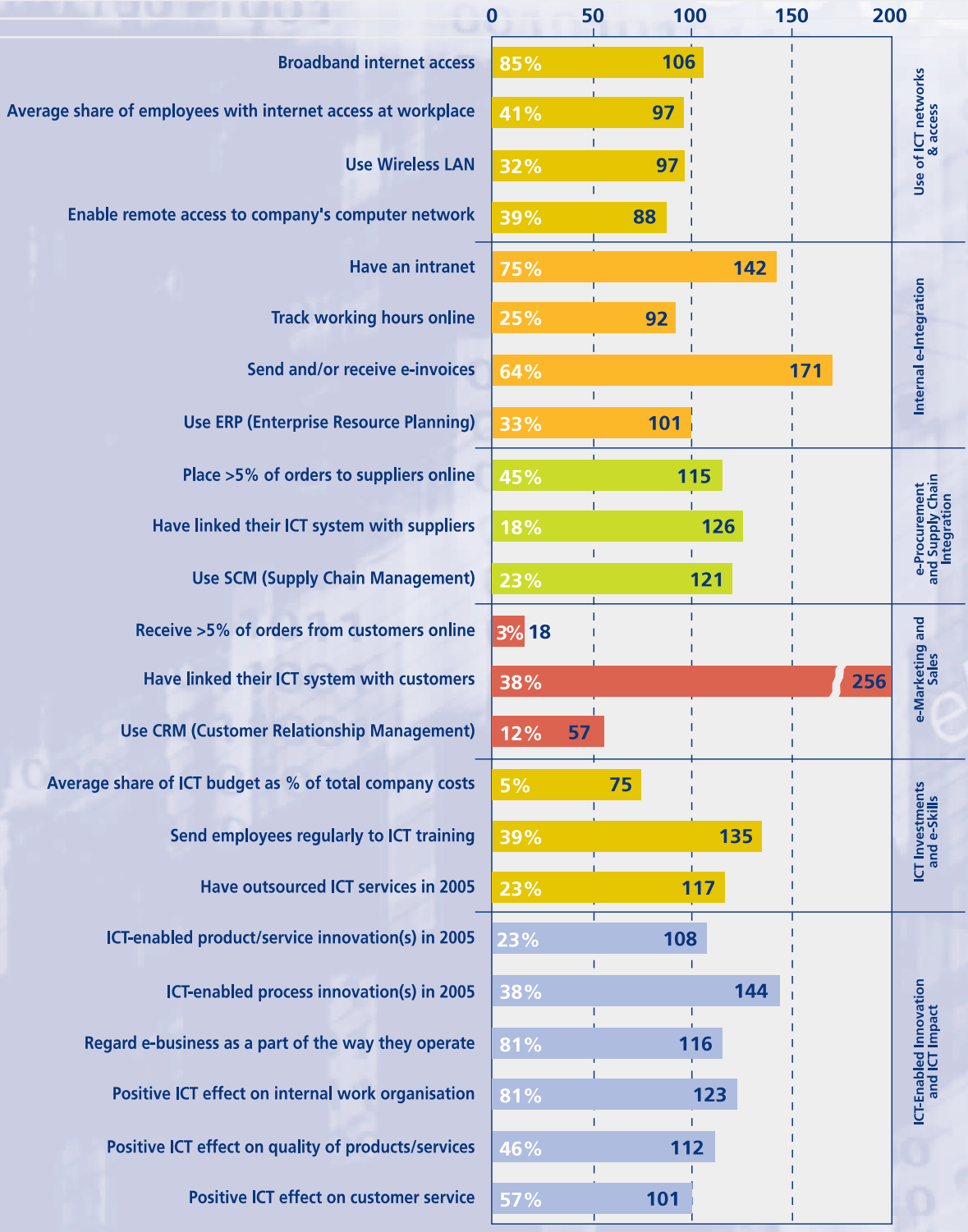
Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 88% of employment in the telecom industry said they had broadband internet access in 2006. This deviates by 10% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

e-Business Benchmarking Scoreboard: Hospital Services



Index: 100 = arithmetical average (mean) for the 10 sectors surveyed (data weighted by employment). Figure on the right side: survey result for the sector (weighted by employment).

Base: enterprises using computers.

Reading example: "Companies representing 85% of employment in the hospital sector said they had broadband internet access in 2006. This deviates by 6% from the mean (arithmetical average) for the 10 sectors studied (Index = 100)."

Data source: e-Business Survey 2006

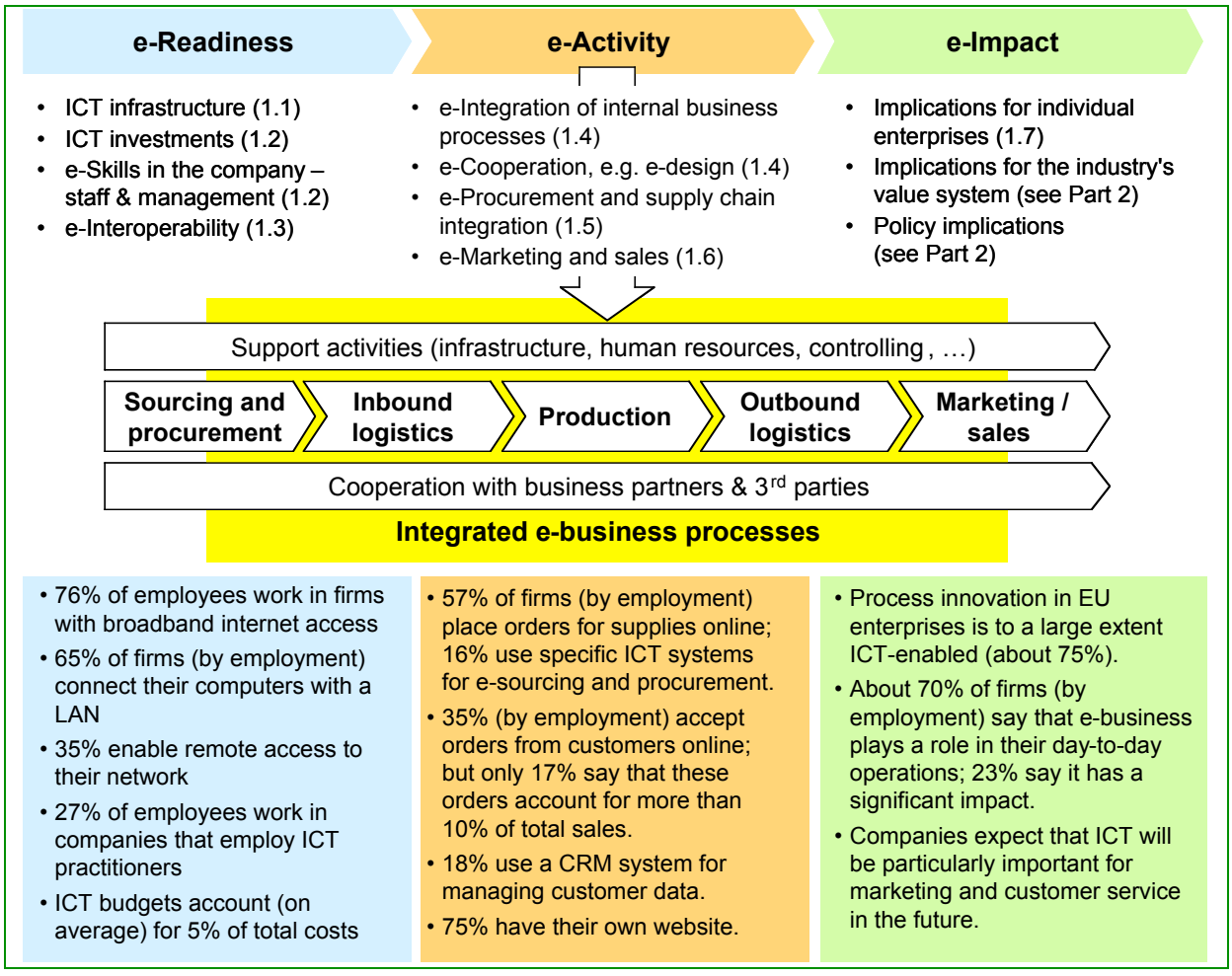
Part 1: Synthesis of Main Study Findings 2006/07

This chapter provides an overview of the state of e-business adoption in enterprises from ten sectors of the EU economy. It is largely based on the e-Business Survey 2006 (cf. Annex I). The reference year for data is either 2005 (in case of period-related items) or early 2006 (e.g. for yes/no questions on ICT adoption). "Electronic business" is defined – following an OECD definition – as "*automated business processes (both intra-firm and inter-firm) over computer mediated networks*" (see Annex IV).

The results update and elaborate on the analysis presented in previous editions of the European e-Business Report. However, results are based on a different set of sectors compared to the earlier surveys. For this reason, and due to some changes in the survey set-up, direct comparisons of totals to those published in 2005 or before should be made with caution.

Framework of the e-Business Survey 2006 and key results

(figures in brackets are references to sections of this report)



Source: *e-Business W@tch* (2006)

The e-Business Survey 2006

Most of the data and evidence presented in this part of the report are based on results of the e-Business Survey 2006.

e-Business W@tch collects data on the use of ICT and e-business in European enterprises by means of representative telephone surveys. The e-Business Survey 2006 was the fourth survey after those of 2002, 2003 and 2005. It had a scope of **14,081 interviews** with decision-makers in enterprises from 29 European countries.[1]

Most of the tables in this report feature a breakdown of the population of enterprises based on the aggregate of ten EU countries – **the "EU-10"**.[2] In these countries the survey covered all ten sectors (at least to some extent) and therefore comparability of the sample across sectors is given. The EU-10 represent more than 80% of the total GDP and inhabitants of the EU-25 and are thus to a large extent representative for the whole EU.

The survey was carried out as an **enterprise survey**, i.e. focusing on the enterprise as a business organisation (legal unit) with one or more establishments. Similarly to 2005, the 2006 survey also included only **companies that use computers**.

The configuration of the survey set-up (e.g. sampling) reflects the mandate of *e-Business W@tch* to **focus on sectors** and **SMEs**. As a result, comparisons should mainly be made between sectors and between size-bands of enterprises. Breakdowns by country are also possible, but should be treated cautiously.

The **mix of sectors** surveyed is different to the mix in 2005 and in previous surveys. Aggregate results of 2006 are heavily influenced by results for construction and tourism, as these are the largest sectors in terms of employment and number of enterprises.

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 III** and on the website of the *e-Business W@tch.*

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1 The survey was conducted in March-April 2006 using computer-assisted telephone interview (CATI) technology. Field-work was co-ordinated by the German branch of Ipsos GmbH (www.ipsos.de) and conducted in co-operation with their local branches and partner organisations. The countries covered include EU Member States, Acceding and Candidate Countries, and countries of the European Economic Area (EEA).

2 The EU-10 cover the Czech Republic, Germany, Spain, France, Italy, Hungary, the Netherlands, Poland, Finland and the UK.

1.1 Use of and Access to ICT Networks

Internet access

In all ten sectors studied, nearly all companies which use computers and have at least ten employees are **connected to the internet**. Only among micro-firms, about 10% responded that they have no internet connection. Most of them are bars and restaurants, small construction or food companies. By share of employment, companies representing 99% of the ten sectors' workforce are connected to the internet (see Exhibit 1.1-1).

About 70% of the firms surveyed have **broadband access**, i.e. they connect to the internet either by DSL (see Glossary, Annex I), cable, direct fibre or wireless broadband. Even among micro and small firms, more than 60% of all companies said they used (at least) one of these connection technologies.

Exhibit 1.1-1: Internet access and remote access to company network

	Companies with internet access		Companies with broadband internet access		Share of employees with internet access *		Remote access to company network	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**95**	**93**	**76**	**69**	**n.a.**	**43**	**35**	**16**
By firm size								
Micro (1-9 empl.)		89		62	n.a.	51		12
Small (10-49 empl.)		98		75	n.a.	29		22
Medium (50-249 empl.)		99		83	n.a.	33		43
Large (250+ empl.)		99		84	n.a.	44		60
By sector								
Food & beverages	95	88	72	64	n.a.	25	35	14
Footwear	96	89	75	62	n.a.	28	17	10
Pulp & paper	99	94	80	68	n.a.	40	56	21
ICT manufacturing	100	99	84	79	n.a.	74	69	35
Consumer electronics	98	97	87	74	n.a.	80	51	32
Shipbuilding & repair	100	100	87	86	n.a.	30	41	27
Construction	95	90	72	64	n.a.	47	25	13
Tourism	93	90	72	68	n.a.	53	38	13
Telecommunication	100	99	88	85	n.a.	90	74	46
Hospital activities	100	98	85	78	n.a.	41	39	34
Base (100%)	firms using computers		firms using computers		firms with internet access		firms using computers	
N (for total, EU-10)	7237		7237		6900		7237	
Questionnaire reference	A1		A3		A2		A5	

* Read: "In the companies surveyed, on average, 43% of employees have access to the internet at their workplace.

Source: *e-Business W@tch* (Survey 2006)

There are significant differences between sectors in terms of how many employees use the internet as part of their day-to-day work. This is a good indicator for the **transformation of work and production processes** in manufacturing. In sectors where traditional, manual work is still important (e.g. footwear, food), relatively few workers (about 25-30%) need internet access to perform their tasks. By contrast, companies from

ICT related industries (e.g. telecommunications, ICT manufacturing) reported that 75-90% of their employees use the internet in their daily work routine. In some sectors, ICT are increasingly used to manage and control production processes (the pulp & paper industry is a good example); however, this does not necessarily involve the internet.

Remote access to the company network

"Remote access" means that employees can **access data from the company's computer system remotely**, e.g. when working from home or travelling. In the ten sectors studied, 16% of all firms (comprising about a third of total employment) said they enabled remote access (see Exhibit 1.1-1). Although this is no longer a sophisticated functionality, remote access is quite common only among large firms (60%) and medium-sized ones (43%), but not yet widely used by small firms (about 20%).

Most of the medium-sized and large firms use Virtual Private Network (VPN) technology to enable secure access from remote workplaces (see Exhibit 1.1-1).

Use of internal computer networks

The use of ICT to connect computers internally to a company network (Local Area Networks – LAN, and Wireless LAN) increases with company size. **LAN** is widely deployed among companies which have at least a few computers: even close to 60% of small companies (with 10-49 employees) operate a LAN (see Exhibit 1.1-2). **Wireless-LAN technology** is already used by close to 50% of large firms and about a third of all medium-sized companies. ICT-related industries (telecommunications, ICT manufacturing) show the highest diffusion of W-LAN.

Voice-over-IP

The use of telephony services over internet networks, by means of digitised voice transfer technology, has gained momentum over the past few years. Telecommunication service companies and internet service providers – both established and new – offer new services based on this technology, with its cost saving potential for user companies.

These services are usually referred to as "Voice-over-IP" (VoIP) services, as they have in common that they use the Internet Protocol (IP) to transfer voice calls. However, there are many ways for VoIP to be implemented. For example, calls can be initiated and terminated via a computer or a VoIP-enabled phone. The provision of VoIP is driven by increasing broadband penetration.

Private users typically encounter VoIP services as an internet-based peer-to-peer network service (for example Skype or Google Talk). But from the perspective of corporate users, there are more usage scenarios. Corporate users can generally follow **two paths** if they want to benefit from VoIP. They can use either **hybrid solutions** or pure **IP-based networks**.[3]

VoIP is increasingly used, even in sectors which are not typical early adopters of ICT. In 2006, 13% of companies from the ten sectors said that they used Voice-over-IP services

[3] See *e-Business W@tch* Sector Study on the Telecommunications Industry, 2006. Available at www.ebusiness-watch.org ('resources' – 'by sector').

(see Exhibit 1.1-2). There is not much of a difference in usage between firm sizes; only among large firms is diffusion slightly more advanced (more than 20%).

The pioneer in the business use of VoIP is the telecommunications industry itself; about 40% of firms from this sector said they used VoIP services. It can be expected that business usage will increase quickly in other sectors as well over the next few years. Eventually, as a common scenario depicts, all fixed network voice telephony could be converted to internet protocol. "Voice-over-IP" would then no longer be an issue, having become the standard technology for telephony.

Exhibit 1.1-2: Networks and protocols used

	LAN		W-LAN		Use Voice-over-IP		Use VPN for remote access	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**65**	**46**	**32**	**16**	**16**	**13**	**57**	**26**
By firm size								
Micro (1-9 empl.)		35		12		14		20
Small (10-49 empl.)		59		21		11		32
Medium (50-249 empl.)		84		37		13		57
Large (250+ empl.)		96		47		22		79
By sector								
Food & beverages	69	31	30	9	15	19	65	29
Footwear	58	33	17	10	15	10	33	18
Pulp & paper	83	51	33	15	13	12	68	44
ICT manufacturing	91	71	47	34	28	20	73	47
Consumer electronics	83	54	36	27	29	22	61	39
Shipbuilding & repair	82	74	33	24	11	10	61	31
Construction	58	43	20	13	13	11	52	34
Tourism	65	39	30	15	16	15	57	16
Telecommunication	94	74	52	44	45	37	78	50
Hospital activities	96	84	32	26	8	8	71	63
Base (100%)	firms using computers		firms using computers		firms using computers		firms enabling remote access	
N (for total, EU-10)	7237		7237		7237		2639	
Questionnaire reference	A4a		A4b		A4c		A6d	

Source: *e-Business W@tch* (Survey 2006)

1.2 ICT Skills, Outsourcing and ICT Budgets

1.2.1 Demand for ICT skills and skills development

Improving e-business skills, especially among SMEs, has been identified as a relevant **concern for policy** in several *e-Business W@tch* sector studies. Notable examples from 2006 are the studies on footwear, food & beverages, hospitals and construction.[4] However, at least from the perspective of small companies, this concerns mainly the managerial understanding of e-business.

Employment of "ICT practitioners" [5]

A clear distinction has therefore to be made between companies that can afford **employing ICT practitioners** (i.e. staff with the specialised skills and tasks of planning, implementing and maintaining ICT infrastructure) and companies that do not employ such practitioners. The critical divide here is between small and medium-sized firms. While only about 15% of small companies from the ten sectors said that they employed ICT practitioners (see Exhibit 1.2-1), nearly 30% of medium-sized firms and **60% of large companies** did so.

If employing practitioners is used as a proxy for having an IT department, this raises some questions. Assuming that most companies with 250 or more employees have some sort of IT department with at least 1-2 people mainly charged with IT-related tasks, why then do 40% of large enterprises appear to have the perception that it does not employ ICT practitioners? Maybe the term "ICT practitioner" in itself can be misleading in time-constrained telephone interviews, and some companies do not count their PC and network administrator(s) in, although they are mainly charged with ICT tasks.

Some of the other results regarding the demand for ICT skills have to be assessed on the basis of this low overall reported employment of ICT practitioners: for example, the fact that only about 1% of all firms reported that they had had "**hard-to-fill" vacancies** for ICT jobs in 2005. This figure appears to be surprisingly low, but increases to **7%** if only companies are considered that actually employ ICT practitioners. In fact, in some of the studied sectors (telecommunications, tourism, consumer electronics, ICT manufacturing), 10-15% of the interviewed companies reported “hard-to-fill” ICT vacancies.

These results show that it is difficult to track the ICT skills gap in a representative survey, based on simple standardised questions, which is conducted among a wide range of sectors and types of enterprises. The discussion of the – possibly widening – ICT skills gap needs more specific focus in terms of qualifications required, and industries and companies concerned.

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[4] All sector studies can be downloaded from the *e-Business W@tch* website at www.ebusiness-watch.org ('resources' – 'by sector'). The conclusions on policy implications are presented in the summaries of the respective sector studies in Part 2 of this report.

[5] The European eSkills Forum, established by the EC in March 2003, defined "ICT practitioner skills" as the "capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and service of ICT systems." Cf. eSkills For Europe: The Way Forward", Synthesis Report by the eSkills Forum, September 2004.

On the other hand, it is also possible that many companies – particularly in non-ICT-related industries – are not aware that they should actually upgrade their ICT skills by hiring qualified people.

Exhibit 1.2-1: Networks and protocols used

	Companies employing ICT practitioners		Regular ICT training of employees		Companies with hard-to-fill vacancies for ICT jobs in 2005		Companies using e-learning	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**27**	**14**	**22**	**13**	**2**	**1**	**21**	**11**
By firm size								
Micro (1-9 empl.)		12		9		2		12
Small (10-49 empl.)		15		16		0		11
Medium (50-249 empl.)		29		28		2		19
Large (250+ empl.)		59		41		6		35
By sector								
Food & beverages	26	11	26	14	2	0	16	9
Footwear	20	13	14	6	1	0	7	5
Pulp & paper	35	16	29	12	3	1	21	13
ICT manufacturing	52	31	39	24	8	3	28	20
Consumer electronics	35	17	21	16	4	2	23	18
Shipbuilding & repair	36	33	29	20	4	0	14	15
Construction	22	14	18	12	2	1	12	8
Tourism	27	12	21	11	3	2	29	15
Telecommunication	63	33	52	21	12	5	41	28
Hospital activities	57	39	39	34	5	3	26	22
Base (100%)	firms using computers		firms using computers		firms using computers		firms using computers	
N (for total, EU-10)	7237		7237		7237		7237	
Questionnaire reference	B1		B4		B2		B5	

Source: *e-Business W@tch* (Survey 2006)

ICT training for employees

Companies representing about 20% of employment said that they regularly send employees to **ICT training programmes**. The figure increases by size-band, from about 15% of small firms to 30% of medium ones and 40% of large firms. Training activities do not concern only ICT practitioners that run the systems, but also **ICT users** among the workforce. As can be expected, companies from ICT-related industries appear to be the most active supporters of ICT training for their employees, since the required ICT skills depend on the typical daily work routine of employees. For example, the low degree of training activity in many footwear companies indicates that production in this sector is not (yet) as much ICT-based as in other manufacturing industries.

e-Learning, which means supporting training with learning material in electronic format, for example material that is available on an intranet or the internet, is used only by about 10% of firms, but increases by firm-size. e-Learning applications can be used for ICT-related training, but also for other sector-specific or even company-specific training sources (e.g. about raw materials or manufacturing methods).

"e-Skills" – mainly a managerial issue?

In summary, evidence suggests that the lack of ICT skills is more of an **issue at the managerial level**, i.e. how to use e-business to support the company strategy. According to the e-Business Survey 2006 results, ICT skills gaps seem more of a concern for companies in the ICT-related industries and less so in some other sectors studied this year. However, this is a debatable issue. The EU ICT Task Force[6] recommends measures to counteract the "*growing e-skills gap*" (see box). The challenge is that there is probably no simple, straightforward answer as to which ICT-related qualifications are needed and whether there is a shortage in supply of these qualifications or not. Companies from sectors with a high affinity to ICT, such as the ICT producing industries, are probably the ones most concerned by such a skills gap. For the others, more in-depth research is required, by type of industry, company size or specific level of ICT skills.

Snapshot

Signs of a growing e-skills gap - conclusions of the EU ICT Task Force

"(…) Innovation and ICT uptake in Europe are thus highly dependent on the e-skills of the workforce, in terms of practitioners and users, as well as ICT-related business skills. However, evidence points to growing e-skills gaps (either a shortage of absolute numbers of ICT workers, or a mismatch between supply and demand of specific skills). Europe's educational and professional training systems do not sufficiently deliver the 21st century skills needed to ensure workforce competitiveness and economic innovation."

Source: "Fostering the Competitiveness of Europe's ICT Industry." EU ICT Task Force Report, November 2006. p. 26.
Available at http://ec.europa.eu/enterprise/ict/policy/doc/icttf_report.pdf

1.2.2 Outsourcing of ICT services and ICT investments

Outsourcing

e-Business W@tch asked firms whether they had **outsourced** any of their ICT services to external service providers **in 2005** which they had previously conducted in-house. In the ten sectors studied, this was the case for about 15% of companies, with a slight increase by firm-size (see Exhibit 1.2-2). There is not much difference in this respect between size-bands or sectors, except for micro-enterprises.

It is interesting to compare these figures with those from the e-Business Survey 2005, where a different question was asked. In 2005, the question was whether companies had outsourced *any* ICT services, not necessarily in the previous year. About 60% of the small firms and about 80% of the medium-sized and large firms had replied that they had outsourced ICT services. Assuming that the picture would be quite similar if the same question had been asked in 2006, this would mean that about **one in five** companies (out of those that use outsourcing) had **outsourced additional ICT services** in 2005.

[6] For more information, see http://ec.europa.eu/enterprise/ict/taskforce.htm.

Exhibit 1.2-2: Outsourcing and spending on ICT

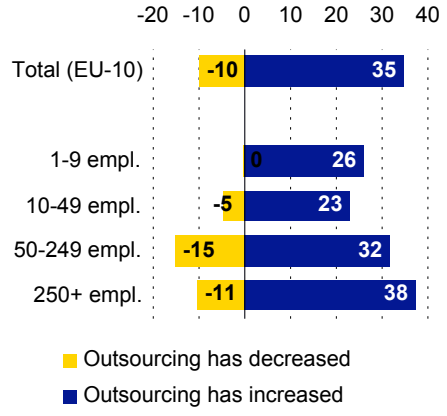
	Have outsourced ICT services in 2005		Share of ICT budget as % of total costs **		Have made ICT investments in 2005		Difficulty to draw funds for investments	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**19**	**14**	**n.a.**	**5**	**65**	**50**	**19**	**15**
By firm size								
Micro (1-9 empl.)		8	n.a.	5		39		25
Small (10-49 empl.)		21	n.a.	5		60		3
Medium (50-249 empl.)		21	n.a.	6		78		6
Large (250+ empl.)		31	n.a.	6		86		29
By sector								
Food & beverages	19	12	n.a.	4	65	44	*	*
Footwear	16	14	n.a.	5	53	43	*	*
Pulp & paper	17	14	n.a.	4	77	54	*	*
ICT manufacturing	22	15	n.a.	12	85	66	*	*
Consumer electronics	19	12	n.a.	6	76	63	*	*
Shipbuilding & repair	17	20	n.a.	3	73	65	*	*
Construction	20	14	n.a.	4	58	45	*	*
Tourism	21	10	n.a.	7	63	45	*	*
Telecommunication	24	15	n.a.	21	88	70	*	*
Hospital activities	23	20	n.a.	8	87	79	*	*
Base (100%)	firms using computers		firms using computers (excl. "don't know")		firms using computers		firms with external funding sources for their ICT investments	
N (for total, EU-10)	7237		4510		7237		395	
Questionnaire reference	B6		C1		C3		C5	

* Figures not displayed because of low number of observations (N < 50).
** Read: "In the companies surveyed, the ICT budget accounts – on average – for about 5% of total costs."

Source: *e-Business W@tch* (Survey 2006)

Exhibit 1.2-3: Outsourcing trend: percentage of companies that have increased / decreased their outsourcing activities in 2005

The overall trend appears to be that more services will be outsourced in the future. Asked whether outsourcing would increase, decrease or remain the same in 2006/07 (compared to 2005), about 35% of companies anticipated an increase, while only 10% said that outsourcing would decrease. Outsourcing considerations are most widespread among the largest companies in the sample; sector differences are not pronounced in this regard.



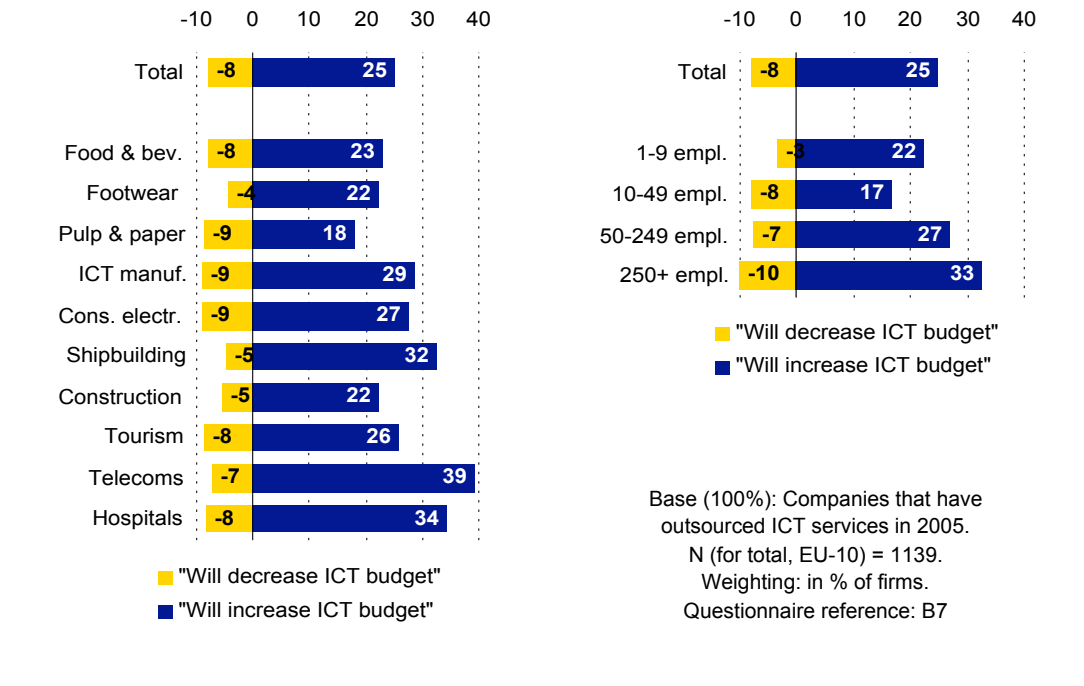
Base (100%): Companies that have outsourced ICT services. N (for total, EU-10) = 1139.
Weighting: in % of firms. Questionnaire reference: B7

Source: *e-Business W@tch* (Survey 2006)

ICT expenditure and investments

The **average ICT budget** of a company from the ten sectors studied in 2006, including hardware, software, services and personnel, corresponds to about 5% of total company costs (see Exhibit 1.2-2). About 25% of all firms plan to further **increase their ICT budgets** in 2006/07, compared to the current budget. About 8% say that they will reduce their budgets (see Exhibit 1.2-4). The remaining two thirds said that they would maintain their current level of spending.

Exhibit 1.2-4: ICT budget trend: percentage of companies planning to increase / decrease their ICT budgets in 2006/07 compared to the previous year



Source: *e-Business W@tch* (Survey 2006)

Where companies stated they had made **investments in ICT**, *e-Business W@tch* asked about the **major source** for financing the investments[7], and whether they experienced difficulties in obtaining funds from external financing sources. In each of the ten sectors surveyed, **self-financing** (out of the cash-flow generated) was by far the dominant source of financing for ICT investments (about 80% of firms said that this is their major source).

Bank loans are the major financing source for about 7% of firms. Interestingly, only very few large firms reported the use of bank loans. **Venture capital** and **public funds** were found to be insignificant as a *major* source – these funding instruments are probably used more as complementary sources.

[7] Ideally, a question about the percentage of particular investments funded by the different financing sources would be asked; however, only few interviewees would be in a position to spontaneously answer this question on the telephone; furthermore, such a question would be extremely time-consuming. Thus, the only feasible solution was to ask for the *major* source for investments in general.

1.3 e-Standards and Interoperability

Definitions

A "**standard**", used as a technical term, is "*a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory*".[8] There are national, European and international technical standards. In addition to such formal standards there are also industry specifications which result from collaboration, in consortia or smaller partnerships, subject to differing levels of openness and participation.

Whatever the source, agreement on shared technical standards is an instrument to achieve **interoperability** between different systems. Without interoperability of ICT systems, which requires standards and compatibility between standards, advanced forms of e-business (such as the digital integration of systems in B2B exchanges) are hardly possible.

Industry organisations, however, often use the term “standard” in a broader sense, e.g. for **industry-accepted e-business solutions** such as RosettaNet® (in the ICT and electronics industries) or papiNet® (in the pulp & paper industry). Moreover, there are also solutions for data exchange agreed upon among a limited number of companies operating in the same supply chain, which can be referred to as **proprietary standards**.

1.3.1 Types of e-standards used

EDI (electronic data interchange) is still the preferred messaging standard among medium-sized and large firms in the P&P industry. About 10% of medium-sized companies and 30% of large firms report that they use EDI, but less than 5% of small companies did so (see Exhibit 1.3-1). In manufacturing industries, more companies use EDI. EDI users were asked whether they had migration plans to switch from standard to internet EDI. In all sectors, the majority of users said that they had no such plans.

The deployment of **XML-based standards** has been very dynamic over recent years, and diffusion now approaches the same level as EDI-based standards.

For e-business, **ebXML** is the most important standard within this group. ebXML[9] is a single set of internationally agreed technical specifications and common XML semantics to facilitate global trade. The ebXML framework for e-business is a joint initiative of UN/CEFACT and OASIS (see www.ebxml.org). The initiative started in November 1999 with the aim to “enable anyone, anywhere to do business with anyone else”.[10]

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[8] Directive 98/34/EC of the European Parliament and the Council of 22 June 1998, laying down a procedure for the provision of information in the field of technical standards and regulations, see http://europa.eu.int/eur-lex/pri/en/ oj/dat/1998/l_204/l_20419980721en00370048.pdf

[9] electronic business using eXtensible Markup Language – see also Glossary in Annex I.

[10] For detailed information about the background and adoption of XML and ebXML, see *e-Business W@tch* Special Study on "e-Business Interoperability and Standards" (September 2005), available at www.ebusiness-watch.org ('resources').

Exhibit 1.3-1: Types of e-standards used by companies

	EDI-based standards		XML-based standards		Proprietary standards		Other	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**9**	**3**	**11**	**5**	**19**	**12**	**2**	**4**
By firm size								
Micro (1-9 empl.)		2		6		10		1
Small (10-49 empl.)		4		5		13		2
Medium (50-249 empl.)		10		10		24		2
Large (250+ empl.)		29		27		31		7
By sector								
Food & beverages	31	6	8	4	20	11	4	3
Footwear	7	2	6	2	18	12	2	1
Pulp & paper	20	6	15	5	19	15	2	2
ICT manufacturing	21	3	16	10	26	14	6	3
Consumer electronics	8	4	11	6	23	17	6	5
Shipbuilding & repair	6	2	15	2	21	19	6	8
Construction	3	2	8	4	15	10	2	2
Tourism	7	2	15	6	20	10	3	1
Telecommunication	13	5	29	14	37	23	6	4
Hospital activities	23	19	28	21	32	30	6	4
Base (100%)	firms using computers		firms using computers		firms using computers		firms using computers	
N (for total, EU-10)	7237		7237		7237		7237	
Questionnaire reference	G1a		G1b		G1c		G1f	

Source: *e-Business W@tch* (Survey 2006)

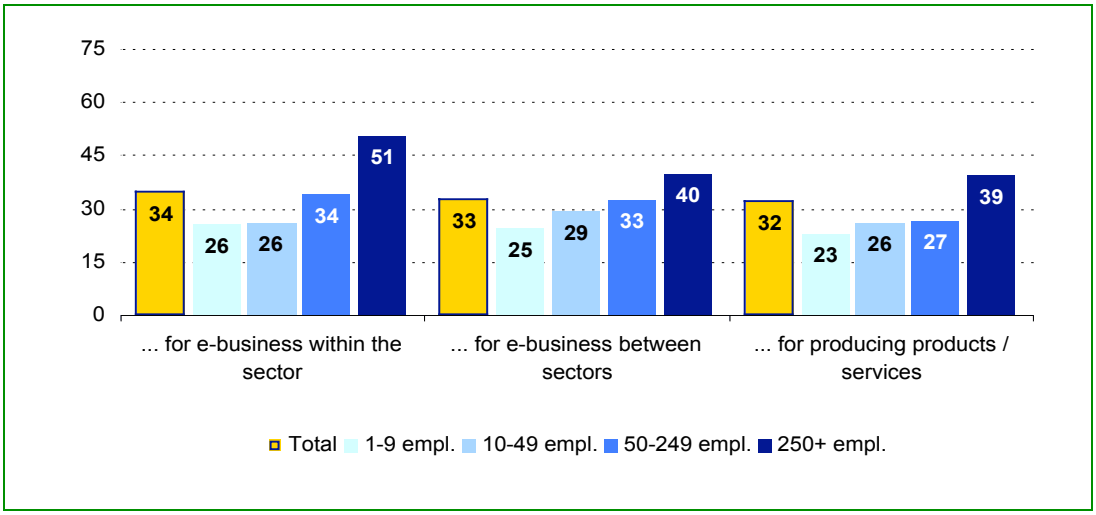
1.3.2 Interoperability challenges

Interoperability refers to the "ability of two or more systems to exchange data, and to mutually use the information that has been exchanged."[11] *e-Business W@tch* asked companies whether they regard **interoperability as critical for conducting e-business** with companies from their own sector, from other sectors, and for producing their products or services. Results are fairly consistent with those obtained from a similar question in 2005 and show no pronounced differences between sectors, with the possible exception of the telecommunications and construction industries.

In total, about a third of all companies see interoperability as critical in each of the three categories asked (see Exhibit 1.3-2). This finding must be seen in perspective, however, as only about 70% of all firms said that e-business constitutes a part of the way they operate. Thus, about 50% of those companies for whom e-business plays a role in their day-to-day routines are aware of the critical role of interoperability. The perceived importance of interoperability increases slightly by company size.

[11] Definition by IEEE and ISO, cf. *e-Business W@tch* Special Study on "e-Business Interoperability and Standards", op. cit.

Exhibit 1.3-2: Perceived importance of interoperability: percentage of companies saying that interoperability is critical …

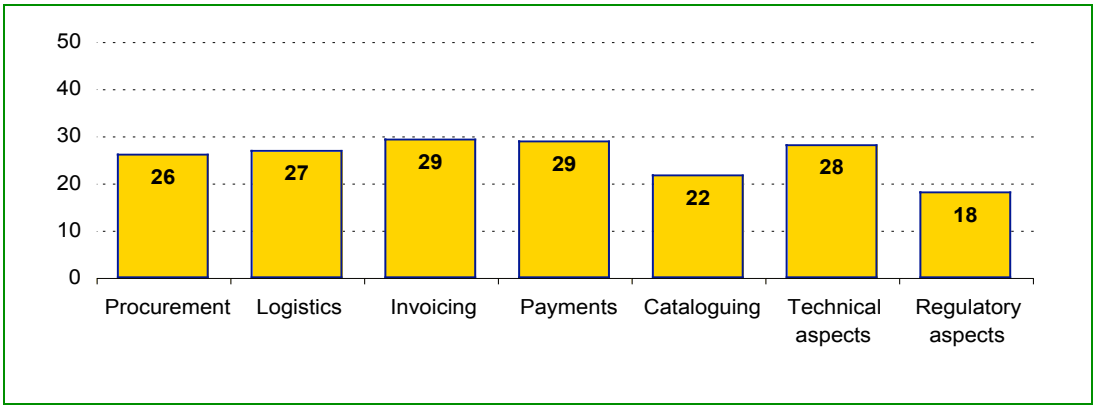


Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
Questionnaire reference: G5a-c

Source: *e-Business W@tch* (Survey 2006)

e-Business W@tch also asked companies whether they experience any **difficulties** stemming from a **lack of interoperability**. The question was put only to those firms which said that interoperability was critical for e-business and/or producing the products; seven potential problem areas were suggested. In each of the suggested areas, about 20-30% of the firms said they were experiencing difficulties stemming from a lack of interoperability (see Exhibit 1.3-3).

Exhibit 1.3-3: Problems due to a lack of interoperability: percentage of companies experiencing difficulties in …



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Questionnaire reference: G8a-c

Source: *e-Business W@tch* (Survey 2006)

In several sectors studied, e.g. the footwear or the pulp & paper industry, the business functions where most companies said they had experienced interoperability challenges include invoicing and payments. This indicates that electronic **processing of payments** between companies is increasing fast, even in sectors with a comparatively low use of ICT. It also implies, however, that there are still unsolved problems with regard to the compatibility of systems and standards. Survey results support the case of some recent policy initiatives by DG Enterprise and Industry, which aim at creating a favourable framework in the EU Member States for the use of e-invoicing; addressing barriers such as a lack of interoperability is one of the issues on the agenda.[12]

1.3.3 Use of Open Source Software

The open source model

Open source software (OSS) refers to computer software under an open-source license. An open-source license is a copyright license for software that makes the source code available and allows for modification and redistribution without having to pay or seek permission from the original authors. In the past years, the public awareness of OSS has grown steadily, with the operating system Linux (an alternative to proprietary operating systems such as Windows) being the best-known project. Besides Linux, other OSS such as the database mySQL or the Internet browser Firefox have each achieved significant market shares.

Policymakers are interested in monitoring OSS developments and the uptake among companies for several reasons. There is debate of different views on whether the use of OSS-based operating systems could reduce ICT costs for SMEs, at least in the long run. Another aspect is whether OSS systems may help to "unlock" companies from specific ICT service providers in the future.

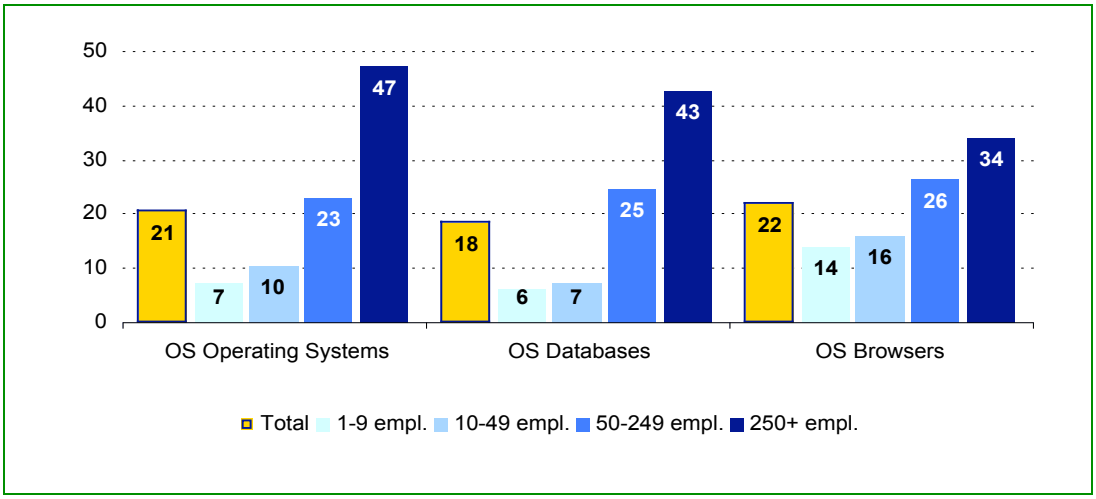
Deployment of Open Source Software

Against the background of this general interest among policymakers and industry, companies were asked whether they used OSS, either in operating systems, databases or browsers. Results show that **use of OSS increases sharply by firm size**, with considerable gaps between the small firms (with up to 49 employees) and the medium-sized ones, and again between the medium and large ones (see Exhibit 1.3-4). This is fully in line with findings of the e-Business Survey 2005.

In particular, **operating systems** (including Linux) based on OSS are widely used by large companies (nearly 50%). In total, companies representing about 20% of employment in the ten sectors reported using OSS for one or more of the applications specified (operating systems, databases and browsers).

[12] For more information, see website the European e-Business Support Network, a network for policy makers coordinated by DG Enterprise and Industry (www.e-bsn.org)

Exhibit 1.3-4: Companies using Open Source (OS) Software



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
Questionnaire reference: G8

Source: *e-Business W@tch* (Survey 2006)

1.3.4 ICT security measures

In its 2005 survey, *e-Business W@tch* analysed in detail security controls and other measures applied by European enterprises to counter security threats. The results, which were presented in a special report,[13] indicated that basic components such as firewalls and secure servers – for those enterprises requiring them – already exhibited high levels of penetration. As a follow-up to this study on ICT security, questions on selected security measures which were of particular interest to policymakers were also included in the e-Business Survey 2006.

Secure Server Technology and Firewall

"**Secure server technology**" means that data exchange between computers is based on certain technical standards or protocols, for example "Secure Sockets Layer" (SSL); this is a widely used protocol for managing the security of a message transmission on the internet. Transport Layer Security (TLS), which is based on SSL, is an emerging successor.[14] In the ten sectors studied in 2006, about 20% of all firms (representing 30% of employment) reported the use of Secure Server Technology (see Exhibit 1.3-5).

As could be expected, **firewalls** are widely used by companies from each of the ten sectors studied and by companies of all sizes. In total, about 60% of all firms (representing 80% of employment) said that they used a firewall to protect their computer system from malicious e-mail and unauthorised access (see Exhibit 1.3-5).

[13] See *e-Business W@tch* Special Study on ICT Security, e-Invoicing and e-Payment Activities in European Enterprises, September 2005. Available at www.ebusiness-watch.org ('resources').

[14] Cf. Whatis.com (http://searchsecurity.techtarget.com)

Exhibit 1.3-5: Use ICT security measures used by enterprises

	Secure Server Technology		Digital Signature or Public Key Infrastructure		Firewall	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**36**	**20**	**21**	**15**	**78**	**62**
By firm size						
Micro (1-9 empl.)		16		13		56
Small (10-49 empl.)		23		17		73
Medium (50-249 empl.)		36		25		84
Large (250+ empl.)		64		39		94
By sector						
Food & beverages	34	18	26	15	72	51
Footwear	21	16	25	16	64	50
Pulp & paper	40	21	24	15	86	64
ICT manufacturing	57	33	32	19	95	79
Consumer electronics	54	32	27	16	88	72
Shipbuilding & repair	42	29	32	20	92	84
Construction	26	19	19	12	69	56
Tourism	42	17	18	16	81	64
Telecommunication	72	45	38	23	96	86
Hospital activities	63	47	40	29	92	90
Base (100%)	firms using computers		firms using computers		firms using computers	
N (for total, EU-10)	7237		7237		7237	
Questionnaire reference	G9a		G9b		G9c	

Source: *e-Business W@tch* (Survey 2006)

Digital signature

An **e-signature** is an electronic information file attached to or associated with a contract or another message used as the legal equivalent to a written signature. Electronic signature is often used to signify either a signature imputed to a text via electronic means, or by cryptographic means to add non-repudiation and message integrity features to a document. **Digital signature** usually refers specifically to a cryptographic signature, either on a document, or on a lower-level data structure. The rationale for measuring the adoption of digital signatures is that it is an important step for the integration of business processes between different enterprises, specifically for the legal recognition of documents sent electronically, as is the case with **invoices**.[15]

In 2005, *e-Business W@tch* had asked companies whether they had "*rules that specify the use of digital signature or Public Key Infrastructure*", as part of a question on the use of ICT security measures. In total, about 11% of firms (accounting for 20% of employment) reported that they had such rules. Figures in 2006 appear to be slightly higher; the adoption of e-invoicing may be a key driver here. In the ten sectors covered, 15% of firms reported the use of digital signature / public key infrastructure (see Exhibit 1.3-5). The use increases with company size. About 25% of medium-sized companies and 40% of large firms said they used digital signature.

[15] To this end, the European Parliament and the Council issued in 1999 the "e-Signature Directive" (Directive 1999/93/EC, of 13 December 1999) - see http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/l_013/l_01320000119en00120020.pdf.

1.4 Internal Process Integration

The use of ICT and e-business to support and optimise intra-firm processes has become increasingly important, particularly in manufacturing. By **digitisation of formerly paper-based processes**, information and documents related to incoming or outgoing orders can be **seamlessly processed** along the company's value chain; orders can be linked with production and inventory management; and the underlying software systems provide support for management and controlling by enabling full transparency of all business processes. Furthermore, **collaborative** processes within and between companies are supported, such as information-sharing among employees (for example by use of an intranet), planning and demand forecast, organising and archiving documents, and human resources management. In general, ICT applications for these purposes are first used by large companies, and eventually also by medium-sized firms.

1.4.1 Use of software systems for internal process integration

About one in four companies from the ten sectors surveyed in 2006 said they used an **intranet**. This facility can be a useful platform for the secure exchange of information within a company and, possibly, for the implementation of internal training programmes (see Exhibit 1.4-1).

Exhibit 1.4-1: Use of ICT systems for internal process integration

	Intranet		Accounting software		ERP system		Document Management system	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**42**	**23**	**70**	**57**	**19**	**11**	**19**	**13**
By firm size								
Micro (1-9 empl.)		19		50		7		11
Small (10-49 empl.)		28		70		16		13
Medium (50-249 empl.)		43		85		25		19
Large (250+ empl.)		76		88		45		42
By sector								
Food & beverages	40	16	75	58	32	10	17	11
Footwear	27	11	69	58	23	7	12	11
Pulp & paper	53	24	79	66	45	16	16	10
ICT manufacturing	68	38	79	63	61	16	24	16
Consumer electronics	53	21	78	53	39	12	26	12
Shipbuilding & repair	56	50	80	78	30	17	17	14
Construction	31	22	68	58	18	11	17	15
Tourism	46	20	67	46	15	7	13	8
Telecommunication	76	41	83	61	32	11	25	13
Hospital activities	75	55	91	77	33	21	69	59
Base (100%)	firms using computers		firms not using an ERP system		firms using computers		firms using computers	
N (for total, EU-10)	7237		5555		7237		7237	
Questionnaire reference	D1a		D1e		D1d		D1c	

Source: *e-Business W@tch* (Survey 2006)

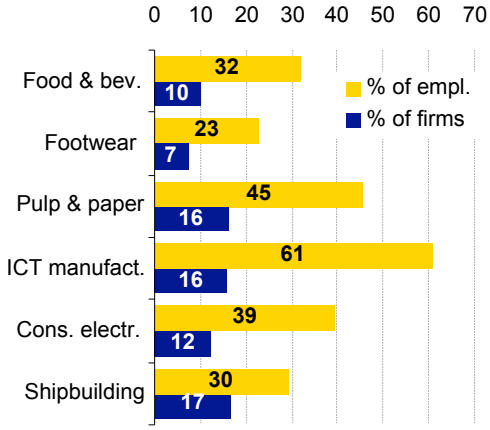
The value of an intranet for facilitating access to company information (guidelines, process and technical documentation, archives) increases by firm-size. Accordingly, nearly three out of four large firms from the ten sectors said that they had an intranet, while only about 30% of small firms and 45% of medium-sized firms reported adoption.

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

For manufacturing companies, ERP systems are an important "hub" for much of their e-business activities with other companies. B2B data exchanges as well as planning and controlling processes are largely based on functionalities provided by ERP systems.

ERP systems are widespread among larger companies, in particular in ICT-producing and in the pulp & paper industries. They are not much used in construction and tourism, however. As these are the largest sectors in the sample, the total adoption rate is only about 20% (by employment).

Exhibit 1.4-2: Companies with an ERP system



Base (100%): Companies using computers.
N ~ 900 per sector.
Questionnaire reference: D1d

Source: *e-Business W@tch* (Survey 2006)

In the 2006 survey, *e-Business W@tch* asked – for the first time – those companies that do not use any ERP system whether they use a special **accounting software** (other than just spreadsheet programmes, such as Microsoft Excel). In smaller companies, accounting software typically substitutes to some extent the functionality which ERP software provides in larger firms, although on a much simpler level and with a lower potential for automating order-related document flows. Results show that the majority of firms in all sectors (comprising about 70% of employment), if they do not have an ERP system, at least use some type of accounting software (see Exhibit 1.4-1). Only among micro enterprises did 50% still say that they had neither an ERP system nor a special accounting software. Very small companies often handle their accounting and planning by means of self-created spreadsheet solutions.

Special software systems for **electronic document management** (EDM) are rarely used in most of the ten sectors studied. These software systems are typically used to archive and manage documents of any type in digital format; this is highly relevant for example in the insurance industry (for management of insurance policies), and to a lesser extent in manufacturing enterprises.

However, EDM is an important and growing product segment within the software industry, which is also increasingly developing industry specific solutions, including for manufacturers. The main software applications in this field can be grouped as Document Management Systems (**DMS**) and Enterprise Content Management (**ECM**) systems. The more traditional DMS are used for systematically archiving documents. The more recent concept of ECM goes beyond DMS, as it also covers information objects (e.g. database systems) and not only individual documents. In the manufacturing and retail sectors, document management can be important for the digital integration of ordering and sales processes. Typically, EDM systems are integrated into ERP systems in the form of sector specific modules.

1.4.2 Use of ICT for cooperative and collaborative processes

ICT tools can support cooperation among companies in supply chain processes; both cooperation in production processes within the same link of the supply chain, and at the interface between different links. Supply chain processes consist of discrete value adding activities that are increasingly organised in integrated production networks within industry clusters. Examples are the pulp & paper industry (as part of the forestry and woodworking industries) and the food & beverages industry and its integration with distribution channels (retail).

Exhibit 1.4-3: Online cooperation and collaboration within the value system

	Share documents in collaborative work space		**Manage capacity / inventory online**		**Collaborative design processes**		**Collaborative forecasting of demand**	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**27**	**14**	**22**	**10**	**15**	**7**	**20**	**11**
By firm size								
Micro (1-9 empl.)		10		8		5		10
Small (10-49 empl.)		19		14		8		13
Medium (50-249 empl.)		31		21		13		19
Large (250+ empl.)		47		41		25		41
By sector								
Food & beverages	28	10	24	11	15	6	23	10
Footwear	18	12	17	9	11	10	11	11
Pulp & paper	27	17	32	13	16	11	19	12
ICT manufacturing	45	26	37	16	27	15	26	16
Consumer electronics	45	22	29	12	20	18	17	19
Shipbuilding & repair	27	19	19	15	20	7	16	11
Construction	22	9	14	8	9	5	14	8
Tourism	26	12	25	8	21	8	30	15
Telecommunication	51	36	29	19	27	19	29	23
Hospital activities	37	33	34	25	11	8	n.a.	n.a.
Base (100%)	firms with internet access		firms with internet access		firms with internet access		firms with internet access (without hospitals)	
N (for total, EU-10)	7008		7008		7008		6475	
Questionnaire reference	D5a		D5e		D5d		D5c	

Source: *e-Business W@tch* (Survey 2006)

The requirements of manufacturing industries with regard to ICT-based applications for online cooperation and collaboration[16] differ from those of services. For example, online tools for collaborative design ("**e-design**") with other companies are mostly used by large firms from ICT-related industries and in the shipbuilding industry (see Exhibit 1.4-3).

Collaborative **forecasting of demand** is another example of such applications. Sophisticated online tools exist for calculating demand, determining the amount and time of production and thus the demand for various inputs (supply goods), storage capacity and other services. In total, companies representing about 20% of employment reported the use of these applications. Figures are higher for large enterprises (40%).

Systems for **managing capacity and inventory** online tend to be more widely diffused than those for e-design and demand forecasting. In particular in sectors where logistics is an important cost factor and service criterion, the adequate use of ICT to support logistics processes can be an important strategic issue.

1.4.3 Deployment of e-invoicing

In the e-Business Survey 2006, special attention was paid to the issue of electronic invoicing (e-invoicing). e-Invoicing is a computer-mediated transaction between a seller / biller (invoicing entity) and a buyer / payer (receiving entity), which **replaces traditional paper-based invoicing processes**. In e-invoicing, the invoice is electronically generated and sent by the biller, and electronically received, processed and archived by the payer. In practice, e-invoicing typically goes hand in hand with making payments electronically.[17]

It is widely recognised that the use of e-invoicing promises rather easy-to-achieve cost savings for both parties involved (invoicing entity and receiving entity), because processing invoices in a standardised, electronic format can be accomplished much faster compared to the often cumbersome handling of printed invoices. The cost saving potential obviously depends on the number of invoices that have to be processed; companies and sectors differ widely in this respect.

Current state of adoption

e-Invoicing can either be conducted in a **web-based** environment, or processes can be integrated with a company's planning system (e.g. with the **ERP** system). Such integrated systems promise the highest cost-saving potential for companies.

In total, firms representing close to 20% of employment are now sending e-invoices (either to customers in the public sector and / or in the private sector), and 22% said that they received e-invoices from suppliers (see Exhibit 1.4-4). Findings are very similar for several manufacturing industries, e.g. food & beverages, pulp & paper, ICT manufacturing and for the shipbuilding & repair industry.

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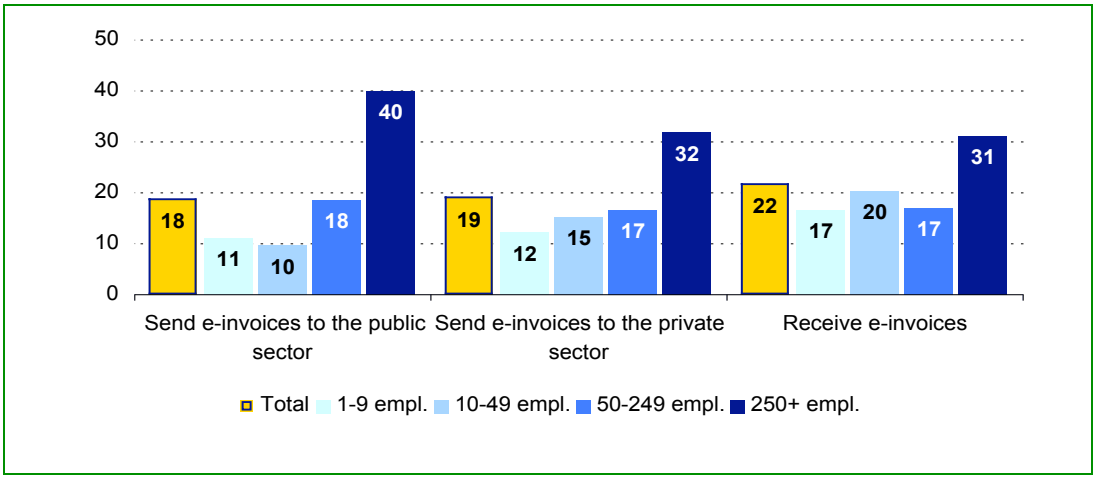
[16] "Cooperation" means splitting a common, centrally managed task into sub-tasks which are performed by different partners of the cooperation. "Collaboration" means that several partners work together on the same task at the same time.

[17] For more background information on e-invoicing activities of enterprises, see *e-Business W@tch* Special Report "ICT Security, e-Invoicing and e-Payment Activities in European Enterprises" (September 2005). Available at www.ebusiness-watch.org ('resources').

There is hardly a difference between micro, small and medium-sized firms in the adoption of e-invoicing. **Large firms** lead the development (about 40% send and 30% receive e-invoices).

Exhibit 1.4-4: Adoption of e-invoicing

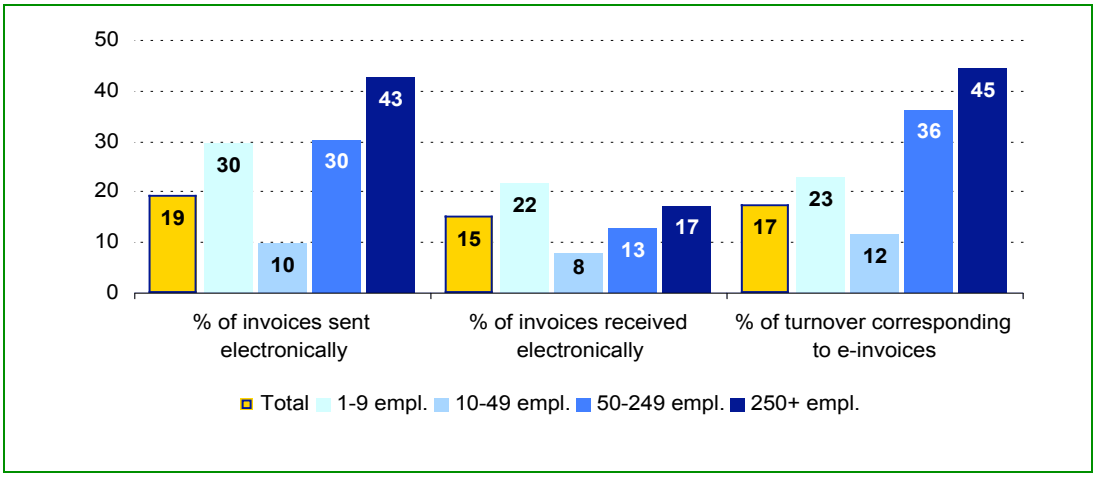


Base (100%): Firms with internet access. N (for Total) = 7008.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
Questionnaire reference: D5f-h

Source: *e-Business W@tch* (Survey 2006)

When looking only at those companies that actually use e-invoicing, the **average share of e-invoices** (measured as a percentage of a company's total invoices sent or received) is about 15-20%. Among large firms, the penetration is higher for sending invoices electronically than for receiving; among very small companies, it is the other way round (see Exhibit 1.4-5).

Exhibit 1.4-5: Share of e-invoices as % of total invoices / of turnover



Base (100%): Firms sending / receiving e-invoices. N (for Total) ~ 1300.
Read: "Enterprises from the 10 sectors covered send / receive on average …% of their invoices electronically." / "In enterprises from the 10 sectors covered, e-invoices account on average for …% of their turnover."
Questionnaire reference: D6-8.

Source: *e-Business W@tch* (Survey 2006)

1.5 e-Procurement and Supply Chain Integration

Introduction

Efficient management of procurement is a fundamental activity in all manufacturing industries, and – to some extent – also in services and construction. The larger the number of transactions, the more even slight improvements in this domain will produce significant overall **cost savings**. Online procurement can be carried out regardless of a real integration of systems with suppliers, for instance by placing orders via a supplier's website. This is often the first step towards a more comprehensive and integrated use of ICT in business processes.

Inputs that can be sourced and procured online from suppliers can be MRO goods[18] (e.g. office supplies), **raw materials** (e.g. leather for footwear companies; woodpulp for paper producers) and intermediary products and services (e.g. electrical components in ICT manufacturing; building materials for construction). All these products can theoretically be procured online, in particular if these products are well suited to be described and catalogued in a standardised way. If raw material quality is important, customers may prefer to order only from trusted, well-known suppliers, with whom they have longstanding business relations. Buyers will not easily switch their suppliers by means of e-procurement on the basis of cost considerations only.

1.5.1 B2B online trading: companies placing orders online

About 50% of all firms active in one of the ten sectors surveyed in 2006 said that they placed at least some orders to suppliers online.[19] The incidence increases by firm size (see Exhibit 1.5-1). The e-procurement adoption rate is highest among ICT-related industries and in hospitals (with about 70% of firms). In the footwear and the food & beverages industry, comparatively few companies place orders online.

As in previous surveys, the relatively high adoption rates of online purchasing/ordering always has to be qualified in terms of the **share of e-procurement** as a percentage of the total procurement volume.[20] A significant percentage of firms that place orders online said that these orders accounted for less than 5% of their total procurement. About one in four companies (out of those placing orders online) said that online orders account for more than 25% of their total orders to suppliers (see Exhibit 1.5-1).

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[18] MRO goods are maintenance, repair, and operating supplies. This category typically includes office supplies and diverse other items which are not materials or components directly used for the products or services which a company produces.

[19] The underlying question in the e-Business Survey 2006 was changed compared to previous years. In 2006, companies where asked whether they "use the internet or other computer-mediated networks *to place orders* for goods or services online". In previous surveys, the question was whether they "use the internet or other computer-mediated networks *to purchase* goods or services online". Thus, a direct comparison of figures, e.g. with those for the publishing & printing industry in 2005, is not recommended.

[20] Companies are asked to estimate how large a share of their total purchases (2003, 2005) / orders (2006) is conducted online.

Exhibit 1.5-1: Companies ordering supply goods online

	Place orders online		Place 1-25% of orders online		Place more than 25% of orders online		Use specific ICT solutions for e-sourcing	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**57**	**48**	**74**	**75**	**26**	**25**	**16**	**9**
By firm size								
Micro (1-9 empl.)		44		73		27		7
Small (10-49 empl.)		54		80		20		10
Medium (50-249 empl.)		60		76		24		16
Large (250+ empl.)		68		75		25		29
By sector								
Food & beverages	54	39	86	91	14	9	14	5
Footwear	35	29	83	87	17	13	9	5
Pulp & paper	59	49	81	75	19	25	14	8
ICT manufacturing	72	69	67	49	33	51	20	10
Consumer electronics	70	71	60	47	40	53	16	9
Shipbuilding & repair	62	53	78	69	22	31	18	12
Construction	53	51	74	72	26	28	12	6
Tourism	60	39	77	72	23	28	20	12
Telecommunication	78	77	54	49	46	51	26	12
Hospital activities	67	67	71	73	29	27	19	12
Base (100%)	firms using computers		firms placing orders online		firms placing orders online		firms using computers	
N (for total, EU-10)	7237		4224		4224		7237	
Questionnaire reference	E1		E3a-c		E3d-e		E7	

Source: *e-Business W@tch* (Survey 2006)

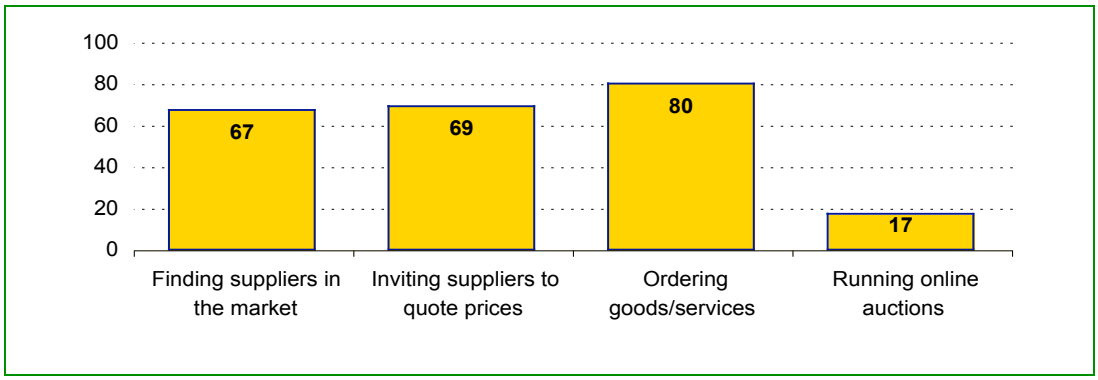
Use of ICT for e-procurement processes

As in 2005, *e-Business W@tch* asked companies whether they "*support the selection of suppliers or procurement processes by specific ICT solutions*." The rationale for this question was to further test whether electronic procurement is in fact a systematic and **digitally integrated** process in a firm, or rather an occasional business activity without much significance for the overall business.

In 2006, only about **10% of firms** in the ten sectors reported the use of software solutions or internet-based services for e-procurement (see Exhibit 1.5-1). This shows that there is a massive gap between the percentage of companies placing at least some orders online (about 50%) and those that use special software for this (about 10%). It can be assumed that companies without such software place orders mainly through websites or extranets of suppliers, which does not require any special e-procurement system. The digital back-office integration of procurement related processes (all the way from ordering to the receipt of goods / services) is probably not in an advanced state in these cases.

Those companies which have procurement systems in place tend to use them for several functions, but in practice mainly for actually placing orders (80%), for finding suppliers in the market, and for inviting them to quote prices (about 70%, see Exhibit 1.5-2). 17% of firms with special ICT systems said they ran online auctions among suppliers.

Exhibit 1.5-2: Sourcing and procurement processes supported by specific ICT solutions



Base (100%): Companies using specific ICT solutions for e-procurement. N = 905.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Questionnaire reference: E8

Source: *e-Business W@tch* (Survey 2006)

1.5.2 Supply chain integration

SCM – Supply chain management

Supply chain management (SCM) software can help companies to **match supply and demand** through integrated and collaborative interaction tools. SCM provides an oversight of the flows of products/materials, information and finances, as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. SCM coordinates and integrates these flows both within and among companies. One of the key objectives of any effective SCM system is to reduce inventory (on the assumption that products are available when needed).[21]

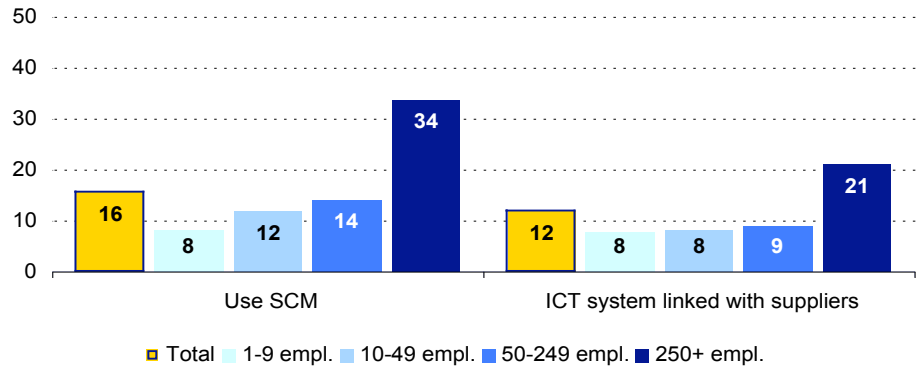
In the sectors studied in 2006, enterprises representing about 15% of employment said that they used an SCM system (see Exhibit 1.5-3). This application is clearly a domain of the large firms: while only about 10-15% of SMEs said they had adopted a SCM system, about 35% of large firms did so.

ICT links with suppliers

e-Business W@tch also asked companies whether their **ICT system** was **linked to that of suppliers**. Interestingly, the share of firms reporting ICT links with suppliers is lower than the share with an SCM system (see Exhibit 1.5-3). This is somewhat in contradiction to the idea of SCM where some form of linking ICT with suppliers can be regarded as a prerequisite. A possible explanation, however, is that many companies have software for managing their inventory and supplies internally, without really integrating suppliers directly through the system. Thus, they use a form of SCM which is not interactive between different companies; they just automate the internal flows of materials and information, and use other means to communicate their demand to suppliers.

[21] Cf. www.mariosalexandrou.com/definition/scm.asp: "Definition of Supply Chain Management"

Exhibit 1.5-3: Supply chain integration: use of SCM and ICT links with suppliers



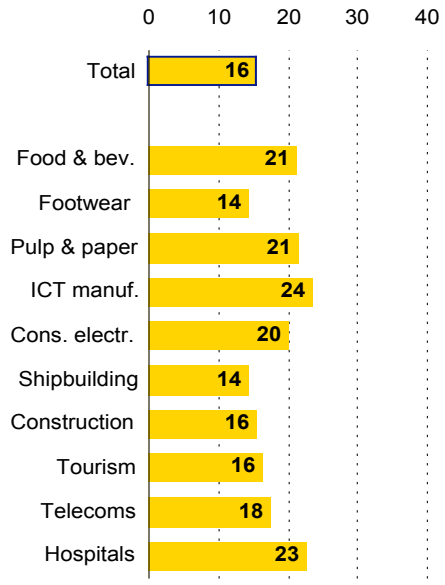
Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
Questionnaire reference: D1f, F13a

Source: *e-Business W@tch* (Survey 2006)

Exhibit 1.5-4: Use of SCM systems by sector

SCM systems are mostly used by larger enterprises from manufacturing industries, for example in the ICT producing sectors, the food & beverages and the paper industries. Hospitals are also among the advanced users of SCM.

The areas of **intra-enterprise integration** (mainly represented by ERP, see Section 1.4.1) and **inter-enterprise integration** (mainly represented by SCM) are strongly intertwined and have similar features.[22] Therefore, most ICT service providers address these two areas with interlinked modules. From a market trend and time perspective, the evolution of SCM has followed that of ERP and relies heavily upon it.



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the sector(s)". Questionnaire reference: D1f

Source: *e-Business W@tch* (Survey 2006)

[22] Trends in the use of SCM are discussed in more detail in the sector study on the food & beverages industry (2006), Section 4.2.1. See www.ebusiness-watch.org ('resources' – 'by sector').

1.6 Improving Customer Service: e-Marketing

ICT, and in particular the internet, can be used in various ways to support marketing activities, including communication with customers, offering products for sale, and developing new marketing strategies. Business processes and applications used depend in particular on whether companies sell directly to consumers (as many service companies do), to intermediaries (wholesalers, retailers) or to other companies, e.g. intermediary products to manufacturing companies.

1.6.1 Companies receiving orders from customers online

Online orders from customers

About 25% of all firms active in one of the ten sectors covered said that they **enabled customers to order products online**. There is practically no difference between companies from the various size-bands in this respect (see Exhibit 1.6-1); this observation holds true for most sectors.

At first sight, 25% appears to be a high figure when making comparisons with previous surveys by *e-Business W@tch*. However, due to a change of the survey question from 2005 to 2006,[23] results are not directly comparable to previous surveys on "online selling".

Furthermore, findings should be put into perspective by the relative share of customer orders received online (as a percentage of the total order volume).[24] In all sectors, a majority (typically about 70-90%) of those companies that enable customers to order online said that these orders accounted for **up to 25% of their total orders** received (see Exhibit 1.6-1). The e-commerce share is higher in ICT-related industries (ICT manufacturing, telecommunications) and in tourism.

[23] The underlying question in the e-Business Survey 2006 was changed compared to previous years. In 2006, companies where asked whether they "allow customers *to order goods* or book services online from the website or through other computer-mediated networks". In previous surveys, the question was whether they "use the internet or other computer-mediated networks *to sell* goods or services online". Thus, a direct comparison of figures, e.g. with those for the publishing & printing industry in 2005, is not recommended.

[24] Companies are asked to estimate how large a share of their total sales to customers (2003, 2005) / orders from customers (2006) is conducted online.

Exhibit 1.6-1: Companies receiving orders from customers online

	Accept orders from customers online		Receive 1-25% of orders online		Receive more than 25% of orders online		Use specific ICT solutions for e-selling	
Weighting scheme:	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms	% of empl.	% of firms
Total (EU-10)	**35**	**25**	**73**	**75**	**27**	**25**	**18**	**9**
By firm size								
Micro (1-9 empl.)		23		79		21		6
Small (10-49 empl.)		26		76		24		12
Medium (50-249 empl.)		29		75		25		16
Large (250+ empl.)		26		74		26		27
By sector								
Food & beverages	31	19	82	87	18	13	14	4
Footwear	25	23	86	88	14	12	8	5
Pulp & paper	26	28	78	77	22	23	19	11
ICT manufacturing	26	27	55	64	45	36	24	12
Consumer electronics	25	35	90	66	10	34	20	12
Shipbuilding & repair	18	14	100	100	0	0	12	8
Construction	13	11	84	88	16	12	8	5
Tourism	49	36	68	72	32	28	28	11
Telecommunication	36	40	66	63	34	37	37	21
Hospital activities	7	10	83	83	7	17	8	8
Base (100%)	firms using computers		firms accepting orders online		firms accepting orders online		firms using computers	
N (for total, EU-10)	7237		1994		1994		7237	
Questionnaire reference	F4		F6		F6		F10	

Source: *e-Business W@tch* (Survey 2006)

Use of ICT for marketing and sales processes

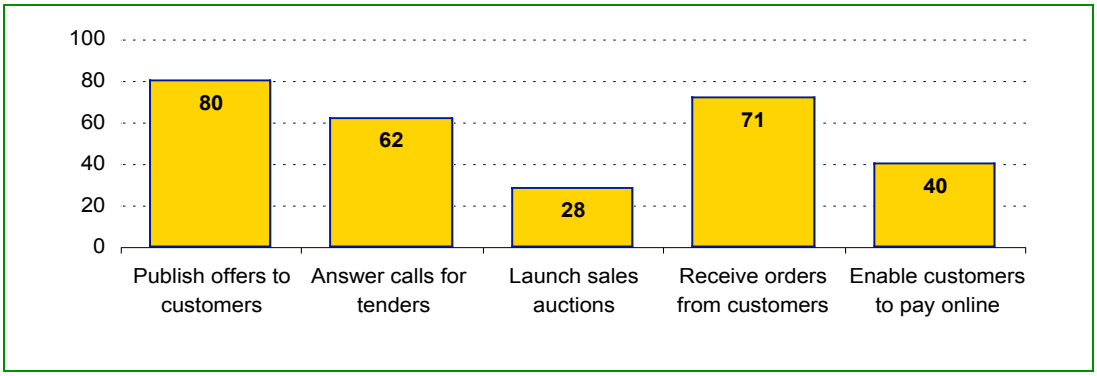
As in 2005, *e-Business W@tch* asked companies whether they "*support marketing and sales processes by specific ICT solutions*." The rationale for this question is to further test to what extent their e-commerce activities are **digitally integrated** processes, or whether they use rather "simple" forms of e-commerce, such as receiving orders by e-mail without any system integration of the related information and document flow.

About **10% of firms** (representing close to 20% of employment) reported the use of software solutions or internet-based services for their marketing and sales activities (see Exhibit 1.6-1). There is a gap between the percentage of companies receiving at least some orders online (about 25%) and those that have special software for doing so (about 10%). Interestingly, the share of companies receiving orders online is much closer to the share for ERP adoption (11%). In many cases, particularly in manufacturing, the systematic management of online orders will be conducted via the ERP system of a company.

Those companies which have specific sales systems in place tend to use them mainly for the core functions of **publishing offers** to customers (80%), enabling **customers to place orders** (about 70%), and answering calls for tender (about 60%). 40% of companies with such systems also enable customers to actually pay online for the goods which they have ordered. This last incidence shows how important it is to differentiate between the distinct phases in e-commerce transactions when analysing this topic.

Enabling customers to place an online order is in many cases still separated from payment for the order. Payment is then accomplished in traditional ways, e.g. by bank transfer upon receipt of an invoice for the respective order.

Exhibit 1.6-2: Marketing and sales processes supported by specific ICT solutions



Base (100%): Companies using specific ICT solutions for marketing / sales. N = 1012.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Questionnaire reference: F11

Source: *e-Business W@tch* (Survey 2006)

1.6.2 e-Integration of marketing processes: CRM and ICT links with customers

An ICT application which can help companies to improve the distribution of their products is **Customer Relationship Management** (CRM) for business intelligence purposes. CRM systems promise a company the ability to systematically increase knowledge about its customers and their buying behaviour, and to build and adapt marketing strategies on the basis of this intelligence.

CRM is a term that refers to a broad range of methodologies and software applications. Normally, it involves some kind of database with systematic information about customers and the business record the company has with them. Three levels of application of CRM are commonly distinguished:[25]

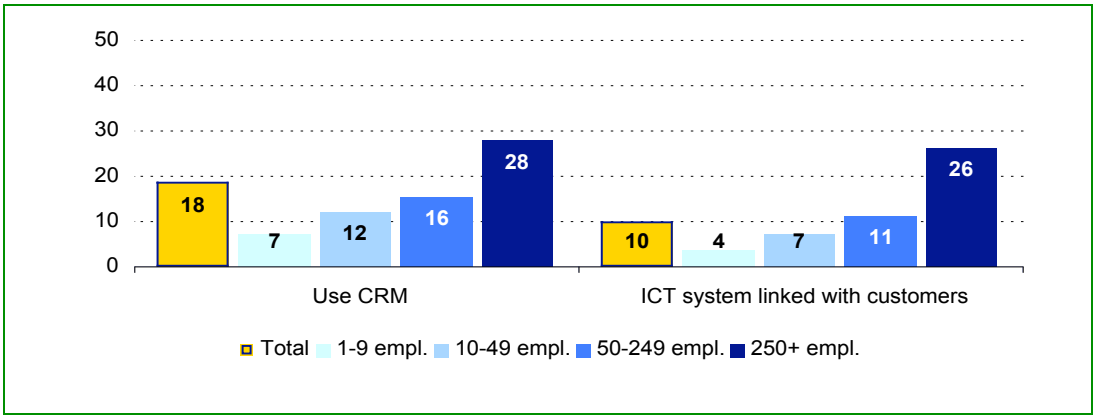
- **Operational CRM**: supporting front-office work by storing basic data on customers (e.g. addresses, track record of contacts); front-office enters new data as part of their work;
- **Analytical CRM**: analysis of data gathered through operational CRM in order to segment customers;
- **Collaborative CRM**: facilitates interactions with customers through all channels (personal, letter, web, e-mail) and supports co-ordination of employee teams.

In 2006, companies representing close to 20% of employment in the ten sectors reported the use of CRM (see Exhibit 1.6-3). There is a pronounced gap between SMEs and the large firms with regard to CRM adoption.

[25] Cf. www.mariosalexandrou.com/definition/crm.asp: "CRM Definition"

CRM is a key application for many of the larger companies in some of the service sectors studied in 2006, in particular telecommunications (48%). However, CRM is also used by manufacturing companies, in particular in the ICT manufacturing industry (31%, see Exhibit 1.6-4).

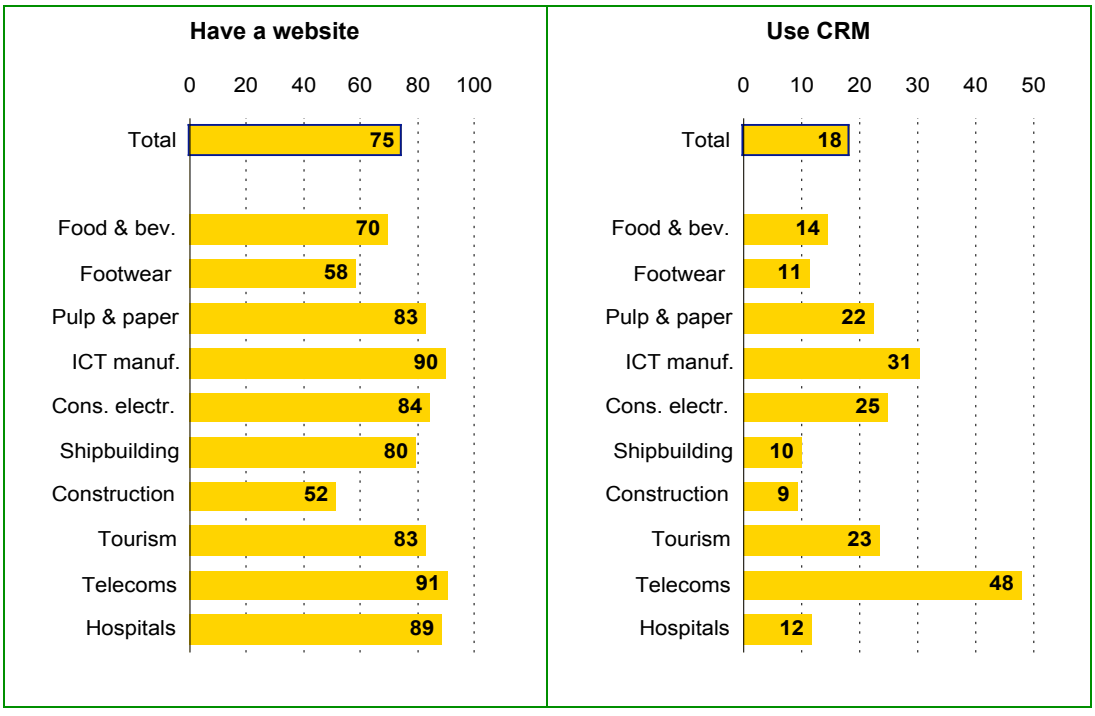
Exhibit 1.6-3: Use of CRM and integration of ICT systems with customers



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
Questionnaire reference: F2, F13b

Source: *e-Business W@tch* (Survey 2006)

Exhibit 1.6-4: Companies with a websites / use of CRM systems by sector



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the sector(s)". Questionnaire reference: F1, F2

Source: *e-Business W@tch* (Survey 2006)

e-Business W@tch also asked companies whether their ICT system had links to that of customers. About 10% of SMEs and 25% of large firms in the ten sectors said that they had established such links. This is not necessarily directly related to collaborative CRM, however. It is also possible, that these links are part of an integrated e-commerce scheme between companies, e.g. via dedicated EDI connections.

1.7 ICT and Innovation

The **capability for innovation** is very important for European companies, particularly in industries which compete increasingly on global markets. Innovation drives productivity growth and enables companies to keep their position in higher market segments, which rely on differentiation and quality. ICT can play a major role in enabling both product and process innovation.

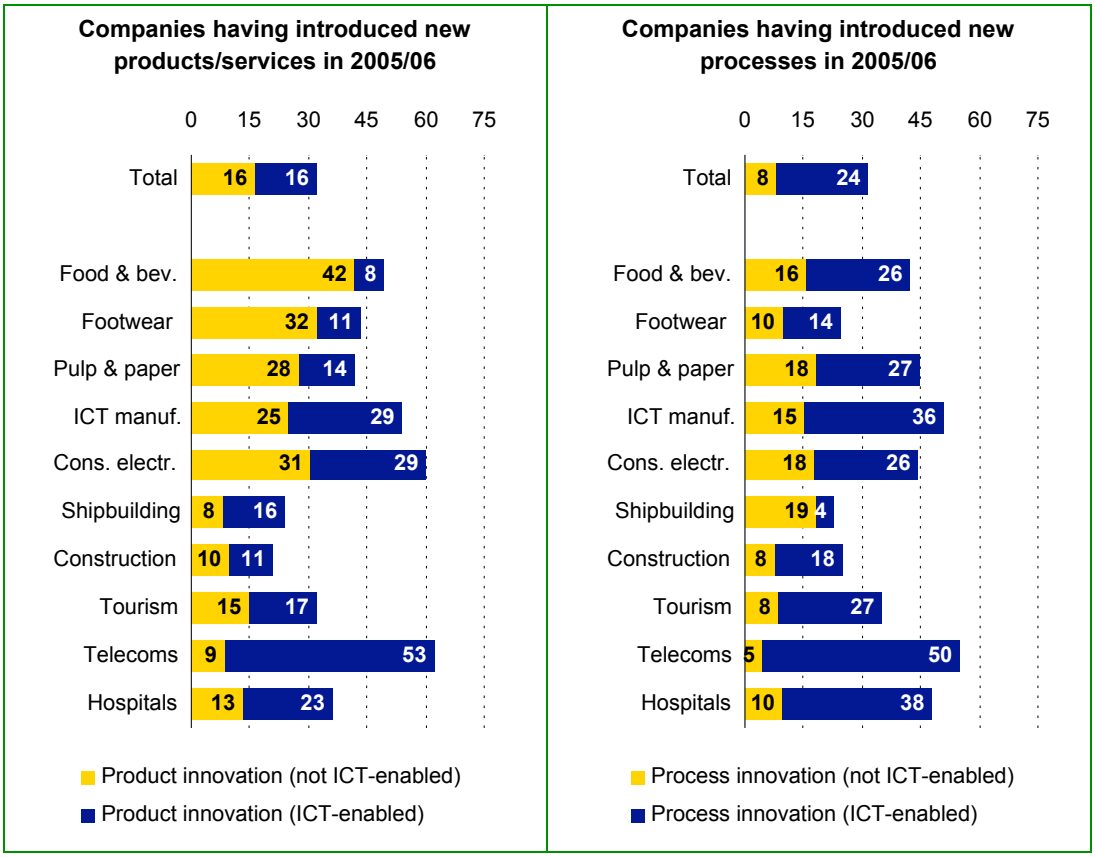
e-Business W@tch asked companies whether they had launched any new or substantially improved products or services during the 12 months prior to the interview, and if they had introduced new or significantly improved internal processes in the same period of time. Companies indicating that they had introduced innovations were then asked follow-up questions on the role of ICT for their innovation activity.

Firms representing more than 30% of employment in the ten sectors studied in 2006 said that they had launched new (or improved) products in 2005/06. About **half of these product innovations** had been directly related to or **enabled by ICT** (see Exhibit 1.7-1). As can be expected, ICT is most important for product innovation in the ICT-related sectors themselves.

The use of ICT for **process innovation** is often centred on production processes, such as automated and computer-based manufacturing systems, or processes aimed at manufacturing products that can combine costs of mass production with differentiation of customised, optimisation of the value chain. In total, companies representing 32% of employment said that they had introduced new processes in the 12 months prior to the interview. **75%** of these innovations were considered to be **ICT-enabled**.

Among most of the manufacturing industries studied, the share of companies that introduced new processes is higher (40-50%), with ICT playing a critical role, typically enabling about 60-80% of these innovations. The shipbuilding and footwear industries are the exceptions among the sectors studied; apparently, fewer companies use ICT for process innovation, in particular among the larger firms. However, these two industries differ from the others in terms of their production and distribution characteristics. In shipbuilding, for example, innovation cycles are usually longer than one year, which was the predefined time frame of the survey question. In footwear, traditional work organisation still prevails; the degree of ICT adoption is generally lower than in most other manufacturing sectors.

Exhibit 1.7-1: The role of ICT for product and process innovation



Base (100%): Firms using computers. N (for Total) = 7237.
Weighting: Figures are weighted by employment and should be read as "enterprises comprising …% of employment in the sector(s)". Questionnaire reference: I1 – I4

Source: *e-Business W@tch* (Survey 2006)

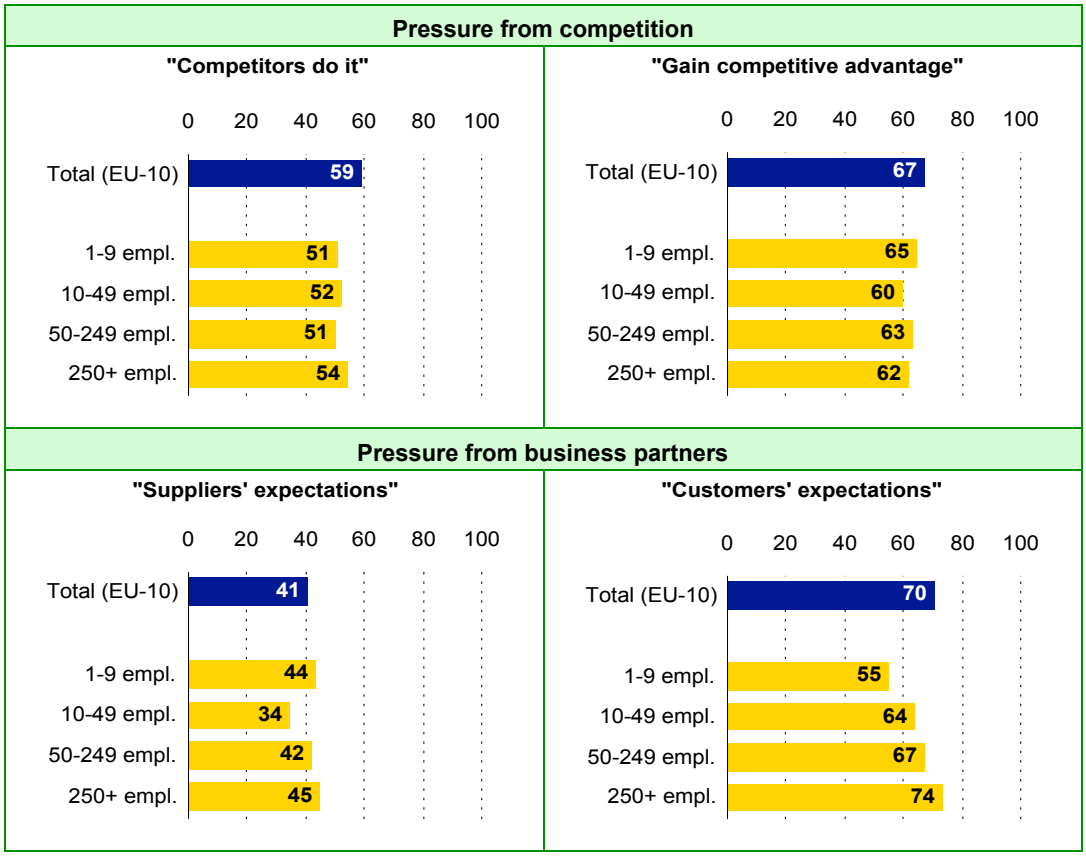
1.8 Drivers and Barriers for the Uptake of e-Business

Drivers of e-business adoption

In the e-Business Survey 2006, those companies that confirmed that e-business constitutes "a part of the way they operate" were asked to indicate important reasons for starting their e-business activity. Four main reasons were suggested: “because competitors also do it”, “to gain competitive advantage”, “to fulfil customers’ expectations”, and “to fulfil suppliers’ expectations”. These reasons were suggested in order to see whether e-business use was more due to competition in the market than due to demands from business partners, i.e. from customers or suppliers. As far as competition is concerned, “gaining competitive advantage” may be interpreted as more opportunity-driven, while “competitors do it” is more reactive to market pressure.

Replies show that all reasons were perceived as relevant. “**Customers' expectations**” and the opportunity to “**gain competitive advantage**” turned out to be the most important reasons, as stated by firms representing around 70% of employment in the ten sectors (see Exhibit 1.8-1).

Exhibit 1.8-1: Drivers of e-business adoption: companies saying that … was an important reason for starting e-business



Base (100%): Companies saying that e-business does not play a role in their operations.
Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.
N (for total, EU-10) = 4602. Questionnaire reference: H3

Source: *e-Business W@tch* (Survey 2006)

Pressure from competitors was also reported to be important by a majority of companies: firms representing 59% of employment in all sectors stated this. Suppliers' expectations are less important as a driver of e-business adoption (firms representing about 40% of employment said that this was an important reason). These results indicate that customers tend to have greater negotiation power than suppliers.

There are no big differences between size-bands for three of the four suggested reasons. Notable differences were reported only for "customers' expectations". The percentage of companies that name customers as relevant drivers of e-business increases by firm-size, from 55% of micro-firms to about 75% of large enterprises.

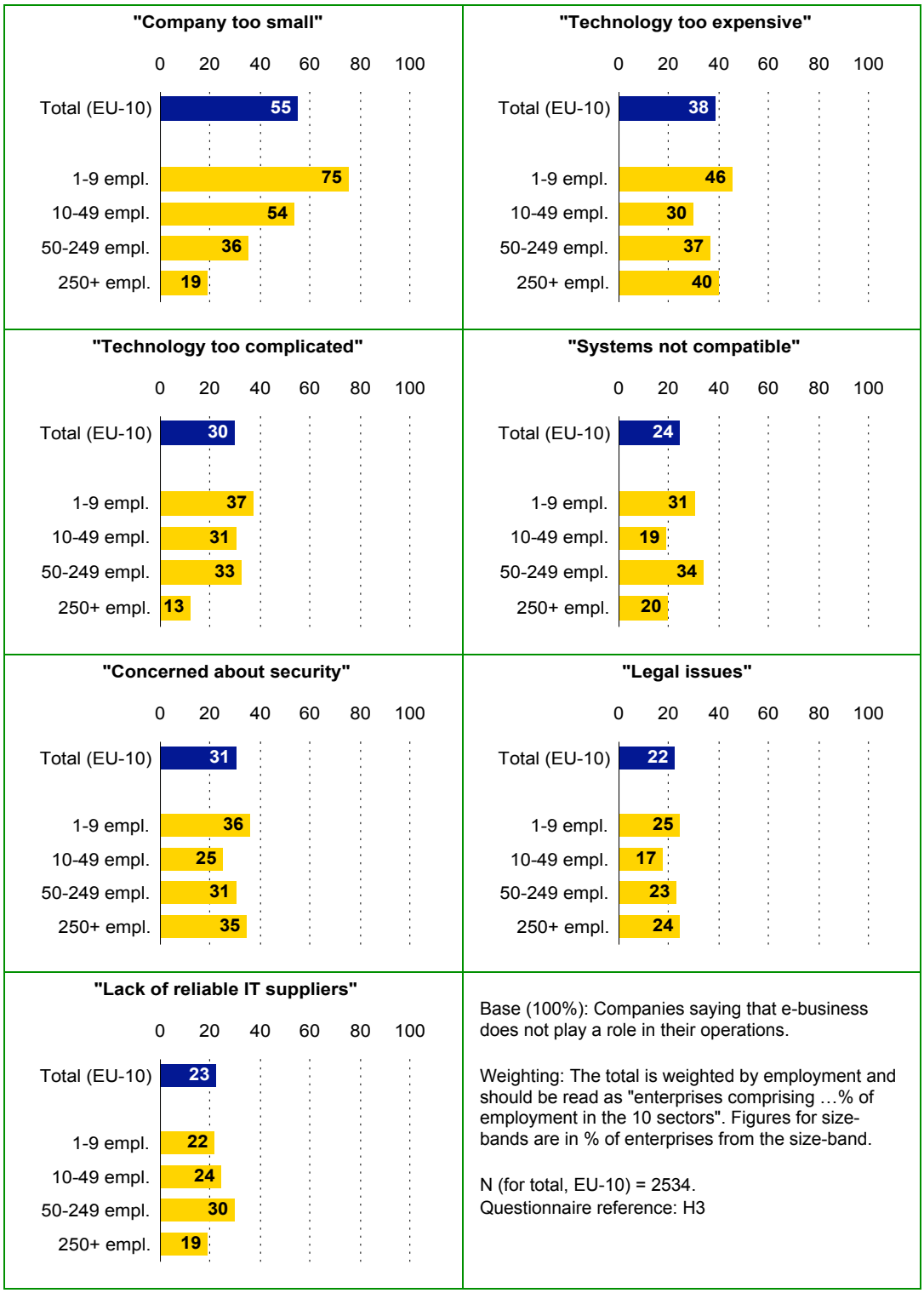
Barriers to e-business adoption

Companies saying that e-business does not play a role in their operations were asked to indicate important reasons why they did not practise e-business. Several reasons were suggested (see Exhibit 1.8-1). For smaller companies, the main reason for not using e-business is that they feel their **company size is too small to benefit**. 75% of the micro firms (1-9 employees) and 54% of the small companies (10-49 employees) said so.

Other possible reasons were perceived as less relevant. 38% of the non-users argued that the required **technology was too expensive** (38%), and about 30% felt that the technologies were too complicated, or indicated concerns about security as an important barrier. Only about 20-25% said that their systems were not compatible with those of suppliers or customers, felt that there was a "lack of reliable IT suppliers", and/or saw unsolved legal issues as a barrier (see Exhibit 1.8-1). Consequently, there is no clear picture by size-band.

For large firms, technology costs appear to be the most important barrier to e-business use. For medium-sized firms, several reasons appear to be of similar importance. Smaller companies highlight SME-typical barriers such as small company size and high technology costs.

Exhibit 1.8-2: Barriers to e-business adoption as perceived by companies: percentage of firms saying that … is an important reason for not practising e-business



Base (100%): Companies saying that e-business does not play a role in their operations.

Weighting: The total is weighted by employment and should be read as "enterprises comprising …% of employment in the 10 sectors". Figures for size-bands are in % of enterprises from the size-band.

N (for total, EU-10) = 2534.
Questionnaire reference: H3

Source: *e-Business W@tch* (Survey 2006)

1.9 e-Business Impact on Corporate Performance, Productivity and Employment

Background

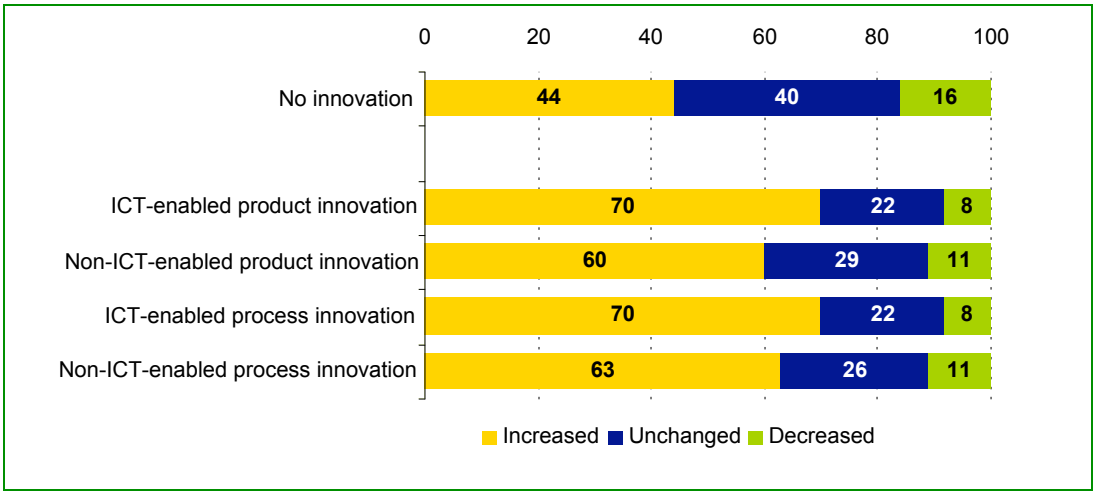
This section summarises a special study which *e-Business W@tch* conducted in 2006. The study focuses on possible consequences of ICT and e-business in three different, although related, areas: (1) corporate performance, empirically measured by turnover development, (2) productivity and (3) employment dynamics. Based on a literature review of recent research findings on these topics, hypotheses were developed that were confronted with the data from the e-Business *S*urvey 2006. The literature review provides a comprehensive overview of the current state of research. Together with the new empirical evidence, this report gives an overview of the current economic impacts of ICT.

1.9.1 ICT impact on corporate performance

Positive impact of ICT on turnover growth

In the study, corporate performance was empirically measured in terms of turnover growth. The hypothesised relationship between ICT and turnover growth is straightforward: The implementation of new ICT and complementary investments can lead to innovations, and innovations are positively associated with turnover growth. In other words, innovative firms are more likely to grow. This holds both for ICT- and for non-ICT-related innovations, and it holds for process and for product innovations. The empirical results support this view and indicate that innovative firms exhibit significantly more frequently increasing turnovers than non-innovative firms do.

Exhibit 1.9-1: Turnover development of firms and innovative activity 2005



Base (100%): All companies. N = from 12,721 to 12,799 depending on missing values.
Questionnaire reference: I1-4, U14

Source: *e-Business W@tch* (Survey 2006)

ICT use and profitability

The relationship between ICT usage and profitability is more complex and contingent upon firm- and market-specific factors such as the timing of the investment relative to competing firms and the reaction of competing firms in the market. Hence, no general relationship between ICT usage and profitability can be hypothesised because profitability crucially depends on the respective competitive environment of each individual firm and its ability to limit imitation by rivals.

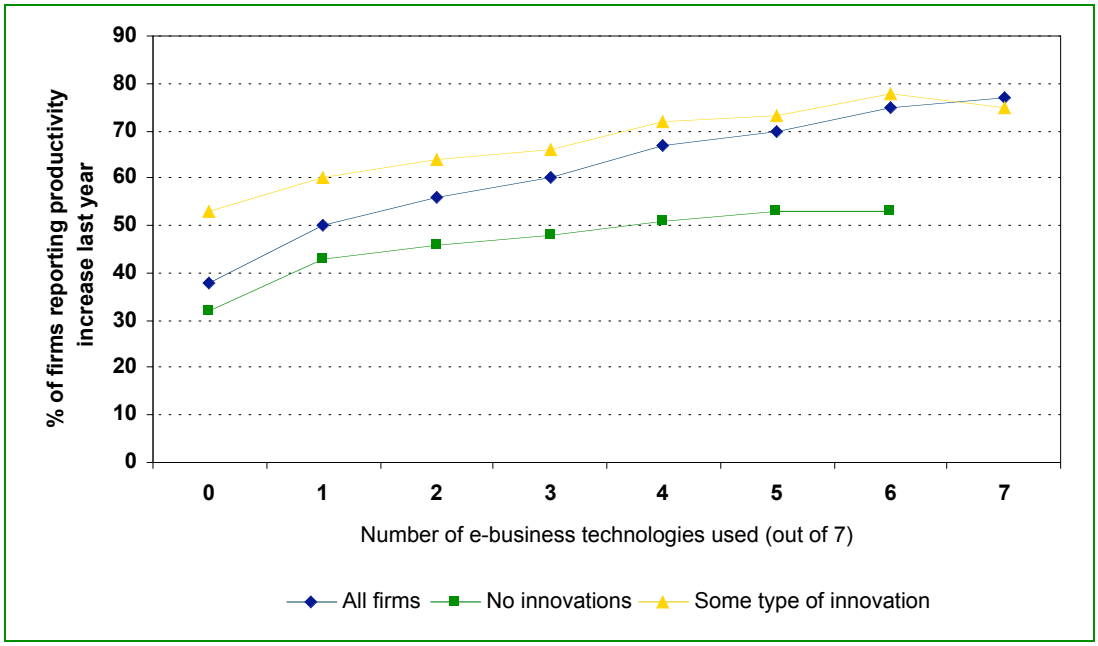
1.9.2 ICT impact on productivity

Although measurement problems and a debate about the sustainability of ICT-enabled productivity growth remain, there is now a growing consensus that ICT does have positive effects on labour- and total-factor-productivity. However, the effects vary greatly between sectors and countries. Furthermore, the link between ICT-investments and productivity is indirect, and positive effects are contingent upon additional complementary investments in innovation and human capital at the level of the firm.

Empirical evidence suggests that ICT use increases productivity

The empirical evidence reported in this special study suggests that innovative firms are more likely to exhibit productivity increases at all stages of ICT development. More advanced users of ICT are also more likely to experience productivity gains. These results suggest that intense ICT usage combined with innovative activity are positively related to productivity growth at the level of the firm.

Exhibit 1.9-2: Productivity increase, ICT usage and innovative activity



Base (100%): All companies. N = 10,392. Questionnaire reference: I1-4, U16, D1b, D1d, D1f, B5, E1, F2, F4. Technologies counted are: E-Learning, ERP, SCM, Knowledge Management, CRM, Online Sales and Online Purchasing.

Source: *e-Business W@tch* (Survey 2006)

1.9.3 ICT impact on employment

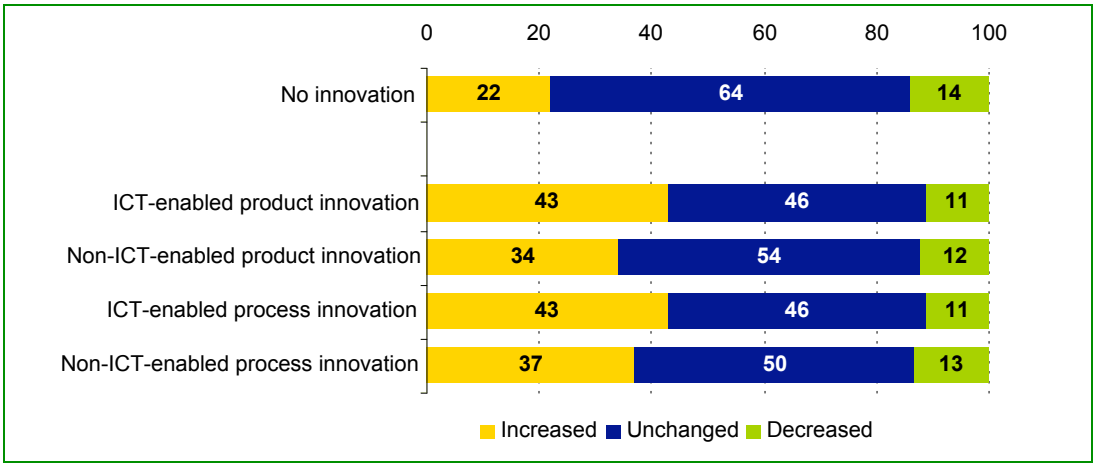
Net impact of ICT on job growth can be negative or positive

Whether the increasing use of ICT creates or destroys jobs remains a subject of debate. Theory suggests that the net impact depends on the relative strength of two competing effects: On the one hand, the use of ICT can lead to innovations, which can result in output growth and a concomitant growth in jobs. On the other hand, process innovation and ICT-related productivity gains imply that a given output level can be attained with less labour input. In addition, there can be substitution effects if new ICT-related products and services replace other, potentially more labour-intensive, products and service. Depending on which of these effects dominates, the net impact of ICT on job growth could be positive or negative. Furthermore, the net effect can vary between the company level, the industry level, and the macroeconomic level. Additional employment can be generated in some sectors and labour displacement in others by ICT as investment products. This is part of the structural changes that are caused by the diffusion of ICT in the economy, which will lead to a more efficient allocation of resources in the long run.

Positive employment effects of ICT use on firm level

New empirical results based on company level data from the *e-Business W@tch* 2006 survey suggest a positive relationship between ICT-enabled innovations and employment growth. In addition, more advanced users of ICT in the sample are significantly more likely to increase employment than less advanced users of ICT. Finally, the empirical results suggest that firms with a high share of college-educated employees tend to be more advanced users of ICT, while the opposite holds true for firms with a lower share of college-educated employees. This is consistent with the view that a highly skilled workforce and intense ICT usage complement each other. This could lead to changes in the labour market which over-proportionately benefit highly skilled individuals. However, due to the fact that the e-Business Survey 2006 does not cover all sectors of the economy, the results cannot be extrapolated to the aggregate level.

Exhibit 1.9-3: Employment development of firms and innovative activity



Base (100%): All companies. N = from 13,516 to 13,610 depending on missing values.
Questionnaire reference: I1-4, U4

Source: *e-Business W@tch* (Survey 2006)

1.9.4 General conclusions

ICT and e-business trigger important structural changes

The evidence discussed above (in more detail in the special study) suggests that ICT and e-business are currently triggering important structural changes in the economy. These new technologies have implications for the competitiveness of individual enterprises, the competitive dynamics in markets, the creation of new markets, the demand for labour, the price of products and production factors, the type of products and services that are produced, and ultimately the structure and performance of entire national economies.

In addition to these hypothesised relationships, evidence from the new *e-Business W@tch* data suggests that ICT usage and high levels of employee's skills complement each other, leading to skill-biased technological change and an advantage for firms with highly skilled employees in adopting and using ICT. The empirical evidence also suggests a positive relationship between ICT-development and employment growth at the company level. Data also suggest that firms conducting ICT-related process innovations are more likely to increase employment than non-innovative firms.

Empirical results depend on sectors included

However, empirical results should not be overstated. The theoretical literature suggests that the effects of ICT are likely to vary significantly among firms, sectors and nations. For example, positive effects of ICT on productivity and employment are more likely to be found in ICT-producing sectors and sectors that are already advanced users of ICT. Also, the employment effects of ICT are likely to vary among sectors that produce ICT and those that only use ICT. Furthermore, the employment effects among the users of ICT depend on the specific circumstances of ICT usage. So, the empirical results reported above are contingent upon the specific choice of countries and sectors included in the survey and should not be generalised.

Impact of ICT depends on firm- and sector-specific factors

The causal relationships are complex and the actual impacts of ICT on corporate performance, productivity and employment depend on many firm- and sector specific factors. As a result, more ICT usage does not necessarily imply superior performance and productivity growth. Instead, these positive impacts are contingent upon auxiliary factors such as the competitive dynamics in individual markets, the ability of firms to transfer ICT investments into innovative activity and the speed of innovation and technology diffusion.

Nevertheless, the evidence presented above emphasises that ICT remains an important variable both for strategic management and for policy aiming at improving business performance and economic progress. In many sectors and firms, the innovative potentials of ICT have not yet been fully exploited, which implies that ICT-related innovations can still result in competitive advantages, if the innovating firm is able to protect its innovation from imitation by rivals. Investments in ICT and e-business combined with complementary investments in human capital and organisational change are also still likely to result in further increases in labour- and total-factor-productivity.

1.9.5 Policy implications

Improving framework conditions for innovation in general

From a policy perspective, several aspects of the above discussion and evidence merit attention. Firstly, there is **no direct link between ICT and economic variables** such as profitability, productivity and employment dynamics. Instead, **ICT has only indirect effects** that occur via innovations that are carried out and triggered by the adoption of new ICT. Although ICT remains an important source of innovation in Europe at the moment, it is not necessarily true that ICT-enabled innovation must be superior to non-ICT-enabled innovation. Also, "lagging behind" in terms of ICT development does not automatically lead to competitive disadvantages because continuous technological improvements and falling prices of ICT can make it attractive for firms to delay adoption. In addition, not all ICT tools are necessarily beneficially in all firms and sectors.

Thus, instead of promoting ICT in general or specific ICT solutions, policy should focus on improving the framework conditions for innovation in general. This includes improvements and higher investments in education in many countries of the European Union, more public engagement in research and development, a further deregulation of markets to stimulate competition via innovation, and improved conditions for firms to finance risky and innovative projects. These generic and technology-neutral policies will also benefit the diffusion and impact of ICT.

No direct policy interference if there is no clear market failure

Investments in innovation and new technologies might be subject to market failure, which can result in either too much or too little investment in technology compared to the social optimum. However, it is **not clear a priori or even after empirical observations which scenario occurs and what the social optimum would actually be**. Thus, policies that aim at accelerating the diffusion of particular technologies are aiming at an invisible target, which might result in significant windfall gains. As a rule of thumb, policy should not interfere directly if there is no clear sign of a market failure.

Public investments in education and R&D

Even if there is public benefit to speeding up the diffusion of a particular technology, it should be realised that **the leverage of public policy is limited, and the positive impacts of such policies are often more a matter of belief than of empirical facts**. Studies on this issue conclude that governmental intervention rarely speeds up the diffusion process, and that government-controlled firms move no faster than privately owned companies. This also suggests that public funds are likely to be better spent in areas where positive returns are beyond doubt, such as in investments in education and Research and Development (R&D).

Continued monitoring and analysing of ICT and e-business developments

Most likely, ICT will remain an important enabler for further economic development in the future, because the ICT producing industry is still very innovative in developing new software and services for industry purposes, and hardware continuously becomes both cheaper and more powerful.

New ICT, and other new technologies with potentially important economic consequences, will certainly, therefore, be developed in the future. **Public organisations will need to continue to monitor and analyse these developments**. Although private organisations also carry out such monitoring initiatives and analysis, they are usually interested only in particular aspects, rather than in "the big picture." In addition, they are motivated by private rather than public incentives, and their financial resources for conducting in-depth research on a broader scale are limited.

As a counter-example, public initiatives like *e-Business W@tch* suffer less from such limitations and, via their research and dissemination activities, they can generate new knowledge, resolve information asymmetries, and potentially help both policymakers and companies to make better decisions.

Implications for ongoing public policy action

Consequently, ongoing action of public policy is mainly needed in two areas:

- **Improving the framework conditions for innovation in general**: this includes education, R&D and market regulation.
- **Monitoring and analysing recent technological developments**, with the aim of informing governmental institutions, industry and the interested public about the implications of these developments.

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1.10 The Role of New Companies in e-Business Innovation and Diffusion

Background

This section summarises a special study which *e-Business W@tch* conducted in 2006. The study analysed the role of new companies in the introduction and take-up of new e-business applications, i.e. for e-business innovation and diffusion. It focuses on the importance of new companies for innovation and economic growth which has been commonly acknowledged by political decision makers and researchers. The analysis is based on (unweighted) data from the e-Business Survey 2006 (for all countries), literature findings, secondary statistical data, qualitative findings from case studies and a survey among the members of the *e-Business W@tch* 2006 Advisory Board.

1.10.1 The importance of new companies for growth and innovation

Various studies show that new companies contribute significantly to economic growth and employment. At a national level, research results indicate a positive association in developed countries between the number of nascent entrepreneurs and owners of young firms, and growth. Empirical evidence also suggests that small and new enterprises serve as an engine of employment creation in Europe. New firms may have distinct advantages over established firms in innovative activity, including organisational flexibility, interest in incremental innovations, and sustained excitement about innovation. In recent years, economic framework conditions are assumed to have changed in such a way as to shift innovative advantage towards new and small firms.

1.10.2 Findings from qualitative research and literature

Findings from qualitative research and from literature confirm that new companies play an important role in the introduction and uptake of new e-business applications in many industries.

However, some industry representatives are dismissive of the suggestion of significant differences between new and established companies in this respect. Furthermore, many innovations of new companies may be incremental, not necessarily visible and widely known. Many new companies are not innovative at all as far as e-business is concerned. At the level of individual firms, the impact of new companies on e-business innovation and diffusion obviously depends on the importance of e-business in their business model. At an aggregate level, the impact of new companies on e-business innovation and diffusion differs between industries, regions, types of technologies, and stages of the innovation process:

- **Differences between industries**: In industries with strong supplier and customer relationships, new companies may play a less important role for innovation and diffusion than in industries with weak vertical integration. Further industry

characteristics that shape the role of new companies include the innovativeness of the industry and the industry's type of products or processes.

- **Differences between regions**: In regions with a high innovative performance, start-ups are more important for e-business innovation and diffusion than in generally less innovative regions.
- **Differences between technology types**: New companies may play a more important role in ICT-related product and service innovation than in process innovation.
- **Innovation versus diffusion**: Findings suggest that new companies contribute significantly to the diffusion of e-business applications, but they do not necessarily adopt more innovative applications than established companies.

1.10.3 Findings from the e-Business Survey 2006

Company age groups in the e-Business Survey 2006

In 2006 the e-Business Survey offered for the first time the opportunity to analyse data about e-business infrastructure, use and impacts by the age of the company. Overall, 9% of the survey companies were founded between 2006 and 2003. This group is considered as "new companies" here, and this is the group focused here. 22% of the surveyed companies were founded between 2002 and 1997, a relative majority of 42% was founded between 1996 and 1981 and 26% were founded before 1981. The findings indicate that new companies are important for e-business innovation and diffusion, but not necessarily more important than established companies. There are considerable differences between industries and also technologies in this respect. Core findings include the following.

Product, service and process innovation

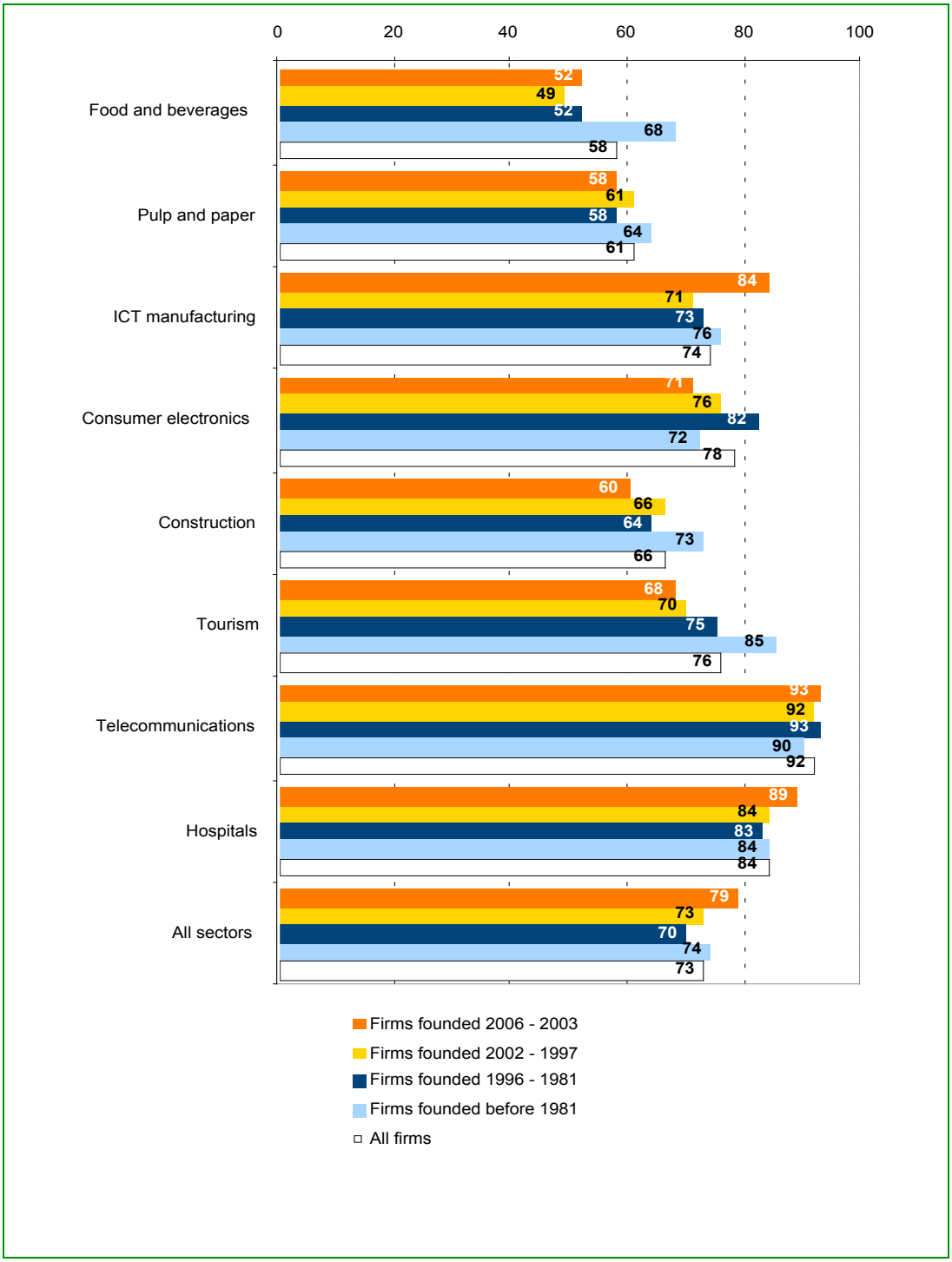
The survey distinguished, firstly, between product and service innovation on the one hand and business process innovation on the other. Secondly, for both product and service innovation as well as process innovation, the interviewees were first asked about general innovation and then, if applicable, about ICT-related innovation.

Product and service innovation activity, whether general or ICT-related, was found to decline with increasing company age. The differences between age groups for *general* product and service innovation were found to be only a few percentage points: 44% of the companies of the youngest age group and 39% of the oldest group reported general innovation activity. There were more distinct differences for *ICT-related* product or service innovation: 62% of the innovating new companies reported ICT-related product or service innovation and 49% of companies founded before 1981. As regards the introduction of new *business processes*, no clear patterns were identified. In general process innovation, the oldest companies reported the highest activity level (37%), and in ICT-related process innovation the youngest companies (79%). In both cases, the companies founded between 1981 and 1996 reported the lowest innovation levels.

Important industry differences

The overall importance of new companies for product or service innovation as well as for process innovation (see Exhibit 1-10.1) was found to differ sharply by industry.

Exhibit 1.10-1: ICT-related process innovation in past 12 months by company age



Base (100%): Companies stating process innovation in past 12 months. N = 4,599. Questionnaire reference: I4.

Source: *e-Business W@tch* (Survey 2006)

New companies reported the highest innovation levels in some industries and the lowest levels in other industries: new companies appear to play a particularly important role for ICT-related innovation in the ICT manufacturing industry, while the role of new companies appears to be particularly small in the construction and tourism industries.

This implies that results for the overall importance of new companies for e-business innovation depend very much on the composition of the sectors in the sample. The results also depend on the specific characteristics of the sectors covered that determine the role of new companies for ICT innovation activity.

Innovative e-business solutions

Among the ICT applications and solutions which were covered by the e-Business Survey 2006, the following were considered as being particularly innovative: Voice over Internet Protocol (VoIP), Radio Frequency Identification (RFID), and e-Invoicing. Results show that start-ups tend to display the highest percentage of use of these applications. In fact, new companies display the highest use of VoIP across all age groups (24%) and they are at the same level with companies founded before 1981 as regards e-invoicing (20%) and RFID (4%). Again there are large differences between the industries examined. However, in contrast to what one may expect, in industries in which new companies were found to be less important for ICT-related product and service or process innovation, new companies reported higher levels of VoIP and e-invoicing use than established firms.

Other e-business solutions

In e-business applications that are already common, new companies were not found to have a clear lead. According to the survey results, new companies have the highest percentages for Wireless Local Area Network (33%), online applications other than e-mail to collaborate with business partners in the design of new products or services (22%), placing orders for goods and services online (62%), and specific IT solutions to support their marketing or sales processes (18%). Furthermore, the share of companies stating that e-business constitutes a significant aspect of their operating methods was largest among new firms (26%). In all these cases, however, differences between age classes were not marked. In contrast, new companies were found to lag behind other age-classes in the use of Enterprise Resource Planning, Supply Chain Management and Customer Relationship Management systems. These ICT applications are more beneficial for large than for small companies.

1.10.4 Business impacts for individual enterprises and industries

The findings have implications for the importance of start-ups for competitiveness and productivity in economic sectors. As new companies may have more organisational flexibility and more interest in introducing incremental inventions than established companies, new companies contribute to customisation and co-operation in innovative networks. To the extent that customisation and co-operation become more important for regional and national competitiveness, industries in regions or countries with fewer new companies may lose competitiveness and productivity to industries in other areas with a larger number of agile start-ups.

1.10.5 Policy implications

Promoting new companies

Knowledge and capital are particularly important resources for new companies that use or produce e-business applications: New firms may need particular ICT skills for the production or use of e-business applications, and they may need skills for e-business management. They also need financial capital to the extent that the production or use of e-business applications requires considerable investment – in certain cases from specialised venture capitalists. Furthermore they need real estate with appropriate production and office space.

Promoting e-business innovation networks

Decision makers in governments, industry associations and other organisations can facilitate the access to and the use of knowledge and capital. They can promote innovation and diffusion of e-business technologies through establishing and supporting related stakeholder networks. Such networks may include, above all, companies producing or purchasing ICT and e-business applications as well as firms offering related services. New companies should receive particular attention in such fora in order to exploit their innovative potential.

Promoting access to finance and real estate

In terms of finance, the opportunities for "business angels'" investments appear to be largely untapped. On the investors' side, in order to increase the investment skills of active and potential business angels and thus to increase their readiness and capability to invest in new ICT firms, relevant academies could be created. On the companies' side, new ICT firms should be made aware of such funding opportunities from "business angels". Furthermore, policymakers can facilitate the access of company founders to appropriate real estate. They can, for example, help to establish and foster business incubators specialised in hosting and providing consultancy to new companies that either produce ICT or have a business model based on e-business.

Promoting spin-offs from universities and public research institutions

"Spin-offs" from universities and public research institutions should receive particular attention from policy makers. There appears to be a large and unexploited potential for commercialising inventions and related knowledge applicable in e-business. Approaches for promoting such start-ups should be differentiated and involve, for example, relevant research institutes or clusters within universities, educational courses for e-business management, specialised finance providers, and university-related business incubators. Such measures should target not only graduates and students, but also university professors as potential company founders.

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1.11 Case Studies in e-Business: Conclusions and Lessons Learned

1.11.1 Introduction

In 2006, *e-Business W@tch* collected 75 case studies, including examples from all sectors covered and from nearly all EU Member States, as well as from Croatia, Norway, Switzerland and the US. Case studies[26] are examples of real-life e-business activity in firms from the sectors studied. The objective is to complement the quantitative picture of e-business adoption from the e-Business Survey 2006, and to illustrate the impact of e-business activity in enterprises. Case studies are based on personal interviews with company representatives and on desk research. Most of the cases are published in the ten sector studies of 2006 and on the website.[27] This section presents a synopsis of the main results.

Selection of case studies

Cases were selected mainly on the basis of their relevance for the e-business issues analysed in the various sector studies, with the intention to validate, illustrate and contextualise the assessment and findings presented in the studies. Examples include different types of cases:

- **Typical example**: cases that represent typical state-of-the-art e-business activity in the respective sector.
- **Best practices**: cases that are considered to represent good e-business practice within the respective industry.
- **Innovative e-business approach**: cases that represent innovative approaches and methods of e-business, particularly if this practice reveals some insight about future developments in the sector.
- **Lessons learned**: cases containing an interesting experience of a company, i.e. lessons to be learned from the described activities.
- **SME dimension**: an adequate quota of cases from small and medium-sized enterprises was achieved, considering the rationale of *e-Business W@tch* to focus on e-business implications for SMEs.

Distribution of case studies by firm size and countries

In total, about 40% of the case studies conducted in 2006 cover e-business initiatives of small and medium-sized firms (with up to 500 employees), and about 40% examine

[26] The term "case study" normally implies a more detailed and in-depth analysis of a specific example. e-Business Activity Views presented by *e-Business W@tch* in sector studies have a scope of 3-5 pages on average. However, they have in common with more detailed case studies that results are mostly based on primary research, i.e. personal interviews with company representatives. Interviews were carried out either face-to-face or by telephone.

[27] All case studies conducted by *e-Business W@tch* are available at http://www.ebusiness-watch.org/resources/casestudies.htm.

activities of large firms (with more than 500 employees). The remainder (about 20%) describe other activities which cannot be attributed to individual private sector companies (see Exhibit 1.11-1); this category includes activities of the public sector or associations, joint projects involving several companies, and case studies on hospitals. From a geographic perspective, about 90% of the cases concern firms from the 27 EU Member States, and about 10% are international or cannot be attributed to a specific country (e.g. international projects).

Exhibit 1.11-1: e-Business case studies conducted in 2006

Sector	Case studies about firms with up to 500 employees	Case studies about large company (500+ employees)	Case studies about projects / other
Food & beverages	Pastificio Riscossa (IT) Chocpix (UK) La Bello Easo (ES)	Godiva Chocolatier (BE) Blédina (FR)	Latterie Virgilio (IT) LogisticsXP (UK)
Footwear	Whelan Shoes (IE) Safe Way (IT) Moreschi (IT)	Atomic (AT) Alpina (SI)	Shoe-D-Vision (DK) Shoenet project by INESCOP (ES)
Pulp & paper	Nordic Paper (NO) Rexcell (SE)	Mayr-Melnhof (AT) VPK Packaging (BE) Stora Enso (FI) International paper (USA)	
ICT manufacturing	RCD Radiokomunikace (CZ) Signalion (DE) Tesla (CZ) Option (BE)	Nokia (FI) Motorola (USA)	
Consumer electronics	Convergen (USA) Jogal Enterprises (MT) KiSS (DK) Seeburger (DE)	Mio Technology (BE) Fujitsu Microelectronics (DE) Sony Ericsson (UK/SE)	
Shipbuilding & repair	LTH – Baas (EE) Finomar (PL) ShipServ (UK)	Fincantieri (IT) Meyer Werft (DE) Uljanik Shipyard (HR) ENVC Estaleiros Navals de Viana do Castello (PT)	
Construction	e-Construction (EL) Constructus (LT) C.F. Møller Architects (DK)	Spie SCGPM (FR) Skanska (SE)	e-Vergabe (DE) Leeds City Council (UK)
Tourism	Adriatica Net (HR) CSI Media (UK) Countryside Tourism Association of Lithuania (LT) yourGreece (EL)	Accor Hotels (FR) Lastminute.com (UK) Ryanair (IE) SN Brussels (BE)	
Telecoms services	Brutélé (BE) Budget Telecom (FR) Upnet Taide Baltic (LT) WiMax AG (CH)	COSMOTE Mobile Telecommunications (EL) Grupalia Internet (ES) Skype (LU) Swiss Mobile (CH) T-Mobile Slovakia (SL)	
Hospital activities		Ambroise Paré hospital (BE) National Heart Hospital (BG) Son Llàtzer Hospital (ES) Hôpital Marie Curie (FR) John Paul II Hospital (PL) Chelsea & Westminster Hospital (UK)	Hospital District of Helsinki and Uusimaa (FI)
Special reports			New companies and e-business in Munich (DE)

Case studies focus on different areas of e-business. Exhibit 1.11-2 shows which topics and applications are described by the cases listed above. This does not mean that application areas not covered in a certain sector are irrelevant for this particular sector. The matrix reflects the selected research priorities of the 2006 period. Some cases address more than one aspect.

Exhibit 1.11-2: Main application areas described in e-Business case studies of 2006

	Food & beverages	Footwear	Pulp & paper	ICT manu-facturing	Consumer electronics	Shipbuilding & repair	Construction	Tourism	Telecoms	Hospitals
General issues										
e-Business opportunities			✓	✓		✓				✓
e-Business models	✓							✓		
Business process efficiency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Procurement and logistics										
e-Procurement						✓	✓		✓	
Supply Chain Management	✓	✓	✓	✓	✓	✓			✓	✓
Inventory management	✓				✓					
Marketing and sales										
Online sales & reservations	✓	✓	✓		✓			✓	✓	
CRM & customer service		✓		✓					✓	
e-Marketplaces				✓	✓	✓	✓			
Specific applications										
ERP		✓	✓	✓		✓		✓	✓	
RFID	✓	✓	✓							
Quality assurance	✓		✓							
Information management				✓		✓	✓			✓
e-Collaboration, networks		✓	✓	✓			✓			✓
Sector-specific issues										
New network technologies									✓	
Digital content / digital rights					✓					
Imaging systems										✓
Dis-intermediation								✓		

1.11.2 Synopsis of main results and lessons learned

e-Business opportunities and models

Several case studies dealt with e-business opportunities in general, highlighting aspects such as cost effectiveness, service quality improvement, finding new business partners, enhanced communication and organisational improvement. Two cases from quite different industries focused on firms that are almost completely based on computer-based processes: *Ryanair* illustrates how the use of ICT for online booking, e-ticketing and internal communications can support a business model based on continuous improvements in cost containment. In the *Son Llàtzer Hospital*, the complete computerisation has proved to be cost-effective – particularly with regard to the integration of other health service providers. The most important benefit, however, is the improvement of health service quality.

Two other cases underline that ICT and e-business can serve different objectives in firms in quite different business situations: In the *Finomar* shipyard, despite a sceptical approach towards e-business, internet technologies brought measurable benefits in terms of new clients, new suppliers, advertising and world-wide communication via internet platforms. However, the cost of ICT is regarded as a major obstacle to the adoption of advanced ICT tools. At the wireless technology producer *Option*, ICT applications helped to manage rapid expansion, to design an appropriate organisational structure and to find the right balance between operations retained internally and those outsourced.

Procurement, supply chain integration and logistics

Issues related to procurement, inbound logistics and supply chain integration played an important role in many case studies, and in all of the ten sectors. Cases focus on different aspects, such as e-procurement portals, implications of public e-procurement and inventory management.

Case studies demonstrated opportunities and benefits of supply-side solutions, but also the challenges companies are confronted with when introducing these solutions. For example, the case of the *Meyer Werft* shipyard highlights the opportunities and challenges of an e-procurement portal for the shipbuilding industry. While such a portal can reduce costs, the firms using it need to become more open in terms of disclosure and exchange of information in order to realise the full potential of the portal. The example of the *Skanska* construction company shows where the implementation of e-procurement needed professional change management, requiring profound staff training, support and top management dedication. The importance of change management was also recognised (and possibly underestimated at the start) when implementing a Supply Chain Management (SCM) system at the footwear branch of *Atomic*.

In the construction industry, public e-procurement is a particularly important issue. Two cases from the public sector highlight benefits for both public administration and firms. The example of *e-Vergabe*, an e-tendering platform of the German federal administration, shows how e-procurement can save costs for the public authorities, and increase the transparency of processes – with advantages for tenderers as well. *Leeds City Council* implemented a Supplier and Contract Management System that led to cost savings, quicker collating of information on suppliers and contracts, and easier information sharing on the part of the authorities, as well as simpler processes for suppliers.

SCM systems are often used to manage the entire value chain of a company, i.e. inbound and outbound logistics. In the food & beverages sector, the baby-food producer *Blédina* implemented an SCM solution that offers complete visibility of the supply chain and all logistics chain players from milk production to sellers of the final products, leading to more efficient reactions to changing situations and more satisfied customers. The telecommunication equipment manufacturer *Motorola* employed Enterprise Application Integration and Business Activity Monitoring technologies to connect companies at various stages of the supply chain. With these systems, supply-chain complexity was reduced, workflow efficiency was improved and orders can be tracked and fulfilled more effectively.

Customer facing activities: e-marketing, sales and distribution

Several case studies highlighted the opportunities and benefits of customer-facing e-business solutions, i.e. applications for marketing, sales and distribution, including online trading platforms (e-marketplaces). For example, *LogisticsXP* is an initiative offering distribution diagnostics and opportunities for cooperation between business partners in the food and drink retail suppliers industry, with a huge potential for reducing the costs of distribution logistics.

Case studies showed that some companies may be forced to continuously rethink their e-sales related applications. For example, the *Alpina* footwear company successfully implemented an online order management system for integrating its distribution network.

Applications for online booking and related management features are particularly important in the tourism industry. Two cases provide examples of how simpler solutions can help to achieve significantly improved customer relationships: *yourGreece* successfully uses an online payment system and a booking request system that assist human interaction. The *Lithuanian Countryside Tourism Association* implemented a search engine allowing users to browse through the Lithuanian farm-stays and craftsmen activities. This tool has resulted in a significant increase in farm-stay travellers, especially from foreign countries.

While small firms may realise benefits with comparatively simpler solutions, large companies and groups need more sophisticated systems. For example, a case study about web-based distribution at *Accor* hotels found that only a fundamental change in distribution reimbursement can deliver the desired cost containment.

Case studies demonstrate that improving customer service is often linked with improving supply chain management. The Belgian *VPK Packaging Group* had experienced logistic problems due to rush orders; the company successfully addressed this challenge by implementing an ICT-based supply chain management system.

To bridge the technology gap to small companies they trade with, some of the large players establish their own extranet as a service for their customers. *Mayr-MeInhof Cartonboard Group* has established a web-based B2B platform as a service for smaller companies, providing them with a comprehensive overview of the status of their orders and tools for reporting and analysis.

Specific applications for improving business process efficiency

Most of the case studies deal explicitly or implicitly with companies' efforts to improve the efficiency of their business processes – internally and in exchanges with suppliers and customers. This includes the use of specific technologies and systems such as ERP (Enterprise Resource Planning), other tools for information management, inventory management and online cooperation. Several case studies focused on the use of RFID (Radio Frequency Identification), which has gained momentum in several sectors, e.g. for warehousing and product tracking.

Facilitating coordination and cooperation among different parties is particularly important in a project-oriented business, for example in the construction industry. Emerging technologies such as 3D visualisation tools facilitate cooperative engineering processes. The case study on *Constructus UAB*, a large construction enterprise in Lithuania, shows

how new software allows construction project developers to integrate and coordinate the main preliminary stages of construction – design, estimation, and technological planning.

Managing cooperative processes is also very important in the ICT manufacturing industry. The case of *Signalion* features a high-tech start-up that has developed a rapid prototyping platform which offers collaborative design applications to design and build hardware and software.

Integrating different systems either internally or between business partners always involves interoperability issues. Two cases, the *Uljanik* shipyard and the *Ambroise Paré* hospital, highlighted the opportunity to increase process efficiency by successfully integrating separate systems.

Networking of companies is also a frequent issue in case studies. Cases showed the variety of opportunities for connecting businesses online. For example, *Nokia* has developed a highly sophisticated system to automate and integrate processes, with the objective of integrating the entire supply chain, including their suppliers and customers. Integration of systems can be a huge challenge for large companies, particularly if they have recently acquired other companies.

Several case studies in 2006 focused on RFID based applications. Cases show how RFID is used for tracing the location of goods, improving process efficiency in warehousing, and for safety purposes RFID tags are embedded into the crust of the cheese produced by *Latterie Virgilio*, thus enabling the tracking of cheese wheels along the entire supply chain. The system also facilitates control of inventory and the safety of the production process. The US paper producer *International Paper* has improved the efficiency of inventory control through RFID. The footwear manufacturer *Safe Way* incorporates RFID tags into a particular kind of safety shoes. The main benefits from this solution include automatic access and exit control, as well as easier coupling of shoes after cleaning.

Sector-specific e-business applications

Several case studies focus on sector-specific applications and developments. For example, case studies from the telecommunications industry assess the impact of new technologies on internet access: wireless broadband technology (*WiMAX Telecom*); Flash-OFDM in Slovakia (*T-Mobile Slovensko*); Voice over Internet Protocol (VoIP) services in general (*Skype*) and in Lithuania (*Upnet Taide Baltic*); combined internet, telephone and television services in Italy (*Grupalia Internet*). These cases highlight the telecommunication companies' dual role as users and suppliers of ICT and e-business technologies. They indicate that the convergence of internet, telephony and television services could have powerful effects for providers as well as users of these services in the near future. In other words, it will have a profound impact on many industries.

In the consumer electronics industry, case studies deal with implications of digital content and rights management. The *KiSS Networked Entertainment* company built an innovative brand of digital video recorders and faces the challenge of supporting various technical formats and content distribution. The case of *Sony Ericsson* shows how large companies use technology to deal with Digital Rights Management (DRM) issues.

A case study on the use of computer-based imaging systems in the *John Paul II Hospital* revealed cost and workflow benefits of related applications, as well as unsolved problems of interoperability with systems of external service providers.

1.11.3 Conclusions

The systematic collection of case studies again proved an indispensable source of information for *e-Business W@tch*. Case studies help to better understand, illustrate and contextualise survey results, and to assess the implications of e-business for firms and industries. Some of the lessons learned, moreover, can be considered of general interest for enterprises or other institutions that may carry out similar initiatives. Issues such as the need for change management and user involvement in the course of e-business implementation go beyond the specific experience and can be taken as general recommendations.

Many case studies clearly illustrate the benefits of e-business for companies, such as enhanced workflows, cost reduction, service improvement, and increased numbers of customers. Investments in new e-business applications may be absolutely necessary in situations that require process integration, such as rapid growth or acquisition of other companies. However, case studies also illustrate the challenges that companies are confronted with when starting e-business. For example, several cases conclude that the success of e-business depends on already fully involving the users during the implementation phase; however, this can meet resistance from those concerned by changes in the company.

Some case studies highlighted the issue of “coopetition”: companies which are competitors in the market may nevertheless cooperate in specific joint activities by means of e-business. This experience confirms that cooperation and networking will probably become even more important in the future, particularly for SMEs. Case studies indicate that the success of such cooperative activities among competitors relies on an open attitude towards providing information, accompanied by the establishment of mechanisms to ensure that confidential information actually remains confidential. To find the right balance is not always easy, and may require a change in mindset in some companies.

Although case studies clearly demonstrate the benefits, it was not always possible to assess the outcome of ICT investments in terms of quantitative figures, e.g. as "% increase in sales" or as "costs saved in % of total costs". Many companies cannot – or do not want to – provide such figures. This has several explanations. First, in cases where ICT systems have recently been implemented, it may be too early to make a valid assessment of the quantitative impact. Second, there are causality issues, since business changes can possibly be attributed to several factors, including overall changes in the market environment.

Notwithstanding the lack of quantitative data, the case studies presented in this year’s *e-Business W@tch* reports have their strength in providing examples for the motivation of companies to invest in e-business, how they go about this task, and about the challenges they have to address. Therefore, more such practical examples of e-business activity should be collected in the future.

1.12 Five Years of Monitoring e-Business in Retrospect

e-Business W@tch has been operational from December 2001 until February 2007.[28] This section looks back at **key assumptions** that have guided the work during these years. It shows how the focus of analysis has changed – and certainly broadened – over time, reflecting technological developments.

e-Business W@tch was implemented in **4 project cycles of 14-18 months** each. At the beginning of each cycle, DG Enterprise and Industry and the contractor agreed on a "Roadmap" which specified the operational arrangements of the respective cycle. These Roadmaps also contained a description of the current situation of e-business ("state-of-play") and an outlook on developments to be expected (stated as "hypotheses"). The Roadmap of the next period then summarised to what extent these working hypotheses had been confirmed by work in the respective period.

The following synopsis of the work of *e-Business W@tch* is mainly based on texts from the Roadmaps and from preceding editions of this report. A starting point for the whole initiative was the observation that the focus on (B2C) e-commerce (which dominated in the late 1990s) was too narrow to explain the real importance of e-business (see Section 1.12.1). This has certainly been confirmed and is unchallenged today.

1.12.1 2002/03: "Misplaced targets for measuring e-commerce"

In its very first report – a special report on "The development of e-commerce in the European Union" (May 2002) – *e-Business W@tch* observed that there was some "*disappointment with the hitherto achieved progress of electronic commerce*", both in the European Union and in the United States, and analysed the underlying reasons. The report concluded that this disappointment was probably based on a too limited and **simplistic view of what constitutes electronic commerce**, and, consequently, on **misplaced targets**, particularly on the gap of what appeared to be a relatively low level of online transactions compared to the level of traditional forms of ordering and purchasing goods and services.

On the other hand, the special report also pointed out that "electronic business" covered a wide and diverse field of **internal as well as external business processes**. While some of them have not yet developed as anticipated (or hoped), in other areas enormous progress had been achieved. The report argued that the real revolution has occurred and was about to take place in business-to-business (B2B) electronic commerce as well as internal e-business processes.

This assessment has been broadly confirmed since. In most sectors, particularly in manufacturing, the major impact of electronic business has been on reducing costs by making business processes more efficient. All sector reports about manufacturing industries published in 2004-2006 provide evidence which supports this claim. It also

[28] The monitoring activity will continue as the "Sectoral e-Business Watch" in 2007/08; however, this follow-up initiative is based on a different contract and has a slightly different focus than its predecessor.

applies to sectors such as retail, where logistics and supply chain management were found – in a majority of cases – more important application areas than B2C e-commerce (see sector reports of 2004).

1.12.2 2003/04: Opportunities and challenges – "Does IT (still) matter?"

ICT opportunities and challenges for SMEs

The Roadmap of 2003 focused on implications of e-business for small and medium-sized enterprises (SMEs) and pointed at relevant opportunities and risks. It was argued that a **revival of e-business** as an important issue could be observed, even if the crisis of the ICT industry in the wake of the new economy was not yet fully overcome. However, the Roadmap also stressed that the mechanisms and significance of e-business for doing business in an increasingly global and digital economy were manifold and complex. There was **no "simple formula"** that applied to all firms or industries.

Against this background, the Roadmap pointed at new opportunities for enterprises, but issued a clear warning that it would not always be a win-win situation for all stakeholders involved:

> ***Who will benefit from e-business? (Roadmap 2003)***
>
> *"… as the piece of the cake cannot grow for all, at the same time when some enterprises make use of these opportunities, it follows that the piece will become smaller for others. It is the most challenging task of e-business related research to forecast for whom the piece will become larger and who will see their piece getting smaller, and to analyse whether and how policy could make an intervention, or at least make sure that there is a level playing field for all actors."*

The ambivalence of the assessment, i.e. the question whether e-business developments benefit all or rather the large firms (possibly at the cost of SMEs), has been a central issue for research since. There is still no clear answer, as contrasting examples can be quoted (see Executive Summary, p. 13: "Opportunities and challenges for small companies"). In this context, it is important to consider that there are no generic "SMEs". Small and medium-sized companies differ considerably in their business activities, the value systems they operate in, and in their organisational structures. Thus, e-business related opportunities or risks can differ considerably for individual firms.

"Does IT still matter?"

An important question that was intensively discussed in the second half of 2003 and in 2004 was **whether ICT had lost their innovation potential** for individual firms.[29] This question still remains unanswered, as there are still contrasting views on whether ICT

[29] The debate was triggered by an article by Nicholas Carr in the Harvard Business Review: Carr, Nicholas G.: "IT Doesn't Matter", in: Harvard Business Review, May 2003.

have already reached a commodity status or not. *e-Business W@tch* contributed to this debate, arguing that two aspects may not have been sufficiently considered in the discussion and thus explain some of the hype it had created:[30]

- **Does it apply to SMEs?** Much of the international discussion was entirely focused on the large companies and global players. For example, it was rarely differentiated between SMEs and large firms in the assessment whether ICT infrastructure has already reached the "commodity" status. This differentiation is very important, however, since all evidence shows that in many smaller firms ICT infrastructure has not yet reached full maturity.
- **ICT infrastructure vs. ICT management**: The debate revealed that there was still a lack of commonly accepted definitions of what constitutes "ICT infrastructure". The argument might be less valid if a broader concept of ICT was considered, including their strategic application for business processes and change management. This could have organisational implications, as the management of ICT in a company might require different skills in the future than the mainly technology oriented skills of "old style" ICT departments.

Against this background, *e-Business W@tch* pointed at recent developments that indicated a new upswing in the importance of e-business for global trade. For example, the broad adoption of **XML based standards**, in particular ebXML, in combination with web services, could become the key to shape electronic business transactions between enterprises in the future. Such developments would drive B2B integration to a much higher level than ever before. Interoperability problems of integrating different legacy systems could be significantly eased, if expectations hold true.

Thus, the discussion of ICT and e-business resulted in a paradox: while, on the one hand, the commoditisation of ICT was debated, the fast technological advancement indicated that "**the next phase of e-business**" might be at the doorstep, with a substantial impact on companies and whole industries. To put it in a nutshell: e-business and globalisation are becoming intertwined, enabling and driving each other.

e-Business W@tch concluded that it was probably more appropriate to study e-business developments in terms of **innovation life-cycles**. From this perspective, both views can be correct. The point about ICT becoming a commodity may apply to the current life-cycle, which is in a mature stage (at least for large companies). On the other hand, new ICT based technologies are likely to trigger new innovations and a new e-business paradigm (or life-cycle).

1.12.3 2004/05: "Operations-orientation and maturing activity among large firms"

The concept of thinking in innovation life-cycles has been renewed in the Roadmap of 2004. In this document, *e-Business W@tch* proposed three main hypotheses as a starting point for the new work period.

[30] European e-Business Report 2004, p. 15f.

Focus on optimisation of business processes

A key assumption and model for these hypotheses was that e-business developments have similarities to the pattern of a typical innovation curve, with different stages of maturity. *e-Business W@tch* argued that large firms had reached a much more advanced phase on this curve than smaller companies:

> ***Hypothesis 1 (proposed in late 2004)***
>
> *"The main focus of e-business continues to be business process oriented. Manufacturing companies strive to increase their productivity by optimising B2B connectivity and the automation of internal business processes through ICT."*

This hypothesis was confirmed for **manufacturing sectors**. Improving the efficiency of procurement and supply chain processes (e.g. inventory management, logistics, sourcing, ordering) continues to be the overall paradigm for a good deal of e-business activity in manufacturing. *e-Business W@tch* sector reports of 2005 and 2006 have extensively covered this topic and presented numerous examples of respective e-business activities throughout Europe.

In **service sectors**, and in industries with a strong service component such as publishing, other objectives can be in the foreground: communication with customers and online delivery of services have become key application areas for e-business in these industries. Normally, however, this goes hand-in-hand with a reorganisation of back-office and production processes in service sectors as well.

Dynamic development among SMEs

The second hypothesis which *e-Business W@tch* proposed in late 2004 referred to the digital divide between large and small firms; it was forecast that e-business developments would be particularly dynamic among SMEs:

> ***Hypothesis 2 (proposed in late 2004)***
>
> *"Electronic business activity will significantly increase among small and medium sized enterprises within the next 18 months."*

The hypothesis turned out hold true for medium-sized enterprises, but only to a limited extent for small firms. Results of 2005 showed that there was still a considerable digital divide between small firms on the one side and medium and large enterprises on the other. It appeared that medium-sized firms (with 50-249 employees) had the 'critical size' for many e-business applications.

However, notwithstanding this divide between small and medium firms, particularly when it comes to more advanced applications, small firms have also made progress in their e-business activity compared to earlier points of measurement. Comparisons of survey results from 2002/03 to those of 2005 provide evidence for this point.

For example, the installed base of ERP (Enterprise Resource Planning) systems – a good indicator for the overall e-business maturity – and the use of e-procurement had matured from 2002 (first measurement) to 2005 (see Exhibit 1.12-1).

Exhibit 1.12-1: Increase in e-business adoption among SMEs (2002/03 – 2005)

Sectors / size-bands	ERP use			Online purchasing		
	2002/03	2005	+/-	2002/03	2005	+/-
Food and beverages						
• Micro (1-9)	7*	3	n.a.	22*	20	n.a.
• Small (10-49)	7*	7	n.a.	22*	25	n.a.
• Medium (50-249)	25	33	+32%	40	49	+21%
Textile industry						
• Micro (1-9)	1	3	+131%	20	26	+32%
• Small (10-49)	6	17	+172%	22	37	+70%
• Medium (50-249)	21	34	+62%	35	46	+30%
Machinery and equipment						
• Micro (1-9)	13*	11	n.a.	34*	32	n.a.
• Small (10-49)	13*	22	n.a.	34*	44	n.a.
• Medium (50-249)	38	55	+32%	49	52	+6%

In % of enterprises from the respective sector and size-band. Base: enterprises using computers.
* Figure for enterprises with 1-49 employees, based on e-Business Survey 2002. No break-down into micro and small enterprises for this survey.

Source: *e-Business W@tch* (2002 / 2005)

e-Business applications as a key technology in large firms

With regard to large companies, *e-Business W@tch* concluded that e-business activities of large enterprises have substantially matured.

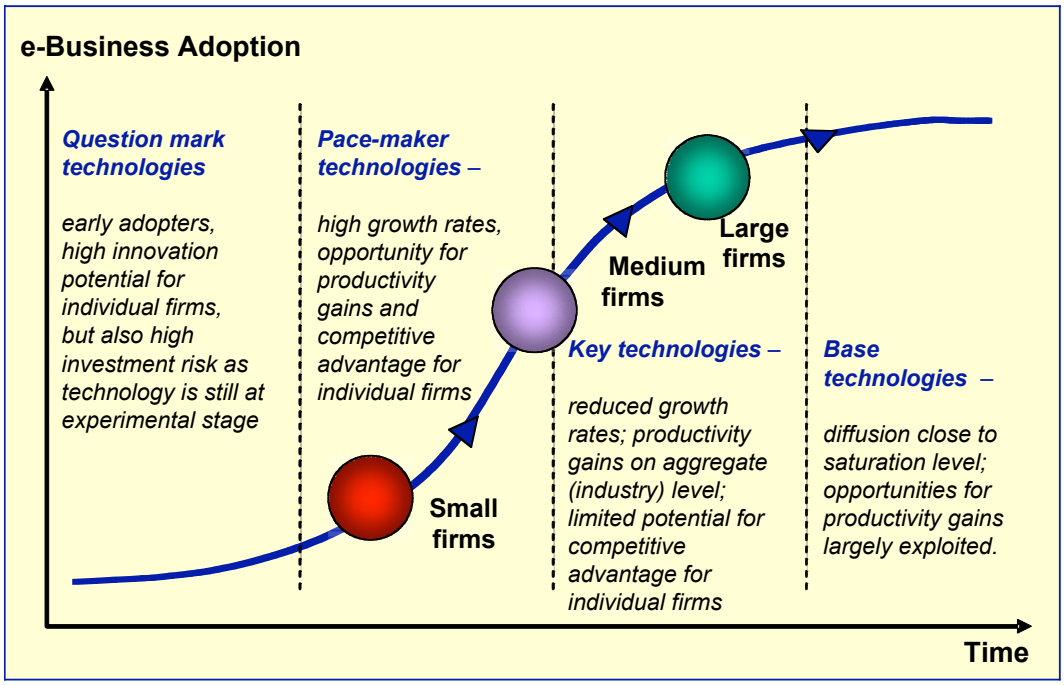
> ***Hypothesis 3 (proposed in late 2004)***
>
> *"e-Business activity of large companies, mainly characterised by increasingly sophisticated B2B connectivity, is maturing in an evolutionary way."*

This hypothesis has been confirmed by work in 2005 and 2006. Case studies as well as survey results demonstrate that some e-business applications have reached the status of a **key or even base technology** in the innovation life-cycle at large companies. This is in line with Nicholas Carr's argument that "IT does not matter" (see above).

Exhibit 1.12-2 illustrates this concept of e-business evolving along innovation life-cycles. The current life-cycle is still characterised by the paradigms of process efficiency and cost cutting in manufacturing (see Hypothesis 1 above), and of improving customer service in service sectors. It can be argued that large enterprises are very advanced, i.e. that e-business is already a base technology for them, while e-business has the characteristics of a pace-maker technology for most of the smaller companies.

If this model applies, the big question is then which factors will characterise the following innovation life-cycle. This question was taken up in the 2005/06 Roadmap (see next section).

Exhibit 1.12-2: e-Business adoption as an innovation life-cycle



Source: *e-Business W@tch* (2006)

1.12.4 2005/06: "Powerful emerging technologies – ICT to *change* the business"

Based on the sectors studies of 2004, the 2005/06 Roadmap speculated that there was "*good evidence that technological development in the area of ICT may soon lead to a **'next wave' of e-business**, with somewhat different objectives and characteristics than the current phase*". The Roadmap described a scenario of a dynamic evolution of current e-business trends with substantial implications for firms in an increasingly international marketplace. Based on these assumptions, four hypotheses were suggested. These theses are still valid, supported by the latest survey and research results of 2006 as presented in this report.

The end of ICT scepticism – and a new role for information management

The first hypothesis formulated in 2005 was that ICT and e-business would gain momentum in the next 1-2 years, with an increase in ICT expenditures. Thus, *e-Business W@tch* agreed with the assessment of EITO that "*the move towards e-business will continue in the years ahead.*"[31]

[31] EITO Yearbook 2005, p. 24

Hypothesis 1 (proposed in late 2005):

The broad ICT scepticism of the years after the new economy failure is finally overcome. On average, firms' ICT expenditures will increase at growth rates beyond the one of GDP. At the same time, companies will be more determined to monitor the return-on-investment. This could imply new requirements for information management and ICT controlling.

This assessment has been confirmed for most sectors studied in 2006, with the possible exception of the footwear industry. The overly pessimistic and hesitant attitude of many companies towards ICT after the burst of the new economy bubble is "passé". The cost saving potential of ICT has been broadly recognised by companies; efficiency and productivity gains have been the key driver.

About 25% of all firms surveyed by *e-Business W@tch* in 2006 said they planned to further **increase their ICT budgets** in 2006/07, compared to the current budget. Only about 8% said that they would reduce their budgets (see Exhibit 1.2-4, Section 1.2.2). Furthermore, the survey confirmed that e-business is a substantial **driver of process innovation** in companies (see Sections 1.7 and 1.10). Firms cannot afford not to take part in these innovations. Large firms, and increasingly the public sector, are spearheads in this development. Thus, the investment climate has clearly improved compared to the previous years.

In line with this development, *e-Business W@tch* anticipates that the role of information management in companies will further increase in importance. **Information managers** will take the role of **intermediaries** between the ICT department and the operational departments of a company (procurement, production, marketing), i.e. the internal ICT users. Information managers have to translate user requirements into technical specifications, while considering overall strategy and business objectives. They have to bring all these pieces together into a coherent ICT strategy for the company. Planning an ICT strategy will thus increasingly become part of the overall strategy of companies.

Powerful emerging technologies – at different stages of maturity

An important factor that supports this scenario is the increasing maturity of enabling technologies and services, some of which are only at the verge of their broad commercial introduction. If these technological innovations hold their promise, the potential of e-business could be taken to a new level. Based on this consideration, *e-Business W@tch* proposed the following hypothesis for its work in 2006/07:

Hypothesis 2 (proposed in late 2005):

"New technologies that are at the verge of commercial break-through will have a significant impact on e-business developments. Relevant trends include, in particular, Voice-over-IP, new mobile solutions and RFID based applications. These technologies are powerful enablers and could help to trigger a new e-business life-cycle within the next 3-5 years."

It is difficult to fully confirm this assessment on the basis of survey results. Some of these new technologies and applications are not yet wide-spread. On the other hand, data clearly show that commercial uptake has begun:

- **Voice-over-IP** (VoIP) is increasingly used, even in sectors which are not typical early adopters of ICT. In 2006, 13% of companies from the ten sectors studied said that they used VoIP services (see Exhibit 1.1-2, Section 1.1). More than 20% of large firms said they used VoIP. It is expected that VoIP ("internet telephony") will gradually replace the traditional fixed lines in telecommunication.
- **RFID** is not yet widely diffused – only about 2% of the surveyed companies said they used it in 2006. In some sectors (e.g. pulp & paper), penetration in large firms has reached more than 10%. However, case studies by *e-Business W@tch* on RFID use demonstrate the potential and signal a dynamic uptake of RFID-based solutions for many purposes, e.g. for supply chain logistics.
- **Mobile applications** enable field workers (including service and sales persons, as well as managers) with real-time access to company data, thus speeding up information flows and reducing the need to work in the office.
- The use of **Open Source Software** (OSS) has increased over the past few years. For example, operating systems (including Linux) based on OSS are used by companies representing about 20% of employment and by nearly 50% of large companies among the ten sectors studied (see Section 1.3.3). This development could lead to reduced costs for e-business software (there are different opinions on this issue, though).

Further digitisation of business processes – large firms and public sector as spearheads

e-Business W@tch studied the development of e-invoicing in a special report in 2005 and concluded that this application had a great potential in many sectors. The forecast for 2006-07 was that e-invoicing would gain further momentum:

> ***Hypothesis 3 (proposed in late 2005):***
>
> *"Further digitisation of B2B, B2G and G2B exchanges and transactions. The digitisation of formerly paper-based business processes will gain momentum. Large companies and the public sector will drive this development and exert pressure on smaller firms, e.g. their suppliers, to follow on. Invoicing and payment procedures could be the focus of digitisation in the near future."*

This assessment is **validated** by the 2006 survey results, which included questions on e-invoicing. In total, firms representing close to a fifth of employment in the ten studied sectors said that they were sending e-invoices (either to customers in the public sector and / or in the private sector), and 22% said that they received e-invoices from suppliers (see Exhibit 1.4-4, Section 1.4). It is also true that large firms take the lead – adoption figures are much higher for large enterprises.

However, e-invoicing is probably only **the first step** in the long-term **development of "e-finance"**. This will go far beyond processing invoices and payments between companies and will include all types of financial services which a company needs, for example credit transactions with banks and support in export finance. Banks, insurances, e-payment service providers, and other intermediaries offering financial services (e.g. export support organisations) will play an important role in this development.

ICT to change the business – a longer term scenario

Based on these observations, it is quite safe to say that the use of ICT in business is **far from having reached its zenith**. At first sight, this might appear to be in contrast with the assessment that "e-business has matured in large firms" (see validated Hypothesis 3 of 2004). However, as indicated above, *e-Business W@tch* suggests that the evolution of e-business can be described in terms of innovation life-cycles. Each of these cycles is characterised by a set of dominating technologies that drive innovation in this particular period, by specific business objectives, and the resulting implications for competition in various industries. If so, another hypothesis can be proposed as a longer term scenario:

> ***Hypothesis 4 (proposed in late 2005):***
>
> *"A new innovation life-cycle is emerging in e-business. Companies will increasingly use ICT not only as a tool "to run the business", but to change their business. While companies will continue to use ICT for optimising the efficiency of their existing business, global competitive pressure will drive firms to adopt new business models. Transactions will increasingly be web-based. In the long run, most business will be "e-business" in one way or another. The term "e-business" will no longer exist as the concept will become common (business) practice."*

This hypothesis cannot directly be confirmed by survey results; however, many of the **case studies** conducted in 2006 (see Section 1.11) are indicative of the **transformative potential** of e-business. In the tourism industry, for example, the internet is transforming the value system by empowering customers in an unprecedented way.[32] In the telecommunications industry, customer service is more and more web-supported (e.g. e-billing, download of software upgrades or services for mobile phones).

In summary, while **cost containment** will continue to be an important objective for e-business activity in the next few years, it is likely that the next life-cycle (which is now beginning to emerge) will see companies go beyond this goal. Enabled by much more powerful technologies than 6-10 years ago, the focus will shift back to the "new economy" vision of **conducting web-based commerce**. This time, however, the idea is more realistic. Eventually, all business will become e-business in one way or another. Once the concept becomes standard business practice, the term "e-business" will become meaningless.

[32] See also the contribution from Rachel Tym in Chapter 3.2 on e-tourism.

Part 2: Sector Perspectives on e-Business in 2006/07

2.1 The Food & Beverages Industry

The sector study on the food & beverages industry was contributed by Databank (www.databank.it).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

The food & beverages (F&B) industry shows a comparatively low level of ICT and e-business adoption. This overall result, however, hides a varied picture. The F&B industry has a good level of development of internal process integration and supply chain-related activities. Supply Chain Management (SCM) systems, in particular, show the highest diffusion among the ten sectors analysed, and a remarkable increase over the past years.

External pressure from distribution is increasingly driving F&B companies to adopt e-business practices - as is illustrated by the wide diffusion of e-invoicing, inventory management, and linking of ICT systems with those of customers. Medium-sized companies appear positive and active in their investment attitude, and are already well-advanced in the adoption of solutions such as ERP (Enterprise Resource Planning), SCM and e-invoicing. While this is of interest for future developments, the cost of software solutions still adversely affects smaller companies more than larger ones.

2.1.1 Sector definition and background

Definition

The F&B industry as defined for the purposes of this study covers selected sub-sectors that deal with the production of processed food, rather than with the primary transformation of agricultural products (see Exhibit 2.1-1).

F&B is one of the major pillars of the European economy. In 2004, the EU-25 food & beverages industry as a whole (i.e. the entire NACE Division DA 15) had a turnover of 815 billion euros, transforming over 70% of the EU's agricultural raw materials and employing about 3.9 million people, of whom the majority work in SMEs.

The competitive scenario of this industry is rapidly changing. Pressure of regulation is increasingly stringent due to consumers' awareness about quality and safety issues, along with the unfortunate sequence of food-safety crises across Europe and world-wide. Large retailers have extended their bargaining power and are increasingly demanding about quality and service, and above all in terms of shorter order-to-delivery cycles.

Exhibit 2.1-1: Business activities covered by the F&B industry (NACE Rev. 1.1)[33]

NACE Rev. 1.1		Business activities
Group(s)	Class(es)	
DA 15		Manufacture of food products and beverages
	15.43	Manufacture of margarine and similar edible fats
15.5		Manufacture of dairy products
	15.51	Operation of dairies and cheese-making
	15.52	Manufacture of ice cream
15.6		Manufacture of grain mill products, starches and starch products
	15.61	Manufacture of grain mill products
	15.62	Manufacture of starches and starch products
15.7		Manufacture of prepared animal feeds
	15.72	Manufacture of prepared pet foods
15.8		Manufacture of other food products
	15.81	Manufacture of bread; manufacture of fresh pastry goods and cakes
	15.82	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
	15.84	Manufacture of cocoa; chocolate and sugar confectionery
	15.85	Manufacture of macaroni, noodles, couscous and similar farinaceous products
	15.86	Processing of tea and coffee
	15.87	Manufacture of condiments and seasonings
	15.88	Manufacture of homogenized food preparations and dietetic food
	15.89	Manufacture of other food products n.e.c.
15.9		Manufacture of beverages
	15.91	Manufacture of distilled potable alcoholic beverages
	15.92	Production of ethyl alcohol from fermented materials
	15.94	Manufacture of cider and other fruit wines
	15.97	Manufacture of malt
	15.98	Production of mineral waters and soft drinks

2.1.2 ICT and e-business adoption in 2006

The e-Business Index 2006 places the F&B industry among the sectors with a comparatively low level of ICT and e-business adoption. This overall result, however, should be regarded cautiously, as it hides a varied picture. Moreover, although a direct comparison of the survey results from 2005 and 2006 is not possible, some interesting trends have been recorded in this analysis. The main results of the survey can be summarised as follows:

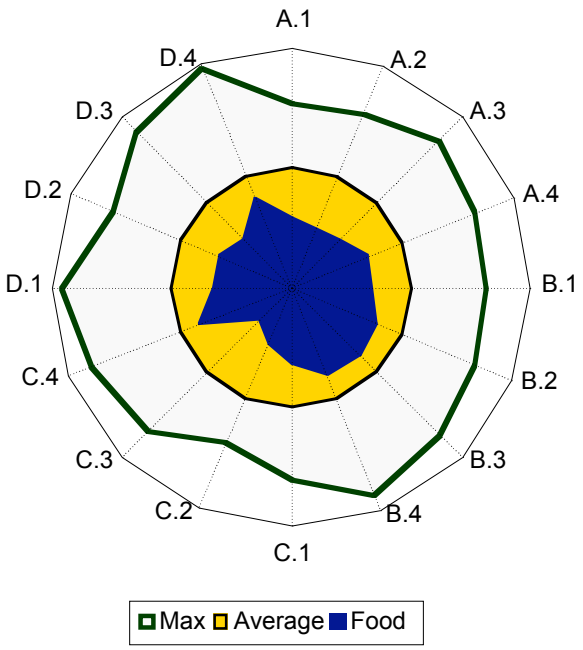
[33] NACE Rev. 1.1 is a 4-digit classification of business activities. It is a revision of the 'General Industrial Classification of Economic Activities within the European Communities', known by the acronym NACE and originally published by Eurostat in 1970.

- There is new evidence that the F&B sector is reducing the basic **ICT infrastructure** gap with other sectors, revealed in the *e-Business W@tch* Survey of 2005. Positive signals can be seen in the remote network implementation data from the e-Business Survey 2006, with figures for F&B markedly above the average for the ten sectors.
- The low importance apparently assigned to training and ICT **skills** in general within the F&B sector gives cause for concern: only 50% of large companies reported practising regular ICT training. Outsourcing of ICT processes has grown slightly, particularly in medium-sized enterprises.
- Standards and **interoperability** are a "hot" topic in the F&B sector, due to regulatory impacts (such as traceability) that require improved communication among the different players of the value chain. Presently, the most widely-diffused standard is electronic data interchange (EDI), notably among the sector's large companies. Open source software is used more by larger firms in this sector, as its lower price is balanced by the need for internal competences to develop and adapt it to company requirements.
- Survey data reveal wide diffusion of **ERP** in F&B industry. ERP appears to be a stepping-stone towards further evolution of e-business, and often includes procedures common to SCM and customer relationship management (CRM) software solutions. Accounting systems have an even wider diffusion, including within small and micro enterprises.
- **e-Procurement** use in the F&B industry still lags behind the average for the ten sectors, probably because of centralisation of purchasing in the large companies that dominate this sector. Where present, e-procurement does not seem a driver for systems evolution. SCM, on the other side, shows remarkable growth, probably due both to regulatory constraints of food safety and traceability, and to the competitive advantages linked to better management of the supply chain.
- **e-Marketing** and sales are focused mainly on the distribution chain and are therefore usually considered as part of the SCM or ERP systems. CRM systems are used mainly by large companies in a B2B environment, while a more B2C-oriented approach is typical of micro-enterprises and SMEs in this sector.
- **Innovation** through ICT solutions is mainly perceived as a process innovation, with an interesting accent on customer services and on the creation of customer communities. Meeting customer expectations joins competitive advantage and regulatory constraints as the main drivers of ICT and e-business adoption in this industry.
- Company size and technology cost are the main **barriers** to e-business adoption reported in F&B. Companies that do not practise e-business said they feel "too small" for doing e-business, and/or that they cannot afford the required technologies. Barriers such as security concerns or the complexity of technology are perceived as less relevant.

e-Business Scoreboard 2006 [34]

The e-Business Scoreboard enables comparisons of ICT adoption and e-business activity across different sectors, countries or size-bands. The synthesis of the results from the e-Business Survey shows that the F&B industry is below the average in ICT adoption and e-business activity. It also confirms that the F&B industry has a relatively good level of development of internal process integration and supply chain-related activities.

e-Business Scoreboard 2006



Component indicators

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

[34] See Methodology Annex for information about the structure and computation of the scoreboard.

2.1.3 Current e-business trends

In the F&B industry, ICT and e-business have their main impacts in production and logistics. Regulation and external pressure from distribution are increasingly driving F&B companies towards the adoption of e-business practices.

Internal processes automation

In the F&B industry, the trend toward integration of internal processes is driven by compliance with food safety regulations, together with increased competition and the search for cost-efficiency. Integrating production-line control, administration, sales and logistics helps companies to manage food safety risks, to increase asset efficiency, and to improve their margins, while achieving continuous product and service innovation, and better corporate accountability.

The introduction of systems for internal process automation is also fostered by the possibility of better exploiting internal assets, which, in the case of the F&B industry, are often represented by recipes or by particular production processes.

ERP is the main solution currently adopted for integration of internal business processes in the F&B industry: 10% of firms, corresponding to 32% of employment in this sector, have adopted ERP systems.

The advantages that can be achieved by implementing solutions that integrate internal processes include increased efficiency and shorter time-to-market, reduced costs, better inventory control, verifiable compliance with food regulation and more rapid response to business requests from other business partners along the supply chain. These solutions may also help deal with sector-specific challenges such as adapting to the availability and changes of materials, or scaling formulas and recipes in line with inventory levels.

However, the economic and cultural effort in implementing such technologies may be beyond the capabilities of SMEs. The results of the 2006 survey show that F&B firms have increasingly adopted solutions supporting the automation of internal processes but cost and complexity of technology are still major hurdles.

Supply Chain Management (SCM)

Through the application of SCM, food manufacturers and grocery retailers are trying to radically reduce costs and inventory levels. SCM facilitates the development of integrated relationships, real-time information transfers and moving towards a 'pull' rather than 'push' distribution system. The focus is on increasing the flexibility amongst upstream suppliers, in response to the strategic power of the dominant supermarket chains, through the closer integration of external enterprise relations.

The implementation of SCM solutions in the F&B sector is on average higher than in the other sectors studied this year by the *e-Business W@tch*. With the exception of ICT manufacturing, no other sector shows such a high degree of integration between firms along the supply chain.

As SCM systems are used to manage numerous and different tasks, inputs are required from distinct applications, and data must be shared with external partners' Information

Systems. Firms therefore need to address a broad range of organisational and technical challenges when introducing SCM.

> ***Case study:***
>
> ***Blédina, France***
>
> *Blédina, one of the leading French producers of baby foods, saw its customer service levels decline after a reorganisation of the distribution network of its owner company, Danone.*
>
> *After a thorough business process reengineering project, Blédina enhanced and redesigned its processes within the supply chain, introducing a supply chain management (SCM) software system based on an SAP® R/3® ERP system.*
>
> *Through the implementation of the business process reengineering project and SCM, Blédina is making considerable headway towards achieving its strategic goal of maintaining a 99% customer service level. Enhancing and reengineering business processes within the supply chain was key to the success of this project. More importantly, people had a very significant role in the assessment of the situation and in the implementation of the system: a close collaboration was established among everyone involved in the supply chain, including sales and marketing, purchasing, production planning, manufacturing, distribution, administration and finance, and information systems.*
>
> *Full case study: www.ebusiness-watch.org/resources/casestudies.htm*

Inter-enterprise integration, represented by SCM, is strongly correlated with and dependent upon the prior effective implementation of intra-enterprise integration (mainly represented by ERP). ERP and SCM represent complementary approaches for addressing the same strategic challenges. SCM, however, provides the opportunity to expand the advantages of optimisation and integration to the entire supply chain through the creation of a collaborative, networked environment.

- **Supply chain coordination in the F&B industry is heavily dependent on ICT** and e-business systems: information technology allows system integration through standardized inter-organisational interfaces.
- **Mutual trust and cooperation of business partners** is crucial for the success of programmes aimed at optimising a complex value chain, as demonstrated by the *Blédina* case study. Moreover, complex projects require accurate **analysis and planning** to ensure effective and successful implementation.
- **Food supply safety and traceability** are two important new links in the supply chain: while SCM was previously focused mainly on cost reduction and logistics, today the focus has moved to quality and safety compliance as a part of the demand-driven competitive scenario.
- **Retail chains continue to drive integration along the supply chain,** leveraging their bargaining power towards manufacturers.

Customer Relationship Management (CRM)

CRM applications are not as widely diffused in the F&B industry as in other sectors, with the exception of the large companies. The low use of CRM in F&B production industry may be attributed to the fact that the "typical customer" in the F&B industry is not the final user, but a further step of the value chain – the distributor/wholesaler/retailer. Therefore, the "CRM" features are often integrated in ERP systems and supply chain management software. CRM systems are mostly used by the medium-sized and large F&B industry firms, as well as by food wholesalers and retailers. These players need a system which is able to capture information and provide the relevant product-related, market and competitor information, or they need to define business rules agreed on between the company and the customer, such as contracts, pricing agreements, pricing strategies, specific delivery rules and category management, and to develop customer related information concerning trends in consumption.

Smaller companies, which sell directly to their customers, do not adopt CRM on a large scale, for reasons of cost and organisation: limited customer bases rarely justify the implementation of a complex system.

CRM software suites are expensive and require heavy organisational preparatory work to be effectively introduced in a company. The Godiva case study illustrates how CRM can be successfully implemented for achieving business process efficiency and improving customer service.

Case study:

Godiva Chocolatier Europe

Godiva Chocolatier is specialised in the production of premium chocolate. The company is based n Brussels, Belgium. It has manufacturing facilities in Belgium and the USA and nearly 4,000 points of sale world-wide.

Customer relationship management at Godiva is a core component of the business strategy. Focusing on creating and maintaining lasting relationships with its customers, the company has developed a CRM solution. The physical channels (shop counter, phone/fax) are complemented by ICT applications like dedicated websites and back-and front-office applications integrated with intranet and extranet. Improvement of business processes at Godiva includes: reduced number of errors, speedier and more accurate deliveries, improved Inventory management and logistics, improved customer service, and streamlining of communication with business partners

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Mobile applications and RFID

Mobile applications and Wi-Fi systems, together with radio-frequency identification (RFID) applications, are linked with supply chain management and quality assurance issues. Currently, these systems are mostly used by large enterprises. SMEs, on the other hand, use strategies such as sales force decentralisation (e.g. working from mobile/home offices) to increase their flexibility and to shorten supply chain processes.

Wireless and mobile systems find applications throughout the whole production system, from the production line to warehousing, labelling and distribution.

Sales force automation appears to be the most widespread mobile application in F&B. The sale force is usually numerous and widely distributed over the territory, and takes advantage of the flexibility and mobility offered by applications of this kind, as illustrated by the case study on La Bella Easo.

Case study:

La Bella Easo, Spain

La Bella Easo is one of the leading companies in Spain's industrial baking market. Its catalogue includes an extensive range of bakery products. In 2005, the company introduced a system to support point-of-sales (PoS) control and management. The project allowed substantial enhancement of PoS management, improved planning of production and logistics, and greater satisfaction among distributors and customers. Involvement of all relevant stakeholders and motivation of the workforce within the organisation contributed significantly to the successful implementation of the project

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Wireless technologies such as bar-code scanners and printers allow the reduction of errors, from picking and warehousing processes to the shipping and distribution phases "on the road". Another advantage is that data entry time and errors can be reduced, as illustrated by the case study on Pastificio Riscossa.

Case study:

Pastificio Riscossa, Italy

Pastificio Riscossa produces a wide range of pasta recipes and formats, both for the Italian and international market, and commercialises other products such as rice and tomato sauce.

Product traceability and the picking process were improved by the adoption of a Wi-Fi order management system, which was integrated with the product labelling and tracking processes. The system led to a substantial reduction in picking times, and enables quicker traceability of product batches, as required by EU legislation.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Applications and benefits of RFID in traceability and quality assurance are well known and documented[35]. The use of RFID in the delivery and the distribution phase can support the flow of information along a company's value chain, in particular at item level. In both application areas, RFID can support the flow of information along a company's value chain, from the receipt of raw materials right up to distribution of the finished

[35] See *e-Business W@tch* Sector Studies on the F&B Industry, July 2005 and Sep. 2005, available at www.ebusiness-watch.org ('resources')

product. This provides real time visibility of information about the product and its processing, including traceability and location of goods.

In the F&B industry, RFID is used by only 1% of firms. This figure does not reflect the heavy emphasis that media and ICT suppliers are placing on the potential benefits of RFID usage. Nevertheless, the experiences analysed in the *e-Business W@tch* case studies demonstrate remarkable potential benefits, and suggest that the pioneering adoption of RFID may lead to relevant competitive advantages.

Case study:

Latterie Virgilio, Italy

Latterie Virgilio is an Italian consortium bringing together 108 dairy cooperatives with more than 2500 farmers. It supplies the market with wheels of Parmigiano-Reggiano and Grana Padano, as well as other dairy products. The consortium initiated a project aimed at tracking the flow of cheese wheels (of Parmigiano-Reggiano) along the supply chain, by using RFID tags embedded into the crust of the cheese.

Although the system is not yet fully implemented, impacts are expected in: reduction of handling times and warehouse costs; reduction of time and human error during the data transcription from the casein identifying plates to the registers for inventory; limitation of counterfeiting of Parmigiano-Reggiano cheese, thanks to the adoption of a more strictly controlled and certificated system.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Key results of the study on the use of mobile applications and RFID in the F&B industry can be summarised as follows:

Mobile applications

- **Sales force automation appears to be the most widespread mobile application** in F&B. The sale force is usually numerous and widely distributed over the territory and takes advantage from the flexibility and mobility offered by this kind of applications.
- Wireless technologies such as bar code scanners and printers allow the **reduction of errors** in picking and warehousing processes to the shipping and distribution phases “on the road”. Another advantage is the reduction of data entry time and errors.
- **Involvement and motivation of the work force** proves to be a key factor for the success of project implying new working procedures. However, **specific technological skills** should be provided to empower agents and employees, as well as to enable the use of new technologies

RFID use

- **RFID applications** are expanding from quality assurance to **efficiency gains** and control over inventory, delivery and selling/distribution.
- RFID use is **driven by large-scale retailers** requiring the use of tags to improve inventory and supply chain management.
- RFID is **mostly used at the pallet and case level**. At unit level, there are still technological constraints to be solved to allow large-scale application.
- The relatively **high cost of implementation** (although the cost for tags is rapidly decreasing, other components are still expensive) and the difficulties in making the switch is still holding back many companies from introducing RFID.

2.1.4 Business impact

Impact at company level

The use of ICT and e-business in the F&B industry has its **main impacts** in areas related to **production** and **logistics**. In marketing and sales, the potential of e-business is not fully exploited for the benefit of manufacturers. Large retailers exert their power in this area and tend to maximise the advantage of their direct control over customers.

In general, the powerful ICT systems and e-business solutions of **large companies** enable more advanced practices, which can yield greater achievements in terms of **savings and efficiency**. Nevertheless, there are areas – traceability being the most important among them – where SMEs are adopting ICT and e-business on a relatively large scale, and where a significant impact can already be observed.

Impact at industry level[36]

In the F&B industry, rivalry in the market is the key competitive force, together with the bargaining power of customers. Rivalry is connected to the growing bargaining power of distribution, as the industry faces a margin squeeze from lower shelf prices and high commodity prices.

Competition is influenced by ICT in distinct ways. On the one hand, ICT has allowed relevant labour savings, and has increased opportunities for collaboration between firms and for improved customer service. ICT may accordingly help companies to support their competitive position. On the other hand, ICT has contributed to increase competition on prices and services. Moreover it requires substantial investments in equipment, software and, more importantly, organisation and skills: this may make it difficult to create and maintain a competitive advantage.

[36] In the full sector studies, the 'five-forces-model' by Michael E. Porter is used to discuss and assess e-business implications on the industry's structure. Porter presented this concept in his book "Competitive Strategy: Techniques for Analysing Industries and Competitors" (1980).

2.1.5 Policy implications

At a general level, policies to promote ICT adoption among F&B companies, notably the smaller ones, should aim at improving the development of infrastructure (including skills and standards) and the legal and regulatory environment, as well as at creating a favourable business environment. The analysis of findings from the survey, the case studies and desk research conducted for this report point to the following issues which could be relevant for policy-making.

Improve e-skills, especially among SMEs

ICT and e-business are changing the way business is conducted in the F&B industry. There is evidence that SMEs may face difficulties in exploiting these changes due to the lack of necessary skills. Measures could aim at promoting entrepreneurial and managerial understanding of e-business applications. It would be also important to provide information about e business, and support to decision-making. Improvement of skills related to the reorganisation of working processes and to the implementation of innovative technologies could be encouraged.

Facilitate F&B compliance with quality and safety criteria

An important application area for ICT in the F&B industry is to ensure compliance with quality and safety regulations. Firms could be supported by measures such as the provision of relevant information and training on how to use ICT to support food tracking and traceability.

Promote a favourable environment for innovation

F&B firms need to continuously innovate. e-Business policies aiming at a favourable environment for innovation could include the promotion of value chain co-operation, the sharing of good practices among F&B firms and the participation of SMEs in business networks.

Standardisation

Policy measures in the area of standardisation should focus on both the sector and cross-sector levels. They could include supportive actions to stimulate increased participation of SMEs in standardisation initiatives, as well as the establishment of standards for electronic integration with distribution in the F&B sector.

The study author

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2.2 The Footwear Industry

The sector study on the footwear industry was contributed by Databank (www.databank.it).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

Among the ten sectors studied by *e-Business W@tch* in 2006, the footwear industry probably has the lowest overall use of ICT and e-business. Structural reasons – such as the prevalence of small companies - explain in part the limited ICT adoption. Other factors derive from the current economic and competitive situation. However, footwear firms do not differ from their counterparts in other industries when simple forms of ICT and e-business, such as accounting software, suit their needs, size and financial capabilities. They also use ICT in their B2B exchanges with international business partners. All these considerations, together with the finding that cost and complexity of technology are perceived as major hurdles to the adoption of e-business, call for specific, simpler, and probably cheaper, e-business solutions, addressed to small companies in particular.

2.2.1 Sector definition and background

The footwear industry as defined for the purposes of this study covers the following business activities: 19.3 (NACE Rev. 1.1 DC19). The sector employed about 290,000 people in 2003 and had a turnover of 26.7 billion euros, representing about 0.5% of total turnover of manufacturing .[37]

Exhibit 2.2-1: Business activities covered by the footwear industry (NACE Rev. 1.1)

NACE Rev. 1.1		Business activities
Group(s)	Class	
19		Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
	19.3	Manufacture of footwear

The sector is dominated by SMEs. This is both a point of strength of the EU industry, as these companies are generally more flexible, and a point of weakness, as they are more likely to lack investment capability.

The footwear industry is highly globalised. Competition from countries with low labour costs and under-regulated working conditions has been forcing EU footwear production

[37] Economic and Competitiveness Analysis of the footwear sector in the EU 25, September 2005, available at http://europa.eu.int/comm/enterprise/ footwear/documents/analysis_en_2005.pdf

into serious restructuring and re-location. The overall performance of the EU has been deeply affected by unbalanced access to the global market.

The European footwear industry is today a mature sector where companies find it difficult to sustain a significant level of growth. It is subject to strong pressures from highly unstable demand with rapid fashion-related and seasonal fluctuations. Firms need to pursue innovation strategies based on creativity, quality and differentiation of products.

2.2.2 ICT and e-business adoption in 2006

According to the findings of the e-Business Survey 2006, the **adoption of ICT** in the footwear industry is **limited** compared to other manufacturing sectors. ICT use relies on less standardised practices and, perhaps more importantly, most of the sector's companies **do not see ICT as a priority**. This applies not only to the SMEs in the sector, but to its large firms too.

Since large firms are not driving development as much as in other industries, the question arises as to how ICT uptake could be accelerated in this sector. This concern is reinforced by the observation that not even distribution is a driver to ICT adoption.

There are structural reasons explaining the limited ICT adoption, such as the prevalence of small companies, many of which have characteristics of traditional craft & trade companies with a low propensity toward ICT. Other reasons relate to the current economic situation. Competition from low-cost countries, globalisation and changes in the distribution system are putting pressure on margins and are forcing the sector as a whole and its component companies to focus on new competitive challenges and often on their own survival.

Several indicators from the survey point to a "digital divide" between companies in the footwear industry and those in other manufacturing sectors studied by *e-Business W@tch*:

- **Internet access at the workplace**: on average, significantly fewer workers in footwear companies have access to the internet at their workplace, compared to companies of a comparable size in the other sectors.
- **Small base of ERP systems**: the installed base of ERP systems, an important backbone for B2B integration and cooperation, is low in the sector. This appears to be the case particularly among the medium-sized and large footwear companies, compared to the average in other manufacturing industries.
- **Online procurement** activity is much less developed than in any of the other sectors studied. Only about 30% of firms place some orders for supplies online, compared to an average of 50% across all ten sectors.
- **Online marketing** and sales have gained momentum in footwear – the gap with other sectors is smaller in this area, and B2B transactions prevail in this industry. Also, footwear firms are more active at the international level in this area. However, activity has not yet reached critical mass to trigger ICT uptake on a broad level.

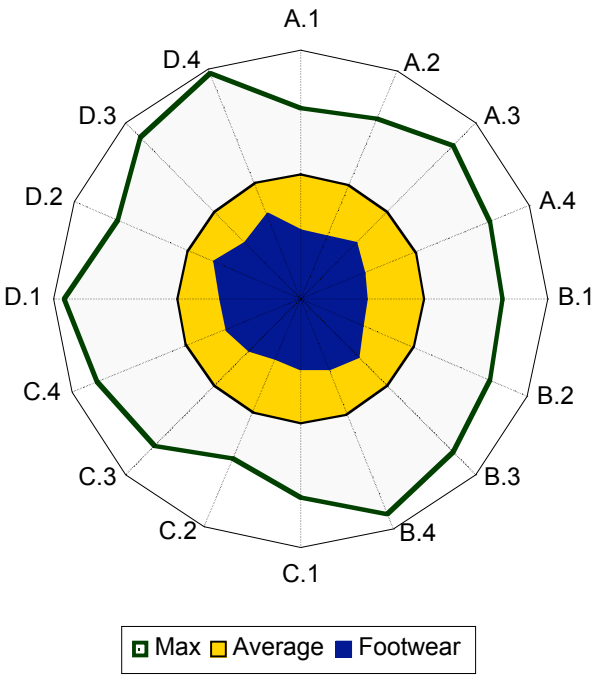
- **Size and cost – the main barriers**: companies that do not practise e-business attribute this to two main reasons: they say that their company is "too small" for doing e-business, and that they cannot afford the required technologies.

Interestingly, however, the survey findings also indicate that footwear firms are dynamic in adopting simple forms of ICT and e-business (such as accounting software) which suit their needs, size and financial capabilities. Furthermore, the same findings also imply that footwear firms are active in e-procuring production materials in international trading, as well as in international e-marketing activities. The average ICT budget of a company from the footwear sector is in line with the respective all-sector average. So despite a persistent 'digital divide', the 2006 survey data suggest a cautious and "selective" approach to e-business by footwear firms in Europe.

e-Business Scoreboard 2006

The e-Business Scoreboard enables comparison of ICT adoption and e-business activity across different sectors, countries or size-bands. Among the ten sectors studied by *e-Business W@tch* in 2006, the footwear industry is among the sectors with the comparatively **lowest use of ICT** and e-business.

e-Business Scoreboard 2006



Component indicators

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.2.3 Current e-business trends

For those companies that use ICT and e-business, the main impact is felt in production and logistics. Firms put serious efforts into the integration of information and logistic flows with their business customers. Strategic investments focus on production planning, stock-turn improvement and reduction of out-of-stocks.

The role of e-business in supporting networking among enterprises

The need for efficient management of complex and diverse production organisation is a major driver towards the adoption of e-business solutions in the footwear industry.

Collaborative work among footwear and footwear component manufacturers is key to speeding and achieving instant visibility of orders, shipments, and inventory across the supply chain, as well as improving the tracking of processes from design to manufacturing.

A prerequisite for cooperation along the value chain is sharing data and management information among business partners. However, the footwear industry is still quite conservative in adopting ICT systems to support these objectives. Despite a tradition of long-term partnerships, many footwear firms are reluctant to pass on information and to open up their information systems.

Footwear companies need to address these issues, without the need to use expensive solutions, or to release sensitive information to external databases.

Case study:

INESCOP, Spain

This case study describes the implementation of a system to improve the exchange of technical data between member companies of Instituto Tecnológico del Calzado y Conexas (INESCOP). These companies are business partners in the distinct aspects of footwear design and manufacturing. The primary focus is on the architecture and methods for the exchange of data between the different agents in this process, and with the company responsible for producing and distributing the end product. The project's main impact has been to improve data sharing between footwear manufacturers and/or distributors and their suppliers. In addition, it has led to: streamlined transmission of information, monitoring the status of information sent, minimising errors in transmission, and greater professionalism in relaying information.

The main lesson is the need to work closely with companies in the sector, so that the proposed solution caters for their needs and adapts to their specificities. Furthermore, the case illustrates that simplicity and user friendliness of the system, enabled by use of the XML standard, are critical success factors when small companies are involved.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Atomic, Austria

This case study describes the application of an SAP-based e-business solution at the footwear division of Atomic, one of the world's leading manufacturers of winter sports equipment. This e-business solution for internal processes includes order management, collaborative development of new products, procurement and inventory management, supply-chain management and most distribution processes.

The adoption of this e-business solution and its related management changes helped increase the efficiency of Atomic's overall management and production processes, which in turn helped improve its economic performance.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The survey results demonstrate that the current development of tools for online cooperation and collaboration in the footwear industry is not spectacular. Similarly, e-integration of business processes along the supply chain is limited. The low degree of computerisation and related know-how, cultural differences, and the diversity of technological equipment are still significant barriers to integration. Clear vision and strategy, however, can allow small companies to implement successful solutions, as illustrated by the INESCOP and Atomic case studies.

- There is a strong case for the development of **user friendly, low cost** solutions. Standard, **XML**-based systems for data exchange, such as the one implemented by *INESCOP*, could be encouraged, and factors limiting their adoption could be addressed.
- **Modularity and scalability** of the proposed solutions are key success factors in the footwear industry, as illustrated in the *Atomic* case study.

Integration with distribution

The competitive positioning of footwear firms is strongly conditioned by the way they manage and integrate distribution. Footwear companies need to react quickly to changes in customer requirements and market conditions. They also need to streamline and manage the sales process, procedures and strategy development, so as to create synergies within organisations and with retailers, and reduce operational timescales.

The main challenge is to manage effectively alternative product distribution mechanisms and resources in complex and fragmented networks.

Diverse IT systems, integration costs and the lack of information standards continue to impede external integration. Significant customers with high levels of innovation are moreover, still limited in number. In this industry, distribution does not drive innovation as much as in other sectors studied by the *e-Business W@tch*. With the exception of a few large retailers, the sector is still largely composed of specialised traditional vendors using fax and e-mail as the normal communication method with the shoe factory - although the situation differs from country to country.

Projects for integration between shoe manufacturers and distributors mainly relate to **integrating the information and logistic flow** along the value chain, linking production to logistics, warehousing and sales. The objectives are generally to achieve savings in cost and time, to boost efficiency of operations, to reduce errors and to shorten lead times with benefits both for manufacturers and retailers.

Case study:

Shoe-D-Vision, Denmark

Shoe-D-Vision (Denmark) reduced its coordination costs and time and improved its service to member boutiques through the implementation of its ERP system, subsequently enhanced with a stock management and ordering tool. This back-office retail system is installed at the group office and manages the shoe inventory of the shops (more than 320 boutiques). A ShoeWeb application facilitates ordering and invoicing and provides shops with real-time stock inquiry, and 24/7 online access to the ERP system. The ERP and WEB e-business solutions have had a significant impact on Shoe-D-Vision's business, especially on work organisation, business relationships with customers (boutiques), and in inventory management and logistics. Significant savings were achieved in the invoicing cycle.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Moreschi, Italy

Moreschi (Italy) is a family owned company, specialised in manufacturing high quality men's shoes. The company invested in innovative manufacturing systems and implemented a "quick response" solution to speed and smooth the flow of goods and information from production to point of sale. The system connects and integrates orders to production and supports the company in minimising errors and out-of-stock at shop level.

The adoption of automated systems in production has delivered remarkable gains in productivity and a rapid return on the cost of the systems. The effort of integrating these advanced solutions with distribution has not yet, however, been fully successful. The full exploitation of the benefits from this system at company and at shop level requires further investment in change management and computer skills. The main obstacles to full exploitation are the lower-than-expected involvement of the sales personnel and the difficulty of ensuring that the new system is used fully and properly.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

In the footwear industry, a major challenge is the management of effective product distribution in complex and fragmented networks with multiple alternative sources. Strategic investments by shoe manufacturers focus on production planning, stock-turn improvement and reduction of out-of-stocks. The most advanced companies have implemented projects to integrate proprietary distribution networks. Integration with external networks, and especially with independent wholesalers operating with multiple suppliers, is, by contrast, rare.

RFID in the Footwear Industry

The diffusion of RFID is still limited at a general level and among footwear companies: 2% of footwear firms stated that they use RFID. Only very large companies have started introducing RFID-based systems for tracking products.

In the footwear industry, RFID can be used to locate shoes in successive industrial phases. In addition, tags allow collection and recording of information about materials, production, suppliers and timing. In footwear logistics, RFID produces significant benefits because of the handling of large amounts of small units. In distribution activities, RFID tags are currently inserted on warehouse pallets rather than being embedded in individual items. Application of RFID at pallet level offers benefits in tracking and replenishing inventory.

Benefits of RFID at individual item level are reduction of out-of-stock, improvement of inventory management and pricing, and integration with mobile and wireless applications. Use at item level is, however, still in the pioneer phase.

There are several reasons for the limited application of RFID. In addition to cost, the technology still needs improving and stabilising, and process and data synchronisation need to be worked out. Full exploitation is also dependent on RFID being deployed in a **standardised manner along the entire supply chain**. This implies the adoption of industry standards, integration with internal information systems, investments in RFID tagging and reading equipment and in supporting technology infrastructure. For most companies, RFID is not yet commercially justified.

Case study:

Safe Way, Italy

Safe Way Srl is a family-owned manufacturer of protective and safety shoes. This innovative company has been able to capture a niche market by developing a technical solution which matches the organisational needs of customers. It is an interesting example of innovative technology (RFID) applied to traditional products. Safe Way patented a system called "Microchip" for incorporating RFID tags into a particular kind of safety shoes with a specific ISO EN class. Applications of this RFID-based system include: the recognition of the ISO EN class of the shoes and their suitability for use in specific environments, and the recognition of operators wearing shoes. RFID equipped shoes are produced and marketed in small and customized quantities. Economic return has not yet been achieved, but is expected within two years. So far, the main benefits have been for customers, including automatic access control, easier coupling after washing, and automatic monitoring of exit points for verifying the complete staff evacuation in case of emergency.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.2.4 Business impact

Impact at company level

In the footwear industry, ICT and e-business have their main impact in production and logistics, where increasing efforts are being directed towards integration of information and logistic flows between footwear enterprises and their business customers. Direct economic impacts (revenue growth and savings on procurement costs) are perceived by fewer firms. This, however, also holds true for the average of all sectors studied this year by *e-Business W@tch*.

Only about half of all companies in the footwear sector think that e-business constitutes a significant part or some part of how they operate. Large companies were found to attribute even less importance to e-business than SMEs in the sector. The highest positive impacts of e-business was reported to be on internal work processes, business process efficiency and customer service.

Companies in the industry expect the main ICT impacts to be in accounting and customer support, followed by marketing, management and logistics. They expect little impact on production and R&D activities.

Impact at industry level

Although ICT adoption in this sector is lagging behind other manufacturing industries, it could have a significant impact on the bargaining power of both suppliers and customers in this industry, and – to some extent – on competition in the market. In particular, enhanced e-business adoption could create a "win-win" situation for manufacturers and retailers by improving integration and collaboration between producers and distribution networks.

2.2.5 Policy implications

On the basis of this study, some issues could be relevant for policymaking in relation to the footwear sector. Initiatives could be considered to promote and accelerate ICT adoption in the industry, so as to enhance ICT-enabled innovation. For example, implementing ICT-supported supply chain processes could increase the productivity and competitiveness of companies. Relevant issues to be considered in this context include:

Interoperability and standardisation

Support could be considered for projects to enhance interoperability for the exchange of computerised data. Emphasis should be placed on a **global classification and standardisation scheme for products**. This includes not only the development of such schemes, but also their dissemination and the raising of awareness among footwear companies about global classification activities.

Substantial efforts have been made on the technological side, and policy measures could now aim at fostering faster and wider implementation of standards both at sector and at cross-sector level, in particular in integration with distribution. A study would be opportune to analyse the impact, the effectiveness and the potential benefits from the various

standardisation and interoperability activities undertaken so far for this sector, as well as to identify their future implementation steps. The economic problems faced by footwear companies in Europe mean that ICT solutions will be perceived as helpful only if they combine a pragmatic, short-term approach with a longer-term strategic vision.

Improving the managerial understanding of e-business potential

Activities in this area could include promotion of entrepreneurial and managerial understanding of e-business applications, especially among SMEs; providing information about e-business and support to decision-making; and improving skills related to the reorganisation of working processes and to the implementation of innovative technologies. Policy measures may include 'peer-to-peer' demonstrations of successful ICT implementations, training courses in ICT and e-business management, and the establishment of platforms where footwear companies can meet providers of ICT and e-business solutions.

Promote a favourable environment for innovation

Footwear companies need to pursue innovation strategies based on creativity, quality and differentiation of products in a very competitive environment. In this effort, continuous investments and an improved governance of knowledge are critical. e-Business policies could, therefore, stimulate the diffusion of new technologies (e.g. RFID) that may help footwear companies in the EU to protect their Intellectual Property Rights (IPRs) and combat counterfeiting. In parallel, EU policy should continue its efforts towards the establishment and harmonisation of rules to protect innovation and IPR.

Cooperation with ICT service providers

e-Business uptake in this sector would benefit from improved dialogue and cooperation between footwear industry and software providers, to support the development and diffusion of sector-specific, scalable and affordable solutions.

Mobilise industry associations

To increase the effectiveness of support actions for this sector, footwear industry associations (at regional, national and European levels) should be actively involved. They can leverage actions by promoting the issues among their members.

The study author

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2.3 The Pulp & Paper Industry

The sector study on the pulp & paper industry was contributed by empirica GmbH (www.empirica.com).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

In the pulp & paper (P&P) industry, the impact of ICT is mainly felt as a driver and enabler of process innovation in business-to-business (B2B) trading processes and logistics. Survey results and case studies showed that companies use ICT in all application areas along the value chain: for procurement processes, in production, inbound and outbound logistics, and in marketing and customer service.

However, the e-business activities of the smaller companies in the sector are different from those of large companies. While large P&P manufacturing companies are advanced users of e-business, many of the smaller companies rely on a simpler ICT infrastructure. On the whole, the P&P industry is a perfect yardstick for the state-of-play in ICT adoption and e-business activity among the ten sectors studied by *e-Business W@tch* in 2006.

2.3.1 Sector definition and background

Definition

The P&P industry as defined by *e-Business W@tch* for the purpose of this study covers the business activities specified in NACE Rev. 1.1 Division DE 21. The manufacture of pulp, paper and paperboard (NACE 21.1) is mainly an industry where large companies typically operate in a world-wide market. In the manufacture of articles of paper and paperboard (NACE 21.2), often termed the 'converting industries', companies are usually smaller and operate more on a regional or national basis.

Exhibit2: Business activities covered by the pulp & paper industry (NACE Rev. 1.1)

NACE Rev. 1.1		Business activities
Division	Group(s)	
DE 21		Manufacture of pulp, paper and paper products
	DE 21.1	Manufacture of pulp, paper and paperboard
	DE 21.2	Manufacture of articles of paper and paperboard

In 2003, the total sector directly employed about 740,000 people in the EU-25 and had a production value of about 150 billion euros.[38]

[38] Source: Eurostat, Structural Business Statistics (Industry, Construction, Trade and Services), Annual enterprise statistics (latest figures available, i.e. for 2003). Downloaded from the Eurostat website in March 2006.

The **paper and paperboard industry** converts inputs (raw materials) from forestry and from the chemical industry into papers of different grades. These are used by other industries for various purposes or go directly to consumers via retail distribution.

Users of these materials also include the **converting industries** (manufacturers of articles of paper & paperboard). Outputs of this sub-sector include a large range of product categories, the most important of which are packaging solutions representing about 40% of all paper and board production.[39]

2.3.2 ICT and e-business adoption in 2006

Results of the e-Business Survey 2006 show that companies from the P&P industry use ICT intensively in all application areas along the value chain: for procurement processes, in production, for inbound and outbound logistics, marketing and customer service. As in most manufacturing industries, improving supply chain management by integrating business processes with suppliers and customers is the main focus of all activities.

The main results of the survey can be summarised as follows:

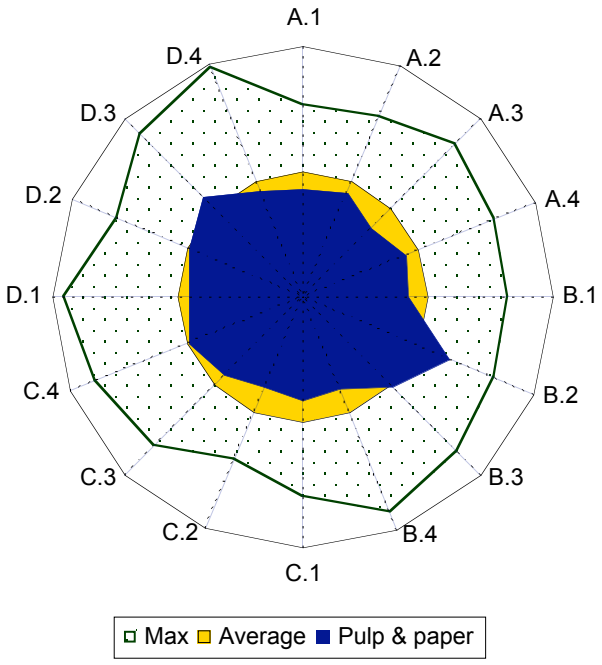
- **Differences by firm size, not by sub-sector**: structural differences between the two sub-sectors (P&P manufacturing, paper converting) do not show up in the survey results. According to these results, it is the size of the firm that matters, not the sub-sector in which firms operate.
- **ERP as a backbone for B2B integration**: ERP systems are widespread among companies from the P&P industry, compared to most other sectors studied this year by e-Business W@tch. In total, companies representing 45% of employment in this sector said they operated an ERP system; only the ICT manufacturing industry - among the ten sectors studied - has a higher adoption rate (61%). However, there is still a considerable gap in ERP adoption between small and larger firms in the P&P industry. These systems constitute the basis for many advanced forms of e-business in manufacturing.
- **Supply chain management and e-procurement**: P&P firms use ICT intensively to support logistics and supply chain integration; but emerging technologies such as RFID are not yet widely adopted. About half the firms active in the P&P industry said that they place at least some orders to suppliers online. The incidence increases by firm size.
- **Online marketing is gaining momentum**: almost 30% of firms said they accepted orders online and more than 20% (by employment) that they used a CRM system; this is more than the average in the ten sectors studied and shows that e-marketing is gaining momentum among several manufacturing industries. It further confirms results from the machinery & equipment industry in 2005.
- **Size and costs as the main barriers for small firms**: SMEs that do not practise e-business see two main barriers: they feel that their company is "too small" for doing e-business, and that they “cannot afford the required technologies”.

[39] Source: CITPA, the International Confederation of Paper and Board Converters in Europe

e-Business Scoreboard 2006

The e-Business Scoreboard makes possible comparisons of ICT adoption and e-business activity across different sectors, countries or size-bands. It shows that the P&P industry is a near-perfect **yardstick for the state-of-play** in ICT adoption and e-business activity, at least among the ten sectors studied by *e-Business W@tch* in 2006. For many of the indicators, figures for the P&P industry are very close to the all-sector total and represent very accurately the average situation in manufacturing industries.

e-Business Scoreboard 2006



Component indicators
(based on data in % of firms)

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.3.3 Current e-business trends

In the P&P industry, the impact of ICT is mainly felt as a driver and enabler of process innovation in **business-to-business (B2B) trading processes** and **logistics**. Meeting requirements for organising trade and logistics on an international scale has been a strong driver of ICT adoption.

papiNet® – a success story

The importance of standards and interoperability for e-business is commonly acknowledged.[40] In the forest and paper products supply chain, the papiNet® standard has been **successfully established** as the main industry standard for e-business.

[40] See *e-Business W@tch* Special Report on Interoperability and Standards, September 2005. Available at www.ebusiness-watch.org ('resources')

Even if papiNet® is by all measures a well managed and successful initiative, there is still **scope for new implementations** of this standard, especially for SMEs. Due to legacy factors and a wide diversity of partners from different industries, implementation issues are not always straightforward. Currently, as the e-Business Survey 2006 show, only about **2-3% of firms** in the P&P industry use this standard, and these are mainly large enterprises. However, their number as well as the amount of messages exchanged increase fast.

The strengths of the papiNet® organisation and its processes may have strong potential for similar cooperative developments in other sectors. In this sense, papiNet® could serve as **role model**. The sector study has identified some factors which have substantially contributed to the success of papiNet®, and which could also be **success factors** for the deployment of industry standards in other sectors:

- **decentralised development and implementation**, focusing on the most relevant subsectors or market segments in a region and their specific semantic issues,
- a clear messaging **interoperability** strategy, supported by a strong basis in stable message standards (ebXML);
- effective **cross-sectoral partnerships**, and
- **no certification overheads**.

To further enhance this deployment, there is an ongoing **requirement for good case studies** on the practical benefits for SMEs that implement papiNet®. The case study on *Stora Enso* illustrates this point: the initial enthusiasm of smaller partners for papiNet® implementation is often dampened when the **magnitude of the task** relative to their existing software architecture is understood.

In this sense, although papiNet® is universally recognised as being a very good standard, specific implementations (e.g. in particular market sub-sectors) do not always require all the data elements in the standard messages. In particular, having to process a full general papiNet® message would be perceived as “overkill” by those whose business management software consists of simple spreadsheet calculation.

Case study:

Stora Enso, Finland

Development, adoption and use of papiNet® collaborative messages, combined with FENIX ERP and PartnerWeb, are presented as the major steps and achievements in the Stora Enso overall European world-class supply chain integration strategy. Stora Enso customers have two immediate complementary options for e- transactions: PartnerWeb and use of papiNet®. Customers can make use of either or both, depending on circumstances and perceived benefits relative to the efforts to be invested by either partner.

The Packaging Boards Division is also leading the way in intelligent packaging, as demonstrated in the summary of PackAgent, currently a pilot software project using RFID to track and trace pharmaceutical products and to protect against the growing problem of counterfeit drugs.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

ICT as a driver of improved process efficiency

The use of ICT is a key enabler of **increased process efficiency** in the P&P industry, just as in other manufacturing industries. Relevant applications in this context are ERP and SCM systems, other applications for managing capacity and inventory, and collaborative tools, such as for production planning. In particular, the integration of digital information flows during all phases of **B2B transactions** (including ordering, invoicing and payments) with production management and logistics has significantly facilitated business processes between P&P producers and their suppliers and customers.

Effects are most pronounced if companies operate **ERP systems** and use them as the platform on which e-business processes are conducted. ERP systems are widely diffused in the P&P industry among larger companies, but not yet among smaller firms. This translates into a significant gap between large and small companies when it comes to more advanced forms of e-business.

Case study:

Mayr-Melnhof Cartonboard Group, Austria

The Mayr-Melnhof Cartonboard Group (MMK), headquartered in Vienna, is a leading producer of recycled cartonboard within Europe and world-wide. As a vital part of its strategy, the company emphasises developing and maintaining lasting business relations with clients and suppliers.

The case study shows how MMK deliberately uses ICT and e-business as instruments to support this strategic goal. The case focuses on a web-based workplace ("coMMunity") which was mainly implemented as a service for smaller companies with whom MM is in business. It illustrates how online services of this type can support B2B trade processes in a win-win situation, with a high chance of creating value for both parties involved.

The company believes that its portal paves the way for testing new business models, such as Vendor Managed Inventory (VMI) or Supplier Managed Inventory (SMI).

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

VPK Packaging, Belgium

The case study shows how VPK Packaging Group uses ICT and e-business to develop customer-sized solutions.

It describes how the company implemented the Forward Logistic Integration (FLI®) concept as an instrument to optimise its supply chain, with benefits both for VPK and its customers. In the past, rush orders had caused major logistic problems; order placement and order management improvements. The case study illustrates how these B2B processes are facilitated by a detailed and open exchange of information between trading partners.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Rexcell Tissue and Airlaid AB, Sweden

Rexcell, a large manufacturer of tissue and airlaid paper in Sweden, was looking for new ways to organise and structure its quality management system (QMS) in order to meet demands from customers.

Today, the company is being helped by ICT to ensure quality management throughout all its processes, and to provide a better overview of them. It implemented an ICT-based quality management system which allows employees to follow any process within the company from start to finish and to see the steps taken to maintain quality.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Nordic Paper, Norway

Nordic Paper in Greåker, Norway, is the world's largest producer of greaseproof paper. Since the late 1990s, the company has been using the computer-based tracking system "Semtracker" to obtain a complete overview of logistic information about its products and orders.

In 2004, Nordic Paper linked the lab analysis-tool Mikon LIMS with Semtracker in order to further increase information transparency across production and logistics processes: the new system provides the company with real-time electronic information about the quality of the paper and the levels of chemicals in it.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

On the whole, the impact of ICT adoption with regard to process efficiency certainly includes the following:

- **Acceleration of processes.** In most large P&P firms, the manual handling of orders and related paper work has largely been automated by means of ICT (e.g. by ERP systems). This has enabled companies to accelerate processes and to, shorten lead times for their customers (i.e. reduce the amount of time between the placing of an order and the receipt of the goods ordered).
- **Increased internal transparency of processes.** ICT can offer a powerful tool to increase the transparency of business processes within a company. This is an important effect with implications for **work organisation** in this industry and should not be underestimated.
- **Improved use of production capacity.** ICT support for P&P companies is improving their planning of sourcing, production and logistics, and enabling wider collaborative processes such as vendor managed inventory. This leads to an acceleration of ordering and delivery processes and to improved internal use of production capacity.

Deployment and implications of RFID

In the P&P industry, about 3% of all firms said they used RFID in 2006. Large companies are the forerunners: 10% reported RFID adoption.

The main application areas for RFID in P&P manufacturing are **warehouse and inventory management** (the case studies on *International Paper, ICT for New Production Tracking* and *Stora Enso* which are presented in the full study are representative examples). RFID can help companies to link ordering, production and logistics processes, and so to streamline their supply chain and reduce lead times.

However, the benefits of RFID over the use of bar-code technology for the same purposes are still not obvious. In particular, although the price of tags is constantly falling, the **total costs** for RFID projects are still **considerable** when implementation and operation are taken into account. Implementation can also have a substantial impact on work processes and skills requirements in the company.

The main conclusions of the analysis are:

- **Different strategies**: While some P&P manufacturing companies have chosen to be early adopters, others deliberately opt for a wait-and-see strategy with regard to RFID. There is no single correct strategy for all firms; it depends on the context, such as the company's overall strategy, its vision, market position and customers. Companies with a cost leadership strategy may be hesitant to adopt at this point of time, as RFID is still costly. Companies with an innovation leader strategy are more likely to adopt.
- **Impact of customer demand**: Compliance with customer demand is a key driver for RFID adoption in the packaging industry. Large retail chains and consumer goods producers (notably the food & beverages and the pharmaceutical industries) are influential sectors in this respect.
- **General IT capability critical for smooth adoption**: A company with a clear information management strategy, and with sophisticated IT systems already in place, is likely to manage the transition to RFID quickly and smoothly.
- **Risk of information overload**: RFID creates an abundance of data which, in turn, necessitate sophisticated business administration software to manage and make exploit.
- **High impact potential in the long run**: Notwithstanding the limited diffusion in 2006, RFID could become a key technology with substantial impact on B2B trade in the future.

ICT impact on paper consumption

Although the adoption of ICT by households and businesses leads in some instances to substitution of paper or paper-based products, the net impact of all relevant factors is a continued **growth in paper demand** and consumption.

The following **factors** are likely to further drive paper consumption in the next 10 years:

- **Economic growth / industrialisation** in major emerging markets (most notably in China, India, Russia, Brazil).
- Publication of **new magazines** in parallel to new technological developments.
- **Ease of printing**. ICT has greatly facilitated the printing and copying of documents rather than eliminating it. This applies to both domestic and office use of ICT.

Substitution effects are most significant in the daily and weekly newspaper markets, where a large proportion of **classified advertising** is already migrating to the internet. There is a decline in the average volume of newspapers as well as in total circulation. However, a projection of figures on paper consumption in Europe since the mid-1990s indicates a moderate growth even in advanced economies.

2.3.4 Business impact

Impact at company level

ICT and e-business have a considerable **impact on work processes** and on **business process efficiency** in companies from the P&P industry. Companies increasingly use ICT for enhancing **customer service**, and also expect that this will be a major area of ICT impact in the future.

All the evidence suggests that the powerful ICT systems and e-business solutions of the **large companies** currently allow more advanced practices, which enable greater achievements in terms of **process efficiency** and **cost savings**. Many of the smaller companies in this sector, on the other hand, have only recently taken their first steps towards e-business. However, the P&P industry has good pre-prerequisites for B2B exchanges; **dynamic development** in e-business can accordingly be expected over the next 3-5 years.

Impact at industry level

Structural determinants make the P&P industry a sector with **intense competition,** mostly between well-established players. Rivalry could further increase if Asian or South-American competitors enter the European market. However, the key drivers of this competition are **not to be found in ICT** and developments in e-business. For instance, globalisation issues and the critical impact of rising energy costs (with implications for costs of raw materials such as chemicals) are not directly linked to ICT or e-business developments.

2.3.5 Policy implications

Survey results, case studies and desk research identify some issues which could be relevant for policy. The first two points relate to the **acceleration of ICT adoption** among small and medium-sized P&P companies; the second two points concern the objective of ensuring a **favourable framework for e-business**.

Large firms as multipliers

Small and medium-sized P&P firms are increasingly facing pressure to upgrade their ICT systems from customer industries (in particular from the large retail chains, the pharmaceutical and the food and beverages industries), as well as from large suppliers within their own sector (pulp & paper manufacturers).

The limited degree of B2B integration between large firms and their smaller business partners is a bottleneck for the optimal exploitation of e-business opportunities. An innovative policy approach in this context is to launch focused initiatives where large firms (and possibly the public sector) are used as vehicles to accelerate e-business adoption among their SME suppliers. Furthermore, co-operative initiatives can create 'positive pressure' on small companies, e.g. in the area of e-invoicing.

Solutions for SMEs

The e-Business Survey 2006 confirmed that ERP systems are still mostly used by large and medium-sized enterprises. In the P&P industry, about 70% of large firms have an ERP system, compared to about 45% of medium-sized ones, and to less than 20% of small firms. Recognising the importance of ERP (Enterprise Resource Planning) systems for doing e-business in this industry, it is proposed to enhance the development of solutions for SMEs. Initiatives could build on a trend among software providers to adopt more SME-centred strategies.

Standards for e-business

There are parallel industry-driven initiatives to establish standards for B2B trade within the P&P industry and in exchanges with the consumer goods industry.

- **papiNet®** is an industry initiative to develop a standard specifically for the forest and paper industries for automating business flows in the sector. It is currently used by 2-3% of firms, but more than 10% of large firms, and in particular by pulp & paper manufacturers.
- In parallel, the consumer goods industry promotes **GUSI** (Global Upstream Supply Initiative) as a standard for exchanges with their suppliers, which includes packaging suppliers (NACE 21.2).

This has implications in particular for companies from the converting industry. It therefore merits closer assessment of the business case for integration and consolidation of technical components and semantic aspects of these standards.

Legal framework for e-invoicing

Since 2005, the use of e-invoicing has increased rapidly, as this application promises enterprises - including SMEs - a fast return on investment. Currently, firms accounting for about 25% of employment in the P&P industry say they receive e-invoices, and about 20% send e-invoices. Among SMEs, about 15% send or receive e-invoices

The fast development of e-invoicing has led to some legal uncertainties with regard to taxation in certain EU Member States. Furthermore, the different approaches taken in Member States make it difficult to use e-invoicing in cross-border transactions. A consultation among stakeholders could amend this situation.

The study author

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2.4 The ICT Manufacturing Industry

The sector study on the ICT manufacturing industry was contributed by DIW Berlin (www.diw.de).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

The ICT manufacturing (ICTM) industry emerges as one of the sectors with the highest overall use of ICT and e-business among the ten sectors studied by *e-Business W@tch* in 2006. There are structural reasons which drive the adoption of ICT and e-business practices, such as the prevalence of large companies, intense competition, frequent product changes and production dispersion. Nevertheless, the level of e-business activity differs with the size of firms. e-Business is taken up by SMEs with a slight delay, compared to large enterprises. Additionally, there are some differences in terms of ICT adoption and use between sub-sectors in the ICT manufacturing industry.

The 'intensive use – positive performance' paradigm seems to hold true in the ICT manufacturing industry. By combining new tools with adjustments in their product and marketing strategy, ICT manufacturers found ways to offset the negative effects of some technologies on company productivity, and managed to increase their competitiveness.

2.4.1 Sector definition and background

Definition

The ICTM industry, as defined for the purposes of this study, comprises two sub-sectors defined according to the NACE Rev. 1 classification. The ICTM I sub-sector produces office machinery, computers and computer peripherals (NACE DL 30.01 and 30.02). The ICTM II sub-sector produces electronic intermediate goods radio, television and telecommunication equipment (NACE DL 32.1 and 32.2).

The international character of ICTM leads to a high degree of specialisation by individual countries in particular aspects of manufacture. The use of ICT has allowed knowledge and information to be codified, standardised and digitised, enabling in-depth specialisation and fragmentation of the production process. As a result, the production can be dispersed over different countries according to their comparative advantages.

In 2003, production by the ICTM industry in EU countries was worth more than € 223 billion . The industry value-added at factor cost was estimated at about € 57 billion. In the same year, the nearly 37,000 enterprises producing ICT equipment across the EU-25 had more than 1 million employees.[41]

[41] Source: Eurostat, Structural Business Statistics (Industry, Construction, Trade and Services), Annual enterprise statistics (latest figures available, i.e. for 2003).

Exhibit 2.4-1: Business activities covered by the ICT manufacturing industry (NACE Rev. 1.1)

NACE Rev. 1.1		Business activities
Divisions	Groups	
ICTM I		
DL 30		Manufacture of office machinery and computers
	30.01	Manufacture of office machinery
	30.02	Manufacture of computers and other information processing equipment
ICTM II		
DL 32		Manufacture of radio, television and communication equipment and apparatus
	32.1	Manufacture of electronic valves and tubes and other electronic components
	32.2	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy

2.4.2 ICT and e-business adoption in 2006

Among the ten sectors studied by *e-Business W@tch* in 2006, the ICTM industry displays very high overall use of ICT and e-business. There are structural reasons, such as the prevalence of large companies, intense competition, frequent product changes and production dispersion, which drive the adoption of ICT and business practices in this specific industry. Nevertheless, even in such an ICT-intensive sector, the level of e-business activity varies according to the size of firms. Furthermore, a closer look at the adoption levels within this industry revealed differences in ICT use between the sub-sectors studied. In general, companies from the ICTM I sub-sector seem to be more advanced ICT users than those from ICTM II.

The main survey findings are, in summary:

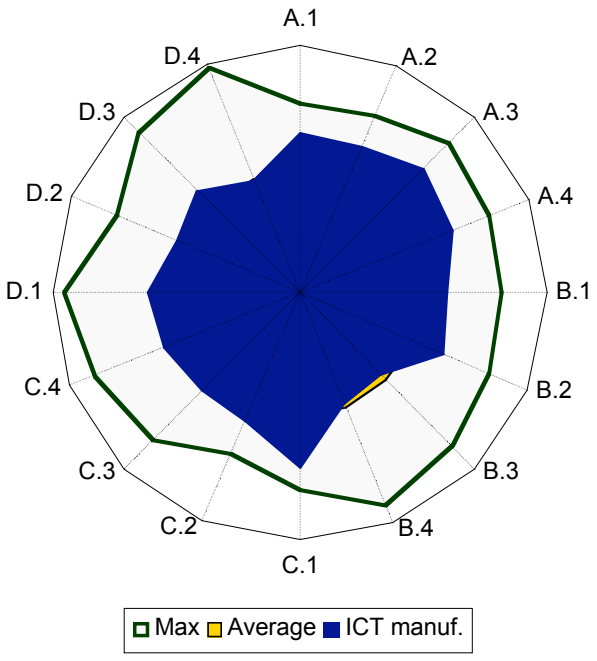
- **Internet access at the workplace**: Significantly more employees in ICTM companies have access to the internet at their workplace than in other companies.
- **ICT investments**: Despite an already-high ICT endowment, many companies in the sector are planning to increase ICT investments.
- **Need for interoperability**: An insufficient use of standards supporting inter-firm collaboration causes serious interoperability concerns.
- **e-Selling and e-procurement not affected by firm size**: Companies in all size-bands exhibit similar patterns with respect to the adoption of the internet as a selling/procurement platform and the share of orders placed/received online.
- **Online auctions play a minor role**: Companies in the ICTM sector were resistant to join trading networks, perceiving them as a means intending to restrain competition and a way to drive down prices.
- **Network technologies and scale effects**: Applications such as ERP or SCM have significant effects in the sector; they are primarily used by large firms.
- **Globalisation drives process automation and vice versa**: Companies engaged in cross-border trading automate document and payment flows more often than firms operating within their national borders.

- **Bottom-up supply-chain integration**: The pressure to integrate the supply chain comes from the bottom of the value chain, i.e. Original Equipment Manufacturers (OEMs) or customers.
- **Barriers to e-business may also lie outside the IT-using industries**: Complaints regarding the lack of reliable IT providers, interoperability and high technology cost might be a sign of restrained competition in the IT market.

e-Business Scoreboard 2006

The e-Business Scoreboard makes possible comparisons of ICT adoption and e-business activity across different sectors, countries or size-bands. It shows that the ICTM industry is one of the most advanced in ICT adoption and e-business activity among the ten sectors studied by *e-Business W@tch* in 2006. For nearly all indicators, figures for the ICTM industry are well above the all-sector total.

e-Business Scoreboard 2006



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D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.4.3 Current e-business trends

ICT and e-business are used by ICTM companies not only to support business processes, but also as integral parts of the products and services they supply. Many companies in the sector provide hardware, software, implementation and consulting services. At the same time, ICTM companies are intensive ICT users themselves. In this context, the following specific issues were selected and analysed as particularly relevant for the ICTM industry.

Convergence

Convergence is one of the most important issues in the ICT manufacturing industry. The development of new technologies and services affects companies in this sector as producers of ICT. But the opportunities stemming from the expansion of internet technologies and related services have not been fully utilised by companies in the ICTM sector, despite the obvious advantages. Locked into traditional technologies, firms dominating the market in the pre-internet era lost significant market share to newcomers. Although the prospects for ICTM are positive, the success of technology manufacturers depends on a wide range of factors. The opportunities go hand-in-hand with high uncertainty and risk.

The main implications for the ICTM sector related to convergence include the following:

- **Business convergence follows technological convergence**: Technological convergence blurred the lines between various business areas and changed the market environment in the ICTM sector. However, many firms were late to adapt to changing conditions and lost market share to newcomers.
- **Growth requires business integration**: Companies expanding operations in converged markets are forced to focus on integrating business processes between distinct units and businesses.
- **Technology should follow strategy**: Decisions to implement particular technologies should be paired with market strategy. Companies investing in cutting-edge technologies in order to achieve a dominant position might find themselves locked-in and unable to follow new market trends if a technological shift occurs.
- **Complementarities between technology and content**: Companies' success relies on the diffusion of new technologies, which in turn, depends on consumers' skills and the provision of complementary products by content providers.
- **Regulatory framework**: The regulatory framework might influence the decisions regarding the development of new communication technologies.

The extended enterprise concept

Intense competition forces companies in the industry to re-locate their production facilities and outsource their operation to low-cost locations. At the same time, short product life cycles require retaining research, engineering and development tasks close to destination markets. Considering the market characteristics and production organisation, effective communication along the entire value chain is vital to companies' operations.

The deployment of inter-organisational applications in the ICTM industry is slightly higher than in other manufacturing industries. However, the use of such applications as ERP or SCM is particularly low among the smallest firms. Similarly, this sector's SMEs lag in the adoption of tools supporting collaborative product development or inventory management, compared to large firms. The imbalance between small and large enterprises regarding the use of applications supporting processes between companies might have a negative impact on the progress of supply chain integration at the lower

levels of the supply chain. This is particularly worrisome, as the deployment of inter-firm computer networks has a significant impact on firm and its industry competitiveness.

Case study:

Process integration at Motorola, USA

Broad adoption of Business to Business Integration (B2Bi) in the ICT manufacturing industry demands the standardisation of exchanges between suppliers and customers. Leveraging the standards for hi-tech manufacturing, Motorola chose a new way of conducting business with its supply-chain partners, employing XML-based B2B Standards, Enterprise Application Integration and Business Activity Monitoring technologies. Driving the changes are supply-chain complexity, global competition and the need for Motorola to conduct business in non-conventional ways.

The implementation of the RosettaNet B2Bi standard marks a new way for Motorola to conduct supply-chain business with its trading partners. At its core is a new manufacture-to-ship strategy, whereby orders are placed with the most advantageous manufacturer, and the products are shipped directly to the customer. Within Motorola, orders are generated from Oracle ERP, translated and then sent as XML standard documents to its trading partners, using a common middleware business technology. With the employed B2Bi standards, adding partners is greatly simplified for Motorola, with no systemic changes required.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The most important issues related to the process of supply chain integration include the following:

- **Supply chain integration maximises profits**: Optimising the flow of goods and information along the value chain reduces inventory costs and improves production planning.
- **Networking stimulates innovativeness**: Inter-organisational cooperation gives companies access to competitive resources and information. By being able to spread the cost and risk of R&D projects, firms eliminate the problem of efforts' duplication and maximise the likelihood of introducing major innovations.
- **Who accrues benefits?** Frequently, large companies initiate the process of supply chain integration forcing their interests and requirements on business down the value chain. In addition, controlling the major resources and information, they might exercise their power on small firms.
- **SMEs participation in standard setting**: The full potential of supply chain integration can be realised if all its members become integrated in the network. Thus, it is necessary that SMEs play an active role in the standardisation process that is essential to achieve this integration.

Industry transformation

Advanced e-business tools enabling virtual collaboration on product development or supply chain management between separate companies offer them opportunities to redesign their processes and relations with business partners. Furthermore, innovative processes create efficiencies at both firm and industry level.

According to survey results, the diffusion of advanced ICT tools had a significant impact on the organisational structure of firms and the value chain in the ICTM industry. For example, nearly half of the surveyed companies in the ICTM sector reported that ICT influences the organisational structure of their company, while one third reported similar influences on their outsourcing decisions. Furthermore, ICT enabled equipment makers to adopt demand-driven production and a standardised organisational structure, which result in significant inventory and overhead cuts. However, although the sector is an ICT forerunner, one could argue that there is still underutilised potential, for example in areas such as inter-firm collaboration and integration, where the use of ICT can further increase the efficiency of operations along the value chain.

Case study:

Linking Business Processes in Supply Networks, XYZ, Finland[42]

XYZ OYJ is an international company manufacturing power systems used, for instance, in mobile network base stations. In recent years, the company experienced rapid growth, which created an organisational challenge to maintain high product quality and flexibility without increasing operational costs.

In 2003, the firm began integrating its business processes with its suppliers and completed the projects by the end of 2004. Smooth coordination between XYZ and the suppliers' manufacturing and logistics processes since then guaranteed benefits and increased cost efficiency for both parties.

The benefits from a common system that joins the company's plants across the world are that production lines become more efficient and up-to-date without centralisation. It is easier to make production transfers between XYZ China and XYZ Finland from a material handling point of view. In addition, the digitised purchase process made it possible for XYZ China to provide suppliers with forecasts, making it easier to follow material prices in different markets.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

[42] The real name of the company has been withheld.

Who benefits from e-business?

One of the most important findings of *e-Business W@tch* studies has been that ICT is an important driver and enabler of innovation. Nearly half the enterprises in the ICTM industry said that they had launched new or improved products in the 12 months before the survey. About two-thirds of these product innovations had been directly related to or enabled by ICT. However, the internet is not the only source of competitive advantage and not all ICT applications have a positive impact on firm performance.

Case study:

Transforming Information Management at Tesla, the Czech Republic

Tesla is a Czech manufacturer of radio and communication technology products. Since 1995, the company has been developing its IT infrastructure with the aim of improving process efficiency and supporting information management. Expansion to new markets and a pressing need to obtain better control of its complex business processes led Tesla to introduce a number of information management solutions, and these now serve as a linchpin for its core operations. However, inconsistent and non-integrated systems implementation impeded realisation of the desired workflow support. Tesla was consequently forced to review its information management requirements, and this in turn led to the implementation of a unified ERP system.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

ICT, Innovation and Growth Management at Option, Belgium

Option is a Belgian developer and manufacturer of wireless technology products. Intensive development of the mobile communication market has driven the firm's rapid growth. Consequently, it has faced the challenge of maintaining an innovative and entrepreneurial spirit at the same time as expanding its product range, geographical reach and manufacturing capacities.

The company takes advantage of modern ICT applications to manage the rapid expansion, to design the appropriate organisational structure and to find the right balance between operations that should be kept internal and those that could be outsourced.

Three relevant impacts of ICT on Option's operations were identified. First, ICT strengthens Option's core competences in new product design and development. Second, it enables the firm to create an infrastructure that facilitates information exchange between organisations in the value chain, and to outsource activities - which in turn allows it to benefit from scale economies available to external contractors. Thirdly, e-commerce allows Option direct access to its consumer base and so to, build brand awareness and attain higher margins.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The following points summarise the main conclusions regarding the benefits of ICT.

- **ICT facilitates innovation and market success**: ICT enables companies to introduce new products or innovative ways of doing business. This, in turn, leads to productivity growth, and increases market share.
- **One size does not fit all**: Although large firms use ICT to innovate and increase profitability, SMEs exhibit greater R&D intensity, which also yields positive financial returns.
- **Network technologies are particularly attractive**: Advanced computer networks, which facilitate inter-firm collaboration, generate higher benefits in terms of value enhancement than applications focused on internal use.
- **Online procurement guarantees the greatest benefits**: The best performing firms are those using e-commerce for purchasing only. Electronic markets increase transparency, and reduced prices may make companies that are selling online worse off.
- **Start-ups enjoy higher returns on ICT**: As young companies are not locked into inflexible organisational structures and have a younger and better ICT skilled workforce, they are perfectly suited to exploit the full potential of ICT.
- **Service sectors exhibit higher ICT productivity gains**: ICT manufacturing companies can expect greater benefits from ICT investments in service areas than in manufacturing activities.
- **ICT-driven growth tapers over time**: As once-innovative technologies become commodities over time, technological advantage can be sustained only if a company remains innovative and open to new technologies.

2.4.4 Business impact

Impact at company level

Companies from the ICTM sector see e-business as a very relevant part of their operations. This is in line with the intensive use of ICT by firms in this sector. However, there are significant discrepancies between the two sub-sectors. A much larger share of companies from the ICTM I sub-sector perceive e-business as a significant part of their operations, compared to the ICTM II sub-sector. Furthermore, the importance of electronically facilitated operations increases with the size of the firm too

Most firms from the ICTM industry reported that ICT had a positive impact on business process efficiency, their internal work processes and productivity. Nearly 60% of companies from the ICTM sector stated that ICT positively influences their relationship with customers. In contrast, less than half the companies experienced a positive influence of ICT on procurement costs, revenue growth and quality of products. This suggests that ICT may have primarily an indirect positive impact on company performance, i.e. through process reorganisation. Direct impacts such as revenue growth or lower procurement cost were reported less frequently.

The most advanced users, i.e. firms from the ICTM I sub-sector, report the highest satisfaction from ICT use. Regardless of the area of operations, companies from this sub-sector see more benefits in ICT use than their counterparts from ICTM II. It seems that the importance of e-business is strongly related to the need for ICT and its actual use.

Impact at industry level

Network technologies have the strongest impact on the performance and shape of the value chain of the ICTM industry. Considering that network technologies generate the highest payoffs of all ICT investments, companies in the ICT sector are well **positioned to benefit from ICT**. The most obvious benefits of these technologies stem from substitution of information flow for inventory and physical activities. Moreover, network technologies give companies easier access to external knowledge and resources, thus strengthening their innovation capabilities and improving their competitive position. This is particularly true in the case of applications supporting collaborative work.

ICT and competition

There are some clear differences between companies from different sub-sectors with respect to why they use e-business, how they use it and what effect it has on them. In particular, there seems to be a clear pattern in the interaction between ICT and competition: *more competition forces companies to look for innovative ways of doing business, thereby increasing efficiency and increasing productivity*. ICT helps enterprises to achieve these aims but, at the same time, increases the pressure to stay innovative. Overall, the outcome seems to be positive, as companies operating in the industry become more efficient, productive and, therefore, able to compete on a global scale.

2.4.5 Policy implications

Survey results, case studies and desk research point to some issues which could be relevant for policy. The first four points aim at accelerating the adoption of ICT and e-business activity among companies, particularly SMEs, in the ICTM industry. The latter twp points describe interventions that affect the sector as a producer of ICT.

Emphasise the necessity of co-inventions

Increased market transparency and lower transaction costs resulting from increased use of ICT benefit companies that procure online and hurt firms that sell online. Because negative effects can be offset by the introduction of new processes, products and applications, and by adjustments in the product and marketing strategy, it is important to emphasise "co-inventions" that accompany ICT implementation[0].[43] For instance, ICT enables firms to “leapfrog” the value chain to their final customers, to reduce intermediaries, and to appropriate some part of their value added.

[43] "Co-invention" means that users of ICT make their investments more valuable through their own experimentation and innovation, e.g. the introduction of new processes and products.

Role model of the public sector

The share of business-to-government (B2G) transactions conducted with companies from the ICTM sector remains low. The use of ICT, internet and e-business applications in the public sector can spur active use of these technologies in the private sector.

Interoperability more important than ever

Despite the wide diffusion of ICT applications in the sector, there is still potential for further productivity increases through supply chain integration. This potential currently remains underutilised due to interoperability problems. Public bodies might help firms to overcome the market failure resulting from the co-ordination problem.

Competition in the IT market

Markets for advanced IT applications are usually dominated by a few companies, and this can translate into limited competition. The potential lack of competition in these markets might have serious implications not only for the IT-producing sector, but also for the IT-using sectors and e-business development in general. This issue calls for closer examination and, possibly, policy measures securing competition in IT markets.

Customised innovation policies

Incumbents and start-ups follow distinct innovation and ICT strategies. Policymakers therefore face a challenge: they need to customise innovation policy to take account of the evolution of divergent technological trajectories in the ICTM sector and of divergent ICT development patterns.

Networking for innovation

Networking organisations have access to new competences within or beyond the industry that enable them to build resources which would be difficult to acquire otherwise. The policy challenge is to encourage companies to support industry dialogue and knowledge sharing.

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2.5 The Consumer Electronics Industry

The sector study on the pulp & paper industry was contributed by Berlecon Research GmbH (www.berlecon.de).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

Consumer electronics (CE) companies are generally well equipped with basic ICT infrastructure. e-Business technologies of limited complexity are widely used. Additionally, the share of reported ICT-enabled product and process innovation is clearly higher than on average in all sectors covered by the *e-Business W@tch* 2006.

However, more sophisticated ICT systems are less widespread than might be expected for an ICT-related manufacturing industry. While many companies place and receive orders online, this exchange is mainly limited to national partners. In addition, only few CE companies use e-business technologies for internal and external process integration.

2.5.1 Sector definition and background

Definition

For the purpose of the study, the sector has been defined by business activities subsumed under NACE 32.3: "manufacture of radio, television and communication equipment and apparatus". However, the more recent NACE Rev. 2 (not ratified yet) explicitly uses the term "consumer electronics" (Group 26.40: "Manufacture of consumer electronics") and has a more consumer-oriented focus than the technology-related focus of NACE 32.3. The analysis of current trends (Section 2.5.3) follows this approach and puts the emphasis on those electronic products and their manufacturing that are intended for use by consumers.

Exhibit 2.5-1: Business activities covered by the CE industry (NACE Rev. 1.1 and 2)

NACE Rev. 1.1		Business activities
Division	Group	
32	32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods.
NACE Rev. 2		
26	40	Manufacture of video cassette recorders and duplicating equipment, televisions, television monitors and displays, audio recording and duplicating systems, stereo equipment, radio receivers, speaker systems, household-type video cameras, jukeboxes, amplifiers for musical instruments and public address systems, microphones, CD and DVD players, karaoke machines, headphones (e.g. radio, stereo, computer), video game consoles.

The CE industry's manufacturing process is divided, with two easily distinguished groups of manufacturers: **Original Equipment Manufacturers (OEMs)** and **Electronics Manufacturing Services (EMS).** OEMs typically have far more extensive public exposure, as they design and market their products under unique brands. However, the production and design processes or parts of them are often outsourced to specialised EMS.

2.5.2 ICT and e-business adoption in 2006

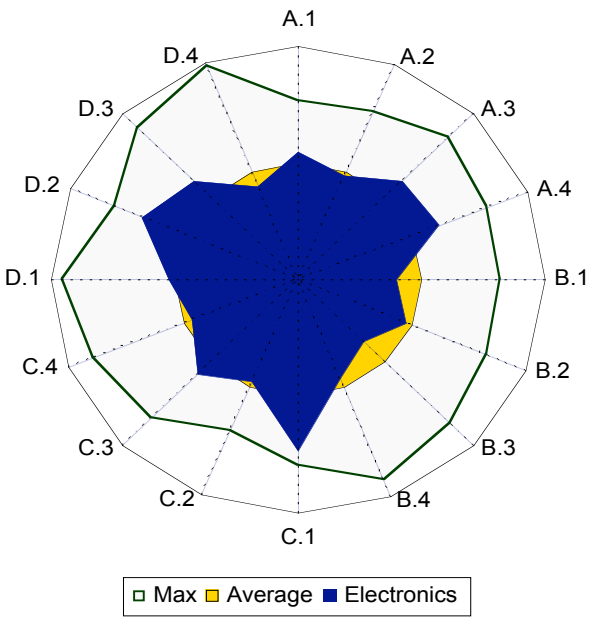
Results from the e-Business Survey 2006 reveal that CE companies are well-equipped with basic ICT infrastructure. Simple e-business technologies are widely used. However, more complex ICT systems are less widespread than might be expected for an ICT-related manufacturing industry. More specifically, the most important findings are:

- **CE companies are well equipped with ICT infrastructure**. The share of employees with access to the internet is well above the all-sectors average. CE companies are also forerunners with regard to the use of remote access, VoIP, and open source technologies.
- **Online ordering is widespread – but mainly with national partners**. The share of CE companies that reported placing or accepting orders online is above the average of all sectors surveyed. However, most e-ordering activities take place with national or regional partners. Financial processes related to international trade are mainly handled "paper-based".
- **Only a small share of CE companies uses e-business technologies to support internal and external process integration**. Software applications as a basis for internal and external process integration (e.g. ERP and SCM systems) are not as widespread as might be expected in an ICT-related manufacturing sector. Only a small share of CE companies has integrated their ICT systems with those of their customers or suppliers. Finally, only a marginal share of CE companies reported using XML- or EDI-based e-business standards.
- There is an established role for **ICT in product and process innovations**. The share of reported ICT-enabled product and process innovations is clearly higher than on average in all sectors covered by the e-Business Survey 2006.
- **SME-typical problems constitute the main barriers for e-business adoption.** SME-typical problems such as small company size, or technologies that are too expensive or complicated, are perceived as the main barriers for e-business activities.

e-Business Scoreboard 2006

The e-Business Scoreboard enables comparisons of ICT adoption and e-business activities across different sectors, countries and size-bands. In this respect, the graph illustrates that the CE industry **ranks in the mid-field** compared to other sectors covered by *e-Business W@tch* in 2006. On the one hand, CE companies are well equipped with basic ICT infrastructure. Simple e-business technologies are widely used. On the other hand, more complex ICT systems are less widespread in this sector.

e-Business Scoreboard 2006



Component indicators

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.5.3 Current e-business trends

The report analyses **three key issues** that reflect the relevance of ICT and e-business in the CE industry: **Convergence of markets, products and services** due to an increased availability of broadband and digitised content; **Digital Rights Management** (DRM) for secure digital content distribution and **ICT supporting a globalised and fragmented supply chain.**

Convergence in the CE industry

The term "convergence" is used in the full sector report (and in the other two ICT-related sector reports[44]) to describe technical and market developments that result in the blurring of lines between adjacent industries and their offerings, including CE and ICT manufacturing, telecommunications services, and the digital content industry. A main driver of convergence that is particularly relevant for CE companies is the increasing availability and importance of broadband internet connections for new products and services.

Due to increased availability of broadband at decreasing prices, there is increasing demand for CE devices supporting the online distribution of content. There are **many opportunities, but also challenges, for CE manufacturers trying to leverage this development.** CE manufacturers have the opportunity to establish themselves as an

[44] Sector studies on ICT manufacturing and telecommunications. All sector studies are available at www.ebusiness-watch.org ('resources' - 'by sector').

important part of digital content distribution. They can also tap additional revenue streams by supplying related offerings, such as financial and news services.

For SMEs too, there are **opportunities to establish themselves in this segment**. Entering this segment in an early stage of market development helps to establish a visible brand and to partner with major industry players.

Among the **main challenges** for CE companies active in this segment are the **support of different file formats** and **their new role as content distributors.** Partnerships and integration with content providers and external technology providers emerge as critical success factors.

Case Study:

KiSS Networked Entertainment, Denmark

KiSS Networked Entertainment (KiSS), which in 2006 became a business unit within Linksys, a division of Cisco Systems, Inc., built an innovative brand of digital video recorders and thus utilised the increased impact of broadband in the CE market.

Main challenges, which are related to the company's role as a manufacturer of networked entertainment devices and services, are the support of distinct technical file formats, and the new role as content distributor. Close cooperation with content and technology providers emerges as an important factor for the company's success.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Digital Rights Management

Digital Rights Management (DRM) comprises various technical protection measures that are supposed to **secure digital content from copyright-infringing use**. DRM technology is **deployed on almost all CE devices** to enforce usage rights for digital content such as music, video, games or documents.

CE manufacturers face a **conflict of interest** with regard to DRM: On the one hand, consumers perceive DRM as a limitation of usability; but on the other hand, most content providers don't make any digital content available for online distribution without DRM protection.

Challenges related to the implementation of DRM technology on devices include legal issues, technical risks, dependency on DRM technology suppliers and additional licensing - and thus production - costs. These challenges are further complicated by the fact that there are **multiple DRM technologies** on the market **which lack interoperability with each other**. The electronics and content industries are working on standards to make DRM implementation more cost-effective and usable.

Case study:

Sony Ericsson, United Kingdom/Sweden

As a producer of high-end multimedia mobile phones, Sony Ericsson needs to deal with Digital Rights Management (DRM) technology. Thus, the company decided to become a member of the Open Mobile Alliance (OMA) and to implement OMA's DRM framework in its devices, which are increasingly used to buy and consume digital content. The case study describes the motivation of Sony Ericsson to participate in this standard organisation and gives insights into the work of OMA.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

ICT supporting a global supply chain

CE companies face many challenges related to supply chain activities, such as the need to **manage highly fragmented global supply chains, very short product lifecycles and significant dependence on major distributors and retailers.**

Although ICT usage for supply chain management is a key issue, **sophisticated systems are not widespread in this sector**. However, this finding should not be interpreted as scepticism towards e-business only, but also as lack of information about appropriate e-business tools available (particularly among SMEs). Additionally, sophisticated e-business solutions do not appear to be the single best answer to key challenges for the CE industry, such as compressed product lifecycles.

Case study:

Converge, Netherlands/United States

Converge is a procurement service provider with operations in North America, Europe and Asia. Its inventory management tools enable consumer electronics companies to allocate scarce or excess materials. Converge helps manufacturers and distributors reduce financial and operational risks and significantly increase recovery rates. The case study illustrates the usefulness of trading platforms as e-business tools helping CE manufacturers to overcome specific challenges related to supply chain management in this sector. It also shows the challenges that platform operators in this field are facing. It emerges that the provision of online sourcing tools is often not sufficient. Rather, participants also demand human support.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

e-Business standards (e.g. EDIFACT) or industry-accepted interoperability frameworks (e.g. RosettaNet) provide a solution for many challenges faced by CE companies. It seems, however, that so far it is primarily **large players that profit from and thus drive these solutions**.

ICT tools supporting marketing and sales activities on a global basis are increasingly important in this sector: **Online direct sales to consumers** may not immediately lead to significantly increased revenue; however, CE companies' web shops are also a source for data about customer needs and shopping behaviour.

Case study:

Fujitsu Microelectronics Europe and Seeburger, Germany

Fujitsu Microelectronics Europe (FME) – a supplier of electronics components for further use in the consumer electronics, automotive and telecommunications industries – implemented a RosettaNet-based solution in 2005. The software and service provider Seeburger is a specialist that advises and supports companies in the CE sector to optimise their supply chain by implementing and integrating such solutions.

Based on interviews with managers of FME and Seeburger, this case study outlines the relevance, as well as the opportunities and challenges, arising from the implementation of RosettaNet in CE companies.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.5.4 Business impact

Impact at company level

Almost three quarters of CE companies interviewed by *e-Business W@tch* in 2006 stated that e-business accounted for a **"significant" or "some" part of their operation**. Firms experience the impact of ICT in almost all business functions. The positive influence of ICT is most significant with regard to **productivity growth, business process efficiency and customer service quality**.

ICT and e-business also significantly impact CE companies' management of **internal processes and supply chain activities**. Technologies that support digital distribution of content – such as DRM systems – are also integral parts of products and services supplied by CE manufacturers.

Impact at industry level

ICT has a strong impact on rivalry in the market and is accordingly a **main force for competition** in this sector. ICT and e-business technologies, in fact, provide the basis for the establishment of global delivery models in the CE market, as they facilitate global sourcing from and market entry of companies all over the world.

In addition, product substitution – e.g. substitution of conventional analogue with digital devices – is increasing competition among CE companies. Competition is even more intensified by the **entrance of companies from neighbouring industries** (e.g. ICT manufacturing) on the CE market, that try to leverage their original expertise.

2.5.5 Policy implications

Based on findings of the report, policy initiatives could be considered in two areas. One is the **targeted promotion of existing e-business support initiatives** to SMEs. The other is raising awareness about the **statistical implications of convergence in high-tech industries**, including CE manufacturing.

Targeted promotion of e-business support initiatives and their outputs to SMEs

The report provides statistical and anecdotal evidence that **SMEs still lack information on reliable and affordable e-business tools** available for their requirements, although such information is already available to a large extent from multiple sources. It is provided, for example, by numerous SME initiatives at national and regional levels. However, it seems that many SMEs are not aware of these initiatives.

Therefore, it might be valuable to focus efforts aiming to accelerate e-business adoption by SMEs on a **targeted promotion** of support initiatives and their outputs towards ICT managers in small companies. In this sense, "targeted" means that the limited time resources of people supporting ICT in SMEs are taken into account. This is a cross-sectoral issue of relevance for European, national and regional e-business and SME support initiatives.

Raising awareness on statistical effects related to convergence in high tech industries

Current and emerging industry trends are insufficiently reflected in recent industry classifications such as NACE 2.0 (which has just been finalised and will be applied as of 2007). Reliable statistics on market dynamics in these segments, however, are needed as a basis for identifying relevant policy implications. Therefore, consultations and related activities (e.g. industry workshops) could be initiated to raise awareness and broadly discuss this issue. Competent platforms already exist, but they primarily concern representatives of statistical services and organisations. Policymakers and industry through respective associations should be involved more actively in such events.

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2.6 The Shipbuilding and Repair Industry

The sector study on the shipbuilding and repair industry was contributed by DIW Berlin (www.diw.de).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

For most of the companies in the shipbuilding and repair industry (SRI), the main reason to use ICT and to start e-business was to gain competitive advantage. Survey results and case studies show that companies use ICT to cut costs and to increase productivity. However, the e-business activities of the smaller companies in the sector are different from those of large companies. Large SRI companies are more advanced users of e-business, and they benefit from it more than the sector's small companies.

In general, ICT and e-business activities are adopted by SRI companies and their deployment has become increasingly important for the industry.

2.6.1 Sector definition and background

Definition

The shipbuilding and repair industry as defined by *e-Business W@tch* for the purpose of this study covers the following business activities: building and repairing of ships (NACE Rev. 1.1, DM 35.11), with an emphasis on shipbuilding. Although the SRI is composed of several different subsectors, with a distinction between the construction of merchant and naval ships, the repairing and conversion of ships, and the different suppliers of marine equipment and engineering services, a sophisticated analysis of all these subsectors is beyond the scope of *e-Business W@tch.*

Exhibit 1: Business activities covered by the shipbuilding & repair industry

NACE Rev. 1.1		Business activities
Group(s)	Class(es)	
DM 35		Manufacture of other transport equipment
	35.11	Building and repairing of ships

As a result of structural changes and outsourcing, the modern production processes of the SRI are complex and embedded in a network of yards, subcontractors, suppliers of marine equipment, suppliers of engineering services, and classification societies. Nearly 70% of a ship's value is generated by equipment and suppliers. Today, shipyards are the coordinating body of the shipbuilding value chain.

In 2004 there were 202 shipyards in the European Union with about 127,500 employees. Germany, Italy and Poland are the most important European shipbuilding countries measured in terms of compensated gross tonnage (cgt) in 2004.

The European SRI will face three main challenges within the next few years: the fast growing Asian shipbuilding industry, the worldwide demand for ships, and the rising prices of resources. Further investments in new technologies, increased co-operation among the companies, and more effective use of e-business might be the right strategies responding to these challenges.

2.6.2 ICT and e-business adoption in 2006

For the e-Business Survey 2006, 150 companies in the SRI were interviewed. Out of this sample 143 observations were useable and for the E-10 countries[45] the sample comprised 98 enterprises. Due to this small sample size the survey results should be cautiously interpreted.

The e-Business Survey 2006 reveals that ICT and e-business activities are generally adopted by companies in the SRI and that their deployment has become increasingly important for the industry. Key findings regarding ICT and e-business activities in the SRI are summarised below:

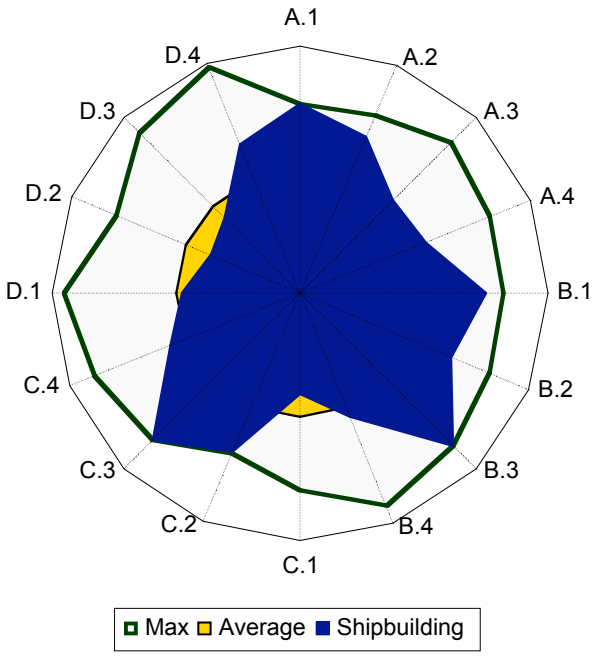
- **Internet connectivity** covers all enterprises and the majority of companies have broadband access.
- A relatively high proportion of companies said that they employ **ICT practitioners** and use open source software.
- The share of companies that reported using secure server technologies or a firewall is above the all-sectors average of the ten sectors studied this year. **Security** is an important issue in the SRI.
- About half the companies reported that e-business is a significant aspect of their operations. About one third said that **interoperability** is critical for e-business within the sector and for producing products and services.
- The use of Enterprise Resource Planning, Document Management System, Supply Chain Management or Customer Relationship Management applications is still **not widespread** within the SRI, broadly in line other industries.
- The share of companies in the SRI which said that they have launched **new products or new processes** in 2005 is lower than the average across all sectors studied this year.
- According to the surveyed companies in the SRI, their main **driving forces** for the uptake of e-business are "*gaining competitive advantage*" and "*customers' expectations*".

[45] The EU-10 cover the Czech Republic, Germany, Spain, France, Italy, Hungary, the Netherlands, Poland, Finland and the UK.

e-Business Scoreboard 2006

The e-Business Scoreboard shows that the SRI is above the all-sectors average for most of the indicators. In line with expectations for the SRI and due to this sector's characteristics, the indicators for e-marketing and sales are mostly below the average. These survey results indicate that in the SRI the focus of e-business is still on cutting costs and not on customer service.

e-Business Scoreboard 2006



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C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.6.3 Current e-business trends

The key role of ICT in contributing to productivity is generally recognised. Cost reductions from improved communication and data exchange, lower transaction costs, and access to new markets are the main reasons companies implement e-business applications. Nevertheless, not every company is able to implement appropriate ICT tools and to meet the requirements of the extended enterprise concept. A lack of awareness of e-business benefits as well as the high costs of ICT tools and implementation projects constitute barriers for small and medium-sized enterprises to adopt e-business practices.

Progress in e-business usage, clusters and strategic implications

According to the survey results, ICT and e-business activities are becoming increasingly important in the SRI. Particularly for large shipyards, adopting and deploying ICT is a major strategic topic. The survey results also show that two-thirds of the companies in the SRI reported that they have made investments in ICT in 2005, and companies comprising

one third of the sector's employees said that they will increase their ICT budget in 2006/07.

However, aside from Computer-aided Design (CAD), e-mail and the internet, there are currently few advanced ICT applications (ERP, SCM, CRM, PLM) used in the SRI. Both the case studies and the survey results indicate that there is a technology divide between large, medium and small enterprises in this sector. Moreover, e-business does not yet constitute a strategic advantage for small and medium-sized shipyards or for suppliers. Consequently, e-business is still at an early stage in the SRI in general.

- **Slow adoption**: Although the use of CAD, EDI, internet and e-mail are common in the SRI, the adoption of new ICT and e-business tools is slow. For small and medium-sized shipyards and suppliers the potential of e-business currently does not seem to play a strategic role.
- **Large companies moving ahead**: There is a technology gap between large shipyards and SMEs. Large shipyards are the forerunner in implementing advanced e-management tools in order to increase their productivity.
- **Complex production structure**: Many different firms are involved in the shipbuilding process. Moreover, the production processes are less standardised and unified when compared to other industries. This is so because vessels, as contract goods, are usually customised. Likewise, the product life cycles are long. Therefore, the cost-benefit structure of advanced e-business solutions seems to benefit large shipyards more than SMEs.

Case study:

Finomar, Poland

Finomar *is a medium-sized shipyard operating in a labour-intensive manufacturing sector that is highly dependent on steel prices. Its competitive position is derived from cost-efficient basic steel repairs and geographic proximity to large ship operators.*

Internet technologies already implemented and used proved to be helpful and brought measurable benefits in seeking new clients or advertising. World-wide communication enabled the company via internet platforms to exchange workers and to reach new clients as well as to find better prices for components without additional costs.

Stock management, design office, finance and human resource departments stand to profit most from more ICT. However, the cost of ICT presents a major obstacle to the adoption of advanced ICT tools. Currently, ICT and e-business activities do not play a strategic role for the company development.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

ENVC Shipyard, Portugal

Estaleiros Navals de Viana do Castelo (ENVC) is a Portuguese shipbuilder located in the town of Viana do Castelo. ENVC specialises in design, construction, repair and conversion of merchant vessels up to 30,000 DWT and non-combat military vessels of small and average tonnage. With the goal of continuously improving the company's management system, ENVC implemented the Enterprise Resource Planning (ERP) software SAP/R3 in 2002. The shipyard encountered some problems during the system's installation and use, but ultimately positive impacts prevailed.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Uljanik Shipyard, Croatia

Uljanik Shipyard (Uljanik) is located in the port-town of Pula, Croatia and is considered the best-managed shipyard in the country. In order to maintain its reputation for high quality and to enhance its competitiveness in the global marine market, Uljanik launched in 1999 a far-reaching project of technological renewal of the company's existing IT systems: computer-aided design and enterprise resource planning.

A product data management system to upgrade the product lifecycle management was implemented in the first stage. In a subsequent step, the CAD, ERP and PDM systems were integrated. Specific outcomes of the systems integration project included the creation of an electronic link within and between the shipyard's systems as well as the assurance of a high degree of data integrity, data transparency and accessibility.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Fincantieri, Italy

Fincantieri Cantieri Navali Italiani S.p.A. is a large state-owned shipyard-group in Italy that builds naval and commercial vessels, especially cruise ships and large ferries. The company runs eight shipyards in different locations across Italy. To be able to interchange ships and data during the construction process between the different yards, Fincantieri introduced in 2001 several modules of an Enterprise Resource Planning system and a Product Lifecycle Management system based upon a SAP application.

The ERP and PLM systems made possible the integration of information along the management and production processes as well as along the value chain: from basic design, detailed design and production planning to production activities. Information and data can now be easily transferred between yards and suppliers via the internet. The goal of this innovative project was to significantly reduce the production time and costs.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The use of B2B trading platforms

e-Procurement portals, particularly developed for the SRI, have already been launched. However, the portals are not yet 'true' e-marketplaces that would support several functions for e-business. Their functionality is usually limited to a search for qualified suppliers and requests for quotations: e-trade is limited to e-procurement. Significant changes in the value chain of the SRI from e-marketplaces are yet not observable. The SRI is still in a learning phase to adapt to e-procurement.

Nevertheless, the survey results indicate that e-invoicing, online co-operation and collaboration are already being adopted within the value chain, and placing orders online is also common. The use of specific ICT-solutions is less widespread.

The case study on *Meyer Shipyard* reveals that both in-house purchasers as well as supplier companies have to be convinced to use the e-marketplace e-Euroship. In general, supplier companies remain sceptical towards electronic practices. Most of them prefer to conduct business in a paper-based way or via e-mail. Moreover, supplier companies fear losing their bargaining power as large European shipyards tend to bundle their orders so as to increase their customers' bargaining power.

Case study:

Meyer Shipyard, Germany

Meyer Werft GmbH was founded in 1795 and today belongs to one of the major players in the shipbuilding industry. Nevertheless, the shipyard faces increasing competition from Asia, especially China. In order to reinforce the yard's situation on the international market, the Meyer Werft tries to constantly improve efficiency, productivity, quality and innovativeness. Since 2004 Meyer Werft participates in the e-EUROSHIP portal, a procurement system jointly developed by five shipbuilding companies belonging to EUROYARDS E.E.I.G.

The case study focuses on the e-EUROSHIP e-procurement portal from Meyer Werft's point of view. The company is not only a member but initiated and helped to establish the portal in 2002. The case study examines the problems faced during establishment, discusses recurring problems and reviews the benefits and impacts from participating in an e-procurement system.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The study findings on the use of B2B trading platforms in the SRI can be summarised as follows:

- **Slow development**: The SRI is still learning to adapt to e-procurement. The functionality of current e-procurement portals is limited to a search for qualified suppliers and requests for quotations.
- **Large companies are the forerunners**: Again, large shipyards are the leading actors in e-procurement. Furthermore, they use e-procurement strategically, in order to enhance their bargaining position towards supplier companies.
- **Suppliers:** The supplier companies remain sceptical towards e-commerce. Most of them prefer to conduct business on paper or via e-mail.
- **Impacts**: e-Procurement via the existing e-portals still has a smaller impact on the production processes and on transaction costs in the SRI than expected.

e-Business and SMEs

Due to structural changes in the SRI, small and medium-sized supplier companies for maritime equipment or engineering services generate today more than 70% of a ship's value. The impact of e-business technologies on the sector's SMEs is therefore a relevant issue. On average, SMEs are slower in adopting ICT and e-business, because they are not able to realise economies of scale and lack expertise as well as a qualified labour force.

Furthermore, in the SRI, suppliers, customers and shipyards do not use compatible ICT systems, and this results in a high rate of use of proprietary and other standards. Consequently, small and medium-sized suppliers in particular face difficulties in deciding what kind of system to implement. However, current internet solutions allow such interoperability problems to be solved.

Case study:

LTH-Baas AS, Estonia

Based in Tallinn, LTH-Baas AS is a small shipyard specialised in ship repair, shipbuilding and conversion. The firm is characterised by an ICT strategy and pattern of utilisation typical for the shipbuilding and repair sector. After implementing a number of applications to support the firm's internal work organisation, such as the accounting system or project and inventory management tools, the company finds it difficult to overcome barriers to the adoption of more advanced applications that would facilitate increased inter-organisational collaboration.

In order to remain competitive, LTH-Baas focuses on improving its manufacturing processes and quality, as well as on increasing the qualifications of its workforce.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.6.4 Business impact

Impact at company level

In the e-Business Survey 2006, about two-thirds of the sector's companies reported that e-business constitutes "*a part of the way they operate*". In the SRI, adoption of ICT leads to structural changes in internal work processes and increased business process efficiency. The survey results also indicate a positive impact on the organisational structure of the sector's companies. However, the perceived overall influence of ICT on productivity and revenue growth appears to be lower than in other industries studied by *e-Business W@tch* in 2006.

The picture is quite different for small companies in the SRI, where security issues, interoperability problems and implementation costs were identified as the major barriers for e-business initiatives. For example, small enterprises often have to make substantial up-front investments in employee training to develop the skills necessary to benefit from e-business. As a result, evidence presented in the sector report indicates that small companies in the SRI benefit less than their larger counterparts from ICT and e-business.

According to the e-Business Survey 2006, more than half of the companies in the SRI expect that the role of ICT and its impact on the way they work will be important for all business activities in the future, except for marketing and customer support services. This can be explained by the production process in the SRI and the characteristics of vessels. These expectations confirm that companies in the SRI use ICT and e-business tools to streamline their business and production processes in order to gain competitiveness over their Asian challengers, who have cost advantages due to low labour costs.

An important point from the analysis presented in the sector study is the relatively low 'innovation activity' in the SRI, notably in comparison with the other manufacturing sectors studied this year and in terms of ICT-enabled process innovation. Furthermore, companies comprising 49% of the sector's workforce said that ICT is expected to have low or no impact on research and development in the future. On the one hand, although these survey results should be treated cautiously, it seems that companies in the SRI undervalue the importance of innovations and the role of ICT in innovation processes. On the other hand, the importance of innovations and the relative role of ICT differs considerably between subsectors such as construction of merchant and naval ships or repairing and conversion of vessels. Therefore, a differentiated analysis in terms of size-bands and sub-sectors would allow a more accurate interpretation of statistical findings.

Impact at industry level

Competition in the SRI is intense due to globalisation, new market entry by Asian countries, and fluctuations in demand. There is a fierce price competition for cargo carrier vessels, and competition on quality for specialised vessels. Under these circumstances, ICT and e-business take on strategic importance, because they can lead to more streamlined production processes, integrate suppliers and allow firms to become more flexible in the production life cycle. However, the e-Business Survey 2006 shows that only a third of the companies in the SRI viewed ICT as having an impact on competition in the industry. This figure is below the weighted all-sectors average.

2.6.5 Policy implications

Survey results, case studies and desk research point to some issues relevant for policy. The first two points concern the acceleration of ICT adoption among companies in the SRI, particularly among SMEs. Two further points concern policy interventions to counteract undesirable effects from the use of ICT in business.

Networking

The complex production processes in the SRI require inter-firm interaction and collaboration among several actors along the value chain in order to increase productivity and to develop innovations. Applications linking inter-firm processes such as collaborative product design and inventory management tools have considerable impact on company performance. Furthermore, applications supporting collaborative work facilitate the flow of information between companies and increase the transparency of inter-organisational cooperation.

Compared to other manufacturing industries studied this year, online co-operation and collaboration within the value system of the SRI is lower. Moreover, the stated supply chain integration using SCM systems in the SRI is lower than in other manufacturing industries. According to the survey, the reported level of both product and process innovations in the SRI was lower than the respective all-sectors averages.

In general, networking in the SRI could be encouraged by inter- and intra-industry dialogues organised by industry federations or via technology platforms such as Waterborne[46] or Wondermar[47] . Companies could learn how they can benefit from co-operation and collaboration. In light of this, the policy challenge is to encourage companies to support inter- and intra-industry dialogues and to implement e-business solutions that facilitate the exchange of both inputs and knowledge.

Interoperability

Interoperability is a key issue for inter-firm co-operation and connectivity. About a third of the companies in the SRI covered by the 2006 e-Business Survey said that interoperability was critical for e-business within the sector and for producing products and services. An important survey result in this context is that more small companies in the SRI said that they see interoperability critical than medium-sized and large companies.

Although the process of standardisation is in the hands of the SRI and ICT industry, policymakers should encourage companies to develop and adopt standardised tools. By supporting the development of uniform standards they can help to avoid market failure resulting from co-ordination problems.

Furthermore, the interests of SMEs in general and from the SRI, in particular, have to be taken into account in the standardisation process. Policymakers could support their needs by increasing the awareness of interoperability problems in the sector.

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[46] See CESA 2006, p. 10

[47] www.wondermar.net

Security and knowledge protection

The e-Business Survey 2006 reveals that security issues are important in the SRI. Although companies in the SRI deploy secure server technologies, digital signature and firewalls to a larger extent than companies in other industries, security and legal complications were reported as barriers to the use of ICT and e-business applications. In the SRI, an industry that produces one-of-a-kind products, all actors face the permanent risk of violation of their intellectual property rights. Online co-operation and collaboration, especially in the design phase of a new vessel, may lead to an increase in knowledge piracy. Consequently, companies are concerned about knowledge protection.

Policymakers might counteract these negative effects in two ways. First, they should increase the awareness and understanding of the risks related to e-business in general and intellectual protection in particular. Second, they might develop legislation and appropriate execution mechanisms to reduce the fear of knowledge piracy. In order to properly address these issues, however, an in-depth analysis would be needed to identify the extent to which knowledge protection is indeed a barrier to e-business in the SRI.

Balance of power

The balance of power between customers (e.g. large shipyards) and small and medium-sized suppliers in e-procurement and supply chain management is an issue in the SRI. On the one hand, online procurement is associated with productivity gains due to price transparency; on the other, price transparency leads to negative effects for companies that sell their products online. Many suppliers fear that their margins will be squeezed more tightly than in the past if large shipyards aggregate their orders, run auctions, or benefit from a degree of information transparency that could reveal suppliers' cost-structures during price negotiations. This scepticism towards e-commerce from the suppliers' side is reinforced by their fears of new commercial risks resulting from incomplete information about market rules, business partners and possible unfair practices.

To respond to these challenges, policymakers could encourage business associations, such as the Community of European Shipyards' Associations (CESA), to better inform their members, especially SMEs, about the risks and unfair commercial practices related to B2B internet trading platforms[48]. Industry associations might also encourage the process of trust-building for participants of e-markets and electronic transactions. Last, but certainly not least, competent authorities should monitor competition in electronic markets and intervene if necessary.

[48] See DLA Piper Rudnick Gray Cary (2006): Legal Study on unfair commercial practices within B2B e-markets, Final report, European Commission Study ENTR/04/69, May 2006

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2.7 The Construction Industry

The sector study on the construction industry was contributed by Ramboll Management (www.r-m.com).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

In the construction industry (CI), the uptake of ICT and e-business is limited compared to the other nine sectors studied by *e-Business W@tch* in 2006. Uptake is most visible in the development of collaborative design systems, development of strategic procurement systems and in document handling and sharing.

Survey results and case studies show that larger construction enterprises are applying ICT and e-business to a wider range of work-flow processes and business activities than small and medium-sized enterprises. Small enterprises are particularly lagging behind larger construction enterprises in terms of ICT skills development and advanced ICT applications, such as e-procurement, project webs and 3D technology.

2.7.1 Sector definition and background

Definition

The construction industry, as defined by *e-Business W@tch* for the purpose of this study, covers business activities specified in NACE Rev. 1.1 groups F 45.2 and 45.3. The building of complete constructions (or parts thereof) and civil engineering (NACE 45.2) is dominated by larger construction and engineering enterprises, whereas the building installation industry (NACE 45.3) consists predominantly of small and medium-sized enterprises.

Business activities covered by this study (NACE Rev. 1.1)

NACE Rev. 1.1		Business activities
Group(s)	Class(es)	
F 45.2		Building of complete constructions or parts thereof; civil engineering
	45.21	General construction of buildings and civil engineering works
	45.23	Construction of motorways, roads, airfields and sport facilities
	45.24	Construction of water projects
F 45.3		Building installation
	45.31	Installation of electrical wiring and fittings
	45.32	Insulation work activities
	45.33	Plumbing

There are approximately 2.4 million construction enterprises in the EU-25, of which 97% are micro or small enterprises with fewer than 20 employees. The industry employs about 14 million people, corresponding to about 7% of the European work force and 28.5% of industrial employment. According to recent figures from the European Construction

Industry Federation (FIEC), the CI is the largest industrial cluster in the EU, representing some 9.9% of Gross Domestic Product (GDP), corresponding to one-quarter of total European industrial output. The main activities in the European CI are house-building (26%), non-residential building (29%), civil engineering (20%) and rehabilitation (25%). [49]

The industry faces a trend towards consolidation among industry stakeholders, increased use of sub-contractors, increased focus on environmental issues, and the impact of globalisation on the manufacturing of construction materials.

2.7.2 ICT and e-business adoption in 2006

The e-Business Survey 2006 illustrates that in the CI, ICT and e-business are used less than in most of the other sectors studied. Two main reasons for this comparatively low ICT uptake can be highlighted:

- the high concentration of SMEs in the CI
- the typical nature of the service provided in the CI which, being an on-site and often highly customised service, does not lend itself to the typical e-business concept, which is more adapted to manufacturing industries.

The main findings of the survey can be summarised as follows:

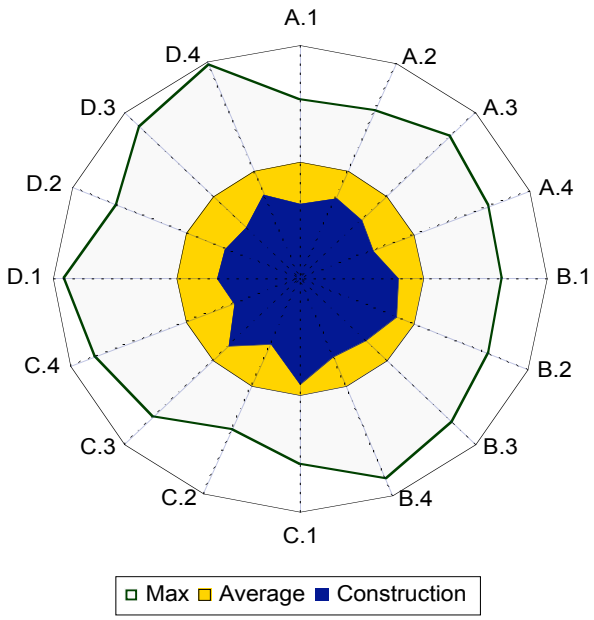
- **Large construction enterprises** are currently **increasing focus on ICT issues**, as they have started introducing more advanced ICT solutions such as e-procurement systems, collaborative design systems (3D technology) or collaborative document sharing (project webs). This trend is in line with the case studies presented in the report.
- Construction enterprises have **limited focus on hiring ICT practitioners** and on ICT training. This trend is most clearly observable among this sector's SMEs.
- The **use of e-standards (EDI, XML and proprietary standards) is limited** but is about in line with the weighted all-sector average. This could indicate that issues of interoperability are widespread across different sectors.
- The CI **lags behind on both product and process innovation** when compared to the respective cross-industry totals. However, the reported shares of ICT-enabled product and process innovation in the CI are more or less the same as the respective cross-industry totals for the ten sectors covered this year by *e-Business W@tch*.
- **Complete construction enterprises in general have a higher level of ICT uptake** than building installation enterprises. In addition complete construction enterprises employ ICT practitioners more often, use ICT more to support innovation, and spend more on ICT than companies from the building installation industry. This is probably because complete construction enterprises are generally larger than building installation enterprises.

[49] Source: European Construction Industry Federation, Key Figures. Construction in Europe, April 2006

e-Business Scoreboard 2006

The e-Business Scoreboard makes possible comparisons of ICT adoption and e-business activity across different sectors, countries or size-bands. The **e-Business Scoreboard 2006** shows that the CI lags behind the all-sector average on all the component indicators used to generate the scoreboard. The condensed presentation of survey results in the e-Business Scoreboard should, however, be carefully interpreted. Since the survey instrument used on the CI was adapted from the e-business concept for manufacturing enterprises, it is obvious that the CI would not be among the intensive users in application areas such as supply chain management or online marketing and sales. However, there are other areas – not included in the Scoreboard – such as collaborative systems, where the CI is, to some extent, ahead of many other sectors studied this year by *e-Business W@tch*.

e-Business Scoreboard 2006



Component indicators
(based in data in % of firms)

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online (>5%)
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms receiving orders online (>5%)
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch (*Survey 2006)

2.7.3 Current e-business trends

In the CI, increased uptake of ICT and e-business is mainly observed within **electronic procurement systems** for, e.g., building materials and construction equipment. In addition, a trend towards implementation of **three-dimensional technology** for building design and construction is increasingly evident, especially among larger construction enterprises. A growing number of enterprises also implement **ICT-based document handling and sharing systems** (project webs) to increase process efficiency.

e-Procurement

Many large construction enterprises are working towards strategic procurement and consolidation of their supplier base, using e-procurement in order to optimise prices and to secure compliance with quality standards, terms of delivery etc. In this process, change management is crucial to successful implementation of e-procurement systems. The change management process should be driven by strong and dedicated senior management, with a focus on ICT skills development through employee training. The case study of *Skanska* illustrates this point.

Case study:

Skanska, Sweden

Skanska AB is one of the world's largest construction enterprises. With headquarters in Sweden, the Skanska group employs 54,000 people worldwide and provides construction-related services and project development. Skanska began to implement e-procurement solutions in its Nordic branches in 2004. The main objectives were to reduce procurement costs and improve efficiency of the procurement process while developing closer cooperation with suppliers. This project was divided into five phases: e-procurement, collaborative commerce, e-tendering, logistics, and e-invoicing.

The two main focus points for the development of the e-procurement project so far have been support from top management, and internal change management, including the training of staff and suppliers. The implementation of e-procurement has already cut costs: for example, new procurement contracts signed by the Swedish branch of Skanska generated about 5 million euros in savings in 2005.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The adoption of e-procurement in large construction enterprises indicates that the business case for e-procurement implementation is now established. It is, however, still difficult for construction SMEs to identify a solid business case for e-procurement, due to their lack of ICT skills and the volume and investment requirements associated with custom-made e-procurement solutions. In consequence, short-term developments in the SME segment are more likely to be driven by suppliers' networks, involving building material providers and/or producers and the like. For e-procurement to be of interest to European construction SMEs, it could be argued that e-procurement solutions need to be more affordable, easier to use, and web-based. The statistical findings of the *e-Business W@tch* Survey support these arguments, showing that SMEs are spending less on ICT and more often have difficulties drawing funds for ICT investments compared to large construction enterprises. In addition, SMEs more seldom employ ICT practitioners and spend fewer resources on ICT training compared to large enterprises. The Greek case study of *E-Construction* supports this finding by illustrating the barrier to the uptake of e-procurement solutions of conservative work-flow processes and limited ICT skills among construction enterprises.

Case study:

E-Construction, Greece

E-Construction was founded in May 2002 by the three largest Greek construction enterprises in order to provide electronic B2B solutions. In February 2003, E-Construction launched the first Greek construction e-marketplace, www.b2bconstruct.gr, which offers three main e-procurement options: a commercial catalogue of products offered on the site, an e-sourcing solution, and online auctions.

The construction enterprises using www.b2bconstruct.gr have experienced better communication between stakeholders through a more secure e-procurement system, changes in their human resource policy as more IT skilled employees have been hired to carry out procurement, and reduced procurement costs. However, the traditional workflow processes make the introduction of new electronic solutions time-consuming and costly.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The advantages of framework contracts and single sourcing in normal e-procurement situations may not be applicable to well-defined construction purchases conducted by large construction enterprises. Such cases may be better suited for an e-tendering process yielding better economies of scale. Besides economies of scale, the public sector is a driver for the use of e-tendering. The public e-procurement solutions are, however, currently focused on the initial steps of the procurement process, i.e. notification of public tenders online and e-tendering, with the aim of increasing transparency in the public procurement process. The case study of *E-Vergabe* supports these findings.

Case study:

E-Vergabe, Germany

E-Vergabe is a procurement/e-tendering platform for the federal public administration in Germany (Vergabeplattform des Bundes). The main features of the platform include the publication of public tender notices and tender documents, receipt of tender documents and communication between buyer and supplier. The e-Vergabe system is in place at 33 German federal tender offices and numbers about 600 users (suppliers), including about 60 firms related to the CI.

The impact of using e-Vergabe has two main aspects: on the buyer side (public authorities), it promotes cost savings and modernisation of the administration system; on the seller side (construction enterprises), it promotes greater transparency, leading to equal opportunities for tendering. Cost savings of about 10% and better communication within the Government and with businesses were also expected.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

3D Technology as a way to reduce costs and minimise errors

The benefits of 3D technology are often listed as cost reduction, risk minimisation, more efficient communication between stakeholders, and earlier error detection. These benefits are exemplified in the case study of the Lithuanian construction enterprise *Constructus*.

Case study:

Constructus, Lithuania

Constructus UAB is a large construction enterprise in Lithuania. It operates exclusively in the Lithuanian market and provides various construction-related services. In 2004, Constructus implemented a new e-business tool in its productivity processes called SAS Programinis Paketas, based on 3D technology. This Lithuanian-made software allows construction project developers to integrate and coordinate the main preliminary stages of construction – design, price calculation, and technological planning.

Constructus predicts that use of 3D technology can save up to 40% of the time used to plan construction works and to estimate the final expenditure of the project. 3D technology can also be used in connection with maintenance of finished construction projects. Constructus sees this as a major selling proposition towards future clients. Using 3D technology, Constructus would furthermore be able to maintain and renovate buildings at lower cost than traditional building maintenance.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

A geographical difference in the promotion and uptake of 3D technology has been identified, with the Nordic region acting as frontrunners. Furthermore, the survey of 2006 confirmed that the uptake of 3D technology is not so much hampered by barriers in the software itself as by barriers arising from traditional workflow processes, which are not adapted to ICT, and from the low level of ICT skills and capabilities, especially among SMEs.

Another barrier to the uptake of 3D technology is the lack of a clear business case for the change from 2D technology, especially among engineering and construction enterprises. 2D technology is currently being used by many enterprises in the CI which feel that their needs are sufficiently covered by this technology. For some stakeholders, the extra benefits arising from 3D technology (e.g. virtual construction, simulation of changes and the like) are not perceived as valuable or necessary.

The benefits from using 3D technology are distributed throughout the value chain in the CI, but the architects and contractors often carry the ICT system investments alone. In the short run, the sub-contractor and sometimes the building owner have little incentive to work with 3D technology, because it may take a long time to compensate for the potential cost burden. This, in conjunction with the lack of broadband connections among a large section of construction SMEs, makes the business case, from their perspective, difficult to identify.

Project webs

The survey findings verify a higher uptake of project webs in large than in smaller construction enterprises. The lack of integration possibilities between project web solutions and existing ICT systems, however, constitutes a barrier for implementation of project webs in construction enterprises. This is mostly visible among European construction SMEs and stems from the lack of a European-wide industry standard for project webs. The uptake of project web solutions could be supported by focusing on the creation of an industry-wide European standard concerning the integration of collaborative systems with other business-related applications. The uptake of project web solutions is also hampered by different and often complex software solutions based on different user interfaces and ICT standards.

Furthermore, the required ICT competences and skills for handling the complex user interfaces of project webs are lacking in SMEs. Hence, more focus could be placed on creating simpler and more cost-efficient project webs that would be easy for construction SMEs to implement. By having both standardised "off-the-shelf" project web solutions for construction SMEs, and customised complex solutions for the large construction enterprises, the uptake of project webs could increase.

The case study of the French construction enterprise *SPIE SCGPM* illustrates this.

Case study:

SPIE, France SCGPM

In 2000, the regional branch of French construction enterprise Spie Batignolles, Spie SCGPM, introduced project web solutions into its construction projects and has, as of spring 2006, used project web solutions in ten different construction projects. The project web solution has had a positive impact on the work organisation of the enterprise as well as on the workflow process of construction projects.

The main advantages of the use of this project web solution within Spie SCGPM have been improved response time and communication among stakeholders in the construction project and greater efficiency in construction planning and building.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Among industry experts there is still open debate as to whether project web solutions should adapt to existing workflow processes or whether implementation should lead to the abolition of outdated workflow processes. The incentive for changing the workflow process to fit the new electronic workflow process of a project web solution should be to obtain full benefit of online document handling and sharing. Otherwise, the traditional workflow processes may hamper utilisation of the features of the project web solutions, making them less effective and efficient.

2.7.4 Business impact

Impact at company level

ICT and e-business are perceived as having a limited impact on construction enterprises in the short run. However, the increased uptake of e-procurement will require a further strengthening of ICT skills among employees of European CI enterprises. Despite the currently slow uptake of 3D technologies and project web solutions, these developments will eventually require both large companies and SMEs in the CI to invest not only in the technologies themselves, but also in ICT training to ensure that the required ICT skills among employees are in place.

Fuller uptake of project web, 3D technology and e-procurement systems is expected to affect organisational structures and workflow processes in the CI. In order to succeed, for example, with strategic procurement in the CI, enterprises need to implement support functions such as help desks and hotlines in addition to standard operating procedures. The purchaser (often site and line managers on the physical construction site) should be supported by a centralised procurement department to handle large scale, framework-based procurement across different construction projects.

Impact at industry level

The main driving forces and major areas where ICT and e-business will have an impact in the future are the relative bargaining power of suppliers and customers, and market rivalry. The threat of new entrants is not expected to affect the industry due to the fact that implementation of e-procurement, 3D technology and project web technologies, for example, is mainly driven by the companies' internal need to reduce mistakes in the construction process and increase efficiency in procurement and communication. The CI is not greatly affected by the issues of client substitution of other products and services, because there are no real alternatives to construction products and services.

e-Procurement systems are gradually becoming more widespread, especially among large construction enterprises. This development may decrease the bargaining power of suppliers, because buyers would then tend to engage in a limited number of framework contracts. The possible limitation of the supplier base may increase competition among suppliers of "off–the-shelf" construction products and raw materials, leading to a decrease in suppliers' bargaining power.

The bargaining power of the construction clients (customers) is already strong, due to vigorous competition in many EU Member States. The competitive situation is affected by a market that has been largely stagnant for the last few years, and which, until recently, has been characterized by greater supply than demand. This has tended to strengthen the bargaining power of customers. The use of e-tendering by public and private clients may further increase the bargaining power of customers, because greater information transparency will mean a larger number of potential tenderers.

Rivalry in the construction market is already intense, and the use of e-procurement is expected to reinforce this. Among complete construction enterprises, rivalry is expected to be affected by continuing consolidation among large enterprises. The uptake of ICT is,

however, not expected to affect this process, which is rather driven by volume and profitability issues.

2.7.5 Policy implications

Findings from this year's survey suggest that focus on improving ICT skills among construction enterprises, especially among SMEs, may prove vital in supporting the further uptake of ICT in the CI. Other relevant policy areas include an increased focus on generating awareness of ICT benefits and potentials, and continuous focus on facilitation of interoperability .

Improve ICT skills

Having the right ICT skills has been identified as a challenge for SMEs both in general and with respect to the three studied areas of ICT use in the CI (e-procurement, 3D technology and project web). Most importantly, this concerns the transition to 3D technology, which is a complex technology containing many software features. Attention should be directed to defining the required ICT skills in the CI and to assessing market imperfections with regard to the training offered by public and private educational institutions. In this context, any new initiatives aiming at ICT skills development should be coordinated and promoted locally to ensure commitment from local stakeholders and the customisation of content to country specificities.

Raise awareness of ICT benefits/ potentials and e-business policies

It is important to raise awareness about ICT and e-business among CI enterprises and business associations, in particular with regard to new technologies discussed in the sector report (project web, 3D technology and e-procurement). In this context, the public sector can play an active role by supporting initiatives to promote best practice examples based on successful ICT implementation in construction enterprises. Industry operators could facilitate such "peer-to-peer" demonstrations of successful cases to improve awareness about ICT solutions in this industry.

Facilitate the process of interoperability

Setting standards and promoting interoperability is an important area to address. On-going work towards common e-standards has promising benefits for the uptake of ICT in the CI. Nevertheless, on the basis of the statistical findings and within each of the three ICT application areas presented in the full sector study, a number of standardisation-related issues should be addressed at international and European levels. The European Commission could, for example, consider analysing the benefits of introducing standard transfer protocols, and disseminating the results of this analysis.

The study author

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2.8 The Tourism Industry

The sector study on the tourism industry was contributed by Salzburg Research GmbH (www.salzburgresearch.at).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

Tourism is in the vanguard of ICT adoption and e-business in the area of e-marketing and online sales. In this area of customer-facing e-business activities, "e-tourism has taken off". Yet, in a ranking of the ten sectors studied by *e-Business W@tch* in 2006, the tourism industry only achieves a mid-level score in the overall use of ICT and e-business. Customer expectations and market competition are the main drivers of e-business in the tourism sector, while the small size of most companies and the considerable costs associated with acquiring technologies constitute the main barriers to greater uptake of e-business.

In relation to ICT adoption and company size, the most striking result is that small tourism companies are more active users of e-business than their counterparts from other industries. The gap between big and small companies in using ICT and e-business applications is smaller than in other industries. Furthermore, results broken down by different sub-sectors of tourism show that travel agencies and tour operators seem to be the most enthusiastic adopters of ICT and e-business, followed by the accommodation sub-sector and – with much lower adoption rates – by the catering and restaurant sub-sector.

2.8.1 Sector definition and background

Definition

Tourism is most commonly understood as the provision of services for people travelling to and staying outside their usual environment for less than one consecutive year for leisure or for business purposes. The tourism industry as defined for the *e-Business W@tch* survey of enterprises covers the business activities listed in Exhibit 2.2-1.

In the analysis of results from the *e-Business Survey 2006*, some indicators are broken down into three tourism sub-sectors: (1) accommodation, (2) bars, restaurants and catering services, and (3) travel agencies and tour operators. Results for the whole tourism industry also contain data about 'Recreational, cultural and sporting activities'. This sub-sector is not, however, presented separately in tables, because case numbers for it are too low to provide representative results.

Tourism as a whole is one of the fastest growing industries in Europe and worldwide. In recent years, growth rates in tourism have been higher than those of the overall world economy. This trend is unlikely to slow down in the near future. From a global per-

spective, the European Union is still the most tourism-intensive region worldwide. This assessment can be backed by numerous key figures, such as contribution to regional GDP, global market share, or employment effects. In the EU nearly 1.5 million enterprises directly related to tourism employ about 8 million persons (cf. Eurostat 2006) and generate more than € 419 billion of production value (2001).

Exhibit 2.8-1: Business activities covered by the tourism sector (NACE Rev. 1.1)

NACE Rev. 1.1		Business activities
Divisions	**Groups/ Classes**	
H 55		Hotels and restaurants
	55.1	Hotels
	55.2	Camping sites and other provision of short-stay accommodation
	55.3	Restaurants
	55.4	Bars
I 63		Supporting and auxiliary transport activities; activities of travel agencies
	63.3	Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
O 92		Recreational, cultural and sporting activities
	92.33	Fair and amusement park activities
	92.52	Museums activities and preservation of historical sites and buildings
	92.53	Botanical and zoological gardens and nature reserves activities

The sector is dominated by micro-firms and SMEs (companies with 1 to 249 employees). In fact, about 92% of tourism enterprises are micro-enterprises (with 1 to 9 employees). Only 0.1% of enterprises in tourism have more than 250 employees. Micro and small enterprises (10-49 employees) together constitute 99% of companies in the tourism sector. This results in a labour market where SMEs contribute about 79% of employment.[50]

2.8.2 ICT and e-business adoption in 2006

Tourism is in the vanguard of ICT adoption and e-business in e-marketing and online sales. In this area of customer-facing e-business activities, “e-tourism has taken off”. Yet, especially regarding the deployment of ICT infrastructure and the adoption of e-integrated business processes, tourism companies are still lagging behind their counterparts in other industries.

In relation to ICT adoption and company size, the most striking result is that small tourism companies are more active users of e-business compared to their counterparts in other industries. The gap between big and small tourism companies in using ICT and e-business applications is smaller than in other industries. Furthermore, results broken down by different sub-sectors of tourism show that travel agencies and tour operators seem to be the most enthusiastic adopters of ICT and e-business, followed by companies in the accommodation sub-sector and – with much lower adoption rates – by the bars, restaurants and catering services sub-sector.

[50] Source: Eurostat (New Cronos)

The main results of the survey can be summarised as follows:

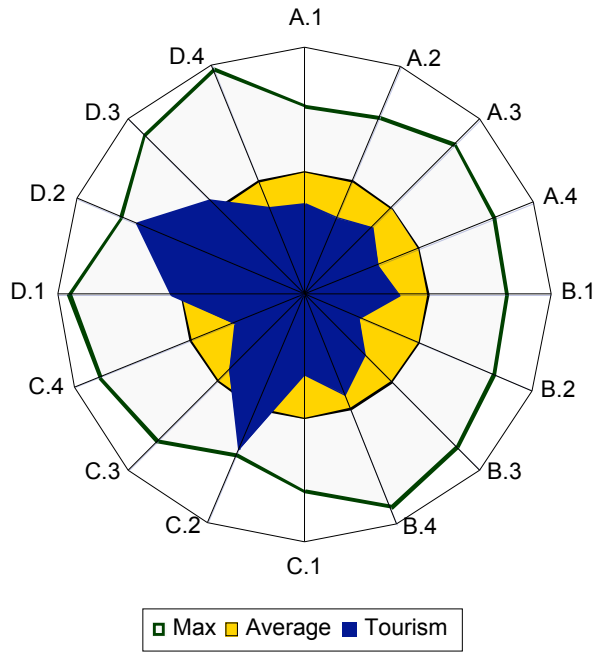
- **Companies with broadband internet access**: The uptake of broadband internet connections in tourism companies is similar to the average in the ten sectors surveyed. On average, micro enterprises in tourism show a stronger broadband penetration than their counterparts in other economic sectors. But the overall internet connectivity in the sector is somewhat below the average of the ten sectors, i.e. there are still many "internet deniers".
- **Small base of ERP systems:** The overall uptake of Enterprise Resource Planning systems - an important backbone for B2B integration and cooperation - is low in the sector; only large tourism enterprises show a higher uptake of ERP systems.
- **Online procurement** activity is significantly less developed than in other sectors studied. But the results differ considerably between sub-sectors: travel agencies and tour operators are strong adopters of e-procurement and the accommodation sector is close to the average of other economic sectors, while in bars and restaurants online procurement activities are little developed.
- **Online marketing and sales** are the applications responsible for the common perception that "e-tourism has taken off". This is true especially for the business-to-consumer (B2C) area, in particular for the accommodation sub-sector and for tour operators.
- **Customer expectations and gaining competitive advantages – the main drivers:** The higher relevance of B2C e-business activities corresponds to the companies' perceived major influence on customer expectations. Furthermore, gaining competitive advantage is still one of the most important drivers of e-business adoption. Interestingly, this holds true for the whole spectrum of company size classes.
- **Size and cost – the main barriers**: Companies that do not practise e-business see two main barriers: their company is "too small" for doing e-business, and they cannot afford the required technologies. Other barriers (e.g. security concerns, incompatibility of technologies) are perceived as less relevant.

e-Business Scoreboard 2006

In the ranking of the ten sectors studied by *e-Business W@tch* in 2006, the tourism industry scores in the middle field regarding its overall use of ICT and e-business. Marketing and sales-oriented objectives dominate electronic business in tourism. In three out of four component indicators in the field of e-marketing and sales (i.e. D.1 'CRM use', D.2 'Firms accepting orders online' and D.3 'Use of ICT systems for marketing/sales') tourism shows results above the average of all ten sectors surveyed. The only other component indicator scoring above the cross-sectoral average is an indicator in the field of e-sourcing and procurement (i.e. C2 'Use of ICT systems for sourcing').

In all other areas, the deployment of ICT and e-business in tourism is below the average of the ten sectors. In particular, there are shortfalls regarding the infrastructure for ICT networks and the uptake of e-integrated business processes.

e-Business Scoreboard 2006



Component indicators
(based on data in % of firms)

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.8.3 Current e-business trends

A number of issues were selected in consultation with industry federations[51] and in coordination and agreement with DG Enterprise and Industry as particularly relevant and topical for e-business developments in the tourism industry. These issues were analysed in the full sector study and, along with the presented case studies, provide useful insights into current ICT use and e-business practices which are specific to the tourism sector.

Dis-intermediation and re-intermediation

e-Business processes have led to conflicting, parallel trends which have a profound impact on the role of intermediaries in the tourism market:

- **Dis-intermediation:** ICT permits tourism service providers to interact directly with consumers, which puts enormous pressure on traditional intermediaries (i.e. travel agencies and tour operators). The extent to which intermediaries are by-passed differs considerably between sub-sectors. While, for example, the accommodation sector is only partially affected by dis-intermediation, the aviation industry tends to be much more affected – mainly by airlines selling tickets directly to consumers over the internet.

[51] E.g. ETOA – the European Tour Operators Association, HOTREC – Hotels, Restaurants & Cafés in Europe and ECTAA – Group of National Travel Agents' and Tour Operators' Associations within the EU. Among others, representatives from these organisations attended the *e-Business W@tch* kick-off meeting in Brussels on January 24th, 2006, and discussed the topics in focus with the authors of this study.

- **Re-intermediation:** ICT solutions may also provide new opportunities for traditional players and newly emerging online intermediaries. Many new entrants in the market, operating exclusively online, successfully provide intermediary services, while some brick-and-mortar intermediaries have managed to secure their position in the market by offering value-added online services.
- **Ongoing market consolidation:** There is an ongoing trend of market consolidation among intermediaries, driven by organic growth, mergers, acquisitions and strategic alliances. This, despite an increase in competitiveness on company level, might lead to reduced competition in the tourism market in the long run.

Case study:

Accor Hotels, France

The case study on Accor Hotels supports to some extent the dis-intermediation argument: By introducing an electronic revenue management system as well as a central reservation system (CRS) which links each individual hotel with the group, Accor has managed to boost its direct sales via its own hotel network, thereby by-passing traditional intermediaries. This allowed Accor to save commission costs which it would have had to pay to intermediaries if it had not offered these services itself.

However, Accor also realised that completely circumventing the use of intermediaries would not be an option, since these intermediaries proved to be particularly effective and valuable for the promotion of hotel rooms in the low season. Accor therefore adopted an anti-cyclic intermediary strategy: instead of paying an average commission to intermediaries for each hotel room booked, it adopted a system in which during an individual hotel's high season, when the level of occupancy is high – and hence the need for intermediary services low – the commission would be lower; in contrast, in a hotel's low season, when the level of occupancy is low – and hence the need for intermediary services is high – the commission for intermediary services would also be high.

This two-tier strategy benefited from the cost-saving effects of dis-intermediation, while at the same time creating incentives for traditional intermediaries to promote its services, especially in low seasons.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Adriatica.net, Croatia

adriatica.net is a Croatian online travel agency and tour operator based in Zagreb. The company aims at allowing its customers to search, plan and book travel arrangements by means of web based search and booking functionalities. For this reason, adriatica.net has developed its own booking technology.

Adriatica.net represents both an online and a "brick-and-mortar" business intermediary. Adriatica.net started as a mere online intermediary but has since established a strong presence in the "brick-and-mortar" intermediary business by acquiring several established traditional travel agencies.

Having only started in 2000, it already represents the biggest online intermediary business in Croatia, it employs more that 100 people and has subsidiaries in Prague, Warsaw, Trieste, Ljubljana, Bratislava and Vienna. Its web portal comprises over 150,000 pages that have been translated into 11 languages.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Dynamic packaging

Traditional packages offered by tour operators and travel agencies tend to be effective in bundling separate products, but only with limited flexibility. However, the increasing trend towards individualisation of tourism demand requires more flexible, dynamic packages.

Dynamic packaging (DP) depicts probably the most sophisticated and challenging e-business format in tourism (in both B2B and B2C) in terms of technological requirements (connectivity / interoperability of heterogeneous data) and organisational demands (management of enormous number of external suppliers). For this reason, it is almost exclusively the large enterprises – the leading adopters of ICT in tourism – that have been implementing / offering dynamic packaging services so far.

Case study:

CSI Media, United Kingdom

The CSI Media case study focuses on the business and technology lessons gained from the wide range of DP solutions implemented to date. DP is a generic e-business solution on a web-service basis which supports customisation and the integration of separate products and services into a single package for customers. The company offers its Travelberry solutions to travel-service providers who wish to add DP functionality to their online services. The case study illustrates that the implementation of DP solutions is a challenging but not an insuperable problem and that, in fact, there are already several DP service providers using the Travelberry technology.

Two kinds of technological interoperability problems that have yet to be solved are highlighted in this case study: The first is the lack of standards in geographic and location codes across different GDS and other systems, which makes it very difficult to integrate different data sets. The second refers to the seamless customer search across different repositories.

To reap all the advantages of DP, such as measurement and analysis of customer data for improved yield management or the optimisation of internal work-flows, the DP solution should be fully integrated with back-office solutions. Therefore, the next technological development step of CSI Media is about fully integrating the DP customer front-end with back-office or ERP systems of travel service providers.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Lastminute.com, United Kingdom

The lastminute.com case study focuses on DP strategy and customer experience. The company utilises DP as a tool for matching supply and demand, based on a large volume of supplier relations (17,000). Also, DP is used for "a multi-brand approach", i.e. to enable "differentiated ways of building, presenting and delivering products" to customers. Currently, DP accounts for 40% of total transaction value in lastminute.com and further customer uptake is expected. But lastminute.com also points to a great complexity of DP-based e-business in terms of technological requirements (web services) and business models.

The main driver for customer satisfaction after value for money is the ability to assemble packages including diverse (un)related journeys and other travel and lifestyle products in the same basket. Issues arise around simple and user-friendly presentation of content with sufficient information on destination location and surroundings.

By means of customer experience management, lastminute.com identifies which brand is performing better and adapts its DP strategy accordingly. The main challenges and potential obstacles are a lack of technology standards for product descriptions, and legal regulations concerning packages that include diverse products.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

ICT-related developments in the aviation industry

The aviation industry is one of the sub-sectors of tourism most affected by the development of ICT and the internet. In this context, no-frills airlines are the most striking feature of this market as they rely heavily on e-business solutions.

- **e-Ticketing**: The avoidance of classical paper-based tickets is one of the core elements of the low-cost business model, but e-ticketing is not limited to no-frills airlines. It is also increasingly being adopted by network carriers. The International Air Transport Association – IATA – intends to achieve a 100% penetration of e-ticketing among its members worldwide by the end of 2007.
- **Customer self-service**: Another measure for cost reduction and the acceleration of passenger flows at airports is to introduce customer self-service check-in solutions. This may be done on the spot by self-service kiosks or in the form of web based check-ins, which may even allow users to check-in from home or their office.
- **Bar-coded boarding passes** offer a natural link with e-ticketing and self-service check-in. Most recently, it is not only possible to print boarding passes at the passenger's home, but also to place bar codes on the passenger's cell phone which makes a paper document completely obsolete.
- **RFID for luggage handling** might replace classical baggage tags in the near future. This could simplify airline baggage management, improve customer service by reducing mishandled baggage, and provide new security requirements.

Case study:

Ryanair, Ireland

The case study of Ryanair demonstrates how the adoption of e-ticketing and internal e-business systems has permitted an airline to keep its operating costs down. A sophisticated yield management system which allows flexibility in dynamic pricing of tickets has been in successful operation for years. In the near future, Ryanair will further boost self-service check-in processes accompanied by new strategies, such as separate pricing of hold luggage. Furthermore, Ryanair intends to increase ancillary revenue sources, e.g. by packaging flights with hotel rooms, car rentals and travel insurances. These ancillary business areas are expected to become even more important in the future.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

SN Brussels Airlines, Belgium

The case study of SN Brussels Airlines *shows how a traditional network carrier benefits from the deployment of e-ticketing and dis-intermediation. The main difference, compared to Low Cost Carriers (LCC), is that SN Brussels Airlines applies e-ticketing also for interlining flights. This way, e-ticketing also supports the formation of alliances and cooperation between different airlines. Another difference to the LCC e-ticketing model is the sale of more flexible e-tickets, e.g. it is possible to book a ticket but not buy it immediately. The flexibility in issuing the ticket depends on its price class. In this way, the network carrier may simultaneously meet the needs of business travellers, who are less price-sensitive, but require more flexibility for the date and time of their travel, and of leisure travellers, who tend to be more flexible but are more price-conscious.*

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.8.4 Business impact

Impact at company level

The high impact of ICT on the organisational structure of large enterprises indicates a stronger level of integration of ICT in their business operations and thus an additional competitive advantage of large companies compared to SMEs. ICT influence is clearly linked to firm-size: it is perceived to be considerably more influential in large companies than in SMEs.

A strong ICT influence is particularly evident in the front-end area, i.e. in the customer service domain, which is presumed to be the result of well established online booking and e-marketing activities. Customer-facing e-business activities are the only domain that substantially outstrips the average figures of other industries. Interestingly, however, the influence of ICT on the back-end area – internal work organisation, business process efficiency, productivity and revenue growth – is also strong. This could be explained by a growing reliance of companies on digital business environments (e.g. for e-invoicing or e-procurement) and, to a smaller extent, by the trend to integrate customer-facing operations with back-office systems.

Impact at industry level

The ongoing **market concentration** might lead to the formation of “oligopolies”, where only a few companies dominate the market, and which will eventually lead to reduced competition. Yet, at the same time, competition pressure is expected to increase, as forecast growth in turnover in the next few years is limited, and as consumers become ever more price-conscious and put further pressure on tourism enterprises to reduce costs. The following business trends, some of which are contradictory, are expected to shape the market in the near future:

- Low barriers to **new market entrants**, which pose a threat for traditional players;
- Ongoing **ICT-based substitution of services** provided by traditional players;
- **Online distribution** channels strengthening the role of suppliers;
- Driven by ICT, **consumers are becoming more directly involved** in the production, compilation or innovation of products and services;
- **Growing competition** in the online market.

2.8.5 Policy implications

Survey results, case studies and desk research point to some issues relevant for policy. The first point concerns counteracting ICT-induced market failure in the field of tourism intermediaries; other points concern promoting ICT adoption and fostering a favourable framework for e-business, especially among small and medium-sized companies in the tourism sector.

Ongoing market concentration among tourism intermediaries

The further consolidation of intermediaries – and in particular the market concentration of online intermediaries – is influenced by ICT. This could, in the long term, lead to the formation of oligopolies, with negative effects on competition. In order to counteract such ICT-induced market failure, policymakers need to closely monitor the ongoing market concentration of tourism intermediaries and intervene, if necessary.

Encouraging initiatives for networking and cooperation

According to the e-Business Survey 2006, only a minority (8%) of all tourism companies use online collaboration tools. In addition, the adoption of advanced collaborative e-business solutions such as DP might pose a significant technological and organisational challenge for many smaller providers of tourist services, which do not have the resources to acquire complex and interoperable computing systems. If smaller tourism providers and operators cooperate and combine their efforts and resources, they are able to operate successfully in an increasingly competitive market. But very often small tourism providers are reluctant to abandon traditional business cultures or to cooperate with other small stakeholders that might be perceived primarily as competitors.

It is therefore important for encouragement (in particular from industry federations and business support networks) for SMEs to **form networks** with other players and to **share resources** in order to satisfy the needs of diverse and ever faster changing customer requirements. This, in turn, could increase the competitiveness of the whole network, as well as of each participating SME.

Encouraging the adoption of e-business in micro and small companies

Although smaller tourism companies are active users of e-business solutions compared to their counterparts from other industry sectors, many companies still consider themselves as “too small” for doing e-business, or they cannot afford the necessary investments. To improve this situation, concrete measures should be envisaged for

promoting the adoption of ICT and e-business solutions by tourism SMEs, and in particular by micro and small companies.

Promoting ICT infrastructure and e-integrated business processes

While ICT and e-business technologies and applications in the tourism sector are widely used in marketing and sales and, to a lesser extent, in e-sourcing and procurement, the tourism sector is clearly lagging behind in terms of deployment of ICT infrastructure and the adoption of e-integrated business processes. The European Commission has initiated various schemes to enhance ICT infrastructure and encourage the adoption of e-business processes.

Encouraging innovation and R&D in e-tourism

Research and innovation (R&D) constitute vital elements for strengthening the competitiveness of European companies, especially against the background of increasing globalisation and international competition. R&D and innovation activities should be fostered – again with a particular emphasis on SMEs. The European Commission as well as EU Member States should strengthen their role in this respect.

The study author

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2.9 The Telecommunications Industry

The sector study on the telecommunications industry was contributed by Berlecon Research GmbH (www.berlecon.de).

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

Telecommunications (telco) companies have a forerunner position as intensive users of ICT and e-business in almost all application areas. Moreover, the wide diffusion of e-business technologies also among smaller enterprises distinguishes the sector from most other industries studied by the *e-Business W@tch* in 2006. Due to the double role of telco companies as users and suppliers of ICT, this finding is hardly surprising. In addition, it is in line with the results of previous *e-Business W@tch* reports on this sector.

Overall, e-business practices in the telco industry may serve as a role model for the successful combination of market liberalisation efforts and the use of e-business technologies. In addition, examples for the innovative use of e-business technologies by telco companies might serve as input for promoting e-business technologies to SMEs in less e-business-intensive sectors.

2.9.1 Sector definition and background

Definition

The telecommunications industry as defined for this study covers business activities subsumed as “Telecommunications” under NACE Rev. 1.1 DL 64.2. The classification of telecommunication services by NACE Rev.1.1 as a sub-sector of “Post and telecommunications” (NACE 64) and without any further subdivision reflects the heritage of many companies in this sector as state monopolies providing (fixed-line) telephony and fax services.

Exhibit 2-1: Business activities covered by the telco industry (NACE Rev. 1.1 and 2)

NACE Rev. 1.1		**Business activities**
Division	**Group**	
64	2	Telecommunications
NACE Rev. 2 (Draft)		
61	1	Wired telecommunications activities
	2	Wireless telecommunications activities
	3	Satellite telecommunications activities
	9	Other telecommunications activities

But the landscape of telecommunication services is much more diverse today with a large range of output and heterogeneous ecosystems. The proposed NACE Rev. 2 already incorporates this complexity by defining a distinct division for telecommunications and

further differentiating wired, wireless, satellite and other telecommunication activities.[52] The report follows this approach.

The supplier landscape is highly fragmented with regard to the heterogeneous platforms used for data transmission and the different types of content transferred. With respect to the business approach of suppliers, a broad distinction can be drawn between network operators and resellers/service providers. With respect to the type of network operated, the industry distinguishes between different groups, including fixed-line operators, internet carriers, mobile/wireless network operators and TV cable companies.

Telecommunication services only reveal their full value in combination with input from other sectors. Thus, there are strong links between the telco industry and related sectors, such as ICT manufacturing, IT services and the content industry.

The total sector directly employs about 740,000 people in the EU-25 and has a production value of about €150 billion.[53] Increased competition and cost pressure is a major trend in this industry. Major drivers of this trend include market liberalisation and regulation, convergence of platforms and technologies, market saturation in conventional telco segments, and low return on investment in third-generation (3G) networks.

2.9.2 ICT and e-business adoption in 2006

Telco companies have a forerunner position as intensive users of ICT and e-business in almost all application areas. Moreover, the wide diffusion of e-business technologies also among smaller enterprises distinguishes the sector from most other industries studied.

- **The internet is an integral part of daily work routines in the telco sector.** A large majority of employees (on average about 90%) in telco companies have access to the internet and are connected via sophisticated ICT infrastructure. All statistical indicators reflecting the adoption of ICT infrastructure components are well above the average of all sectors covered by the *e-Business W@tch* in 2006.
- **Telco companies spend every fifth Euro of their investments on ICT and e-business technologies.** Survey results on ICT investments underline the importance assigned to ICT by telco companies. In fact, ICT and e-business technologies are the basis for service provision, for the output of the sector, and for process support. Furthermore, ICT budgets of telco companies are likely to increase in the future.
- **Proprietary solutions and XML-based standards are most widespread as the basis for e-business transactions.** In general, the use of e-business standards, particularly XML-based, is more widespread in the telco industry than on average in other sectors surveyed. However, a large share of telco companies reported using proprietary solutions for e-business transactions (based on agreements between several business partners).

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[52] NACE Rev. 2, Draft, April 12, 2006.

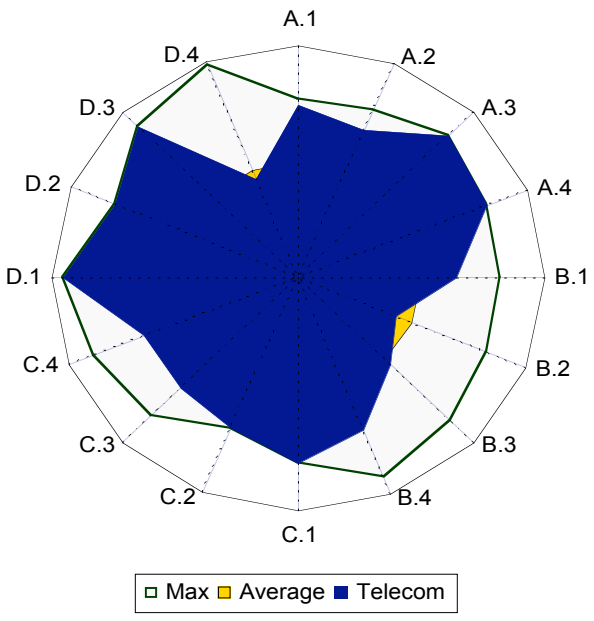
[53] Source: Eurostat, Structural Business Statistics (Industry, Construction, Trade and Services), Annual enterprise statistics (latest figures available, i.e. for 2003). Downloaded from the Eurostat website in March 2006.

- **Telco companies of all sizes make wide use of e-business tools in almost all application areas.** While complex ICT systems (e.g. Customer Relationship Management systems) are more widely diffused among large enterprises, telco companies of all sizes said that they intensively use rather simple e-business applications (e.g. e-ordering).
- **Most product and process innovations in the telco industry are ICT-enabled.** Overall, the share of telco companies that pursued product or process innovations during the past 12 months is higher than in all other sectors surveyed. About three quarters of all product innovations and almost 90% of process innovations were enabled by ICT.
- According to the companies surveyed, **customers' expectations** and **fierce competition** are the main drivers of e-business activities in the telco sector. The main barriers were identified as limited company-size, and concerns over security. Overall, only a marginal share of telco companies (mainly micro companies) reported that e-business does not play any role for the way their company operates.

e-Business Scoreboard 2006

Key indicators of e-business usage are summarised in the **e-Business Scoreboard 2006** below. The graph illustrates the forerunner position of telco enterprises as intensive users of ICT and e-business technologies. Due to the double role of telco companies as users and suppliers of ICT, this finding is hardly surprising. In addition, it is in line with the results of previous *e-Business W@tch* reports on this sector.

e-Business Scoreboard 2006



Component indicators
(based on data in % of firms)

A. ICT Networks
A.1 Internet connectivity (index)
A.2 LAN
A.3 W-LAN
A.4 Remote access to company network

B. e-Integrated Business Processes
B.1 Intranet
B.2 ERP systems
B.3 Online tracking of production time
B.4 e-Invoicing

C. e-Sourcing and Procurement
C.1 Firms placing orders online
C.2 Use of ICT systems for sourcing
C.3 ICT system linked with suppliers
C.4 Online inventory management

D. e-Marketing and Sales
D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.9.3 Current e-business trends

The telco industry has a dual role as user and supplier of ICT and e-business technologies. The analysis of **e-business key issues** in this report reflects both perspectives: **Convergence-driving technology developments** have been identified as a key issue related to the supply of telco services. **Marketing, sales and customer care are core business areas supported by ICT tools** in this sector.

Convergence in the telco industry

The survey findings on the use of convergence-driving technology trends and the discussion of related market developments confirmed that **convergence is no longer a futuristic vision** – it has strong implications for today's market developments in the telco industry and, thus, also for the adoption of e-business technologies in other sectors.

Broadband internet access, for example, which was mainly used by large enterprises only a few years ago, is widespread among consumers and businesses – irrespective of size and sector – today. On average, about two thirds of all companies in Europe reported using broadband connections. Broadband internet access with DSL as a main driver forms the basis for the use of new telco services like VoIP and IPTV, which are gaining increasing popularity. According to the 2006 survey results, for example, 13% of European businesses reported that they use VoIP. Among large companies with 250 and more employees this proportion is as high as 20%.

The availability of broadband is likely to increase in the future. Case studies illustrate activities of telco companies to roll out new fixed and wireless broadband technologies in Eastern Europe.

Case study:

Rollout of broadband services in Central and Eastern Europe by WiMAX Telecom (Switzerland)

The development of WiMAX as a new wireless broadband technology has raised high expectations. However, the number of commercially available WiMAX services today is small compared to the number of broadband services provided via cable, fixed line DSL or 3G mobile technologies.

One of the few providers of WiMAX services in Europe is WiMAX Telecom AG. The case study discusses WiMAX Telecom's market approach as well as challenges and success factors related to the rollout of WiMAX.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Commercial Rollout of Flash-OFDM network at T-Mobile Slovensko (Slovakia)

T-Mobile Slovensko considers itself to be the innovation leader in the Slovakian mobile telephony market. In line with this strategy, T-Mobile Slovakia started the world's first commercial operation of a Flash-OFDM network in October 2005.

Based on this example, the case study illustrates advantages of Flash-OFDM as compared to conventional broadband access technologies. Moreover, opportunities and challenges related to the rollout of broadband services in Slovakia are discussed. Market awareness of broadband services in a country with relatively low internet penetration like Slovakia emerges as a main challenge.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Mobile internet, voice, and TV services are becoming serious alternatives to traditional telco services that are provided via fixed line networks. The 2006 e-Business Survey findings indicate that only a small proportion of European businesses currently use wireless broadband technologies or mobile solutions for remote access. This can be attributed to the early stage of development of these technologies. But mobile solutions are already widespread among typical forerunner groups such as companies in high tech industries and large companies today.

The major outcome of these developments is the **blurring of lines between traditional telco segments**. While telco customers may profit from lower prices and advantages from the use of new technology services like VoIP and IPTV, telco companies are facing an increasingly competitive environment. In order to retain customer relationships under these circumstances, triple-play strategies are of increasing relevance.

Case studies illustrate the activities of smaller players that apply convergence-driving technologies to position themselves as forerunners in the telco market.

Case study:

Upnet tries to establish VoIP–based Services in Lithuania

Upnet Taide Baltic is a small telecommunications consulting company trying to position itself as a VoIP provider on the Lithuanian market. Based on the example of Upnet, this case study illustrates opportunities and challenges related to the establishment of VoIP services for private and business users. Dealing with low broadband penetration in Lithuania emerges as a main challenge for Upnet.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Triple play by Grupalia Internet S.A. (Spain)

Grupalia Internet positioned itself as an ISP offering internet services to business customers in Spain in 1999. In 2004, the company entered the consumer market offering broadband internet access. Next, it added telephony services and – since November 2005 – also access to TV.

The bundled offering, which combines Internet, Telephony and TV services, is promoted under the "Superbanda 3" (SB3) brand. The case study provides insights into opportunities and challenges related to the realisation of triple-play strategies.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Market developments impact the use of e-business technologies in this sector. Combined offerings, for example, require a seamless interplay of marketing, sales, and billing systems. This makes application integration increasingly important in the telco industry.

ICT to support marketing sales and customer care

The e-Business Survey 2006 indicates that the telco industry has a forerunner position in ICT usage to support marketing and sales processes. The diffusion of simple e-business tools (e.g. company websites and e-ordering activities with customers) as well as of advanced solutions (e.g. CRM, specific ICT solutions for e-commerce) is well above the average of all sectors studied. Remarkably, the adoption of advanced e-business technologies in this field is widespread even among small companies in this sector: more than 20% of micro companies in this sector reported the use of CRM systems.

The intensive use of e-business tools for marketing, sales, and customer care is due to the complexity of customer relationship management in this sector. Marketing and sales departments have to deal with an increasing range of products and services, heterogeneous needs of different target groups, and mass-market issues. ICT and e-business tools play a central role in the provision of customer service and in support to marketing.

Case studies provide further insights into the practical use of customer-facing e-business applications. First, the case study on *Budget Telecom* illustrates how small companies in this sector in particular may use the internet as a channel to reach a worldwide audience at low costs. While the business model of *Budget Telecom* is almost entirely based on the internet, larger telco companies like *Brutélé* or *Swisscom Mobil*e support telco customers via different channels, including call centres, own shops, service centres and independent dealers. They need ICT primarily to provide customer sales agents with the information necessary to provide services at high quality levels.

CRM systems are suited to supporting this task by integrating various customer-facing applications and interacting with other enterprise systems that contain customer-relevant data (e.g. billing and ERP systems). Accordingly, the implementation of a CRM system, particularly in large telco companies, often turns into a complex integration project (see also the cases of *Brutélé* and *Swisscom Mobile*).

Case study:

Use of the web as a marketing and sales channel by Budget Telecom (France)

Budget Telecom is a small French telephony service provider that offers low-cost telephony connection services to worldwide customers. The company's business model is almost entirely based on use of the internet as a low-cost channel for acquisition and marketing activities.

The increase in customers, revenue and profits confirm the success of this strategy. The case study illustrates how small companies can use simple e-business technologies to establish a visible brand and reach customers on a global scale.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

Brutélé (Belgium) supports customer-centric strategy with new CRM and invoicing system

Since its market entry in 1968, the Belgium TV cable company Brutélé managed to continuously expand its range of services and to increase its customers. In order to ensure high-quality customer service for the larger number of customers and the broader range of telco services provided, the company installed a new CRM and invoicing system in 2003.

The integrated solution provides customer care agents with complete customer profiles, which makes it possible to provide efficient consulting as well as technical and invoicing services.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Case study:

ICT-based Customer Relationship Management at Swisscom Mobile

Swisscom Mobile is market leader in the mobile communication market in Switzerland. In 2002, the company started to implement a new CRM system, which integrates the applications needed for the provision of customer services and sales activities. The system also connects the different distribution and support channels via a common modular platform.

The case study illustrates the requirements for CRM systems of telco firms that have to deal with an extensive number of applications to support customer care and sales activities at different customer contact points. It emerges that integrating marketing and sales applications into one modular CRM platform can significantly reduce the time-to-market for the launch of new products and services. However, integrating a new CRM system into an existing complex ICT environment is a long-term project, which is best carried out step by step.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

The range of ICT tools to support marketing and sales activities is not limited to core applications like company websites and CRM systems. e-Business projects that help to optimise supply chain activities also impact telco companies' sales success. SCM software may help to optimise logistics processes and thus to improve service levels for delivery of products. Internet trading platforms, as illustrated by the case study on *COSMOTE*, might be used to streamline the exchange of information between suppliers and customers, eventually reducing ordering times.

Case study:

Use of e-Marketplace Services by COSMOTE (Greece)

COSMOTE, a leading mobile operator in Greece, is co-founder, stakeholder, and also one of the largest clients of the Greek e-marketplace operator and procurement services provider cosmoONE. The company uses cosmoONE's services both as a buyer and a supplier, supporting processes along the supply chain.

The case study illustrates the potential of e-business technologies for process improvements in large and fast-growing telecommunications companies like COSMOTE, and discusses challenges related to their implementation. By using e-procurement tools, the mobile operator was able to streamline the entire procurement process, thus reducing time and costs related to the ordering process.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.9.4 Business impact

Implications for enterprises

According to the 2006 survey results, three out of four telco enterprises perceive e-business as important for their company operations. Due to the dual role of telco companies as suppliers and users of e-business technologies, these technologies affect all business fields. According to the analysis in this report, the implications of ICT and e-business are relevant principally for the following areas:

- **Marketing, sales and customer care**: As shown by the survey results and confirmed by the analysis, marketing and sales is a key e-business application area in this sector. There are many opportunities provided by customer-facing e-business technologies to support sell-side activities of telco companies. Not only large companies can profit from ICT usage. Basic e-business tools, such as product websites, when applied in an innovative way may also help small companies to establish a visible brand and build an extensive customer base.
- **Products and services offered**: More than 50% of telco companies reported a positive impact of ICT on the quality of products and services. New technologies based on the internet (e.g. VoIP and IPTV) are likely to replace traditional telco services and enhance the range of products and services offered.
- **Automation and streamlining of business processes:** More than 60% of telco companies experienced a positive impact of ICT on the efficiency of business

processes, according to the survey findings. Competition and saturation in traditional telco market segments have led to increased cost pressure in this sector. As shown by the survey findings and confirmed by the analysis, larger telco companies in particular are concerned with streamlining and automating internal processes in order to save on costs.

ICT impacts on competition

About two thirds of companies in this sector, irrespective of their size, perceive increased competition due to ICT. Fierce competition and saturation of traditional telco markets are driving product innovations that are based on new ICT and e-business developments. Telco companies are forced to adopt new technologies for services like IPTV in order to remain competitive and to initiate growth in an increasingly converging environment.

However, entering new market segments places additional challenges for internal process organisation. New processes, e.g. for billing and marketing new service offerings, have to be defined and implemented. Innovative use of ICT, both as an input for new products and to support the transformation process, is of increasing importance in this sector.

2.9.5 Policy implications

Based on the analysis of the use of e-business technologies by telco companies in this report and discussions with industry representatives, **neither a need for promoting ICT adoption** in this sector **nor for counteracting ICT-induced market failure** were identified. Rather, the telco sector appeared as a forerunner in almost all e-business application areas, with adoption rates very much higher than those of other sectors surveyed. In addition, the relatively high usage rates of e-business technologies by micro and small companies distinguish the telco sector from other sectors surveyed.

e-Business practices in the telco industry may rather serve as a role model for a successful combination of market liberalisation efforts and the use of e-business technologies. The experiences of the telco sector might be a helpful input for the discussion of liberalisation efforts in other sectors. In addition, examples for the innovative use of e-business technologies by telco companies like *Budget Telecom* might serve as input for promoting e-business technologies to SMEs in less e-business-intensive sectors.

The study author

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2.10 The Hospital Activities Industry

The sector study on the hospital activities industry was contributed by empirica GmbH (www.empirica.com)

The full reports can be downloaded from the website (www.ebusiness-watch.org) at the 'resources' section.

The use of ICT and e-business has a profound impact on workflows and business process efficiency in hospitals. The e-Business Survey 2006 shows that the hospital activities sector is one of the sectors with the highest ICT and e-business use. This is however partly due to the fact that hospitals tend to be larger organisations with more than 250 employees. Small hospitals generally lag behind medium-sized and large hospitals in ICT and e-business use.

Hospital Information Systems are the core means of e-business in hospitals. Two types of systems are of particular importance: firstly, e-prescribing and medication management systems, as prescriptions are a core means of treatment; and, secondly, imaging systems, because imaging is a core means of diagnosis. However, only a minority of European hospitals use such systems. Integration of separate systems is a further important issue.

As investment in ICT increases, the relationship of hospitals with patients and the need for in-patient care may change.

2.10.1 Sector definition and background

Definition

Hospital activities, as defined in class 85.11 of NACE Rev. 1.1, are a sub-section of human health activities (group 85.1) which comprise medical, surgical technical and other related on-site care activities. The activities of NACE class 85.11 are chiefly directed to so-called in-patients staying over night, as opposed to health care for out-patients who are treated in ambulatory fashion. In this report the hospital sector is defined even more narrowly: only acute-care hospitals are considered. The notion “acute” refers to the fact that the hospitals are predominantly serving patients in immediate need of health care, as opposed to long-term care.

Industry background

In terms of business services, hospitals are primarily engaged in services required by in-patients. Hospitals may also provide outpatient services, i.e. ambulatory care, as a secondary activity. Many health services in hospitals can only be provided using specialised facilities and equipment that form an integral part of the production process. On the input side, hospitals need a large variety of inputs from suppliers to provide their

services, including, e.g., food and beverages, garments and bed textiles, stationery products, drugs and medical technologies. On the output side, hospitals are integrated in a network of health service providers with particular roles, including other hospitals as well as ambulatory care services offered by general and specialised practitioners. Furthermore, hospitals deal with non-medical organisations for purposes of administration, reimbursement, and information.

Current sector trends and implications

Two overarching issues currently dominate the discussion about the health sector in general and the hospital sector in particular: cost containment and service quality. Cost containment is sought because of high costs of medical technology as well as increasing health-care expenditures due to the ageing European population and an increasing incidence of chronic diseases. Issues affecting quality of care include medication errors, diagnosis failure, negligent supervision, delayed treatment, failure to obtain consent, and lack of technical skill. An increased use of ICT, notably hospital information systems and Electronic Patient Records, is frequently intended to tackle these problems.

2.10.2 ICT and e-business adoption in 2005

The e-Business Survey 2006 shows that hospitals in Europe are advanced in ICT and e-business use. The findings also show that many e-business practices, particularly with regard to customers, that is, patients, can still be improved.

- **Sector differences:** In comparison with the other nine sectors considered in the e-Business Survey 2006, hospitals were found to be advanced in ICT and e-business use. For example, as regards ICT networks, hospitals were above the all-sector average in internet access, broadband access and remote access. Hospitals also reported higher levels for e-procurement as well as for internal and external e-collaboration. This is to some extent due to the fact that the share of medium-sized and large organisations in hospital activities is larger than in the other sectors. If only large organisations of each sector were considered, hospitals would not be in the top rank. In any case, hospitals were found to be well behind other sectors in e-business solutions affecting customers, i.e. patients, directly. This applies notably to online booking of services by patients and e-marketing of services by hospitals.
- **Size class differences:** Small hospitals generally were found to lag behind large ones. This applied, for example, to internet, broadband and remote network access as well as to internal and external e-collaboration. However, small hospitals reported higher shares of employees that have internet access, and also the highest levels of internet telephony use and online service booking.
- **Drivers and barriers for e-business:** Expectations from health insurance funds were reported as the most important driver of e-business in hospitals among the factors included in the e-Business Survey 2006. "*Gaining competitive advantage*" and "*competitors do it*" were identified as important reasons by a substantial share of the surveyed hospitals, which confirms the importance of competition in this sector. *Security concerns* and *expensive technology* were the most significant perceived barriers. The other barriers included in the survey followed well behind,

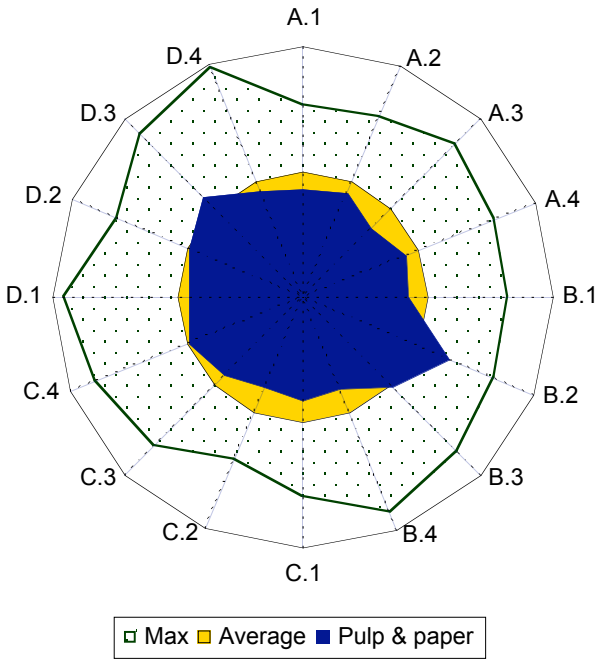
namely "*hospital is too small*", "*legal issues*", "*lack of reliable ICT providers*" and "*systems not compatible*".

- **Standards and interoperability**: Currently many standards for ICT are used in the field of health. Hospital tend to be only weakly committed to European and international e-health standards. There is also a tendency for Member States to create national ICT standards for the health sector.
- **Data security**: Hospitals face a dilemma: on the one hand patient data need to be readily available; on the other hand, information needs to be protected from unauthorised use and against loss or modification. The levels of use of secure server technology and digital signature in the hospital sector were twice the level of all sectors. The level of use of a firewall was also much higher.

e-Business Scoreboard 2006

The e-Business Scoreboard makes possible comparisons of ICT adoption and e-business activity across different sectors, countries or size-bands. It shows that hospitals are particularly strong in electronically integrating their business processes in terms of using intranets, ERP, and e-invoicing as well as in tracking production time online. They achieve the highest levels of all sectors in three of the four items in this category. Hospitals are also above average in e-sourcing and procurement, as well as in ICT networks access. However, hospitals are below average in e-marketing and sales activities.

e-Business Scoreboard 2006



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D.1 CRM use
D.2 Firms accepting orders online
D.3 Use of ICT systems for marketing/sales
D.4 ICT system linked with customers

Source: *e-Business W@tch* (Survey 2006)

2.10.3 Current e-business trends

Trends considered

Hospital Information Systems (HIS) are the core means of e-business in hospitals. Two types of systems are of particular importance: firstly, e-prescribing and medication management systems as prescriptions are a core means of treatment, and, secondly, imaging systems because imaging is a core means of diagnosis. Integration of separate systems is a further important issue.

ICT investment in hospitals impacts not only on the hospitals themselves but also on the wider health care system. Related issues include, firstly, the continuity of care across hospital borders and, secondly, the question whether the role of hospitals is changing with regard to relationships with patients and the division of labour among different hospitals and other health care providers.

Case study:

Son Llàtzer Hospital, Spain

Son Llàtzer Hospital in Palma de Mallorca, Spain, is an example of a paperless and filmless hospital where almost all procedures are undertaken electronically. Online applications are used across all departments, professions, processes and tasks. The hardware is rented, offering the opportunity for cost-effective replacement. The medical workstation is the core unit of the system architecture, allowing health professionals to access a patient's clinical history and related clinical and administrative data. Patient data can also be processed through wireless portable tablet computers and Personal Digital Assistants (PDAs).

The complete computerisation has proved to be cost-effective – particularly with regard to the integration of other health service providers. However, the hospital's chief information officer (CIO) believes that the most important benefits in a fully electronic hospital are for quality of care rather than cost-effectiveness.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

HIS benefits and implementation

HIS can help to cope with the huge amount of data that hospitals require. In addition, communication among professionals and access to useful knowledge can be enhanced, and processes can be made more efficient. Almost all European hospitals have at least an electronic system for patient data and financial administration. However, only a minority use more sophisticated systems for computerised pharmacy services, imaging and medication.

Case study:

National Heart Hospital, Bulgaria

The National Heart Hospital (NHH) in Sofia is the largest hospital in Bulgaria specialised in cardiology care. It is the only Bulgarian cardiology hospital that has implemented and integrated comprehensive hospital information systems, including medical and administrative ICT applications.

The main impacts of HIS integration were improved quality of patient care, improved inventory management and logistics, as well as improved job satisfaction for health-care personnel. Costs were also reduced in many respects but there is not yet an analysis indicating whether the benefits of IT outweigh the costs. The main success factors in implementing the HIS were high motivation and involvement of the hospital management and staff, as well as co-ordination among the HIS developers. The NHH's integrated HIS may be considered as a good practice that could be adopted by other hospitals in the country and in the region.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

e-Prescribing and medication management

When used in support of medical decisions, e-prescribing and electronic medication management systems can reduce errors and, ultimately, save lives. However, less than 20% of hospitals surveyed this year by *e-Business W@tch* reported practising some form of e-prescribing, and only around 2% said that they use "knowledgeable" systems. This makes the introduction of systems for Computerised Physician Order Entry (CPOE) a political and economic issue. However, CPOE systems may not be appropriate in medical units with frequent need of emergency medication because CPOE may delay therapy and diagnostic testing.

Case study:

Chelsea and Westminster Hospital, United Kingdom

Chelsea and Westminster Health-care Trust is an acute care hospital in West London. Its pharmacy department was modernised during 2002 and 2003, including the introduction of an electronic prescription system, a new dispensary, a computer-controlled dispensing robot and pneumatic tubes to distribute medications to the ward or unit where they are required. The new dispensary was designed to meet the needs of new pharmacy processes using electronic prescriptions.

The electronic medication management system encompasses the whole chain of an electronic pharmacy system: e-prescribing, e-dispensing, e-distribution, e-stock-management, and e-procurement. The new system led to more accurate prescriptions, more accurate dispensing, reduced stock holding, reduced waiting times for patients, reduced workload in the dispensary, and fewer visits to pharmacy by nursing staff, allowing more time to be spent with patients.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Radiology Information Systems

Electronic imaging offers improved visualising, archiving and communication methods. It can thus improve diagnosis and quality of care as well as reduce administration costs. However, the e-Business Survey 2006 found that only around a quarter of hospitals apply such systems.

Case study:

John Paul II Hospital, Poland

In the John Paul II Hospital in Cracow, Poland, the deployment of ICT systems for digital imaging improved quality of care and reduced cost. As regards quality of care, the Radiology Information System enables health-care providers in the hospital to access critical information for diagnosis within significantly shorter time, compared to the traditional X-ray methods. By sharing images between different locations the hospital's staff can consult external specialists and provide diagnosis for patients from outside the clinic. As regards costs, shorter time for image delivery and also reduced material use imply considerable financial benefits for the hospital.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

HIS integration

As hospital services require the interaction of numerous different departments, opening up all potential benefits requires the integration of separate HIS. However, this is often not the case inside individual hospitals. Findings suggest that there are three principal reasons: firstly, a lack of ICT planning, which may be caused by a complex and often fragmented hospital organisation; secondly, difficulties with ICT suppliers; and, thirdly, a lack of commonly used industry standards.

Case study:

Ambroise Paré hospital, Belgium

The Centre Hospitalier Universitaire Ambroise Paré is a public university hospital with 500 beds located in Mons, Belgium. It is an example of a mid-sized hospital that effectively integrated its information resources by focusing on the staff's point of view and by selecting a simple pragmatic approach. The integration effort improved workflows and accessibility of patient records without large investments and without replacing well-known and well functioning specialised information systems.

The hospital unified all patient information in one database, named b-doc, and made it accessible throughout the hospital via a single user interface. The physicians' commitment in using b-doc shows its value as a support tool in their everyday work. Among the benefits are flexibility in adapting subsystems, reduced loss of documents, round-the-clock availability of all data, and savings due to reduced personnel and material cost.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

ICT supporting continuity of care

Since healthcare is increasingly specialised and tasks are distributed across a large number of health professionals, continuity of care needs to be ensured across departmental and extra-mural interfaces. ICT can support structured communication among clinicians to achieve appropriate health-care provision. Two means for improving continuity of care, electronic patient record systems and web services, are currently on the deployment agenda of many European hospitals. However, there is little evidence of actual implementation of comprehensive electronic health records.

Case study:

Institut Curie, France

The Institut Curie in Paris, France, is a hospital specialised in oncology seeking enhanced continuity of care inside and outside its walls by using computerised applications. Two e-health tools form the heart of the institute's ICT systems: Elios and Prométhée.

Elios is a comprehensive Electronic Patient Record system, allowing patient data access during consultations, diagnosis and treatment.

Prométhée is a sophisticate, yet simple-to-use search engine that allows healthcare professionals to clarify medical questions across the hospital's databases, including Elios.

Elios and Prométhée have together fundamentally transformed healthcare processes. They improved the continuity and quality of care by offering access to patient data anytime, from anywhere in the hospital and from outside. Both tools can be accessed by all members of the healthcare team involved in their treatment. In the case of Elios this includes external partners such as other hospitals or general practitioners. The tools also led to considerable economic benefits.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

Changing role of hospitals

The role of acute-care hospitals is to provide in-house, comprehensive, specific and round-the-clock care. Some hospitals also have a role in professional and student education and academic research.

As investment in ICT increases, the relationship of hospitals with patients and the need for in-patient care may change. Most importantly, electronic communication between hospitals and general practitioners or the patients themselves may make a patient's visit to the hospital unnecessary. The hospitals' boundaries potentially become more permeable; the role of hospitals may slowly shift from an in-house care provider to an outbound communicator.

Case study:

Hospital District of Helsinki and Uusimaa

In the Hospital District of Helsinki and Uusimaa (HUS) in Finland, electronic health services and Electronic Patient Records are incrementally impacting on the role of hospitals.

The most important changes are taking place in the relationship with patients. Patients are nowadays entitled to more information about their health status, and many tests and treatments are nowadays ideally effected outside hospitals. ICT supports the related flow of information. This permits a reduction in the number of hospital visits and in the length of stay in hospital, and permits out-patient visits to largely replace in-patient stays.

By lowering the barriers between hospitals and primary care centres, ICT usage also speeds up and increases information flow. And it facilitates increased specialisation of hospitals in the region through, enhancing the level of information. The division of labour between hospitals of different size and of public or private ownership appears unaffected by increased ICT use.

Full case study: www.ebusiness-watch.org/resources/casestudies.htm

2.10.4 Business impact

Impact at hospital level

The analysis of the e-Business Survey 2006 as well as of main topics of e-business in hospitals showed that ICT and e-business has a substantial impact on hospitals. The **core impacts** are in **workflows and business process efficiency**. Workflows are likely to become more streamlined and efficient because patient data are available much quicker when they are accessible from any workstation in the hospital at any time.

Influence on **organisational structure**: 66% of the interviewees said that ICT had an important influence on employee training, supposedly because ICT induced a need for special training about new electronic facilities. 61% of the hospitals reported an important influence of ICT on the hospital's organisational structure. This may mean, for example, the realignment of medical departments according to clinical pathways or the establishment of a medical informatics department. Increased transparency of data, more rigorously defined clinical pathways, and improved controlling and planning may have led to shifts of power and organisational structure in these hospitals. 55% of the hospitals reported a significant impact on task and job descriptions. ICT will not simply replace paper-based tasks, but facilitate task fulfilment and eventually modify some of the tasks themselves.

The interviewees also said that they expect **high future impacts of ICT** particularly on accounting and management. A possible interpretation for accounting is that ICT can improve the availability and systematisation of cost data from different medical departments – data that today remain scattered and unsystematic. The predicted impact on management may be related to the complexity of hospitals' organisation and the multiplicity of medical departments. Hospital information systems that enable and require

the sharing of data across medical departments may lead to a shift of power from the departments to central management. More comprehensive and detailed cost data, provided by ICT may enable improved planning and tighter controlling.

Impact at industry level

Although the majority of European hospitals are public, there is considerable competition in the sector – among hospitals, and between hospitals and primary care providers. ICT can influence this competition. For example, more than half of the hospitals in the e-Business Survey 2006 stated that competition in the sector increased due to ICT. 40% said that the fact that "competitors do it" is a driver of ICT use. In many European countries it may be politically desirable to reduce the number of beds per inhabitant, the number of employees and wards per hospital, or even the number of hospitals, in order to contain costs while improving the quality of care.

2.10.5 Policy implications

ICT and e-business use always require investment in technology and human resources, and a cascade of related decisions. Health policymakers may have direct or indirect influence on investment decisions and thus e-business use in hospitals – public hospitals in particular. They influence hospitals' investment through, for example, hospital-related legislation, regional health-care provision plans, or their membership of hospital boards. Consequently, some of the policy implications described here affect hospital management.

Fostering interoperability

In order to facilitate the integration of separate information systems in hospitals, health policy makers should increase awareness about interoperability issues in e-health. They should actively promote and facilitate interoperability by appropriate investments in the work of standardisation organisations and their standardisation efforts. Voluntary use of standards by hospitals and other health service providers could contribute significantly to interoperability.

Enhancing ICT investment

Improvements in ICT applications in hospitals can come about only if hospitals invest adequately in these technologies. Hospitals should carefully plan ICT spending in the near future, and also develop long-term strategic ICT plans. They should not necessarily expect quick returns on ICT investment. Many hospitals lack the investment capabilities as well as human re-sources for a "great thrust" towards implementation of comprehensive ICT applications. A step-by-step investment approach appears more appropriate.

Improving education and training in health ICT

Effective use of ICT in hospitals requires adequate education of the users, e.g. physicians, nurses, and pharmacists as well as administrative staff. In particular, there appears to be a need for training of hospital Chief Information Officers and Chief Executive Officers, as the e-Business Survey 2006 found that ICT is expected to impact

heavily on hospital management in the future. Policymakers should accordingly aim to provide adequate education and training opportunities for hospital managers.

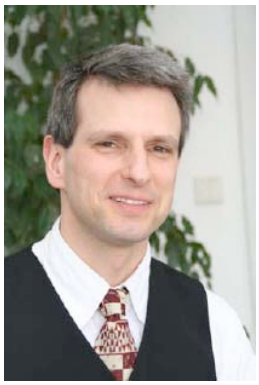
Ensuring data security

Hospitals need to be aware that security and privacy issues cannot be solved by purely technical means. A broad approach is needed, including a security policy, and organisational provisions such as security training.

Monitoring role changes

Health policy makers should thoroughly monitor the changing role of hospitals in order to drive desirable developments and to react to an undesirable developments. Relevant indicators to be monitored include shifts in size classes, in locations, and public or private ownership. The relationships of hospitals with patients, other hospitals, and primary health service providers should also be monitored.

The study author



Stefan Lilischkis is a project manager and consultant at empirica GmbH in Bonn (www.empirica.com). He has been involved in e-Business W@tch since 2002 and has authored studies for various sectors. Current involvement is, beside e-Business W@tch, with the EU-funded project eHealth ERA (www.ehealth-era.org). In 2004 he was also in charge of the e-health part of an impact assessment study for the European Commission. He holds a diploma in economics from the University of Cologne and a doctoral degree in economics from the Ruhr University Bochum.

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Part 3: e-Business Statements by Experts from Policy, Industry and Research

Introduction

During its five-year life cycle, *e-Business W@tch* has cooperated, at both formal and informal levels, with distinguished professionals and selected experts from the policy-making, the business and research communities. They have all contributed significantly to the works of this initiative as members of the *e-Business W@tch* Advisory Boards, with their comments, suggestions, participation at workshops and their ideas.

We are grateful to all of them and decided that they should also have the floor in this last edition of the current *e-Business W@tch* annual report. Therefore, as in previous editions of the European e-Business Report, we invited these distinguished colleagues to present their work in e-business related topics in their organisation or company in a brief contribution to this report.

Furthermore, we invited members of the eBSN Steering Group[54] to present their activities, recognising the success of the eBSN and its valuable contribution to e-business developments in Europe.

In total, invitations were sent by e-mail to about 80 people. We received 17 statements in response and would like to thank all contributors for taking the time, in particular since our invitation came on rather short notice. Statements reflect policy, industry as well as research perspectives on e-business and are well balanced in terms of their geographic distribution.

Potential contributors were asked to address three questions in their statement. First, they should briefly describe what "e-business" meant to their company or organisation today, i.e. how it was an issue in their current work; second, what they considered to be the main ICT-related opportunities and/or challenges for enterprises (in their industry, or in general); and third, to point out some issues they expect to become important for their work in the near future.

We grouped the received statements into three categories, namely policymakers, company and industry representatives, and researchers. Within each category, statements are presented in alphabetical order (sorted by the name of the author).

The first category (see Section 3.1) is quite diverse in itself, including contributions from e-business policymakers as well as from persons representing organisations and intermediaries which maintain close links to policy. This reflects that the design and

[54] The Steering Group of the e-Business Support Network consists of about 40 members, representing all EU Member States, Candidate and EEA Countries as well as e-business experts from international organisations. See www.e-bsn.org.

implementation of e-business related policies requires intensive cooperation of many actors, including governments, business intermediaries (e.g. innovation and competence centres), social partners (e.g. chambers of commerce), standardisation organisations, business advisors and regional development agencies. The statements are examples of activities in Austria, Canada, Norway and Portugal, as well as of standardisation work at the European and international level.

The second group (see Section 3.2) features statements from company and industry perspectives. The focus is on statements from persons who work in companies which produce products and provide services that are essential for e-business (computers, e-health applications, telecommunications, e-payment services). The statement from ETOA (the European Tour Operators Organisation), for example, confirms the massive impact of the internet on the tourism industry, saying that "*the internet is fast becoming the principal channel through which the travel product is sold.*"

The third group of statements presents research perspectives on e-business. The contributions do not only show how European universities and specialised institutes address relevant research questions, but also that they play an active role in the implementation of concrete, practical e-business initiatives in their countries (see, for example, the statements by Professors Doukidis, Gricar and Noci).

Last but not least, we are grateful to Graham Vickery for his statement on behalf of the OECD, which we have also included in the "research" category. The OECD has been a pioneer in defining "e-commerce" and "e-business" for monitoring purposes, and in preparing guidelines for an international approach in this context. *e-Business W@tch* has been a user of these definitions and guidelines from the start and actively participated in OECD working groups on these issues.

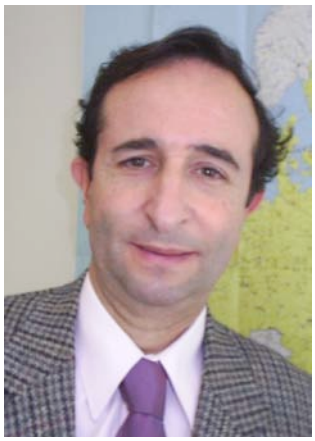
Over the past five years, networking and debate with international experts has become increasingly important for the work of *e-Business W@tch.* The statements in this chapter are an illustrative sample of this networking experience. We hope that this cooperation will be continued and even intensified in the framework of the new "Sectoral e-Business Watch", which has taken up its work at the beginning of 2007.

The editors

Georgios Karageorgos
European Commission,
DG Enterprise and Industry

Hannes Selhofer
empirica GmbH

3.1 Policy perspectives, statements from business intermediaries and standardisation organisations



e-Business Perspective

José António Feu:

The *e*-Economy in Portugal

José António Feu is Director of the Business Competitiveness Service in the Directorate General for Enterprise, Ministry for Economy and Innovation. An industrial chemical engineer, and a civil servant since 1973, he has worked in departments related to chemical and pharmaceutical products and Portuguese industry. He is the national delegate to the e-Business Support Network (eBSN) of the European Commission's DG Enterprise and Industry.

What "e-business" means for us today

By the end of 2004, the structure of the Directorate General for Enterprise in the Portuguese Ministry for Economy and Innovation, newly established under Decree-Law n.º 4/2004, of 19 February, was being modified, with the integration of a Business Competitiveness Service, currently part of the Ministry. The new service is intended to give the information society, the e-economy, e-business and information and communication technologies the prominence they deserve as key factors for the competitiveness of industry, trade and services, and for the global economy as a whole.

For this reason it was felt that participation in the eBSN Steering Group was an important step to give dynamism to these issues in Portugal, along with wide diffusion of the eBSN Portal, since its content is of great importance, not only in its technical content, but also as a tool for international dissemination of e-business good practices.

Where we see ICT-related opportunities and challenges

For us, ICT dissemination and uptake by entrepreneurs is a key condition for improving the competitiveness of the economy. As a first step, we aimed to promote the participation of three organisations in the eBSN members:

- IAPMEI – Institute for Small and Medium Enterprises and Investment Support (e-mail: info@iapmei.pt; web: www.iapmei.pt)
- NERSANT – Santarém Region Enterprises Centre (e-mail: dsci@mail.nersant.pt; web: www.nersant.pt)
- SILICON – Electronics and Telematics. (e-mail: silicon@silicon-et.pt; web: www.silicon-et.pt)

Subsequently, a national eBSN contacts' network has been implemented, aimed at integrating the main Portuguese stakeholders on these issues, involving public administration departments responsible for e-business regulation, promotion and support, associations representing the ICT industry, business intermediaries and other organisations that could support ICT uptake among SMEs. Since 2005, new organisations have joined; nowadays the national eBSN contacts' network also includes:

Sector	Organisation	Contact (e-mail / website)
Public administration	**UMIC** – Knowledge Society Agency	E: umic@umic.pcm.gov.pt W: www.umic.pt
	AdI – Innovation Agency	E: adi@adi.pt; W: www.adi.pt
	INETI – National Institute for Engineering, Technology and Innovation	E: info@mail.ineti.pt; geral@ineti.pt W: www.ineti.pt
	ANACOM – National Communications Authority	E: pca@anacom.pt W: www.anacom.pt
Associations	**ACEP** – e-Commerce Association in Portugal	E: acep@portugalacep.org W: www.portugalacep.org
	APDSI – Association for the Information Society Promotion and Development	E: secretariado@apdsi.pt W: www.apdsi.pt
	APMP – Association for the Multimedia Promotion in Portugal	E: geral@apmp.pt; W: www.apmp.pt
	ANIMEE – Portuguese Association for the Electric and Electronic Sector Enterprises	E: animee@mail.telepac.pt W: www.animee.pt
	ANETIE – National Association for Information and Electronic Technologies Enterprises	E: info@anetie.pt W: www.anetie.pt; www.portugalhightech.com
Enterprises	**SPI** – Portuguese Innovation Society	E: spiporto@spi.pt W: www.spi.pt
	IDC Portugal	E: portugal@idc.com W: www.idc.pt

When important information needs to be disseminated, this network is extended to other organisations, including AIP (Portuguese Industry Association), AEP (Entrepreneurial Association of Portugal), CCP (Trade and Services Confederation of Portugal), CIP (Portuguese Industry Confederation), the National Euro Info Centres Network (10 EIC) and the National IRC Network (3 IRC).

The way forward: issues we will have to deal with in the future

The information society is a priority for the Portuguese Government, in line with the Lisbon Strategy and expressed in the National Action Programme for Growth and Jobs (PNACE) 2005-2008. Within the XVII Constitutional Government Programme too, promoting the information society has been considered one of the main priorities.

Within the National Technology Plan, in line with strategic undertakings to create a favourable environment for business, some measures have already been implemented, such as “Enterprise in one hour”, “Brand in one hour”, “Enterprise online”, “e-Invoicing”, “Notary actions simplification”, “Industrial Property online”, “Business community *webisation*”, and “Diário da República online” (free online access to the national official journal). Given the importance of this issue, the Portuguese Presidency of the EU in the second half of 2007 is to organise a Conference “ICT Uptake for SMEs Competitiveness” in Lisbon on 13 November. The event will address ICT production, uptake and promotion on the supply and demand side, EU and national good practices, Intellectual Property Rights, and training. An eBSN Steering Group meeting is planned for 12 November 2007.

e-Business Perspective

Barbara Gatti:

e-Business Perspectives in European Standardisation

Barbara Gatti is Programme Manager in CEN's Pre-Standards Department, dealing with Workshops and Focus Groups in e-business and e-health.

What "e-business" means for us today

ISSS (Information Society Standardization System) refers to standards work in ICT applications within the European Committee for Standardization (CEN). e-Business standards issues are a core activity of CEN/ISSS, which hosts several working groups on e-business standards issues and is constantly monitoring developments in this field. Currently the main focus is on interoperability of e-business standards, ebXML, and electronic invoicing.

The eBES Workshop is the European entry point to the UN/CEFACT standards process, on traditional electronic data interchange (EDI) and ebXML standards. The Workshop on electronic invoicing aims at helping industry to comply with the EU Directive on e-invoices.

The e-Business Interoperability Forum (eBIF) serves as a strategic focal point in Europe on standards related issues, linking to similar activities in Europe and in other parts of the world. eBIF has constantly monitored the *eBusiness W@tch* activity, has contributed to it – in particular for the 2005 *e-Business W@tch* Study on "Standardisation and interoperability" – and is disseminating information on sectoral reports to its members.

CEN/ISSS is a "user" signatory to a global Memorandum of Understanding on e-business standards, drawn up by international organisations (ISO, ITU, IEC, UN/CEFACT).

Where we see ICT-related opportunities and challenges

There are opportunities and challenges in the context of globalisation, standards proliferation, technology convergence, IPRs, EU policy and funds. Standards in the ICT sector need to be global: but European industry and governments need to make their voice heard at international level. A preferred channel to achieve this is through the European Standards Organisations (ESOs: CEN, CENELEC and ETSI).

There are many actors in standards development: industry consortia, international organisations, associations, etc. A process of convergence has started, driven by the need to reduce the number of sometimes overlapping initiatives/standards. CEN/ISSS activities guarantee neutrality, participation of users, SMEs and other actors which may not be sufficiently visible in industry consortia.

The availability of standards is an issue for adoption and widespread take-up of ICT – so IPRs and use of standards by the market are critical issues for the ESOs.

The European Commission is currently revising its policy in ICT standardisation – which will have an impact on the way the ESOs work.

The European Commission is currently in the process of revising its policy in ICT standardisation – a revision of this policy will have an impact on the way the ESOs work.

Interaction between standards and research is another main challenge: the European Commission's new framework programme for research and development will be launched in 2007 and is a good opportunity to try to develop a stronger link.

The way forward: issues we will have to deal with in the future

The e-business Roadmap describes the key e-business standards issues for 2006-2008.[55] The Roadmap identifies five strategic aspects in e-business standardisation:

- to ensure the framework for cross-border interoperability in e-business;
- to define rules for e-content maintenance and interoperability;
- to ascertain that e-business frameworks and standards specifically meet European requirements at all levels;
- to enable users to trust their trading partners and their e-business systems;
- to give support for interoperable reference implementations as building blocks for solid, affordable solutions and to allow demonstration of use of open interfaces and testing.

Horizontal measures – support to SMEs, awareness of e-business standards issues and take-up actions at sector level – are needed to enable and support the implementation of strategic actions.

[55] Published by CEN in July 2006, available online at www.cen.eu/isss.

e-Business Perspective

Roald Magne Johannessen:

The BIT Programme in Norway: Innovative Business Developments With New Technology

Roald Magne Johannessen is Manager for the BIT Programme owned by Innovation Norway, which is a governmental organisation. Innovation Norway's objective is to promote, throughout the country, business development which is profitable both in private and socio-economic terms, and to help districts and regions to exploit commercial opportunities by encouraging innovation, internationalisation and image-building.

What "e-business" means for us today

The BIT Programme is the national e-business programme of Innovation Norway and the Ministry of Trade and Industry. Its roots are in the early 1990s, when there was focus on ICT in a few business sectors. In 1997 these projects were formalised as a national e-business initiative, and called the BIT Programme.

The main objective is to increase the competitiveness and profitability of small and medium-sized companies through developing, implementing and distributing general IT solutions for specific trades – an objective made possible through close collaboration between companies, software suppliers and trade organisations.

From 2001 the focus has moved to value-chain projects, including several leading business sectors in Norway. In these projects, competence-building, changes of business processes, and organisational development are major challenges. Integration of systems based on open international standards is extremely important.

The BIT Program is a market-and user-driven innovation e-business programme created with the objective of developing and improving internal and external business processes for SMEs in vital sectors, in order to improve the competitive strength at national and international levels.

The Norwegian business community has great need of research and development projects that are both market-driven and user-driven. Such collaborative projects create a basis for better competence, for attaining common goals, and for distributing solutions among a great number of companies. The projects have resulted in proven benefits for the participating companies, and are an important initiative to ensure competitiveness for Norwegian SMEs in domestic and international markets.

Produce and work smarter

Norway is a country with one of the world's highest level of costs, and depends on having one of the world's most competitive business communities. Based on the ability to incorporate know-how, quality and design into the products and services produced, Norwegians must be able to manufacture, distribute and sell products in a smart fashion. To ensure competitiveness over time, companies must keep on developing new advantages at a rate similar to or better than the competition.

Where we see ICT-related opportunities and challenges

The value-chain projects run shared activities on a sector level. Such activities form a basis for projects within each participating company, by providing business models, know-how, standards and IT solutions. These in turn provide the foundation for connecting the company's value chain. External initiative is crucial to achieving shared development in a sector, intended to promote collaboration between competitors on high-risk activities that cannot be assigned to a single company. In Norway, Innovation Norway has a very important role in this work.

Through collaborative projects like the BIT Programme, several Norwegian business sectors have developed an advantageous position compared to other countries, based on successful collaboration at the sector level as well as at the branch and company levels. More than ever, today's main challenge is the development of business concepts, not just for each company but for the entire value chain around it. The greatest profits from improved efficiency may be made in the value chain, the level of service and access to markets may be increased through better product information and efficient logistics solutions.

The way forward: issues we will have to deal with in the future

By offering customers better informational logistics (electronic product information and business information), an added product - an increase in value - is created, providing improved competitiveness for the company. The market demands better informational logistics, and experience shows that businesses offering such a service have a competitive advantage. In international markets, such logistics services are highly valued, and they give Norwegian companies an important competitive edge.

e-Business Perspective

Gerhard Laga:

e-Business Perspectives in Austria – Activities of the Chamber of Commerce

Dr. Gerhard Laga studied law at the University of Vienna and obtained his PhD for work on internet law in Austria. Since May 2004 he has been head of unit of the so called “E-Center”, which is coordinating all e-activities of the Austrian Federal Economic Chamber.

What "e-business" means for us today

The Austrian Federal Economic Chamber (WKO) is the key actor in addressing business awareness in ICT. Our information and awareness programmes are centred around the so called E-Day (every year on the 1st of March) and the TELEFIT road-shows. Since 1997 these road-shows have visited some 50 cities in the Austrian provinces and attracted some 5,500 visitors per year, particularly business-owners from small and medium-sized enterprises (all together: more than 30,000 SMEs visited a TELEFIT road-show).

Another cornerstone activity is the promotion of the Austrian e-commerce trust mark, which has led to the European e-commerce trust mark “Euro-Label”. The trust mark is awarded to companies which distinguish themselves through serious business transactions and customer-friendliness going beyond the minimum legal requirements. Euro-Label represents a harmonised set of national e-shopping principles and operates at both European and national level. Euro-Label provides a key enabling mechanism to support e-commerce. Euro-Label will build consumer trust in e-commerce all over Europe. It will increase sales online. The Euro-Label trust mark is supported by the European Commission, by associations representing industry, and by consumer protection organisations (represented by the Euro-Label national partners).

Our standardisation platform AUSTRIAPRO has developed the Austrian e-billing standard ebinterface. The development of the standard was funded by the Austrian Ministry of Economics and Labour and is becoming the reference application in e-billing. WKO also represents the commercial sector at "platform digital Austria", the Austrian e-government platform

Where we see ICT-related opportunities and challenges

The integration of e-business processes e.g. connecting a webshop with ERP-software, e-billing and e-procurement, is increasingly becoming a key success factor not only for big companies but also for SMEs in Austria.

At present, e-billing is the main topic for WKO. The seamless integration of e-billing data into electronic accounting and banking systems can lead to great savings. In addition, only recently, and as a response to WKO’s intervention with the Ministry of Finance, a

number of problems and uncertainties have been resolved and clarified in relation to the long-term validity of digital signatures and auditing procedures for electronic invoices from the Austrian tax authorities.

Furthermore, SME interest should also be developed in examining how ICT can change and streamline internal and external business processes.

Austrian SMEs still underestimate the huge potential for using technology to connect with their customers. An increase is needed in high-quality e-content, which remains limited to providing basic information instead of creating extra value through elaborate digital content. Enhancing IT-security and tackling spam will also feature on the agenda for the next few years.

The way forward: issues we will have to deal with in the future

In our view, the current EU Directive on spam and its implementation in Austria in the business-to-business environment does not strike an adequate balance between the ability to market products and the users' right to protection from unsolicited e-mails. It seriously impedes the use of electronic networks and creates an important competitive disadvantage for start-ups and SMEs on the Austrian and European market. The problem of spam cannot be solved by legislative measures alone, but must be tackled by a combination of instruments, with the main focus on self-regulation by network providers.

The lifelong learning component in e-Learning programmes may not alone be sufficient to address the macro-economic challenges of an aging population or, more importantly, issues of labour market flexibility in the later stages of career. Better monitoring of ICT skills across a wider range of workplace skills and occupations is needed to design and co-ordinate policy measures and will also help to avoid gaps, especially for older workers.

European companies experience particular challenges, as declining birth rates and support for pensioners in Europe require organisations to consider increasing retirement ages and providing opportunities for older workers who want to continue working. The skills gap left by retirees cannot be filled by younger workers because they do not have the tenure and 'on the job' experience. Supporting different working styles will, however, drive productivity and worker capabilities.

e-Business Perspective

Gilles Morin:

Export Development Canada

Gilles Morin is Vice-President IT Business Services at EDC (Export Development Canada). EDC is Canada's Export Credit Agency serving 6,700 Canadian exporters through its financial services (credit insurance, working capital, bonding, foreign buyer financing and equity). EDC supports nearly CAN$60 billion in trade volume annually.

What "e-business" means for us today

At Export Development Canada (EDC), ICT and e-business are critical enablers of our top corporate strategies and a key component of our new "Go to market" business model. EDC has reorganised its operations to focus on supply chain driven financial services and on customer/market centric services delivery. This new business model is enabled through three key IT strategic pillars: CRM/Portal, enhancement of the existing Business Intelligence capabilities (Data Warehouse-business analytics) and growth of e-Trade capabilities (electronic point of sales, e-trade products/services).

Over the last five years EDC's e-business status has evolved from the standing of a side line – "Let's experiment!" – to becoming a "critical service delivery and strategic business development lever". In 2006, EDC's overall e-business portfolio includes 21 IT/business investment projects. Some of the key e-business initiatives include building a portal management framework and strategy, building our brokers' and bankers' portal prototypes, delivering new e-products/services like Express Claim and online Contract Insurance & Bonding, incubating a new Global Trade Management Innovation Centre and developing knowledge management (KM) tools such as our country portal. In 2006, three key APEC countries have sponsored EDC to lead a qualitative and exploratory study on the impacts of the integration of supply chains on innovation in e-trade finance, which will help us to focus on some new growth plays.

The *e-Business W@tch* sector reports have played a major role in how EDC views and approaches e-business strategically. First, it provided us with a baseline and very comprehensive material, delivering the only longitudinal multiyear study that we are aware of that defined the impacts of e-business on key sectors and European countries.

Secondly, it gave us the "fuel" to raise awareness and step up the urgency status of e-business within our corporation. The studies clearly showed how e-business and ICT investments have increased drastically over the years and their importance in transforming certain supply chains (transportation, ICT, light manufacturing etc.).

Lastly, it helped us to create excitement that allowed us to focus key resources in understanding further the potential impacts of these major changes on trade finance, and to identify future e-business strategic and tactical opportunities to help Canadian businesses in their continuing struggle to stay competitive.

Where we see ICT-related opportunities and challenges

ICT and e-Business bring many new strategic and tactical opportunities to EDC. First, the CRM business strategy will enable us to deliver more market and customer value by proactively meeting needs, addressing critical market gaps, and gaining valuable channel-customer/market and services insights to help us step up our value creation capabilities. CRM will also help us bring appropriate visibility into our overall customer and market performance, a critical cornerstone of our new business model.

Secondly, part of the success of our new business model depends on how well we execute our portal strategy, and how we reposition our web channel distribution strategy within our overall corporate multi-channel strategy. We see multiple opportunities in building key transactional and informational portals aimed at key trade services intermediaries such as banks and brokers. The KM – portal strategy will also provide us with capabilities to share critical market knowledge between different key audiences (i.e. employees, exporters, customers, banks). Our portal infrastructure has been built and we are now in the process of validating our business model. We also think that the portal strategy will enable us to increase our system delivery agility and will allow us to enhance our overall value offering to the SMEs. For instance, Express Claim allows us to process low value claims electronically and much more efficiently while saving time and money to our customers.

Obviously, EDC faces key challenges which are mostly focused around our ability to execute our three key ICT and e-business strategies in the context of a very dynamic market landscape driven by the acceleration of the integration of supply chains.

The way forward: issues we will have to deal with in the future

As EDC pushes its development into the supply chain arena, it faces numerous challenges, particularly concerning the positioning of its offering within the emerging electronic trade platforms developed by banks, large buyers, non-banks (ASP-Software), power trading houses, governments and logistics companies. The use of ICT and e-business in the world trade value chain is increasing mainly to address and eliminate trade process inefficiencies (taking costs out). This provides new opportunities for traditional trade services providers to change their business model (banks as Application Service Provider (ASP), logistics as financial services providers, large buyers and power trading houses as global trade services providers and bankers, or simply realign their existing business model to maintain their value creation equation.

For EDC, ICT and e-business will provide exciting new opportunities to address widening market gaps in the areas of non-trade finance products and services and technological products.

e-Business Perspective

Freek Posthumus:

The Work of UEAPME and NORMAPME – Advocating the Needs of SMEs

Freek Posthumus is Chairman of the Pan-European Network for ICT and eBusiness for SMEs (PIN-SME).

What "e-business" means for us

UEAPME and NORMAPME have participated actively in the policy and standardisation of ICT and e-business as seen from the specific angle of the SMEs. Representing around 12 million of the 23 million SMEs in Europe in 33 countries, we have a wide variety of ICT users in our membership.

Our policy has been focused on promoting the development of systems and solutions that are suitable for those small enterprises, but that still offer the flexibility and performance to work with large companies' and governments' computerised systems. Using computers and ICT to run the business is one of the best ways to optimise the internal processes and the cost of processes for large corporations, and the trend to e-government tools goes the same way. The key to success in SMEs is to offer them solutions that allow them to save time, cost and manpower by using computers.

As the eBSN Impact Assessment Report of September 2005 said: "*The importance of SMEs to the EU economy means that the Lisbon objective, that aims to make Europe the most dynamic and competitive knowledge-based economy in the world by 2010, cannot be achieved without the full engagement of SMEs in the digital economy. However, to fully engage them in e-business has proved difficult: main barriers are the relatively high level of investment in ICT needed, the lack of technical and managerial skills and their scarce readiness to network with other enterprises. As a result, a large number of SMEs remain reluctant to use advanced forms of e-business, which go beyond being connected to the Internet and having their own website. As policies move on to promote more sophisticated usage of e-business into the regular business practices, the definition of e-business policy objectives and appropriate quantitative and qualitative targets becomes more difficult, but at the same time also more pertinent.*"

In this respect the ICT Task Force was an important initiative, as debated below. The fact that less than 50% of SMEs give their personnel formal ICT training shows how important it is to engage in such new policies.

UEAPME and NORMAPME have tried to gather the SME partners around the table. We have to recognise that ICT uptake among SMEs has occurred mainly within small IT-SMEs and business associations that have engaged in providing education and information support to their local SMEs. In June 2006 the Pan-European Network for ICT and eBusiness for SMEs (PIN-SME) was founded. It aims to be a platform where SMEs can meet and exchange their experiences and seek better ways of cooperating in this

challenging ICT world. It aims at providing a home for the 350,000 IT-SMEs in Europe. We hope with PIN-SME to provide support to the European Commission's efforts to promote ICT and e-business uptake in the SME sector, such as the eBSN initiative and the FP7 research programmes.

Every year we look forward to the new results of the *e-Business W@tch* study as it gives an assessment of where we are. Again this year the subjects have been challenging and the information is interesting.

The way forward: issues we will have to deal with in the future

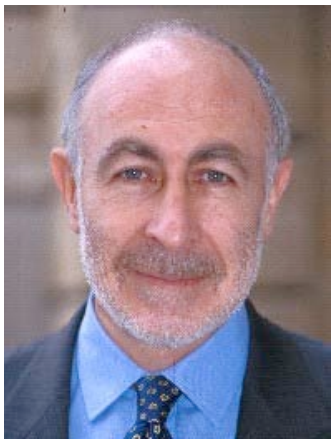
This is a very important year, as the ICT Task Force initiated by DG-Enterprise and Industry and DG Information Society and Media has delivered a stakeholder assessment of where ICT stands and what Europe should do. PIN-SME and UEAPME participated actively and SMEs received serious attention in the final report. For SMEs, the five main conclusions of importance were:

- the recognition of the need for a specific approach to reinforce SMEs in the IT sector and users,
- the need for this is demonstrated by the insufficient uptake of ICT and less than 50% employees with a formal training,
- the need to get better programmes for SMEs in four e-business areas: information, uptake, R&D and innovation policies, and skills development,
- that IPR must not be a barrier to innovation for SMEs,
- the importance of good standards and high interoperability as a help to SMEs to interact with bigger partners in business and government.

What SMEs do not see, they will not take. So we need to spend resources on that. Our top three recommendations to the policymakers were:

1. Promote ICT uptake by wide dissemination of ICT benefits to SMEs
2. Recognise the importance of concrete and practical programmes that can be easily adopted by SMEs, taking into account their current status in ICT; promote the creation and exchange of programmes.
3. Provide practical and economical solutions to SMEs in IPR, and optimum interoperability for big and small actors in the European market

We expect that policymakers will take these recommendations seriously; in fact, the many conferences in the field (such as IST-2006 or the recent e-BSN workshops) show their interest. We look forward to the debate over how to provide SME organisations like UEAPME and PIN-SME with the means to realise these goals. We hope that future *e-Business W@tch* reports will show that progress has been achieved.



e-Business Perspective

Graham Vickery:

e-Business Policy from an International Perspective – Work of the OECD

Graham Vickery is head of the Information Economy Unit, Directorate for Science, Technology and Industry, Organisation for Economic Co-operation and Development (OECD) responsible for activities on e-business, digital content, international sourcing, ICT skills and employment and the *OECD Information Technology Outlook*.

What "e-business" means for us today

The OECD has been undertaking a wide range of analysis directly and indirectly focusing on e-business. We have produced an in-depth report on e-Business Developments for the *OECD Information Technology Outlook 2004* and a range of e-business related studies on logistics and transport and online payment systems. We have also produced a series of studies of the transformation of media and publishing industries as they increasingly digitise their activities and adopt strategies for online development, coordination, delivery of and access to their products. Policies on technology diffusion to businesses, organisational change, and business demonstration programmes are regularly analysed as part of surveys of ICT policy developments in OECD countries.

In addition the OECD has been developing e-business measurement methods and new metrics as part of the "OECD Model Survey of ICT use by businesses". These model surveys are used widely in OECD countries. For example they are used by Eurostat as the basis for official surveys by European National Statistical Offices to measure business uptake and use of ICT in general. Some aspects of e-business have been included after testing by Statistics Canada for e-business processes in the areas of marketing and customer relations, sales, purchases, logistics, and financial and human resource management.

All of these activities are designed to improve measurement, develop new analytical insights, and ultimately to improve policy development, implementation and impacts.

Where we see ICT-related opportunities and challenges

The main ICT-related opportunities in the economy are in the areas of internet-related applications and development of new services, for example in Linux servers, storage (driven by consumer demand for digital music, films and photographs) and new portable business/consumer products and displays. These are being underpinned by the high and increasing R&D intensity of ICT development and by a shift towards more user-oriented business strategies and products. Further opportunities are coming from the effective doubling of the world labour force, with the increasing integration of China, India, Eastern Europe and Russia into the world economy and their rising production and supply of

goods and services – including ICT – and the development of their domestic markets with a rapidly increasing and steadily more affluent middle class.

OECD countries have to develop strategies for the long-term management of these competitive challenges. OECD surveys and analyses show that policies in OECD countries are placing more emphasis on R&D programmes, innovation networks, technology diffusion to business, government online, ICT skills and employment, digital content, enhancing competition in ICT markets including communications network markets, various aspects of IPRs, and underpinning economic development with rapid rollout of broadband infrastructure and applications (see *OECD Information Technology Outlook 2006)*. Questions remain over whether these policies are enough, and whether they are being applied efficiently to bring long-term economic and social benefits.

The way forward: issues we will have to deal with in the future

Key ICT-related issues relate to increasing R&D and, more importantly, translating these inputs via innovation into new and improved goods and services, and into new firms, jobs and economic growth. In the European context this is related to improving the supply of venture capital and risk capital to finance new ventures, increasing product market competition to encourage new entry, and raising skills and increasing labour market flexibility to encourage improved resources allocation to promising areas.

All of these areas are complex and heterogeneous across countries and economic activities and need better measurement and analysis to allow intelligent policy to be effectively implemented in support of economic restructuring and growth.

3.2 Company and industry perspectives

e-Business Perspective

P.G.L. Potgieser:

Equens – A Full Service Provider of Payments and Card Processing Services

ir. P.G.L. Potgieser is a consultant to the Board of Directors. As such he participates in various national and international bodies that deal with formulating and applying standards. He is chairman of the 'Netherlands Board on E-business, Standardisation' (NeBES), and the CEN/ISSS 'eBusiness Interoperability Forum', which operates from Brussels. He also represents the Netherlands in ISO-TC68 'Banking and Financial Services'.

What "e-business" means for us today

Equens is one of Europe's largest and most innovative payment service providers, leading the market for payments and card processing with SEPA[56]-compliant services. Our modular portfolio is complete, customisable and highly competitive, thus catering for a borderless payments market on a pan-European scale. As a full-service provider Equens offers a wide range of payments and card processing services, ready for the Europe of tomorrow where payments are borderless and ease-of-use has no bounds.

Payments support business. Innovation and development in the way business is done, the paradigm shift from *'bricks and mortar'* towards *'bits and information exchange'*, i.e. from business to e-business, is inescapable. It is completely logical that this shift induces developments in the way payments are initiated and processed and that these developments keep in step with each other. SEPA is an example of this.

With the SEPA, the European Commission (EC) and the European Central Bank (ECB) expect to create a dynamic and efficient European market for electronic payments. Such a market allows substantial economies of scale, to the benefit of all agents in the payments landscape and the European economy as a whole. The supporting systems (infrastructures) are to deliver an important part of the benefits intended by the introduction of SEPA.

The SEPA goals imply seamless, timely and cost-efficient processing of electronic giro payments to and from every payment account within the SEPA. This also includes transfers made to accounts outside the customer or participant base covered directly by the executing payment institution or processor, hence involving two or more parties in succession. This is where 'reachability' and 'interoperability' for payments have their centre of gravity.

Equens will be SEPA compliant as from January 2008, allowing its customers to benefit from the tremendous opportunities that SEPA and the euro-domestic market offer. This

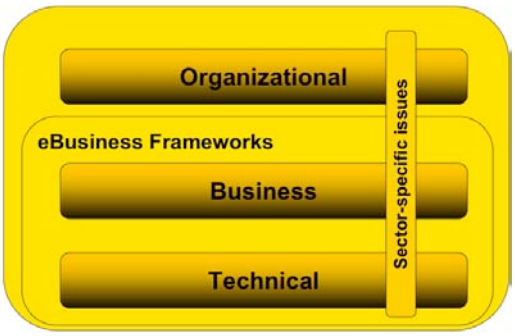
[56] SEPA stands for 'Single Euro Payment Area'

mission implies that Equens is closely involved in payment related developments, as well as the e-business aspects these support.

Where we see ICT-related opportunities and challenges

Interoperability is central to establishing e-business. The goal of interoperability is to allow information to be presented in a consistent manner between business systems, regardless of technology, application or platform. Interoperability thus provides organisations with the ability to transfer and use information across multiple technologies and systems by creating commonality in the way that business systems share information and processes across organisational boundaries.

We identify three basic levels of interoperability: The first is *technical interoperability*, which consists of the common methods and shared services for the communication, storage, processing and presentation of data. This includes the technical foundations for a secure environment, compatible technical standards and a common framework, i.e. (in payment terms) the ability to be systematically and consistently accessible to other payment institutions and processors. The second is *semantic- or business interoperability*, which includes discovery and collaboration aspects, including workflow and decision-making transactions. A third layer is *organisational interoperability*. Sector-specific issues can cut through the entire stack.



On a societal and political level, too, interoperability is a key challenge for enhancing the European information society. i2010, the strategic action plan of the European Commission, rightly presents interoperability as a prerequisite for "devices and platforms that 'talk to one another' and services that are portable from platform to platform". Standardisation initiatives have an especially vital role in catalysing the development of interoperable solutions since they provide an open environment based on consensus as opposed to proprietary technology and/or dominant position(s).

Open standards, i.e. those without proprietary or market-limiting ownership, guarantee that no single market participant or group can shield the market. There should not be any restriction in the use of the standards to any party or to the combination of participants wanting to cooperate for payment-processing purposes.

The way forward: issues we will have to deal with in the future

There are many perspectives on interoperability, for e-services and specifically e-business. including e-payments. Those include technical (e.g. solutions for interoperability), but also business perspectives. Developing e-business solutions that address the concerns of the market is primarily a commercial issue, but one where the frameworks need to be right to allow for interoperable solutions to be developed. Conditions also need to exist to ensure that all sections of the business community, both sector-wise and size-wise, have the opportunity to reap the benefits of interoperability.

e-Business Perspective

Brigitte Preissl:

Deutsche Telekom – e-Business Activities in the Telecommunications Industry[57]

Dr. Brigitte Preissl is Senior Economist at Deutsche Telekom, Company Headquarters, Corporate Academic Relations.

What "e-business" means for us today

e-Business offers our company many possibilities to develop innovative service schemes and to realise better performance. There are two main aims: improving customer contact, and cost savings on the input as well as on the output side. In addition, a comprehensive intranet-based administration system streamlines personnel management, travel cost management and compliance measures.

A good example of an e-business application which saves costs and provides excellent opportunities for customer service is online bill payments. In addition to the fact that this procedure facilitates billing by omitting cost-intensive mailing, and provides interactive opportunities for customer contact, it also has an ecological effect, saving the paper that would otherwise be used for printing the bills. Internally, an interesting application has been developed for training. It allows online teaching sessions for all or groups of employees with direct feedback. This system is used, for example, to train all employees in the adoption of relevant laws and regulations, for example, the new German Antidiscrimination Law or Data Protection rules.

I have read the *e-Business W@tch* sector report of 2006 on our industry. It shows that very large companies face different challenges from smaller firms in implementing e-business. Problems that are major barriers for smaller companies are not an issue for larger firms, while others that smaller companies can resolve fairly easily can be a real challenge for larger firms. Barriers for smaller firms mainly concern technical problems; for larger firms, the problems include the organisational change which is required in shifting business operations from traditional communications to integrated internet-based solutions. It might therefore be useful to give more attention to the larger users. Even if they show impressive results in diffusion, considerable efforts are needed for successful implementation and efficient use of e-business systems.

The organisational hiccups and failures are not shown in the indicators traditionally used to document 'e-business success'. It might also be interesting to observe the organisational changes involved in full exploitation of e-business, as they are likely to differ widely between different industries, small and large firms, between e-business adoptions and between early users and latecomers.

Reflecting on e-business solutions in the telecommunications sector identifies another shortcoming of the current e-Business W@tch format. It is almost impossible to separate

[57] The statements made in this contribution are those of the author. They do not necessarily correspond with those of Deutsche Telekom.

the service business of providing phone calls from the sale of a product such as Speedport 500, a DSL router. Therefore, it does not make sense – as in many other sectors – to exclude service industries from the analysis. To sell a book via the internet is a very traditional and basic e-business application – as is the purchase of office desks. The real dynamics of e-business markets lie in services sectors, such as the financial sector, the media industry or information and business consulting firms and their unlimited variety of business models. Thus, I strongly recommend putting much more emphasis on service sectors and their e-business activity.

Where we see ICT-related opportunities and challenges

The ordering of Deutsche Telekom services can be handled fully online. A major challenge for the coming years will be the integration of the different business branches: combined offers of fixed network telephony, mobile services and broadband data services (including TV programmes) seem to be the business model of the future. This integration of business procedures requires comprehensive organisational changes to induce co-operation in a seamless system among service providers that until now acted largely in isolation. A company the size of Deutsche Telekom can meet the challenge of converging service offers by exploiting the technical possibilities of advanced communication systems; but the management challenge remains at the organisational and marketing levels. The growing importance of bundled services will be accelerated by the shift to new all-IP communication platforms with a wide range of new e-business opportunities, especially in the media and entertainment sector, which will then be barely distinguishable from the telecommunications sector.

In order to offer bundled services online it will not suffice to simply use the old e-business systems. An integration is necessary of the customer interfaces of the three companies: T-Online (merged with T-Com in summer 2006), T-Com and T-Mobile. The addition of media services to the bundle will require co-operation with media producers and distributors who have their own e-business systems. Technical problems of standardisation and billing will be matched by regulatory questions about network access, network safety, copyright, media regulation and content control. The availability of mobile internet will provide interesting new e-business applications. Once the technical problems typical of the infant stage of a brand new technology have been overcome, mobile internet will have a strong positive impact on mobile e-business.

The way forward: issues we will have to deal with in the future

One of the main problems that Deutsche Telekom will have to deal with is the regulation of IP networks. No concepts exist so far and the dynamics of technological and business developments can be hampered by regulatory barriers. e-Business-based business models for next generation networks will become difficult to realise if there are no viable solutions for media regulation in an international all-IP scenario, and if safety problems (including fraud, copyright infringements and privacy issues) cannot be resolved. Net neutrality and its implications for internet development will be one of the coming battlefields with an uncertain outcome.

e-Business Perspective

Joseph Reger:

Fujitsu Siemens Computers – Deploying e-Business Across the Whole Value Chain

Dr. Joseph Reger is Chief Technology & Chief Strategy Officer at Fujitsu Siemens Computers.

What "e-business" means for us today

At Fujitsu Siemens Computers, we deploy e-business and ICT-enabled tools and methods across our whole value chain: On the procurement side, for example, we utilize e-auctions, while our internal logistics processes are facilitated by web-based tools. Finally, the contact to our customers is strongly governed by e-business and ICT, be it via EDI connections to selected partners, via our e-procurement interface open to any customer, or via telesales. Of course, our web presence plays an essential role in our dialogue with our customers: it is a place where they can find out about us, while we can better understand their needs.

The IT business is fast-moving and highly price-driven. e-business helps companies to excel in a business environment with these characteristics by speeding up processes and at the same time enhancing their efficiency. This is why the deployment of the appropriate methods is so vital to our business.

Where we see ICT-related opportunities and challenges

As already indicated above, one of the most important opportunities for us is to continuously improve the relationship with our customers via e-business. In the ideal case, this results in a win-win scenario, e.g. improved efficiency for both parties involved. This happens when we take advantage of open standards to closely link our processes to those of our business customers - for example, if an order carried out via our e-procurement is automatically registered in our customer's ERP system.

An interesting challenge that we are currently facing is the continuous change of the IT market landscape induced by the fact that e-business enables the emergence of new business models. With the introduction of the iPod, Apple moved away from being primarily a provider of hardware to become a company focused on media solutions. If you think further along this example, it becomes clear that we may even have to face the entry of new players to "our" market, which link their original product, e.g. content, to IT by deploying e-business. That may change the rules of the game substantially. But, of course, hidden in a challenge is always an opportunity.

The way forward: issues we will have to deal with in the future

Given the strong relevance of e-business based tools and methods mentioned in the beginning, new developments in this area are very important to us. Service-Oriented Architectures (SOA) are certainly among these. First, SOA will enable new opportunities for further improving the efficiency of collaboration with our customers by linking our processes even more closely and more flexibly . Secondly, as an IT platform provider, we need to be able to supply our customers with the hardware and software they need to implement SOA. Our concept of the Dynamic Data Center (DDC) will provide us with a powerful basis to address our customers requirements in this area, and we already have first solutions available.

Other future issues related to e-business and ICT comprise mobility, security, universal broadband, and customer empowerment.

e-Business Perspective

Marcel Swennenhuis:

Agfa Healthcare – Exploiting e-Opportunities in the Health Sector

Marcel Swennenhuis is Global Head of Marketing,
Agfa Healthcare IT Division.

What "e-business" means for us today

Within Agfa Healthcare we are developing and implementing ICT and e-business solutions for our customers: health-care institutions all over the world.

The healthcare world is undergoing continuous change in which the use of information and communication technologies are making possible new ways of handling diagnostic and treatment processes within the healthcare enterprise. Starting from manual/paper-driven environments, many healthcare institutes have implemented first steps towards ICT through departmental solutions, for instance automating the radiology department within a hospital. Healthcare processes however cross boundaries between department and institutions. For instance, when referring physicians order a radiological examination, the following steps have to be taken:

- Referring physician issuing a request, including background information
- The examination needs to be scheduled, checking equipment and personnel availability
- The patient needs to be informed about the time/date of the examination and about special preparations
- The examination will be executed
- The radiologist will have to perform the diagnosis, and create a written report
- The report will have to be sent to the referring physician

This relatively simple example can take easily several days to a week in a paper-based world, even if all the radiological equipment is available. In the world of e-business, the radiology department can offer online scheduling facilities, allowing the referring physician to plan the examination interactively with the patient.

After the examination, the report is produced electronically within hours and automatically forwarded to the referring physician, often with electronic copies (or access to) the radiological images. The radiology department is moving to a stronger service model in which optimal provision of information and service (fast report turnaround time) to the referring physician become key performance parameters. The radiological business is

turning into e-business. Many other examples exist, including electronic outsourcing of diagnostic services to other radiologists and/or countries.

Where we see ICT-related opportunities and challenges

The key opportunities in e-business for health-care lie in the integration of total care-processes across the continuum of care, both inside hospitals as well as between hospitals and other health-related institutions. In order to enable this there are many technical challenges to overcome such as:

- The creation of electronic patient records accessible for all institutes
- The definition and adoption of standards to allow for the communication between the different systems
- Implementation of secure solutions, preventing the misuse of patient information, whilst at the same time supporting optimal care

The way forward: issues we will have to deal with in the future

The adoption rate of solutions for health-care is very much dependent on financial and reimbursement models. These models differ by region and country and require specific approaches for each model.

Countries with a centralised financial model for health-care (such as the UK and Canada) are driving the ambitious adoption of country-wide electronic patient records with much ambition. Countries with more decentralised models see more and faster institution-oriented initiatives. However the ownership of the integral health-care process is less clearly defined, causing delays and discussions in the adoption rate of care solutions over the continuum of care.

Finally, health-care processes are generally less strictly defined than many business processes, due to the continuously changing and improving medical insights. There is a trend towards “evidence-based medicine”, through which “best practices” are gathered. The practices will form the basis for the definition of optimal care processes. This trend will require extensive research and effort for many years to come.

e-Business Perspective

Rachel Tym:

Trends in eTourism

Rachel Tym is Director of Strategy and Ecommerce. She deals with the issues and decisions made at European and local levels that affect the running of members' business, and is the primary contact person for technology-related matters.

What "e-business" means for us today

The internet is fast becoming the principal channel through which the travel product is sold. So for our industry, “e-business” means selling our product through user-friendly and technologically advanced websites. Indeed, several of our members use this channel exclusively.

The *e-Business W@tch* sector report of 2006 highlighted the fact that tourism is strongest by far on customer facing ICT solutions. This is absolutely the case. Money spent on good customer facing solutions is generally speaking a far better investment than back-office systems in our industry, if a choice is necessary. Travel accounts for almost 6% of all internet traffic and travel products represent 33% of all online transactions. It is therefore understandable that our industry invests heavily in customer facing solutions.

Where we see ICT-related opportunities and challenges

Some of the old challenges still remain, such as the need for a clear online presence thought organic Search Engine Optimisation (SEO), and increasing traffic to company websites via an efficient Pay-Per-Click (PPC) advertising campaign. In addition, increased price transparency of online packages means consumers expect to know prices of individual components, which is not a model that many tour operators work on.

Regarding internal operations, the cleaning and maintenance of databases has become more important than previously, because many of these databases are visible to consumers online. Similarly, ensuring continued protection of data and financial transactions is crucial to our industry if consumers are to keep trusting the internet as a safe booking channel. Many companies have many partners, each one with its own interface for data entry, meaning many extranets need to be updated daily. Management of this is a difficult problem for tour operators and their suppliers. Adapting legacy systems still presents a challenge for many companies. Most businesses in our sector are SMEs who do not have the necessary ICT capability in-house to cope with these demands.

The prevalence of broad band connections in the home has meant that high-resolution brochure content can now be made available online. This enables tour operators to experiment with product offerings they may not previously have been able to sell because

of the risk association with expensive brochure space. The speed of the internet also means that new product can be brought to market much more quickly than before.

Business-to-business transactions increasingly take place online, so operators are now able to work with partners that geography would have previously made impossible.

The way forward: issues we will have to deal with in the future

The emergence of Consumer-to-Consumer (C2C) and peer review sites will be both an opportunity and a challenge for ETOA members. It will become increasingly important to have a strategy for managing company presence on such sites, to monitor both good and bad reviews of products. These sites also represent a great opportunity to generate new sales, and to drive traffic to our members' websites.

Dealing with online transactions in markets where credit card penetration is low or cards are not widely used will be another challenge for our industry. These markets want to buy online, but national legislation or local customs make it difficult for them.

As customers expect to be able to buy increasingly complex products online, the development of ever more sophisticated databases is sure to follow. Companies will need to adapt their platforms to cope with them.

Internally, we will probably see some consolidation in terms of interfaces with partners, so there may be some training issues as new business-to-business technology emerges.

Lastly, the usual challenge of keeping up with the pace of change will always be there.

3.3 Research and consulting perspectives

e-Business Perspective

Prof. Georgios Doukidis:

e-Business and Supply Chain Integration - Perspectives from Greece

Georgios Doukidis is Professor in Information Systems in the Department of Management Science and Technology at the Athens University of Economics and Business (AUEB). He is the founder and director of the E-Business Research Center of AUEB (ELTRUN), which is one of the largest European Business Schools, with 35 full-time researchers, specialising in e-commerce, digital TV, knowledge management, supply-chain management, e-business models, digital marketing and I.S. management.

What "e-business" means for us today

ELTRUN is the E-Business Centre of the Athens University of Economics and Business, involved in various research, consulting and training activities in the field of e-business. ELTRUN has successfully completed more than 30 international research projects in R&D in recent years. ELTRUN is also involved in activities to increase awareness in the fields of e-commerce and e-business. For us, e-business spans a wide spectrum of research and business fields, including:

- Supply chain integration and interoperable system links, enabling new collaborative business processes and the provision of innovative services to the end consumers.
- Integration of alternative channels supporting the provision of e-services and offering advanced consumer experiences, including the classic web, mobile, digital TV and pervasive environments.
- New business models based on the concept of electronic services, intermediation and application service provision (ASP) both in a business-to-business and in a business-to-consumer environment.
- The seamless connection of systems and objects based on unique item identification, automatic data capture and sensor techniques, leading to the integration of the digital and the physical world and creating a wealth of opportunities for advanced data analysis and knowledge capture.

In this context, the research work of ELTRUN aims to:

- Study the impact of new e-business technologies and electronic services on business performance metrics as well as on customer satisfaction and consumer behaviour.
- Design and implement innovative information systems enabling various aspects of e-business, including system integration and business process optimisation, using state-of-the-art information technologies.

- Study and evaluate the effects of collaborative relationships in the supply chain and understand the motives and patterns behind the adoption of e-business initiatives from an inter-disciplinary perspective.

Where we see ICT-related opportunities and challenges

e-Business today is probably the main lever for enhancing consumer and customer experience, on the one hand, and achieving process efficiency and cost optimisation, on the other.

Companies increasingly understand the importance of advancing their customer offerings in order to move from simply satisfied to enthused customers. This move cannot be achieved by a company alone. Nor can it be based on advanced marketing and sales techniques. It requires smart integration with supply chain partners. For example, the food sector today needs to ensure food quality and traceability along the supply chain in order to satisfy the increasing consumer concerns over food safety. At the same time, intelligent systems and pervasive technologies need to be employed to simplify the shopping experience and save consumers money and time.

From a cost perspective, e-business technologies present today serious opportunities for process automation and cost reduction along the supply chain, with the technology of Radio Frequency Identification (RFID) being the most representative. Furthermore, seamless system integration and interoperability is now moving from being a vision to becoming a reality, employing web-services technologies and service-oriented computing.

We further see the emergence of a new industry of electronic services, combining technical capabilities with business knowledge focused on specific sectors and fields, leading to a progressive shift in power from the traditional software business to new market entrants. The service offering of this new industry spans all the typical business functions, from supporting e-learning and human-resource management, to sales, marketing and supply-chain management.

The way forward: issues we will have to deal with in the future

Nevertheless, a major challenge remains in making these opportunities exploitable by all the small and medium-sized enterprises and achieving the critical mass required to reshape the business landscape. There are many business-related, cultural and policy issues that play a critical role in this context and e-business research centres of excellence should explore them and provide concrete directions.

In addition, technology should be seen as an enabler that can lead to advances only if existing processes are redesigned, new practices are employed and the business mentality changes. Pilot testing and proof-of-concept is still required in many fields for the business impact to be demonstrated. Successful implementation examples, best-practice dissemination, and access to new knowledge and technology are probably basic prerequisites towards this direction.

e-Business Perspective

Jesús Galván Ruiz:

INGEFOR S.L. – Studying e-Business Developments in Spain

Jesús Galván Ruiz is Prof. Dr. Eng. In Telecommunications and General Manager of INGEFOR S.L., a small consulting firm in telecommunications, e-business and training.

What "e-business" means for us today

We have recently been involved in several studies concerning the development of e-business in Spain, including:

- A sequence of surveys of the performance of e-business of companies that have been supported financially by the Ministry of Industry in the development of different e-business initiatives, to determine the internet presence of these initiatives.
- Macroeconomic effects of e-business support activities using an input-output methodology, aiming to identify the future effects of public investment in these support activities.
- Identification of new ways for the Spanish government to support e-business activities among SMEs.
- A forthcoming book about e-government, due to appear in early 2007, and supported by a private foundation.

To deal with these issues we use all kinds of secondary information. One of the preferred sources has been the full set of studies developed within the *e-Business W@tch* initiative. They provide fresh data that are often more helpful than official sources.

Where we see ICT-related opportunities and challenges

We feel that the main issue nowadays in relation with ICT and e-business, from the point of view of companies, is to be aware of the potential uses of these technologies, and of whether each individual company can use them. This is still the case, despite the insistence among specialists and salespeople that attention must be focused further ahead. For SMEs, the problem can still be stated as follows:

- What is out there that is new and interesting for me?
- How can I incorporate it in my own business?
- How much do I need to change internally to adopt the new tools?
- Who will do it reliably for me?
- Who will maintain it afterwards?

- How much will it cost?
- Will it pay back?

Returning to the basics will always make us touch the ground.

The way forward: issues we will have to deal with in the future

Among the several future challenges in e-business, we feel that one of the most important is to identify how we can really solve REAL problems.

Getting on-line is very nice. However, if the same effect can be achieved by sending an SMS, that is simple and straightforward. Sometimes it seems as if institutions and researchers are acting as sales forces for hardware and software suppliers. The nature of most e-business indicators suggests a certain bias, implying that companies and institutions can be considered as “modern” only if they comply with certain behaviour patters.

But tools are there only to solve problems: Trading is the problem, not the tool used to achieve it. Nobody should think that we can push companies in southern countries to exchange the direct relation with the customers (which is a cultural tradition) for a website, however sophisticated it might be. The essential challenge is to sell in the most convenient way for both buyer and seller.

e-Business Perspective

Prof. Joze Gricar:

Slovenia's eSMEs Initiative – Experimenting in a Cross-Border Environment

Joze Gricar is Professor & eCenter Director at the Faculty of Organizational Sciences, University of Maribor, Slovenia.

What "e-business" means for us today

At the recent eBSN Workshop in Oulu[58], information on the "Slovenia's eSMEs Initiative" was presented. Its aim is to activate ICT providers, SME support networks, government organisations and universities to cooperate and to enhance the use of new e-business solutions in SMEs. The effort will focus on SMEs in Slovenia, but with a cross-border business perspective. The initiative aims to create an environment for the e-collaboration of all parties involved, so as to support SMEs in e-business adoption.

The direction of the Slovenia's eSMEs Initiative is in line with the "*Helsinki Manifesto: We have to move fast before it is too late*", announced on November 20, 2006. Out of 12 of the most supported measures, four are related to a big-picture perspective of e-invoicing implementation. In this context, we consider the implementation of a European Network of Living Labs (www.OpenLivingLabs.eu), a user-centric platform for products and services in co-creation processes, as very important. The network was launched in Helsinki on November 20, 2006 under the Finnish EU Presidency.

The "Living Lab" approach

The Living Labs have an important role to play in transferring technology and knowledge innovation to the business environment. They can accelerate the implementation of e-business solutions in SMEs.

Living Labs are a form of public-private cooperation aiming to generate and test new services, businesses, markets and technologies in everyday surroundings. They enable SMEs to experiment in a close-to-real-life environment, allowing them to express their expectations and comment on proposed solutions.

It is expected that the eLivingLab, Kranj, Slovenia (www.eLivingLab.org) will experiment cross-border e-invoicing in cooperation with the related stakeholder in the emerging e-region of neighbouring countries: Austria, Croatia, Hungary, Germany, and Italy.

A major advantage is the possibility of building on positive experience with the e-payments implemented in recent years. As can be seen today, e-payments may be

[58] "eBusiness solutions for SMEs", 7-8 December 2006, see www.ouka.fi/ebsn.

considered the first wave of massive e-transactions. The second wave will be e-invoicing. It will be followed by the third wave – massive e-ordering. However, these three waves may be considered the components of something bigger – upcoming e-purchasing, one of the priorities of e-government in the EU by 2010.

As it is for Slovenia, it may be important for every country to be proactive in the e-invoicing movement and to engage in cross-border e-transactions with neighbours. In November 2005, the "Slovenia's eInvoicing Initiative in the eRegion" was launched by companies, municipalities, banks, government organisations, ICT providers, and universities (http://www.eLivingLab.org/Invoicing). From the geographical point of view, the e-region consists of organisations linked by e-technologies from nearby countries in a radius of up to 500 kilometres around the observation point.

The way forward: issues we will have to deal with in the future

The development of cross-border e-regions is strategically important for all countries of the EU. The level of introduced telecommunication technologies and e-solutions allows for accelerated development and intensified links with organisations in neighbouring countries. e-Invoicing may be a practical and easy-to-understand case with a high impact on the general spread of e-business solutions in SMEs.

As Mag. Andrej Vizjak, Minister of Economy of Slovenia, stressed in his opening speech at the 2006 Bled eConference (www.BledConference.org): "*The development of the e-region is beneficial for Slovenia's development. We can offer it as a tangible example of e-cooperation among countries situated in a certain geographical area of the European Union in order to increase the competitiveness of each of the participating countries and the e-region as a whole*".

Besides the Living Labs' involvement in accelerating the uptake of e-invoicing in the e-region, its measurement may be critical. So far, experiences of using this concept are limited to prototyping with a limited cooperation of researchers, developers and users.[59] *e-Business W@tch* could support related experience and collection and dissemination of cases, in combination with conferences and workshops.[60]

Creation of the new contents, services and business models leads to growth and employment. The era of "e-business solutions" is coming now, based on integrated ICT solutions, secure web services and "collaboration tools" that increase productivity. The new development shows that there will be an increase of application of ICT in business in the coming years. The working environment needs to be adjusted accordingly, by means of an effective use of ICT in the workplace and adjustable organisation of secure and high quality work. Particular attention should be paid to e-business solutions for SMEs.

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[59] See for example, Gricar, Lenart, Pucihar: *e-Business W@tch* Reports as a Resource in Student Projects – a Slovenian Case Study. The European e-Business Report 2004, 3rd Synthesis Report. European Commission, Enterprise Directorate General, September 2004, pp 223-225; www.ebusiness-watch.org/resources/synthesis.htm.

[60] For example, ePrototype Bazaar: The Undergraduate and Graduate Students Prototype Presentation: www.BledConference.org/ePrototypeBazaar, or The Merkur Day, annual Undergraduate and Graduate Students eConference, Merkur Ltd., Trade and Services, Naklo, Slovenia, http://eCenter.FOV.Uni-Mb.si/MerkurDay.

e-Business Perspective

Prof. Arturas Kaklauskas:

Vilnius Gediminas Technical University –Department of Construction Economics and Real Estate Management

Prof. PhD. DrSc. Arturas Kaklauskas is Chairman of the Department of Construction Economics and Real Estate Management and Vice-director of the Institute of Internet and Intelligent Technologies.

What "e-business" means for us today

The Department of Construction Economics and Real Estate Management (CEREM) at Vilnius Gediminas Technical University (VGTU) is committed to developing Intelligent Tutoring Systems (ITS), e-business, knowledge, device-based and web-based decision support systems for real-world industrial applications in sectors such as urban planning, construction, real estate, refurbishment, facilities management, international trade, and ethics. CEREM has participated in 20 European, USA and Asia project (including four grants in the EU's FP5, and four grants in FP6) in these fields.

ITS developed by CEREM are able to search and find useful material, carry out multivariant optional module design and multiple criteria analysis, and select the most rational study material alternatives according to students' demands. ITS dynamically adapt learning content to objectives, needs, and preferences of a learner by making use of his or her expertise in instructional methods and the subject to be taught.

Most construction and real estate e-business systems aim to identify how to make the most economically effective decisions. Construction and real estate alternatives have to be evaluated not only from the economic perspective, but must also take into consideration qualitative, technical, technological, environmental and other characteristics. Based on an analysis of the construction and real estate e-business systems, CEREM has developed these e-business and web-based intelligent systems with an emphasis on multiple criteria analysis.

As a member of the *e-Business W@tch* Advisory Board, I had the opportunity to contribute to the sector study on the construction Industry. The study authors conclude that ICT have an increasing importance in our industry. I can only confirm this, from our own experience.

Where we see ICT-related opportunities and challenges

A major opportunity which e-business creates for universities is in students' and learners' study process and services. High quality students' and learners' study process and service are increasingly becoming key success factors in our university. Students' and learners' expectations have increased hugely over recent years, for example with regard

to development of mini curricula that are adapted to individual student's/learner's needs. ITS can significantly support this objective.

Integration of knowledge-based, devices-based, multimedia, voice analysis, intelligent and other systems are important challenges for the construction and real estate sector. The integrated knowledge, device-based and voice analysis-based decision support systems developed in CEREM include different functions: creating and maintaining customers' personalized objectives, preferences, and evaluation criteria; participation of distinct stakeholders in joint determination of criteria-defining alternatives; market signalling; providing device-based data; searching for alternatives and constructing an initial negotiation table of alternatives identified, completing a multiple criteria analysis (calculation of utility degree, priority and market value) of alternatives, conducting electronic negotiations based on real calculations, determining the most rational variant, etc.

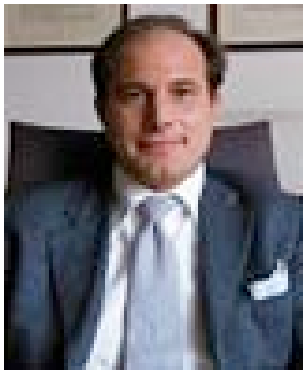
The way forward: issues we will have to deal with in the future

Construction ICT, e-business and intelligent systems can be used at national, organisation, and project levels. At the national level, they may be used to disseminate and analyse the information on laws, norms, standards, technical issues, the results of research, contract offers, or foreign experience. It makes it possible to find and analyse the required data quickly and from various perspectives, as well as allowing effective communication between interested parties for making important decisions at a distance.

On the organisational level ICT, e-business and intelligent systems may be used to acquire, process and analyse data on financing and investment possibilities as well as on real estate, government-provided services, producers and their products, etc. For example, organisations using telecommunication networks and ICT have the possibility to search, analyse and negotiate for the most suitable suppliers and contractors, and to take advantage of the best market offers. ICT also provides opportunities for e-learning and life-long learning. For example, a recent European survey (Hassan and McCaffer, 2002) has highlighted the need for electronic sharing of information between Large Scale Engineering (LSE) clients' information systems and those of funding bodies in the areas of finance and accounting; consultants in the areas of modelling and calculations; project managers in the areas of project planning and QA systems and document control; contractors in areas of CAD drawings, materials procurement, project planning, QA systems and documents monitoring, and communication systems; and suppliers in material procurement.

On the project level the use of ICT, e-business and intelligent systems allow all interested parties (i.e. designers, economists, architects, builders, facilities management personal) to contribute to solving problems across the entire life-span of a building (including brief, design, construction, maintenance, facilities management and demolition). Data bases and knowledge bases are being created embracing the data and knowledge obtained from previous similar projects as well as the experience of experts and the data contained in various norms, standards and other sources of information.

New technologies such as robot technologies or virtual construction environment also have an impact in the construction industry.



e-Business Perspective

Prof. Giuliano Noci:

Studying the ICT Impact on SMEs at the Politecnico di Milano

Giuliano Noci is full professor of Marketing at Politecnico di Milano, where he also chairs the Study Course in Management Engineering. At MIP – School of Management, he is the head of all international projects.

What "e-business" means for us today

ICT provide effective leverage to enhance organisational and managerial changes within companies. Over the last five years, we focused our research on understanding how ICT can improve the competitiveness of Italian SMEs and local public administrations, supporting them "in the field" in e-business and e-government projects.

More precisely, between 2001 and 2006:

- We conducted four principal projects aimed at facilitating the creation of e-business networks of SMEs in manufacturing industries: textile (www.textilebusiness.it and www.progettoicast.it), mechanical (progetto.metalc.it), furniture and nautical (www.artifiliere.it);
- we developed two important Italian e-government projects in Como and Brescia, using this experience to test successful integration between a local public administration and its suppliers, digitising the process of reception and management of invoices between public institutions and private corporations;
- we supported more than a hundred Italian SMEs to plan and develop effective e-business strategies – under the umbrella of our spin-off MetalC (www.metalc.it);

In all these activities, *e-Business W@tch* has been a fundamental reference both to better understand the changing environment and to help define our goals, using the sector study on the textile industry (2004) as best practice.

Where we see ICT-related opportunities and challenges

There are huge opportunities for SMEs of all countries and industries in devoting resources and investment to well-defined ICT strategies. The continuous development of ICT can enhance a company's efficiency and effectiveness on the market The spread of web service technologies for collaborations along the supply chain, and the rise of the web 2.0 paradigm, are two of the main streams that can create opportunities for SMEs too. Through these new technologies, companies can improve processes such as new product development, marketing, operations, supply chain management and after sales.

However, there are also serious challenges. The principal challenge is to make entrepreneurs aware of ICT-related opportunities and how to exploit them in line with individual corporate needs.

The way forward: issues we will have to deal with in the future

A key research question for the future of ICT and e-business related research is the "e-inclusion" of most European SMEs, even those defined as micro-enterprises.

In this respect, a crucial element will be the creation of a standard approach (which is, as far as possible, "industrialised") for the introduction of ICT-related solutions within SMEs. This will provide firms with a low-cost and easy-to-implement open solution for customisation and integration with other software solutions already available within the enterprise.

Many actors must be involved in this process: from ICT solution providers to public institutions and service providers which frequently interact with enterprises (such as banks). But SMEs themselves play the most important role since they must be really and deeply involved and listened. Probably, they will not speak about the latest ICT tools, but about specific and practical problems they need to solve in a flexible and cheap way.

e-Business Perspective

Ilias Vlachos:

Studying e-Business in the Food Industry: The Agricultural University Of Athens

Ilias Vlachos is lecturer in agribusiness management with research interests in e-business and its effect on company performance and growth.

What "e-business" means for us today

At the Agricultural University of Athens, we investigate the role of ICT and e-business in the food and beverages sector. Our research objectives are to examine the factors that influence the adoption of e-business applications, to track the current status and future trends of ICT and e-business in the Greek and EU food & beverages sectors, and to investigate how far e-business relates to company performance and growth. We also examine specific technologies such as web-based food traceability, auto-ID food products using RFID technologies. e-Government is also a motivator of small and medium enterprises to use e-business applications and increase the demand for e-business services.

The *e-Business W@tch* sector report of 2006 on the food & beverages industry includes a thorough investigation of key issues and technologies, increasing awareness of the potential of e-business applications in this industry.

Where we see ICT-related opportunities and challenges

The food & beverages sector presents many ICT-related opportunities that stem from the gap between what can be done and what has already been achieved. More specifically, food-related information is highly valued by consumers that want to know about the food they eat. However, the food sector is highly fragmented and characterised by numerous small and medium enterprises.

This creates an opportunity for more integration at B2B level. If this is combined with the lack of industry-specific software, one would expect more developments in this field. Further, there is still a need to link the primary sector, which suffers from lack of ICT infrastructure, with the food industry and retailing. Food retailers get their supplies from companies with certified food quality and safety, and this kind of information can be send electronically. The certification of food quality and safety can leverage the sales of small companies if they take advantage of B2C channels of distribution. e-Commerce can boost EU sales if it provides hard evidence of food quality and safety.

Furthermore, there is a need for management of huge volumes of data from diverse sources and in different formats, such as business transactions, devices that record temperatures, humidity, and RFID tags. The only way to manage these data is through e-

business applications and transforming business functions and processes from paper-based to electronic format.

The way forward: issues we will have to deal with in the future

e-Business is rapidly evolving and becoming part of everyday life. This affects the way people shop for food, get food information, and pay for it. The entire food supply chain from farm to fork is changing in terms of structure and efficiency. Firms' boundaries are also affected. How e-business affects the food supply chain, B2B relationships, firms' performance, firms' growth and firms' boundaries all therefore merit study. Further, new technologies such as RFID can revolutionise to the way food is stored, transported, and sold. We expect food companies to adopt RFID for many reasons and we are currently investigating RFID and the fruits of its adoption.

Annex I: Glossary of Technical Terms

Term	Definition[61]
B2B	Business to Business. Electronic transactions between companies.
B2B e-marketplace	Electronic trading platforms on the internet where companies can sell and/or buy goods or services to/from other companies. They can be operated by a single buyer or seller or by a third party. Many marketplaces are industry-specific. Some marketplaces require registration and membership fees from companies that want to conduct trade on them.
B2C	Business to Consumer. Electronic transactions between companies and consumers.
Bandwidth	The physical characteristic of a telecommunications system that indicates the speed at which information can be transferred. In analogue systems, it is measured in cycles per second (Hertz), and in digital systems in binary bits per second. (Bit/s).
Broadband	High bandwidth internet access. In *e-Business W@tch* reports, broadband is defined as the capacity to transfer data at rates of 2 Mbit/s (megabits per second) or greater.
Channel	In communications, a physical or logical path allowing the transmission of information; the path connecting a data source and a receiver.
CRM	Customer Relationship Management. Software systems that promise the ability to synthesize data on customers' behaviour and needs and thus to provide a universal view of the customer.
Dial-up	The process of establishing a temporary connection (to the internet) via the switched telephone network.
Digital signature	An electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and to ensure that the original content of the message or document that has been sent is unchanged. Digital signature usually refers specifically to a cryptographic signature, either on a document, or on a lower-level data structure.
DRM	Digital rights management. DRM is a system of IT components and services, along with corresponding law, policies and business models, which strive to distribute and control intellectual property and its rights. Product authenticity, user charges, terms-of-use and expiration of rights are typical concerns of DRM.
DSL	Digital Subscriber Line. A family of technologies generically referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as "twisted copper pairs") into high-speed digital lines which can support advanced services. ADSL (Asymmetric Digital Subscriber Line), HDSL (High data rate Digital Subscriber Line) and VDSL (Very high data rate Digital Subscriber Line) are all variants of xDSL
e-Business	Electronic business. The *e-Business W@tch* uses the term "e-business" in the broad sense, relating both to external and to company-internal processes. This includes external communication and transaction functions, but also ICT-supported flows of information within the company, for example, between departments and subsidiaries.
ebXML	Electronic business using XML. A proven framework and unified set of internationally agreed upon technical specifications and common XML semantics designed to facilitate global trade.
e-Commerce	Electronic commerce. As distinct from the broader concept of e-business, e-commerce refers to external transactions in goods and services between companies (B2B), between companies and consumers (B2C), or between companies and governments (B2G) and may therefore be seen as a subgroup or component of e-business activities.

[61] Some of the definitions in this glossary are derived from or based on definitions suggested by Whatis?com, a leading online ICT encyclopaedia and learning centre. See http://whatis.techtarget.com.

EDI	Electronic Data Interchange. A way for unaffiliated companies to use networks to link their businesses by using a common technical standard for exchanging business data. While electronic mail between companies is common, electronic data interchange passes bigger bundles that replace large paper documents such as bills and contracts.
EDM	Electronic Document Management. The management of different kinds of documents in an enterprise using computer programmes and storage devices. An EDM system allows an enterprise and its users to create a document or capture a hard copy in electronic form, store, edit, print, process, and otherwise manage documents.
e-Invoicing	Electronic invoicing. A business-to-business transaction in which invoices are generated, delivered (and normally paid) electronically, replacing the equivalent traditional paper-based invoicing processes.
e-Learning	e-Learning means supporting training with learning material in electronic format, for example material that is available on the intranet or the internet. e-Learning applications can be used for ICT-related training, but also for sector-specific or even company-specific training content.
ERP	Enterprise Resource Planning. A software system that helps to integrate and cover all major business activities within a company, including product planning, parts purchasing, inventory management, order tracking, human resources and finance.
Extranet	A network using internet protocols that allows external organisations (for example customers or suppliers) access to selected internal data. Essentially it is an Intranet which gives external users restricted access (often password protected) to information through the firewall.
Firewall	A firewall is a set of related programmes that protects the resources of a private network from users from other networks. The term also refers to the security policy that is used with the programmes.
ICT	Information and communication technology. The term includes networks, computers, other data processing and transmitting equipment, and software. The application of ICT in business processes leads to e-business.
Information security	Measures taken to protect information systems against unauthorised use and attacks
Internet	The world's largest computer communication system, with an estimated 700 million users worldwide.[62] The internet is a loose confederation of principally academic and research computer networks. It is not a network but rather the interconnection of thousands of separate networks using a common language.
Interoperability	The technical features of a group of interconnected systems (including equipment owned and operated by the customer which is attached to the public telecommunication network) which ensure end-to-end provision of a given service in a consistent and predictable way.
Intranet	An internal internet, that is an internal network running using TCP/IP, which makes information available within the company. Most intranets are connected to the internet, and use firewalls to prevent unauthorised access.
ISDN	Integrated Services Digital Network. An international telecommunications standard for transmission of voice and data over dial-up lines running at 64 Kbit/s (kilobits per second). It allows sharing of multiple devices on a single line (for example, phone, computer, fax).
IT	Information technology. IT includes hardware (computers, other data processing and transmitting equipment) and software.
KM	Knowledge Management. ICT solutions that support enterprises in systematically gathering, organising, sharing, and analysing their knowledge in terms of resources, documents, and people skills. Knowledge management software typically involves data mining and some method of operation to push information to users.
LAN	Local Area Network. The most common way of connecting computers in a small area (typically inside a building) for sharing databases and communication facilities. The two most common versions are Ethernet and Token Ring. Implementation is based on coaxial cables or plain wires. Speed achieved ranges from 10 Mbps to 100 Mbps.

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

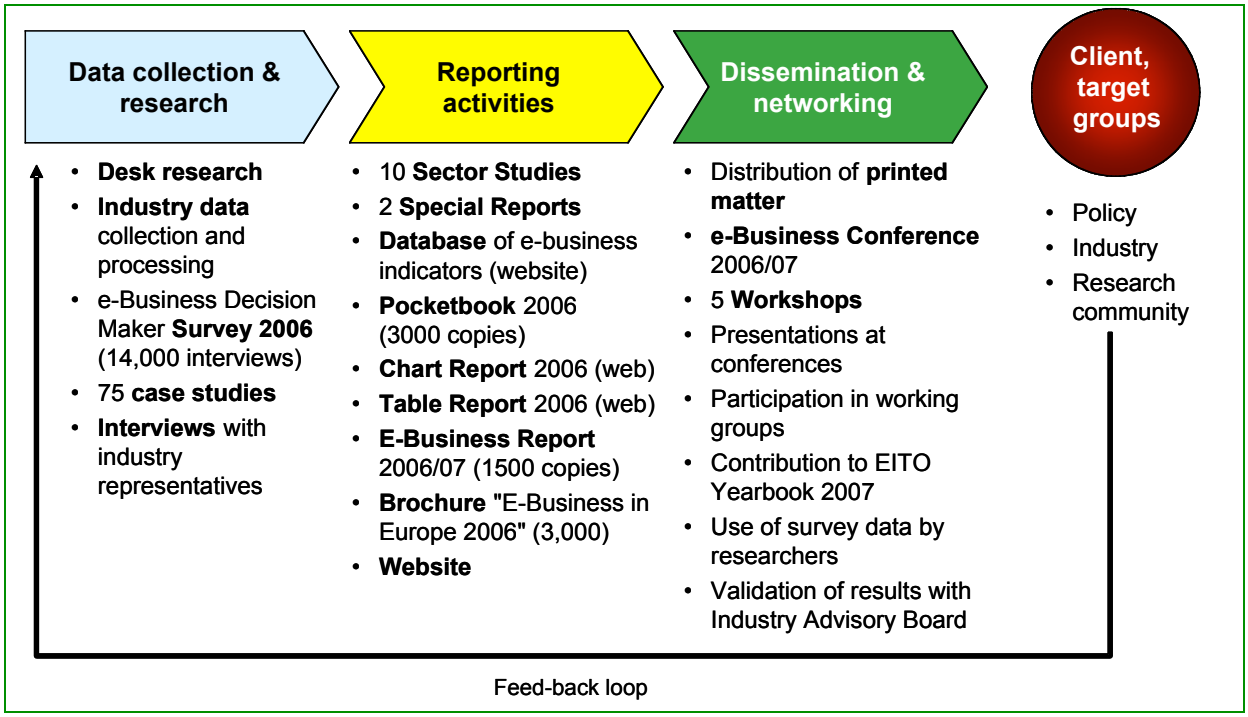
Leased line	A private communication channel leased from the common carrier. It is usually a dedicated fixed-route link (e.g. point-to-point frame relay).
m-Commerce	Mobile commerce. e-Commerce that takes place using mobile connection devices and through data transmission via technical standards for mobile communication.
Micro enterprise	A company with fewer than 10 employees.
Modem	Modulator/Demodulator. A device that modulates outgoing digital signals from a computer or other digital device to analogue signals suitable to be transmitted through a conventional telephone line (copper twisted pair telephone). The reverse procedure takes place for incoming signals.
MRO goods	Maintenance, repair and operating goods. Supplies which companies need to maintain their operations, for example office supplies, in contrast to "direct production goods" which are components of the goods and services the company produces.
OSS	Open source software refers to computer software under an open source license. An open-source license is a copyright license for software that makes the source code available and allows for modification and redistribution without having to pay the original author.
Processes	Business processes are operations that transform the state of an object or a person. This can, for example, be an order placed via the internet. Ordering an object or a service creates a liability for the supplier to deliver, and initiates the transfer of property rights from one entity to another. The electronic handling of processes is likely to speed them up and to introduce new processes in the realisation of the transaction.
PLM	Product lifecycle management. The process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service and disposal. PLM software helps companies to innovate effectively and efficiently, for example by managing descriptions and properties of a product, starting from conception and development.
Remote access	The ability of a company computer network's transmission points to gain access to a computer at a different location.
RFID	Radio Frequency Identification. A wireless technology which is used to uniquely identify an object, animal, or person. RFID is coming into increasing use in industry as an alternative to the bar code. The advantage of RFID is that it does not require direct contact or line-of-sight scanning.
SCM	Supply Chain Management. Software that helps businesses to match supply and demand through integrated and collaborative planning tools.
Sector	Sectors of the economy with comparable business activities. These constitute the main research unit of the *e-Business W@tch*. Aggregated information at the industry level is used to document the diffusion of activities within the industries as well as the overall importance of the observed phenomena for changes in the economy as a whole. The definition of sectors follows NACE Rev.1.1 classifications.
Secure server technology	Secure server technology means that data exchange between computers is based on certain technical standards or protocols, for example "Secure Sockets Layer" (SSL).
SME	Small and medium-sized enterprises with 0-249 employees. To be classified as an SME, an enterprise has to satisfy the criteria for the number of employees and one of two financial criteria, i.e. either the turnover total or the balance sheet total. In addition, it must be independent, which means less than 25% owned by one enterprise (or jointly by several enterprises) falling outside the definition of an SME or a micro-enterprise, whichever may apply.
SSL	Secure Sockets Layer. A commonly-used protocol for managing the security of a message transmission on the internet. SSL has recently been succeeded by Transport Layer Security (TLS), which is based on SSL.
Standard	A standard is a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory.
Transaction	Electronic transactions can be subdivided into several steps, each of which initiates a process. There are pre-sale (or pre-purchase) phases, sale and after-sale phases. Typically a transaction starts with information gathering, price and quality comparisons and possibly pre-sale negotiations. The sale phase includes contracting, delivery and payment. After-purchase transaction stages comprise customer service, the administration of credit payments and the handling of returns.

UMTS	Universal Mobile Telecommunications Service. A third-generation (3G) digital standard for mobile communication, enabling packet-based transmission of voice, text and video at data rates up to 2 megabits per second (Mbps).
Value added	Gross output minus intermediate inputs. It is valued at producers' prices and includes all indirect taxes, but excludes VAT and subsidies.
VoIP	Voice over Internet Protocol (IP). The use of telephony services over internet networks, by means of digitised voice transfer technology.
VPN	Virtual Private Network. A way to use a public telecommunication infrastructure, such as the internet, to provide remote offices or individual users with secure access to their organisation's network.
WAN	Wide Area Network. A network allowing the interconnection and intercommunication of a group of computers over a long distance.
WAP	Wireless Application Protocol. A communication protocol for delivering data over mobile telephone systems, allowing cellular phone sets and other mobile hand-set systems to access WWW pages and other wireless services.
Website	A related collection of World Wide Web files that includes a beginning file called a home page.
Wi-Fi	Wireless fidelity. A popular term for a high-frequency wireless local area network (W-LAN). Wi-Fi technology is rapidly gaining acceptance as an alternative or complementary infrastructure to a wired LAN.
W-LAN	Wireless Local Area Network. An implementation of a LAN with no physical wires, using wireless transmitters and receivers. It allows a mobile user to connect to a LAN or WAN through a wireless (radio) connection. A standard, IEEE 802.11, specifies the technologies for wireless LANs.
WWW	World Wide Web. The collection of pages in HTML format which reside on web-servers. Although WWW and the internet are different, the terms are increasingly becoming interchangeably used.
XML	Extensible Mark-up Language. A standard to describe the contents of a page or file. XML is a way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.

Annex II: *e-Business W@tch* Activities in 2006/07

This Annex summarises activities of *e-Business W@tch* in the period from November 2005 to January 2007.[63] The first part describes the main research activities, which include the e-Business Survey 2006 and the case study collection. The second part presents an overview of reports and other documents published by *e-Business W@tch* in 2006/07. The third part summarises the main dissemination and networking activities during this same period.

Exhibit A2-1: Research, reporting and dissemination activities of e-Business W@tch in 2006/07



A2.1 Research activities

The e-Business Survey 2006

Most of the data presented in *e-Business W@tch* sector studies and in this report are results of the e-Business Survey 2006, a decision-maker survey about the adoption of ICT and e-business among more than 14,000 European enterprises.[64] It was the fourth survey conducted by *e-Business W@tch*, after those of 2002, 2003 and 2005.

[63] *e-Business W@tch* is based on a contract between the European Commission, DG Enterprise and Industry, and empirica GmbH.

[64] See Annex III (Methodological Notes) for detailed information about the survey.

Case studies

In 2006, *e-Business W@tch* collected 75 case studies,[65] including examples from all sectors covered and from nearly all EU Member States, as well as from Croatia, Norway, Switzerland and the US. Case studies are examples of real-life e-business activity in firms from the sectors studied. Their objective is to complement the quantitative picture of e-business adoption from the e-Business Survey 2006, and to illustrate the impact of e-business activity on enterprises. Most of these examples of e-business activity have been published in the sector reports of 2006 and on the website. A synopsis of these case studies is presented in the first part of this report (see Section 1.11).

Industry statistics from secondary sources

Background data on the sectors covered (e.g. structural industry statistics, data on production value and turnover) are either based on statistics provided by the respective European industry federations or extracted from official statistical sources.

The main source for official statistics was the Eurostat New Cronos Database. New Cronos is structured in nine parts ("themes"). Most of the data used for the sector studies are derived from theme 4 "Industry, trade, and services", and from the collection sbs (structural business statistics). For the three ICT-related industries (ICT manufacturing, consumer electronics, telecommunications) statistics presented were prepared by DIW Berlin, which obtained the most recent data available from Eurostat in March 2006. Gaps in the official statistics resulting from missing data for individual countries or the respective year in the time-series of a country were filled by computations by DIW Berlin. The most recent official statistics available for industry-wide macro-economic indicators are those for 2003 or older.

A2.2 Publications of 2006/07

Sector Studies and Special Reports

The main publications of *e-Business W@tch* – apart from this report – are the e-business sector studies. In 2006, ten sectors were covered (see Annex III, "population"). In addition, *e-Business W@tch* published two cross-sector studies ("special reports") in 2006 on the following topics:

- The impact of ICT on corporate performance, productivity and employment
- The role of new companies in e-business innovation and diffusion

Sector studies are summarised in Part 2 of this report, the special reports in Part 1 (Sections 1.9 and 1.10) All studies can be downloaded in full from the website (www.ebusiness-watch.org, 'resources'). Printed copies are not available.

[65] The term "case study" normally implies a more detailed and in-depth analysis of a specific example. e-Business Activity Views presented by *e-Business W@tch* in sector studies have a scope of 2-4 pages on average. However, they have in common with more detailed case studies that results are mostly based on primary research, i.e. personal interviews with company representatives. Interviews were carried out either face-to-face or by telephone.

Synthesis publications

The main synthesis publications of *e-Business W@tch* in 2006/07 are the **e-Business Report** 2006/07, the **Pocketbook** of e-Business Indicators (2006 edition) and the **Brochure** "e-Business in Europe – 2006".

Printed copies of these publications can be ordered from *e-Business W@tch* or from DG Enterprise & Industry. In addition, a **Chart Report** and a **Table Report** which summarise the survey results are available in electronic format on the website (www.ebusiness-watch.org/resources/charttool.htm).

Website

The *e-Business W@tch* website (www.ebusiness-watch.org) was launched back in 2002. It was redesigned in 2006 in order to comply with the newly established online style guide of DG Enterprise and Industry. The site is the **main archive** of *e-Business W@tch*, providing users with free access to all publications and workshop proceedings available since the launch of the initiative. The website had about 23,000 visitors per month in 2006 (monthly average), up from about 13,000 in 2005.

A2.3 Dissemination and networking activities

Workshops and concluding conference

In 2006/07, *e-Business W@tch* organised **six workshops** and a concluding one-day conference to discuss findings with stakeholders from industry, policy and research. To this end, *e-Business W@tch* has actively sought cooperation with other organisations in arranging the workshops (e.g. the workshop on shipbuilding was organised as part of the SSA Conference in London).

The main objective of these workshops is to validate research findings (typically on the basis of interim reports). Proceedings from these events, and a synopsis of main results and conclusions from the discussion with participants, are available on the website at (www.ebusiness-watch.org/events/proceedings.htm).

Exhibit A2-2: e-Business W@tch Events in 2006/07

Date	Place	Event
24 Jan. 2006	Brussels	**Kick-off Workshop**: Discussion of the work programme for 2006 with stakeholders (sector selection, topics in focus)
12 May 2006	Malaga	**Workshop**: Hospital information system integration / ICT impact on hospitals. Seminar at the eHealth High Level Conference and Exhibition.
15 Jun. 2006	Brussels	**Workshop**: Convergence in High-Tech Industries: Implications for Industry and Policy
30 Jun. 2006	Brussels	**Workshop**: ICT and e-Business in the Construction Industry: Trends and implications for policy
22 Sep. 2006	Milan	**Workshop**: ICT and e-Business in the Footwear Industry
11 Oct. 2006	London	**Workshop**: ICT and e-Business in the Shipbuilding and Repair Industry. Held at the Shipbuilders & Shiprepairers Association (SSA) Conference 2006.
30 Jan. 2007	Brussels	**Conference**: *e-Business W@tch* Conference 2006/07: e-Business Impact on Firms and Industry Structure

The main event of this period was the **Conference "e-Business Impact on Firms and Industry Structure"**, which was held on 30 January 2007 in Brussels. This conference concluded five years' work of *e-Business W@tch*. The new "Sectoral e-Business Watch", which has started in early January 2007, is based on a new contract and will have a slightly different focus and approach.

Cooperation with the Advisory Board

To validate research findings, *e-Business W@tch* seeks regular exchange and debate with international experts on ICT, e-business and specific sectors. The Advisory Board of 2006 consisted of 20 industry representatives, researchers and business consultants. Board members made comments on reports, provided input to the research, and thus helped *e-Business W@tch* to identify the relevant trends and to set research priorities. Their services are gratefully recognised.

Exhibit A2-3: Advisory Board members of 2006

Advisory Board Member	Affiliation	Appointed for sector / expertise in	Country
Mr Martin Baker	Tor Consulting	Footwear industry	UK
Mr Dimitrios Buhalis	University of Surrey	Tourism	UK
Mr Jesús Galván	Schiller International University, Madrid	Telecom industry	Spain
Mr Markus Gratzer	Österreich Werbung	Tourism	Austria
Mr Tony Graziano	EICTA – European Information & Communications Technology Industry Association	ICT industries	EU
Mr Arturas Kaklauskas	Vilnius Civil Engineering Institute	Construction	Lithuania
Mr Adam Koprowski	National Institute of Cardiology, Warsaw	Hospitals	Poland
Mr Andreas Labrenz	Fujitsu Siemens	Consumer electronics	Germany
Ms Veronique Lessens	Agfa	Hospitals	Belgium
Mr Bernard Lombard	CEPI – Confederation of European Paper Industries	Paper industry	EU
Mr John Sarborg Pedersen	ITEK – Confederation of Danish Industries	Construction	Denmark
Mr Ulrich Paetzold	FIEC – European Construction Industry Federation	Construction	EU
Mr Axel Pols	BITKOM - German Association for Information Technology, Telecommunications and New Media	IT services	Germany
Ms Brigitte Preissl	Deutsche Telekom	Telecom industry	Germany
Mr Henry J F Ryan	Lios Geal Consultants	Interoperability	Ireland
Mr Paris Sansoglou	CESA - Community of European Shipyards' Associations	Shipbuilding	EU
Mr Alfredo Soeiro	University of Porto	ICT skills	Portugal
Mr Salvatore Testa	Bocconi University, Milan	Footwear industry	Italy
Ms Rachel Tym	ETOA	Tourism	UK
Mr Ilias Vlachos	Athens University	Food industry	Greece

Various dissemination and networking activities

Members of the *e-Business W@tch* study team presented findings at various **international conferences** in 2005 and 2006. Examples include the EU Conference "e-Business – the Way Forward" in Cambridge (5 December 2005), the "5th eTourism Futures Forum" at the University of Surrey, Guildford (27 March 2006), the 19th Bled eConference "eValues" (5 June 2006), the "eGovernment and eHealth Conference" in

Desio (7-9 July 2006), the World of Health IT Conference in Geneva (11 October 2006), and the eChallenges Conference in Barcelona (25-27 October 2006).

e-Business W@tch contributes actively to the **international debate on e-business measurement** and to **working groups** on e-business related issues, for example on interoperability. Examples include the active participation in workshops organised by the **OECD** (e.g. at the 10th Meeting of the WPIIS in Paris, 4 May 2006) and by **Eurostat** (e.g. at the Eurostat Task Force meeting for preparing the Community Survey on ICT Use in Enterprises, 10 November 2005), as well as cooperation with working groups such as **eBIF** – e-Business Interoperability Forum.

e-Business W@tch grants researchers and students **access to survey data** (case level data) for research purposes, for instance for carrying out further empirical analysis on the economic impacts of ICT and e-business use in enterprises. In several cases, results of such research have been submitted to **academic journals** for publication. Examples include two papers on "The Use of EDI-based and XML-based e-business frameworks" and on "ICT solutions and productivity: evidence from firm-level data" (both by Juha-Miikka Nurmilaakso, Helsinki University of Technology), on "Exploring the Contingency Effects of Adoption Context: An Integrative Approach for Innovation Diffusion" (by Kevin Zhu and Kenneth L. Kramer, University of California, Irvine), and on "Implications of e-CRM on B2B Results in European Companies" (by Maria Teresa Borges Tiago, University of Azores).

Members and former members of the *e-Business W@tch* study team also use survey results as a source for **further research** and **publishing articles**. Examples in 2006 include research by Philipp Köllinger from the Erasmus University of Rotterdam ("Technological Change - An Analysis of the Diffusion and Implications of e-Business Technologies") and a discussion paper authored by Daniel Nepelski from DIW Berlin ("The Impact of e-Procurement on the Number of Suppliers: Where to Move to?").

Henry Ryan held a **case study seminar** at the Eurochambres eBusiness Academy in Dublin in November 2006, based on *e-Business W@tch* resources (case studies, sector reports).

e-Business W@tch sends out **electronic newsletters** to its subscriber base and to industry associations and federations across the EU. e-Newsletters provide information about new publications and forthcoming events.

Last but not least, *e-Business W@tch* frequently acts as a "**help desk**" for e-business related questions from all over the world. Over the past 2-3 years, the volume of such individual requests has increased significantly. This reflects the increased recognition of *e-Business W@tch* as a source of information on related issues. Examples are requests for specific types of analysis from companies or business consultants, requests for back-ground information (e.g. about the survey), questions on specific findings in reports, students who contact *e-Business W@tch* in the context of their master or PhD thesis, orders for publications, companies who wish to exchange links, and many other types of requests.

Annex III: Methodological Notes: The e-Business Survey 2006

Background and scope

e-Business W@tch collects data relating to the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2006, which was the fourth survey after those of 2002, 2003 and 2005, had a scope of 14,081 telephone interviews with decision-makers in enterprises from 29 countries, including the 25 EU Member States, EEA and Acceding / Candidate Countries.[66] Interviews were carried out in March and April 2006, using computer-aided telephone interview (CATI) technology.

Questionnaire

The questionnaire is similar to those used in the previous surveys from 2002 to 2005 in order to ensure a basic continuity of the research approach. The module on ICT impact was substantially extended compared to 2005, in response to current policy interest, in exchange for some questions from other modules.

Some questions which were also used in previous surveys were slightly modified. The most important change in this context concerns questions on e-commerce: up to 2005, companies were asked whether they "purchase / sell online"; in 2006, companies were asked whether they "place / accept orders online". This is a more precise question, since the terms "purchasing" and "selling" leave it open whether ordered goods also have to be paid online in order to qualify for "online purchasing / selling".

Some specific topics were added or expanded in the questionnaire in order to reflect the latest e-business developments; examples are the new questions on the use of RFID and Voice-over-IP.

The questionnaires of all four surveys (2002, 2003, 2005, 2006) can be downloaded from the *e-Business W@tch* website (www.ebusiness-watch.org/about/methodology.htm).

Population

As in 2005, the 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 29 countries covered, and which had their primary business activity in one of the ten sectors specified on the basis of NACE Rev. 1.1. Evidence from previous surveys shows that computer use can be expected to be 99% or more in all sectors among medium-sized and large firms. Differences are more relevant, however, for micro and small enterprises, in particular in the food and beverages industry, the textile and footwear industries, 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.[67]

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[66] The EEA (European Economic Area) includes, in addition to EU Member States, Iceland, Liechtenstein and Norway. Acceding Countries with whom an Accession Treaty has been signed are Bulgaria and Romania; Candidate Countries, which are candidates for accession into the EU, are (as of September 2006) Croatia, the former Yugoslav Republic of Macedonia, and Turkey. In most of these countries, interviews and/or case studies were conducted.

[67] Non-computer users include typically small craft firms (textile, construction), bars, restaurants or boarding houses (in tourism), and small food producing companies.

This should be considered when comparing figures over the years, as figures either represent a percentage of "all companies" (as in 2002 and 2003) or a percentage of "companies using computers" (as in 2005 and 2006). Differences are minimal, however, when figures have been weighted by employment.

The ten sectors which were selected for the 2006 survey are very heterogeneous in terms of their size. Construction and tourism are by far the largest with about 1.5 million enterprises in each of the EU-25.[68] At the other end of the range is the consumer electronics industry with about 5,400 enterprises; this is a factor of about 280 between the largest and smallest sector. This imbalance inevitably has a substantial impact on weighting and thus on aggregate results, which are dominated by figures from construction and tourism.

Table 1: Population coverage of the e-Business Survey 2006

No.	NACE Rev. 1.1	Sectors covered	No. of enterprises in EU-25 *	No. of interviews conducted
1	DA 15 (most groups)	Food and beverages	282,000	1,709
2	DC 19.3	Footwear	13,700	980
3	DE 21	Pulp, paper and paper products	18,400	1,158
4	DL 30, 32.1+2	ICT manufacturing	31,800	1,687
5	DL 32.3	Consumer electronics	5,400	665
6	DM 35.11	Shipbuilding and repair	7,200	150
7	F 45.2+3 (selected classes)	Construction	1,546,000	2,655
8	H 55.1/3, I 63.3, O 92.33/52	Tourism	1,500,000	2,663
9	I 64.2	Telecommunication services	12,900	1,580
10	N 85.11	Hospital activities	(e) 13,000	834

* mostly based on Eurostat SBS, latest available figures

(e) = estimated on the basis of figures for the former EU-15 (no figures available for EU-25)

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 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 ten employees.

Samples were drawn locally by fieldwork organisations based on official statistical records and widely recognised business directories such as Dun & Bradstreet or Heins und Partner Business Pool (both used in several countries).

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.

Due to the small population of enterprises in some of the sectors, target quota could not be achieved (particularly in the larger enterprise size-bands) in each country. In these cases, interviews were shifted to the next largest size-band (from large to medium-sized, from medium-sized to small), or to other sectors.

[68] Construction (NACE Rev. 1.1 F 45) in total has about 2.3 million enterprises. The sub-sectors covered in 2006 (see Table 1) account for about 1.5 million of these.

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 2) on behalf of *e-Business W@tch*.[69]

The survey had a scope of 14,081 interviews, spread across the 29 countries and ten industries covered. In ten countries ("EU-10"), all ten sectors were covered; in the other countries, selected industries were surveyed. In most countries, between 400 and 750 interviews were conducted. Pilot interviews prior to the regular fieldwork were conducted with 23 companies in Germany in February 2006, in order to test the questionnaire (structure, comprehensibility of questions).

Table 2: Institutes that conducted the fieldwork of the e-Business Survey 2006 and number of interviews per country (#)

	Institute	# Int.		Institute	# Int.
BE	Ipsos Belgium, 1050 Brussels	400	MT	Misco International Ltd., Valetta VLT 04	101
CZ	Ipsos Czech Republic, Skolska 32/694, 110 00 Praha 1	750	NL	Ipsos Belgium, 1050 Brussels	400
DK	Vilstrup Research AS, 1360 Copenhagen	403	AT	Spectra Marktforschungs-gesellschaft m.b.H., 4020 Linz	400
DE	Ipsos GmbH, 23879 Mölln	800	PL	Ipsos Poland, 02-508 Warszawa	752
EE	Marketing and Public Opinion Research Centre SKDS, Riga LV-1010	314	PT	Ipsos Portugal, 1070-15 Lisbon	400
EL	Synovate Hellas, 15451 Athens	407	SI	GfK Gral-Iteo trazne raziskave d.o.o., 1000 Ljubljana	400
ES	Ipsos Eco Consulting, 28036 Madrid	754	SK	GfK Slovakia Ltd., 813 41 Bratislava 1	400
FR	Ipsos France, 75739 Paris	751	FI	Taloustutkimus Oy, 00510 Helsinki	752
IE	Landsdowne Market Research, Dublin 1	400	SE	GfK Sverige AB, 22100 Lund	400
IT	Demoskopea S.p.A., 00199 Roma	756	UK	Continental Research, London EC1V 7DY	750
CY	Synovate Cyprus, 2107 Nicosia	209		EEA and Acceding/Candidate countries	
LV	Marketing and Public Opinion Research Centre SKDS, Riga LV-1010	432	NO	Norstat Norway, 0159 Oslo	401
LT		404	BG	TNS BBSS Gallup International, 1164 Sofia	400
LU	Ipsos GmbH, 23879 Mölln/20097 Hamburg	117	RO	Field Insights, Bucharest 2	440
HU	Szonda Ipsos, 1096 Budapest	772	TR	Bilesim International Research & Consultancy Inc. Turkey, 34676 Istanbul	400

[69] The survey was carried out under two different contracts. The survey in the six largest EU countries (DE, ES, FR, IT, PL, UK) was carried out as part of the e-Business W@tch contract between the European Commission and empirica GmbH; the survey in the other countries was carried out in parallel, but under a different contract (following an open call for tender for the "extended e-Business W@tch survey", issued in 2005).

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 3 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).

Table 3: Interview contact protocols: completion rates and non-response reasons (2006, examples)

		CZ	DE	ES	FR	HU	IT	NL	PL	FI	UK
1	**Sample (gross)**	5595	7763	7730	8686	21540	8533	4576	11054	3016	11821
1.1	Telephone number does not exist	283	1055	0	186	5545	717	349	2282	139	2663
1.2	Not a company (e.g. private household)	79	80	356	66	2076	89	219	681	34	324
1.3	Fax machine / modem	56	48	0	79	1120	61	28	53	4	130
1.4	Quota completed -> address not used	43	124	660	1939	1665	2154	1002	877	66	158
1.5	No target person in company	17	359	730	142	9	178	232	959	319	736
1.6	Language problems	9	18	0	25	0	1	36	0	41	20
1.7	No answer on no. of employees	2	1	10	13	6	8	1	19	1	0
1.8	Company does not use computers	48	47	158	250	279	314	235	460	28	51
1.9	Company does not qualify	134	330	103	156	0	113	47	813	49	215
	Sum 1.1 – 1.9	671	2062	2017	2856	10700	3635	2149	6144	681	4297
2	**Sample (net)**	4924	5701	5713	5830	10840	4898	2427	4910	2335	7524
2.1	Nobody picks up phone	1071	582	1645	6	1023	647	82	513	22	1898
2.2	Line busy, engaged	83	122	57	46	89	0	3	73	1	1
2.3	Answering machine	143	145	121	1315	1200	0	9	127	1	145
2.4	Contact person refuses	2080	1125	2553	131	2011	729	1653	2009	578	2523
2.5	Target person refuses	450	1865	202	1475	2776	642	113	280	405	1618
2.6	No appointment during fieldwork period	3	11	70	182	2571	384	112	150	50	376
2.7	Open appointment	295	953	35	1896	258	1041	21	763	459	51
2.8	Target person is ill / unavailable	2	31	0	0	0	13	0	29	2	32
2.9	Interview abandoned	43	67	271	29	108	686	34	176	15	130
2.10	Interview error, cannot be used	4	0	5	5	32	0	0	38	50	0
	Sum 2.1 – 2.10	4174	4901	4959	5085	10068	4142	2027	4158	1583	6774
3	**Successful interviews**	750	800	754	751	772	756	400	752	752	750
	Completion rate (= [3] / [2])	15%	14%	13%	13%	7,12%	15%	16,48%	15%	32%	10%
	Average interview time (min:sec)	19:19	18:46	17:29	19:39	17:14	16:43	19:00	23:44	20:19	20:16

Feedback from interviewers

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. Some of the more specific remarks from fieldwork organisations, which point to difficulties encountered in the local situation, are summarised in Table 4.

Table 4: Comments by national fieldwork companies on their experience (2006, examples)

Country	Comments
Belgium	• The questionnaire was very clear. • Business-to-business (B2B) research (i.e. surveys on behalf of companies or authorities amongst companies) is often difficult when the questionnaire length is longer than 15 minutes; target persons often complained that they have no time for an interview during their normal work. • Positive reaction from respondents that the results can be found on the website.
Bulgaria	• Many companies (especially within the tourism sector) have outsourced their ICT operations. Therefore, it was sometimes difficult for respondents to understand the questions.
Czech Republic	• It was difficult to fulfil quotas in several sectors which are mainly represented by very small companies, often by one-person-companies (self-employed), many of which are not willing to do a relatively long interview. There was a high percentage of refusals among micro-companies.
Denmark	• Some technical terms (such as internet protocol, LAN, W-LAN, VPN, RFID, and EDI) were hard for interviewers and respondents to understand.
Finland	• The questionnaire was quite long and that is why there were more refusals than normal. • Smaller companies often refused to answer or interrupted the interview because they thought that they did not know enough about e-business. Respondents in the pulp & paper sector were especially not interested in this topic due to comparably low ICT usage.
Germany	• As with previous e-business surveys carried out, fieldwork ran relative smoothly overall and the questionnaire was easy to understand and interesting for most of respondents. • Respondents from small companies often had difficulty when answering questions related to specific technical terms and applications. • Respondents reacted positively to the fact that the survey was carried out on behalf of the European Commission.
Greece	• There were several cases where companies have outsourced the IT support and thus there was no person to interview. • Respondents who were not IT specialists found some of the IT terminology difficult to understand.
Spain	• Fieldwork did not run as smoothly as expected due to several public holidays occurring during the period, making it difficult to reach the target persons. • IT professionals in large companies were the most available.
France	• In general, the fieldwork went without problems and the questionnaire was understood by the respondents. • For some sectors, the lack of contact addresses was a serious problem. • For future surveys, the case concerning new companies which cannot answer the financial questions should be considered.
Hungary	• The cooperation level in this survey was similar to other telephone surveys among companies; but a problem was that many small companies use only one computer, and only for basic functions.
Ireland	• The B2B sector (not general population or household surveys) is very over-researched in Ireland; hence there was a high level of refusals. • In Ireland more than 90% of businesses employ less than 9 employees, so many companies do not have the need nor use for ICT.

Italy	• Many refusals among the smallest and/or family owned business, where only one PC is available and used more for personal reasons than for business. • Respondents often lost patience because considering the low use of the PC in their business, they had to spend time on the phone always giving the same answers ("no, do not use …").
Latvia	• The main problem was the length of the questionnaire. Although the average interview length was 16 minutes - the shortest of all participating countries - surveys among companies with interviews lasting more than 15 minutes are generally not recommended in Latvia. • It was hard for IT managers to answer about budget, market shares and so on.
The Netherlands	• The questionnaire was very clear, so positive. • Business-to-business surveys are often difficult when the questionnaire length is longer than 15 minutes. • Secretaries/receptionists in the Netherlands are very well trained in refusing to transfer a call.
Norway	• Interviewers found that many respondents / businesses did not wish to participate due to the topic of the survey. Main reason was that they did not feel competent, although they qualified from the results of the screening.
Poland	• There were some difficulties in getting an interview with computer/IT specialists. In many big companies they refuse the time for an interview. • Many small companies did not understand some of the more technical terms.
Sweden	• The questionnaire was understood by most of the respondents.
UK	• Although some of the questions appear technical, this did not prove a problem for respondents. • There was a very low universe of companies in certain quota cells. Given the limited sample available in some sectors, and the need to target a high proportion of large companies, a longer field period would probably have helped to maximize the number of complete interviews. • 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.[70]

- 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.

[70] 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 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 serves as a filter for follow-up questions.

The results for filtered questions can be computed on the base of not only those enterprises that were actually asked the question (e.g. "in % of enterprises with internet access"), but also 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 for the EU-10[71] (based on all respondents) depending on the weighting scheme applied. For totals of all-sectors (in the EU-10), an accuracy of about +/-3 percentage points can be expected for most values that are expressed as "% of firms", and of about +/-2 percentage points for values that are weighted by employment.

The confidence intervals for industry totals (EU-10) differ considerably depending on the industry and the respective value; on average, it is about +/-5 percentage points (in both weighting schemes). Confidence intervals are highest for the shipbuilding and repair industry, due to the small number of observations, and because this sector is more sensitive to weights due to its structure (i.e. the dominance of large firms in a comparatively small population). Data for this industry are therefore indicative and cannot claim to have statistical accuracy.

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 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.

[71] The EU-10 are composed of those countries in which all ten sectors were covered by the survey. To ensure data comparability, only interviews from these countries are included in the aggregated "total" values. The EU-10 are: CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK. These ten countries represent more than 80% of the population and GDP of the EU.

Table 5: Confidence intervals for all-sector and sector totals (EU-10)

		Confidence interval								
	Survey result	Weighted as "% of firms"			Weighted by employment			Unweighted		
All sectors (aggregate), EU-10	**10%**	**8.1%**	**-**	**12.3%**	**8.7%**	**-**	**11.5%**	**9.4%**	**-**	**10.6%**
Food and beverages	10%	**6.6%**	-	**14.8%**	**7.3%**	-	**13.6%**	**8.4%**	-	**11.9%**
Footwear	10%	**7.5%**	-	**13.2%**	**7.6%**	-	**13.1%**	**8.4%**	-	**11.9%**
Pulp and paper	10%	**7.8%**	-	**12.7%**	**7.5%**	-	**13.3%**	**8.5%**	-	**11.7%**
ICT manufacturing	10%	**7.9%**	-	**12.6%**	**7.6%**	-	**13.0%**	**8.7%**	-	**11.5%**
Consumer electronics	10%	**7.4%**	-	**13.4%**	**6.0%**	-	**16.2%**	**8.0%**	-	**12.4%**
Shipbuilding and repair	10%	**4.8%**	-	**19.7%**	**4.6%**	-	**20.4%**	**6.0%**	-	**16.1%**
Construction	10%	**6.9%**	-	**14.3%**	**7.6%**	-	**13.1%**	**8.3%**	-	**11.9%**
Tourism	10%	**6.6%**	-	**14.8%**	**6.8%**	-	**14.4%**	**8.3%**	-	**12.0%**
Telecommunication services	10%	**7.6%**	-	**13.1%**	**6.6%**	-	**14.8%**	**8.4%**	-	**11.9%**
Hospital activities	10%	**7.2%**	-	**13.7%**	**7.2%**	-	**13.8%**	**8.1%**	-	**12.3%**
All sectors (aggregate), EU-10	**30%**	**26.8%**	**-**	**33.4%**	**27.9%**	**-**	**32.2%**	**29.1%**	**-**	**30.9%**
Food and beverages	30%	**24.2%**	-	**36.6%**	**25.4%**	-	**35.0%**	**27.4%**	-	**32.8%**
Footwear	30%	**25.9%**	-	**34.5%**	**26.0%**	-	**34.3%**	**27.3%**	-	**32.8%**
Pulp and paper	30%	**26.4%**	-	**33.9%**	**25.8%**	-	**34.6%**	**27.6%**	-	**32.5%**
ICT manufacturing	30%	**26.5%**	-	**33.8%**	**26.1%**	-	**34.2%**	**27.9%**	-	**32.2%**
Consumer electronics	30%	**25.6%**	-	**34.8%**	**22.9%**	-	**38.1%**	**26.8%**	-	**33.5%**
Shipbuilding and repair	30%	**20.2%**	-	**42.0%**	**19.7%**	-	**42.8%**	**23.0%**	-	**38.1%**
Construction	30%	**24.7%**	-	**35.9%**	**25.9%**	-	**34.4%**	**27.3%**	-	**32.8%**
Tourism	30%	**24.2%**	-	**36.5%**	**24.6%**	-	**36.1%**	**27.3%**	-	**32.9%**
Telecommunication services	30%	**25.9%**	-	**34.4%**	**24.2%**	-	**36.5%**	**27.4%**	-	**32.7%**
Hospital activities	30%	**25.3%**	-	**35.2%**	**25.3%**	-	**35.2%**	**26.9%**	-	**33.4%**
All sectors (aggregate), EU-10	**50%**	**46.4%**	**-**	**53.6%**	**47.6%**	**-**	**52.4%**	**49.0%**	**-**	**51.0%**
Food and beverages	50%	**43.2%**	-	**56.8%**	**44.7%**	-	**55.3%**	**47.0%**	-	**53.0%**
Footwear	50%	**45.3%**	-	**54.7%**	**45.5%**	-	**54.5%**	**47.0%**	-	**53.0%**
Pulp and paper	50%	**45.9%**	-	**54.1%**	**45.2%**	-	**54.8%**	**47.3%**	-	**52.7%**
ICT manufacturing	50%	**46.0%**	-	**54.0%**	**45.5%**	-	**54.5%**	**47.7%**	-	**52.3%**
Consumer electronics	50%	**45.0%**	-	**55.0%**	**41.7%**	-	**58.3%**	**46.3%**	-	**53.7%**
Shipbuilding and repair	50%	**38.2%**	-	**61.8%**	**37.5%**	-	**62.5%**	**41.8%**	-	**58.2%**
Construction	50%	**43.9%**	-	**56.1%**	**45.4%**	-	**54.6%**	**47.0%**	-	**53.0%**
Tourism	50%	**43.3%**	-	**56.7%**	**43.7%**	-	**56.3%**	**46.9%**	-	**53.1%**
Telecommunication services	50%	**45.4%**	-	**54.6%**	**43.3%**	-	**56.7%**	**47.1%**	-	**52.9%**
Hospital activities	50%	**44.6%**	-	**55.4%**	**44.6%**	-	**55.4%**	**46.5%**	-	**53.5%**
All sectors (aggregate), EU-7	**70%**	**66.6%**	**-**	**73.2%**	**67.8%**	**-**	**72.1%**	**69.1%**	**-**	**70.9%**
Food and beverages	70%	**63.4%**	-	**75.8%**	**65.0%**	-	**74.6%**	**67.2%**	-	**72.6%**
Footwear	70%	**65.5%**	-	**74.1%**	**65.7%**	-	**74.0%**	**67.2%**	-	**72.7%**
Pulp and paper	70%	**66.1%**	-	**73.6%**	**65.4%**	-	**74.2%**	**67.5%**	-	**72.4%**
ICT manufacturing	70%	**66.2%**	-	**73.5%**	**65.8%**	-	**73.9%**	**67.8%**	-	**72.1%**
Consumer electronics	70%	**65.2%**	-	**74.4%**	**61.9%**	-	**77.1%**	**66.5%**	-	**73.2%**
Shipbuilding and repair	70%	**58.0%**	-	**79.8%**	**57.2%**	-	**80.3%**	**61.9%**	-	**77.0%**
Construction	70%	**64.1%**	-	**75.3%**	**65.6%**	-	**74.1%**	**67.2%**	-	**72.7%**
Tourism	70%	**63.5%**	-	**75.8%**	**63.9%**	-	**75.4%**	**67.1%**	-	**72.7%**
Telecommunication services	70%	**65.6%**	-	**74.1%**	**63.5%**	-	**75.8%**	**67.3%**	-	**72.6%**
Hospital activities	70%	**64.8%**	-	**74.7%**	**64.8%**	-	**74.7%**	**66.6%**	-	**73.1%**
All sectors (aggregate), EU-7	**90%**	**87.7%**	**-**	**91.9%**	**88.5%**	**-**	**91.3%**	**89.4%**	**-**	**90.6%**
Food and beverages	90%	**85.2%**	-	**93.4%**	**86.4%**	-	**92.7%**	**88.1%**	-	**91.6%**
Footwear	90%	**86.8%**	-	**92.5%**	**86.9%**	-	**92.4%**	**88.1%**	-	**91.6%**
Pulp and paper	90%	**87.3%**	-	**92.2%**	**86.7%**	-	**92.5%**	**88.3%**	-	**91.5%**
ICT manufacturing	90%	**87.4%**	-	**92.1%**	**87.0%**	-	**92.4%**	**88.5%**	-	**91.3%**
Consumer electronics	90%	**86.6%**	-	**92.6%**	**83.8%**	-	**94.0%**	**87.6%**	-	**92.0%**
Shipbuilding and repair	90%	**80.3%**	-	**95.2%**	**79.6%**	-	**95.4%**	**83.9%**	-	**94.0%**
Construction	90%	**85.7%**	-	**93.1%**	**86.9%**	-	**92.4%**	**88.1%**	-	**91.7%**
Tourism	90%	**85.2%**	-	**93.4%**	**85.6%**	-	**93.2%**	**88.0%**	-	**91.7%**
Telecommunication services	90%	**86.9%**	-	**92.4%**	**85.2%**	-	**93.4%**	**88.1%**	-	**91.6%**
Hospital activities	90%	**86.3%**	-	**92.8%**	**86.2%**	-	**92.8%**	**87.7%**	-	**91.9%**

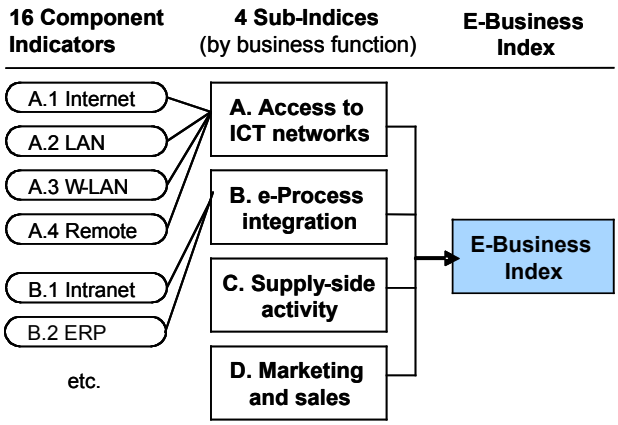
confidence intervals at alpha = .90

The e-Business Scoreboard 2006

The e-Business Scoreboard approach was developed by *e-Business W@tch* in 2004. It is a compound index that condenses data on ICT adoption and e-business activity, enabling comparisons across different sectors, countries or size-bands.

Conceptually, the e-Business Scoreboard owes a debt 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. The Scoreboard consists of **16 component indicators** (see next page), which represent the metrics for these perspectives. Component indicators (CI) can be aggregated on several levels.

- First, CI can be aggregated into the four main **sub-indices** (with four CI each) that represent major application areas of e-business.
- Second, the four sub-indices can be further aggregated into two dimensions and, finally, into the overall "**e-Business Index**".



The e-Business Scoreboard takes into account the percentages (diffusion rates) from all sectors (size-bands, …) and shows how a specific sector (size-band, …) differs from the all-sector-average. An index value is based on mean values and standard deviations. 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 (size-bands, …).

Indexes simplify multi-dimensional concepts. To correctly assess the validity and shortcomings of the Scoreboard and its overall index, the following notes should be taken into account:

- **Weighting**: Results are influenced by the selection of the underlying weighting scheme for component indicators. If employment-weighted figures are used, e-business activity in large firms is emphasized. If indicators are weighted by the number of enterprises (irrespective of their size), the situation in smaller firms is emphasized.
- **Component indicators**: The selection of component indicators may have a bias towards manufacturing activities, as some indicators can be more relevant for manufacturing than for service sectors (e.g. ERP use).
- **Relative comparison**: The Scoreboard results do not represent absolute measures of e-business activity, but depend on the respective set of sectors (or countries, ...) that are compared to each other, because figures express standard deviations from the *average* of the respective set.

Component indicators of the e-Business Scoreboard 2006

(Definitions for indicators weighted by employment)

A. ICT infrastructure and basic connectivity			
A.1	**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. Enterprises that are connected with broadband (via DSL, cable, direct fibre or wireless broadband) are computed with a factor of 1.0, enterprises connected via analogue dial-up modem or ISDN with a factor of 0.5. The maximum value of 100 would be returned if all employees work in enterprises with broadband connections.
A.2	Use of **LAN**	=	the percentage of employees from a sector working in enterprises that have connected computers with a Local Area Network (LAN).
A.3	Use of a **Wireless LAN**	=	the percentage of employees working in enterprises which use a Wireless LAN.
A.4	**Remote access** to the company's computer 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.
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 an **ERP** system	=	the percentage of employees working in enterprises that have implemented an ERP (enterprise resource planning) system.
B.3	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.4	Companies sending or receiving **e-invoices**	=	the percentage of employees working in enterprises that send and/or receive e-invoices.
C. Procurement and supply chain integration			
C.1	Companies placing >5% of their **orders to suppliers online**	=	the percentage of employees working in enterprises saying that they place orders to suppliers online on the web or via other computer-mediated networks, for example via EDI based connections to their suppliers, and that these online orders account for at least 5% of their total orders.
C.2	Use of **specific ICT** 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	Companies **linking their ICT system with suppliers**	=	the percentage of employees that work in enterprises whose ICT system is linked with those of suppliers.
C.4	Companies managing **capacity and inventory online**	=	the percentage of employees working in enterprises that that use technologies to manage capacity and inventory online.
D. Marketing and sales processes			
D.1	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.2	Companies receiving >5% of **orders from customers online**	=	the percentage of employees working in enterprises saying that they accept orders from customers online on the web or via other computer-mediated networks, and that these online orders account for at least 5% of their total orders received.
D.3	Use of **specific ICT** solutions to support marketing and sales processes	=	the percentage of employees working in enterprises that uses specific IT solutions to support marketing and sales processes.
D.4	Companies **linking their ICT system with customers**	=	the percentage of employees that work in enterprises whose ICT system is linked with those of customers.

Annex IV: "e-Business" – The Conceptual Framework

Introduction

Although the 'new economy' revolution has not taken place, as it seemed – for a short moment in history – it might, the **evolutionary development** of electronic business does not seem to have come to an end. On the contrary, the maturity of e-business has substantially increased across sectors and regions over the past five years. It has been a quiet revolution this time, but as a result, a **new picture of the digital economy** is beginning to emerge. ICT and e-business do matter in the global economy – probably even more than during the hype of the late 1990s.

The overall economic situation and market conditions for business innovation and investment have been difficult for European companies during the last few years. Nevertheless, e-business shows a dynamic development in the European Union. Drivers are new technological developments (wireless access technologies, for example) and the increasing **competitive pressure** on companies in a global economy. Firms are in constant search of opportunities to cut costs. This has probably been the most important promise of electronic business: cutting costs by increasing the **efficiency of business processes**, internally and between trading partners in the value chain.

From e-commerce to e-business

As part of this maturing process, electronic business has progressed from a rather specific to a very broad topic over the past 10 years. Initially, however, particularly in the mid-1990s, the policy and research focus was very much on **e-commerce**, which can be defined as online commercial transactions.

The term **'transactions'** refers to exchanges between a company and its suppliers or customers. These can be other companies ("B2B" – business-to-business), consumers ("B2C" – business-to-consumers), or governments ("B2G" – business-to-government). In the broad sense, transactions include commercial as well as other exchanges, such as sending tax return forms to the tax authorities. In the context of this study on e-business, transactions are predominantly commercial business transactions (see boxes for definitions).

If transactions are conducted electronically ('**e-transactions**'), this constitutes e-commerce. Transactions can be broken down into **different phases** and related **business processes**, each of which can be relevant for e-commerce. The pre-sale (or pre-purchase) phase includes the presentation of (or request for) information about the offer, and the negotiation of the price. The sale / purchase phase covers the ordering, invoicing, payment and delivery processes. Finally, the after sale / purchase phase covers all processes after the product or service has been delivered to the buyer, such as after-sales customer services (e.g. repair, updates).

Glossary

Definitions by standardisation groups (ISO, ebXML)

The term "business transaction" is a key concept underlying the development of e-standards for B2B exchanges. Therefore, definitions have been developed by the various standards communities as an underpinning for their practical work. Examples are:

- ***Business**: "a series of processes, each having a clearly understood purpose, involving more than one party, realized through the exchange of information and directed towards some mutually agreed upon goal, extending over a period of time" [ISO/IEC 14662:2004]*
- ***Business transaction**: "a predefined set of activities and/or processes of parties which is initiated by a party to accomplish an explicitly shared business goal and terminated upon recognition of one of the agreed conclusions by all the involved parties even though some of the recognition may be implicit" [ISO/IEC 14662:2004]*
- ***e-Business transaction**: "a logical unit of business conducted by two or more parties that generates a computable success or failure state [ebXML Glossary]*

Practically each step in a transaction can either be pursued electronically (online) or non-electronically (offline), and all combinations of electronic and non-electronic implementation are possible. It is therefore difficult to decide which components actually have to be conducted online in order to call a transaction (as a whole) 'electronic'.

Exhibit 3.3-1: Process components of transactions

Pre-sale / pre-purchase phase	Sale / purchase phase	After-sale / purchase phase
Information about offer	Placing an order	Customer service
Price comparisons	Invoicing	Guarantee management
Negotiations between seller and buyer	Payment	Credit administration
	Delivery	Handling returns

In this context, during 2000 the OECD proposed broad and narrow definitions of electronic commerce both of which are still valid and useful:[72] While the narrow definition focuses on 'internet transactions' only, the broad definition defines e-commerce as "*the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over **computer-mediated networks**. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the goods or service may be conducted on- or offline"* (OECD, 2001).

[72] In 1999, the OECD Working Party on Indicators for the Information Society (WPIIS) established an Expert Group on Defining and Measuring Electronic Commerce, in order to compile definitions of electronic commerce which are policy-relevant and statistically feasible. By 2000, the work of the Group had resulted in definitions for electronic commerce transactions.

Glossary

Definition of key terms for this study

- ***e-Transactions****: Commercial exchanges between a company and its suppliers or customers which are conducted electronically. Participants can be other companies ("B2B" – business-to-business), consumers ("B2C"), or governments ("B2G"). This includes processes during the pre-sale or pre-purchase phase, the sale or purchase phase, and the after-sale / purchase phase.*
- ***e-Commerce****: Electronic Commerce. The sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks. (OECD)*
- ***e-Business****: Electronic Business. Automated business processes (both intra- and inter-firm) over computer mediated networks. (OECD)*
- ***e-Interactions****: Electronic Interactions include the full range of e-Transactions, and in addition collaborative business processes (e.g. collaborative design) which are not directly transaction-focused.*

The addendum regarding payment and delivery is an important part of the definition, but can be debated. The difficult question is which processes among the different transaction phases constitute e-commerce and which do not. The OECD definition excludes the pre-sale or purchase phase and focuses on a specific part of the sale / purchase phase, namely the ordering process. *e-Business W@tch* follows the OECD position on this issue.[73]

e-Commerce, defined in this way, is a key component of **e-business**, but not the only one. In recent years, it has been increasingly acknowledged among policy and research communities that the focus on e-commerce transactions may be too narrow to capture the full implications of e-business. A wider, business process-oriented focus has been widely recognised. Reflecting this development, the OECD WPIIS[74] proposed a (broader) definition of 'e-business' as "*automated business processes (both intra-and inter-firm) over computer mediated networks*". In addition, the OECD proposed that e-business processes should integrate tasks and extend beyond a stand-alone or individual application.

This definition reflects an understanding of e-business that encompasses more than e-commerce transactions. The broad concept of e-business also includes the digitisation of **internal business processes**, as well as **cooperative** or **collaborative processes** between companies which are not necessarily transaction-focused. Collaborative e-design processes between business partners are a typical example from industrial engineering.

[73] This is reflected in the updated wording of the respective survey questions in 2006, when the question about "placing / accepting online orders" was asked instead of "purchasing / selling online".

[74] Working Party on Indicators for the Information Society

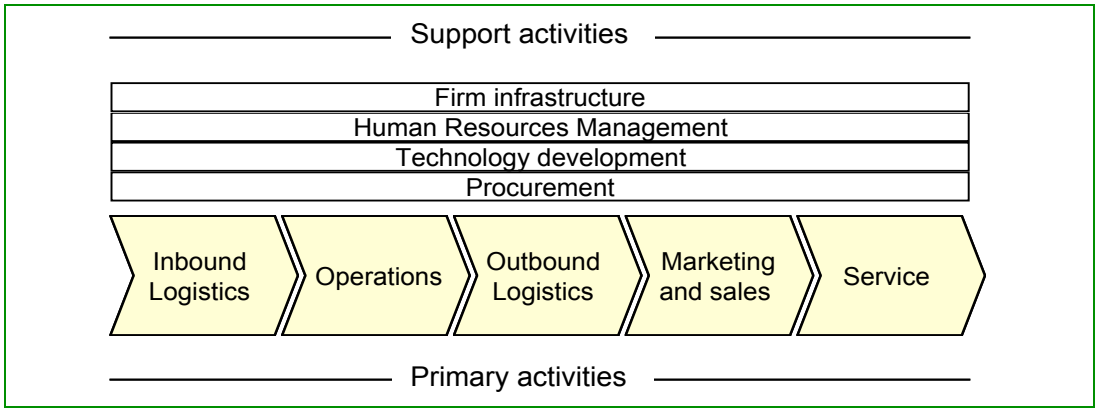
e-Business and the company's value chain

Given the broad concept of e-business applied in this study, which concentrates on business processes and a company's interactions with its environment, some further structuring and mapping of processes is necessary. Michael Porter's framework of the company value chain and value system between companies (Porter, 1985) is still valid and useful in this context, although dating back 20 years to the pre-e-business era.

A **value chain** logically presents the main functional areas ('value activities') of a company and differentiates between primary and support activities. However, these are "*not a collection of independent activities but a system of interdependent activities*", which are "*related by linkages within the value chain*" (p. 48). These linkages can lead to competitive advantage through optimisation and coordination. In fact, it is exactly here that the impact of ICT is significant, operating as a key instrument to **optimise linkages** and thus increase the efficiency of processes.

The **value system** expands this concept by extending the perspective beyond the single company. The firm's value chain is linked to the value chains of (upstream) suppliers and (downstream) buyers, resulting in a larger set of processes – the value system. e-Commerce, i.e. electronic transactions, occurs within this value system.

Exhibit 3.3-2: Value chain framework of a company by Michael Porter



Source: Adapted from M.E. Porter (1985) – simplified presentation

Key dimensions of this framework (notably inbound and outbound logistics, operations, and the value system) are reflected in the **Supply Chain Management** (SCM) concept. Here, the focus is on optimising the procurement-production-delivery processes, not only between a company and its direct suppliers and customers, but also aiming at a full vertical integration of the entire supply chain (Tier 1, Tier 2, Tier n suppliers). In this concept, each basic supply chain is a chain of sourcing, production, and delivery processes with the respective process interfaces within and between companies.[75] The analysis of the digital integration of supply chains in various industries has been an important theme in sector studies previously prepared by *e-Business W@tch*.

[75] cf. SCOR Supply-Chain Council: Supply-Chain Operations Reference-model. SCOR Version 7.0. Available at www.supply-chain.org (accessed in March 2006).

e-Business and innovation

An important aspect for *e-Business W@tch* studies is the link between ICT and innovation. The European Commission places great emphasis on the **critical role of innovation** for European businesses in order to stay competitive in the global economy.[76] On the other hand, strong competitive pressure provides powerful incentives for companies to continuously engage in innovation and R&D. Thus, innovation, competition and competitiveness are closely intertwined.

Information and communication technologies (ICT) have been identified and widely recognised as a major **enabler of innovation**, in particular for **process innovation**. According to the *e-Business W@tch* survey 2006, 75% of those companies that had introduced new business processes in 2005 reported that this innovation was directly related to or enabled by ICT.

In many cases, the implementation of **e-business processes** in a company will constitute a process innovation in itself. In **manufacturing** sectors, e-business has triggered significant innovation inside companies, notably in supply chain and delivery processes, such as automatic stock replenishing and improved logistics. In **service** sectors such as tourism, the innovative element is more evident in the way that external transactions are conducted. For example, if a company starts to sell its services online, this can imply innovation in the service delivery process and in customer communication.

In some sectors, particularly in ICT manufacturing, consumer electronics and telecommunications, ICT are also highly relevant for **product innovation**.

However, as more companies strive to exploit the innovation potential of ICT, it becomes more difficult for the individual company to directly gain competitive advantage from this technology. e-Business is becoming a necessity rather than a method of differentiation from competitors.[77] In addition, the introduction of innovation can provoke **substantial costs** in the short and medium term, as it may take time before the investments pay off. This is a particular challenge for small and medium-sized companies. It is one of the reasons that *e-Business W@tch* focuses on such challenges in its sector studies.

[76] See, for example, "An innovation-friendly, modern Europe". Communication from the Commission, COM(2006) 589, 12 October 2006.

[77] Cf. Carr, Nicholas (2003). "IT Doesn't Matter". In: Harvard Business Review, May 2003.

In Memory of Dr. Thorsten Wichmann

Dr. Thorsten Wichmann, founder and CEO of Berlecon Research, died in 2006 after a short but serious illness at the age of 40. Thorsten Wichmann had been a member of the *e-Business W@tch* study team right from the start in 2002. He authored several sector reports, special studies and made significant contributions to the overall methodology of *e-Business W@tch*. The European e-business community has lost an outstanding expert and analyst and an excellent colleague to work with.

The European e-Business Report – 2006/07 edition

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