



ICT and e-Business for an Innovative and Sustainable Economy

7th Synthesis Report of the Sectoral
e-Business Watch (2010)



EUROPEAN
COMMISSION



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The Sectoral e-Business Watch

The Sectoral e-Business Watch studies the adoption, implications and impact of electronic business practices in different sectors of the economy. It continues activities of the preceding "e-Business W@tch", which was launched by the European Commission, DG Enterprise and Industry, in late 2001, to support industrial policy, notably in the fields of competitiveness and innovation. The Sectoral e-Business Watch is based on a Framework Contract between DG Enterprise and Industry and empirica GmbH, running until the end of 2010 (principal contact and coordination: Dr. Hasan Alkas).

As general purpose technologies, ICT goods and services are seen as important drivers of productivity growth and economic performance across all sectors. DG Enterprise and Industry therefore pursues a range of policies to enhance the use of ICT and the deployment of other key technology-enablers that advance the economy, create innovation and deliver sound competitiveness benefits. The services of the Sectoral e-Business Watch contribute to achieving these goals, by supporting informed policy decision-making in these fields.

The focus of the ICT and e-business studies conducted in 2009 was on the ICT potential for sustainable economic activity. This report summarises the main results. The full study reports, and further resources such as brochures, case studies and table reports with more detailed survey data, can be downloaded from the programme's website (<http://www.ebusiness-watch.org>).

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Imprint

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Copies can be requested, free of charge, from DG Enterprise and Industry (see contact details below). The report is also available in electronic format and can be downloaded from the e-Business Watch website (<http://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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The Sectoral e-Business Watch studies of 2009 provide us with new insights about how information and communication technology (ICT) and electronic business can contribute to an innovative and sustainable economy. In particular, the findings improve our understanding of the role ICT and e-business can play in increasing energy efficiency and reducing greenhouse gas emissions.

A key objective of European enterprise policy is to facilitate the structural change towards the digital knowledge economy. Innovation is crucial in the course of this change and for ensuring competitiveness of European companies and industries. For both innovation and sustainability, the Sectoral e-Business Watch studies in 2009 confirmed that ICT and e-business are very important and need further analysis. The enabling role of ICT for innovation is supported by findings of representative surveys conducted in the energy supply industry and in the glass, ceramics and cement industry in March 2009. As regards sustainability, by means of an econometric analysis the e-Business Watch found a positive impact of ICT on greenhouse gas emissions in energy-intensive industries in Europe.

We need to make sure that European companies are among the leaders in using ICT for making products, services and processes smarter. However, the Sectoral e-Business Watch studies show that there are many challenges to be addressed. A recurrent theme is that small and medium-sized companies normally lag behind large enterprises in ICT and e-business use. A further recurrent theme is a lack of ICT interoperability; connectivity within and between European companies still needs to be improved. A lack of widely used standards, which is essential for increasing the benefits of a large European market, hampers the European-wide implementation of smart applications.

The studies about ICT-related industrial policy and e-skills remind us that the European Commission and the Member States need to join forces to establish powerful policy strategies and measures to sustain the manufacturing base in Europe. The analysis of the European Commission's Competitiveness Report 2009 confirms that if the crisis is used to trigger momentum for structural reforms it can become an opportunity to increase productivity growth and boost EU competitiveness. The outline for a more refined policy for such technologies has been laid down recently in a related Communication from the European Commission. Further activities in this direction can draw substantially from the studies of the Sectoral e-Business Watch in 2009.

Hasan Alkas

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E-Business is dead. It just died its second death. You don't believe? Do an internet search. You will find that e-business first died with the "dotcom" crash in 2001. What died was the false belief that e-commerce would change fundamental economic principles. e-Business has now died again, with the economic and climate crisis. What is fading away is a policy interest in ICT adoption. Other objectives take priority: innovation and sustainability. These were the main themes of the Sectoral e-Business Watch in 2009. Here are some appetisers from our findings:

Nearly 90% of the energy supply companies interviewed said that their new products or services have ICT components, and almost all said that their new processes are supported by ICT. This confirms that the energy industry is undergoing a profound change towards becoming an "intelligent utility". However, to make this change happen, significant standardisation efforts are required. The study on smart electricity grids and metering provides details on this issue.

Sectoral e-Business Watch studies of 2009 provide the first comprehensive economic analysis of the relationship between ICT investment and greenhouse gas emissions in European energy-intensive industries. There are high hopes of the ICT potential to reduce emissions, and the study confirms this potential. Another study confirms the potential of intelligent transport systems to reduce emissions. However, achieving reductions in greenhouse gas emissions using ICT was found to be expensive compared with other abatement technologies.

The study of the glass, ceramics and cement industry completes a series of sector studies about energy-intensive industries conducted over the past three years. While energy costs were, not surprisingly, found to be a major concern in this industry, the study also found, more surprisingly, that only 22% of firms have an ICT-enabled energy management system or a related process. There appears to be some potential to increase energy efficiency in this industry.

The study of "an economic assessment of ICT-related industrial policy" conducted an analysis based on economic theories, with a focus on game theory – a challenging endeavour with some counter-intuitive results. For example, while large-scale European joint research, development and innovation projects may be necessary to create critical mass of new knowledge, such joint activities may also lead to misuse of market power by the companies that win the race.

Finally, a study of demand for e-skills in manufacturing industries indicates that specific competences, for example in business processes, are not sufficiently developed among professionals or graduates.

ICT and e-business are alive and kicking. They will continue to be crucial for Europe's economic wellbeing. So let us recall what Peter Drucker said: "The best way to predict the future is to create it." In this sense, the study team would be pleased if our findings helped decision makers to foster innovation and sustainability in Europe.

Stefan Lilischkis

Sectoral e-Business Watch Project Manager
empirica GmbH

A close-up photograph of a green leaf, showing the intricate network of veins. A semi-transparent teal overlay covers the middle portion of the image, creating a layered effect. The text 'Executive Summary' is centered in white on the upper part of the leaf.

Executive Summary

Executive Summary

ICT, e-business and sustainable economic activity

This report summarises the results of **seven studies** conducted by the European Commission's "Sectoral e-Business Watch" in 2009. The Sectoral e-Business Watch was established in late 2001, with the mission to monitor ICT adoption trends in different sectors and to assess the business potential and impact of ICT for companies and sectors as a whole. A special focus and novelty of the research in 2009, as presented in this report, was to explore the **sustainability potential** of ICT. There are great expectations for ICT as an enabling technology in this domain: to increase the energy efficiency in production processes, to make road transport and logistics processes more efficient, and, as a result, to reduce the carbon footprint of industrial activity. Ultimately, the big question of our time is whether advanced economies can maintain their high standard of living, and emerging economies rise to this standard, without causing irreversible damage to our planet by over-exploiting non-renewable resources. This will only be possible if the global community finds a path to achieve either sustainable growth or, as a

more radical and so far uncharted option, prosperity without growth.

The economic research presented in this report helps to understand the role of ICT in this context. In short, ICT was found to be an important and **useful tool**, but no "silver bullet" capable of solving the problem by itself. However, in the desperate fight to make economic activity around the globe more sustainable, any measurable contribution is welcome. Indeed, there is significant evidence that advances in ICT use are positively correlated with more sustainable production in energy-intensive manufacturing sectors and in the transport industry (see **Chapter 2**). However, the magnitude of ICT's impact on emissions appears to change according to levels of output and ICT capital stock. Although ICT consistently reduced emissions in the sectors analysed over the sample period (1995-2005), the absolute reductions decreased over time.

EXHIBIT 1: ICT IMPLICATIONS FOR ENERGY CONSUMPTION AND SUPPLY: KEY STUDY RESULTS OF 2009

The ICT potential for sustainable production and transport	The role of ICT in the energy supply industry
<p>ICT increases production sustainability: a greater share of ICT in a company's total capital is linked with greater production sustainability in energy-intensive industries. A one-percentage-point increase in ICT capital share is estimated to increase sustainable efficiency between 0.8 and 2.6 percentage points, depending on the sector.</p> <p>Sectoral differences: in absolute measures, the metals industry, transport services and the energy sector revealed the greatest scope for ICT-enabled efficiency increases in most countries.</p> <p>Intelligent Transport Systems: ITS, combined with Ambient Intelligence related technologies, show significant potential to make road transport more efficient. A major barrier to unlocking this potential is the absence of a common framework architecture for these systems.</p>	<p>ICT is needed for "smart" energy distribution: the energy supply sector is currently undergoing a transformation, in particular in distribution. Smart metering technologies are expected to play an important role in supporting sustainability, but the business case for their deployment is not yet sufficiently developed.</p> <p>ICT-intensive sector: Energy companies are well equipped with ICT systems supporting energy network automation and control. About half the companies surveyed were installing or testing smart meters in 2009, and about a fifth planned to do so in the next two years.</p> <p>Standardisation and government support are seen as critical success factors to realise the societal and environmental potential of ICT systems in the energy industry.</p>

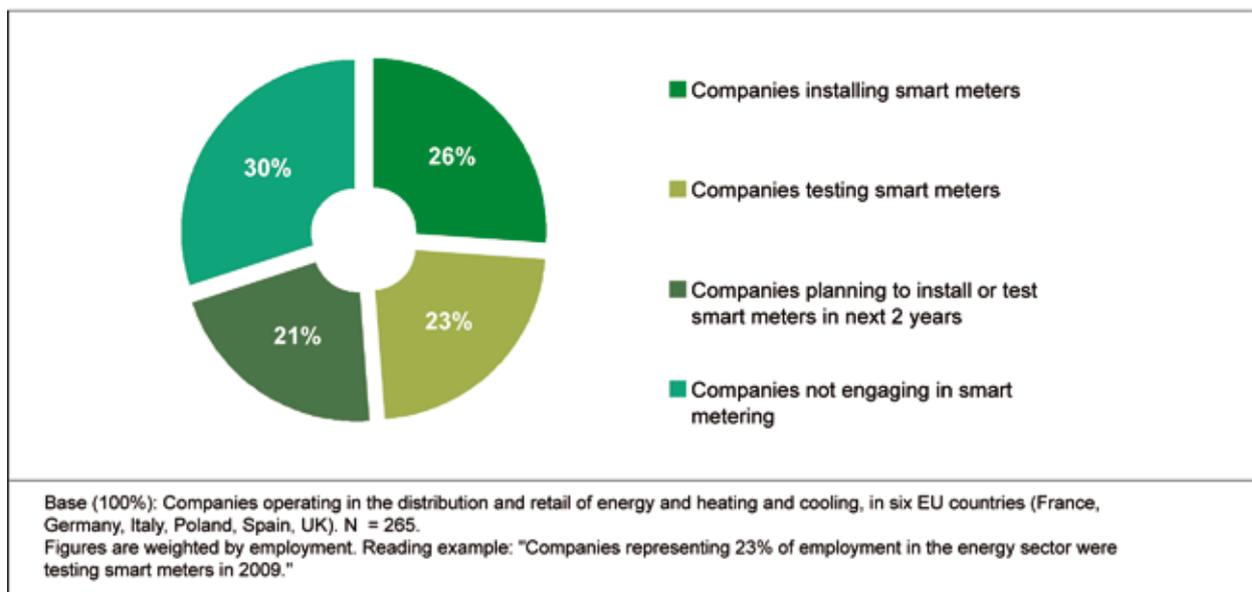
ICT systems have an impact not only on energy consumption (demand side impact), but also on the way energy is produced and distributed (supply side impact). The **energy supply sector** is expected to undergo transformation, in particular in terms of electricity distribution. Technological innovation, with ICT as one of the key enablers, is driving fundamental change in the power grid. The hope is that energy production will become "smarter", as the operation of all interconnected elements in the grid can be better coordinated. This would improve not only the security of energy supply, but also its environmental sustainability. The studies find that the transition towards a more climate-friendly energy supply sector is supported by a range of ICT solutions, which respond to changing regulatory, safety, and security requirements (see studies in **Chapter 3**). Although the sector is already an intensive user of ICT systems (compared to other industries), there is still scope for a much wider deployment of ICT solutions for monitoring and reducing its environmental impact.

A specific focus of the studies was to assess the deployment and importance of **smart metering** systems (see **Exhibit 2**). These are advanced electronic devices combined with modern two-way communication technologies. They collect and provide detailed information about consumption

profiles. These data could have an important effect on both demand and supply, for instance by enabling innovative tariff schemes. The extent to which smart metering will be introduced is a subject of debate and will depend on the incentives introduced and the savings the technology can offer. The Sectoral e-Business Watch study found that about half of the companies were already installing or testing smart meters in 2009, and more than 20% had plans to do so within the next two years. No other application or technology attracted as much attention.

The studies also point to some **barriers** slowing down the deployment of smart metering systems. A general problem is that the business case for energy companies to drive smart metering is not yet clear. Another critical factor is standardisation. Insufficient international agreement on standards keeps companies from investing in the new technologies required for smart grids. The study concludes that only wide-scale organisations such as governments can accelerate and enforce the desired changes. They could set guidelines to decrease uncertainty, inform customers and provide financial incentives (e.g. for RTD on ICT systems which enable new energy technologies, and for investment in such systems).

EXHIBIT 2: DEPLOYMENT OF SMART METERING SYSTEMS IN 2009



Removing barriers on the way towards advanced forms of electronic data exchange

The European e-Business Report 2008 observed a "trend towards digitally integrated value systems", with an increasing "importance of knowledge-intensive activities" within both the manufacturing and service sectors (p. 9f). Even if the economic crisis has slowed the dynamics of this transformation, it has not come to an end or been reversed. ICT systems have become pervasive in business. In fact, "e-business" is probably no longer an adequate term to capture the general trend of applying ICT systems in commercial exchanges. In advanced companies, most business processes are ICT supported in one way or the other; a distinction between "e-business" and "traditional business" is no longer possible. However, even if the concept is being mainstreamed, some important issues remain to be addressed. These include technical and legal challenges for electronic data exchanges between companies, which limit the scope of the network effects and the resulting productivity gains.

With the study on the glass, ceramics and cement industry (see Section 2.2), the Sectoral e-Business Watch completed its series on e-business in energy-intensive sectors (pulp and paper, 2006; chemical, steel and transport services, 2008).

The second sector study of 2009 analysed e-business activities in the energy supply industry (see Section 2.3). The studies confirmed the general trends outlined above. Even in the **glass, ceramics and cement** industry, a traditional manufacturing sector where SMEs account for more than 50% of employment, more than two thirds of the companies said that they conducted at least some of their business processes electronically in 2009. About 15% saw themselves as intensive users. However, many companies use ICT mainly for optimising their internal processes rather than for data exchanges with suppliers and customers. Although the **energy supply industry** is a completely different sector, basic business objectives - such as the efficiency and productivity of operations and the return on assets - are the same. Energy companies make intensive use of a broad range of ICT solutions to reach these objectives. Solutions range from general corporate ICT systems (such as ERP) to sector-specific ICT solutions for various activities covering the full value chain: energy generation, transmission, distribution, metering and retail. All in all, the sector is an advanced user of ICT systems; nearly 90% of the energy companies said they conducted at least some of their processes electronically in 2009.

EXHIBIT 3: E-BUSINESS TRENDS AND CHALLENGES IN 2009/2010

ICT & e-business trends observed in 2009	Challenges to be addressed to advance e-business in Europe
<p>Impact of the crisis: many large companies have reduced their ICT budgets and downsized or cancelled projects. Companies have refocused their e-business activities on cost saving. This is a reverse trend compared to the economic growth period of 2004-2007, when companies began to invest more in marketing and improving customer services.</p> <p>ICT to improve the transparency of internal processes: increasing the efficiency of internal processes remains a key objective of ICT use. Case studies demonstrate the potential of ICT in this regard, both for large companies and for SMEs. The cases also show that gains in efficiency tend to go hand in hand with more transparency in business processes. This facilitates planning and decision making.</p> <p>e-Business as part of the strategy and business model: in large companies and in some SMEs, e-business is deeply integrated with the company's overall strategy. It supports the strategy, and can even become a part of it. This includes decisions on which parts of the value chain to cover, on product portfolios, distribution channels and cooperation strategies.</p>	<p>Supporting SMEs in taking informed decisions: the digital divide is a major barrier for wider use of e-business, limiting the network effects. A challenge for many small firms is to take informed decisions on ICT adoption (or non-adoption), as they are not familiar with ICT concepts and the business opportunities they offer.</p> <p>Creating an optimal framework for advanced electronic data exchanges: some business processes, such as invoicing, are well suited to be digitised. However, there are still complex issues to be solved. The EC's Expert Group on e-Invoicing made comprehensive recommendations on how the framework conditions could be improved (2009); these should be followed up.</p> <p>Broader agreements on standards for e-business within value chains: the scope for expansion in advanced e-business with suppliers and customers remains significant in many sectors. Agreement among the players on standards for data exchanges is a key success factor in driving adoption.</p>

Strategic responses for policy and industry: towards a European strategy for Key Enabling Technologies

ICT as a general purpose technology

ICT is a so-called general-purpose technology with three far-reaching characteristics: it is pervasive as it spreads to all economic sectors; it improves over time and hence keeps lowering the costs for users; and it spawns innovation, i.e. it facilitates research, development and market introduction of new products, services or processes. This last property can be termed the “enabling role of ICT for innovation”. The Sectoral e-Business Watch studies of 2009 confirmed the importance of ICT for product and service innovation as well as for process innovation. This holds true for innovation in the energy supply industry (see Sections 3.1 and 3.2), in road transport (see Section 2.3) and even in traditional manufacturing sectors (see Section 2.2). The development of new products, services and processes could be further enhanced by the “Future Internet”, comprising the “Internet of Things” (i.e. networks of objects and sensors which are interconnected through wireless devices or the internet) and the “Internet of Services” (online networking and collaboration tools).

ICT can support innovation in key enabling technologies

In a Communication published in September 2009, the European Commission introduced a focus on “key enabling technologies” (KETs), i.e. technologies that will be of crucial importance for the development of new products and services over the next five to ten years. The EC identified five KETs: nanotechnology, micro- and nanoelectronics

(including semiconductors), photonics, advanced materials, and biotechnology. These technologies are seen as crucial to ensure the competitiveness of European industries in the knowledge economy.

ICT is still relevant for all of these KETs, not only because it is embedded in almost all high-tech applications. Micro- and nanoelectronics are by definition ICT, as they are basic components of hardware; and photonics, the technical application of light, has large overlaps with ICT. Furthermore ICT may, in its general purpose, help exploit the innovative potential of nanotechnology, advanced materials, and biotechnology. Another condition for successfully establishing these industries and using their applications is a functioning high-speed (broadband) network. The European Commission and Member States are well advised to closely intertwine their KET activities and strategies with those related to ICT.

Policy responses: focusing on commercialisation, applying game theoretical considerations in policy design

A principal problem of European innovation performance is, as the KET Communication states, that “the EU has very good research and development capacities in some key enabling technology areas; however it is not as successful in commercialising research results through manufactured goods and services” (p. 3). Innovation policy will thus have to focus on the **commercialisation** of results from KET R&D. To this end, the European Commission suggests, among other things, increasing the focus on joint strategic programming and demonstration projects in order to reach sufficient critical mass and overcome fragmentation of European R&D. The European Commission also suggests reviewing possibilities to spur innovation through state aid.

The Sectoral e-Business Watch study about ICT-related industrial policy shows how considerations and concepts based on **game theory** can help design effective policies. For instance, policy makers should be aware of the possible downsides of joint European technology programmes and state aid, such as inefficient collusion of firms involved and free-rider behaviour of companies and countries (see Section 4.1).

EXHIBIT 4: ICT AND THE NEW KEY ENABLING TECHNOLOGIES

