



# Impact of **Global Sourcing** on e-Skills



Brochure prepared in relation to the study "Impact of global sourcing on e-skills" for the European Commission in 2008.

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# Acknowledgements

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The activities and analyses carried out in relation to this study have been guided by a Steering Committee consisting of:

- **Bruno Lanvin**, Director e-Lab, INSEAD, Fontainebleau
- **Caroline Jacobsson**, Information and Communication Adviser, EMF, Brussels
- **Elena Bonfiglioli**, Director of Corporate Citizenship, Microsoft EMEA, Brussels
- **Graham Vickery**, Head of Information Economy Group, OECD, Paris

## What are 'e-skills'?

The European e-Skills Forum has defined three main types of e-Skills: ICT practitioner skills (or ICT specialist skills), ICT user skills, and E-business skills.

In the study, we focus on ICT practitioner skills defined as 'The capabilities required for researching, developing, designing, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems'.

- **Jacob Funk Kirkegaard**, Research Associate, Peter G. Peterson Institute for International Economics, Washington

Our contact point within the European Commission was André Richier, Principal Administrator at the Directorate General for Enterprise and Industry. In addition, representatives from other Commission services (in particular Jurand Drop from the Directorate

General Information Society and Media) as well as a range of National, European and international experts and stakeholders have provided valuable contributions to the study.

The Danish Technological Institute would like to acknowledge the immense contributions and insights provided by the members of the Steering Committee as well as from involved experts and stakeholders interviewed.

## DANISH TECHNOLOGICAL INSTITUTE

Danish Technological Institute (DTI) is an independent, not-for-profit institution approved by the Danish authorities to provide technological services to business and the community. The Institute's mission is to promote growth by improving interaction and encourage synergy between research, business, and the community.

The Institute was founded as an independent institution in 1906 and is one of the oldest of its type in the world. The Institute has more than 850 employees, making it one of the world's largest private institutes to supply approved technological services such as consultancy, tests, certification, and training for companies and public-sector organisations.

Centre for Policy and Business Analysis at Danish Technological Institute has 25 employees. The primary focus of the Centre's activities is to contribute to evidence-based policy making through analyses and evaluations within three broad themes:

- Information society and technology policies
- Education, lifelong learning, and labour market policies
- Innovation systems and competitiveness.

In the design of policy studies and evaluations the centre often uses interdisciplinary methods, both quantitative and qualitative, and semi-experimental models that can assist in bridging research, policy formulation and innovation in the business environment. Strategic implications for businesses and for policy formulation are often discussed and facilitated through web tools and scenario methods to link policy and practice.

# Overview of the Study

Global sourcing of ICT software and services is a relatively new policy concern that has grown out of increasing globalisation of the services sectors. Global sourcing is enabled by phenomena such as trade liberalisation and technological developments. Options to codify standardised ICT tasks and ICT-enabled services are furthermore a driver. Changing market dynamics form a relatively open field with both challenges and opportunities for the future competitiveness of the European ICT software and services sector and the employability of European ICT practitioners.

After an open call for tender, The European Commission, DG Enterprise and Industry, selected the Danish Technological Institute to analyse and estimate the impact of global sourcing of ICT software and services on the future supply and demand for e-skills as well as economic impacts. The study is entitled 'The impact of global sourcing on e-skills'.

The main goal of the study is "to better understand the impact of global sourcing on e-skills jobs and occupations in order to anticipate change and concentrate efforts on nurturing talent and developing e-skills where Europe can best compete".

In the study, the project team has identified and addressed the challenges presented by global sourcing and developed a "global sourcing assessment model" and three scenarios. The assessment model and the scenarios offer a platform for a deeper understanding of the potential future impact of global sourcing on e-skills in Europe. The purpose is to facilitate strategic dialogues at all stakeholder levels on the type of short- to medium term policy instruments which can best promote future competitiveness, growth, and employment opportunities in Europe.

The study was launched in January 2008 and two reports – a synthesis report and a final report with scenarios and policy recommendations – were published in September 2008. Furthermore, a dissemination event was held in September 2008 in Copenhagen with the participation of experts, policy makers and stakeholders.

## What is 'global sourcing'?

There are many definitions of global sourcing and it can be difficult to distinguish between different types of sourcing. In this study, we apply the OECD typology in which sourcing is defined by control (independent subcontractor versus affiliate) and location aspects (national versus international).

According to this typology, global sourcing covers both European companies contracting out to independent parties located outside the EU (offshore outsourcing) and sourcing of activities from European companies to affiliates outside the EU (internal offshoring). In addition, the global sourcing of activities from other countries to the EU (onshoring) is also included in the study.

# European Commission



**Costas Andropoulos**  
Head of Unit  
ICT for Competitiveness and Innovation  
Innovation Policy Directorate  
Enterprise and Industry Directorate General  
European Commission

The European Union needs to ensure that the knowledge, skills, competence and creativity of the European workforce – including its ICT practitioners – meet the highest global standard and are constantly updated in a process of effective lifelong learning.

The moving of production capacity by multinational enterprises to countries with lower labour costs is a phenomenon already known over a number of decades.

In a global marketplace, companies also increasingly seek collaborative arrangements with universities, particularly in some Asian countries where there are large supplies of science and engineering graduates. The emergence of global sourcing of ICT software and services and its potential impact on employment caused concern in recent years.

In 2007, the European Commission indicated in its Communication on “e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs”, that e-skills are central in formulating policy designed to ensure that Europe can boost the productivity and employability of its workforce and respond to global competitive challenges.

The study realised by the Danish Technological Institute on “The Impact of Global Sourcing on e-Skills” provides the first comprehensive overview on this important topic. It is particularly interesting because there is a need to respond to global competitive pressure by clarifying the strategic implications and focusing on the strengths of our assets. The European Union must remain an attractive place to live and do business. To this end it is necessary to continue to work at providing a rich science and technology environment and the availability of a breadth and depth of skilled labour force performing well in the latest information and communication technologies.

# Danish Technological Institute



**Hanne Shapiro**  
Centre Manager  
Danish Technological Institute  
Centre for Policy and Business Analysis

E-skills are fundamental to the innovation strategies of the future.

One of the most central effects of globalisation processes is a reconfiguration of value chains – and within ICT software and services, often also with an unbundling of services to different locations across borders. Central and Eastern European countries have been the preferred sourcing destinations for many European companies. To an increasing extent, sourcing destinations outside Europe – in particular Asia – are becoming attractive to tap into new emerging markets and local centres of excellence. Competitive pressures on European companies are at the same time likely to increase as global competitors in Asia move up the value chain.

These changes are in turn likely to impact the nature of skills demands in Europe. Global competitors’ value proposition is likely to follow a pathway of technological and research driven innovation. Therefore, Europe’s competitive edge could be determined by factors other than the quality and volume of R&D. We must dare to initiate forward-looking systemic reforms in our education and lifelong learning systems, so that our future workforce obtains skills and mindsets to take the lead in new and more open forms of market and user driven innovation; this could be critical to a competitive and creative Europe of the future.

European ICT companies must recognise that education even at the highest levels is not a one-time event, but that learning can and must occur in all sorts of contexts and throughout life in order to create products and services that cannot easily be replicated. The innovation strategy of the future for the European ICT software and services sector is a skills- and learning- intensive strategy.



Skills for the Global Age



"As new types of competition, and new kinds of competitors continue to emerge on global markets, the challenge to generate, attract and retain talents may be one of the most daunting that our nations, regions, cities, organizations and enterprises will have to face in the years to come. The increased mobility of production factors across national borders, the growing ubiquity of information networks, and the unprecedented opportunities to cater for global markets that they have brought, have given birth to the phenomenon of 'global sourcing'. In this new context, skills and talents are becoming a major ingredient of competitiveness. At the same time, they need to be rapidly re-defined, and constantly re-aligned.

The challenge of 'skills for the global age' is hence to be shared by analysts, politicians, educators, and decision makers. For all of them, the time has come for a substantial re-visiting of assumptions and principles, and for significant strategic readjustments."

**Bruno Lanvin**  
Executive Director  
eLab - INSEAD

# A globalised economy

Sourcing of activities from Europe to other countries is an integral component in networked and globalised economy.

Global sourcing is not a new phenomenon. It has been practiced for years in relation to standardised low value activities. However, according to the OECD an increasing flow of foreign direct investments to new growth economies also in high value activities is likely to reflect a next wave of ICT globalisation.

Competitive pressures in areas of high value tradeable services will most likely increase as foreign companies and developing countries in general move up the value chain. In the medium term these changes could fundamentally affect demands for e-skills in Europe – quantitatively and qualitatively, as ICT firms will look to new sources of innovation and competitiveness to fully harvest the impact and benefits of globalisation. These changing patterns of competitiveness have led some European ICT companies such as Capgemini to change their sourcing strategy.

Though numerous studies and analyses have been conducted on offshoring sourcing phenomena in ICT and the services sector, the lack of reliable and comparable data have led to that much of the evidence has been anecdotal. Hitherto, several studies have mainly addressed risks of structural employment losses, whereas offshoring and its potential to spur innovation and competitiveness have been less explored - including how the interlinkage between offshoring, innovation, and competitiveness could affect skills demand down to the specific occupational level

Capgemini

Capgemini is a French based ICT consultancy company with over 86,000 people in North America, Europe, and the Asia Pacific region. By using a global supply system, Capgemini has been able to develop a strong market position in the ICT consultancy industry. This has involved massive up-scaling in India. Until now, the strategy has involved using Indian workers as 'internal sub-suppliers' in projects managed by onshore western project managers.

Due to the prospects of increased competition in the important Northern European market from fast growing 'pure play' Indian ICT consultancy companies, such as Infosys and Tata Consultancy Services, Capgemini has initiated a business transformation process. This involves a shift from using Indian workers as sub-suppliers to putting them in managerial positions. This strategy is based on the acknowledgment that customers will most likely turn to the 'pure' Indian players, if European based companies continue to demand western prices for project management and activities in the higher end of the value chain. Thus, the solution is to use more Indian competencies at more levels, and as a consequence this could result in a decrease in people working 'onshore'.

Source: Børsen (18-9-2007)



# Europe's position in the global market

## for ICT software and services

Services are increasingly important in modern economies and this also holds true for the European Union.

The OECD's statistics on service exports show that computer and information services has the fastest growing exports (2000-2005) followed by financial and insurance services, communications and other business services. The economic importance of the sector and its role as a driver of innovation in other sectors means that global sourcing of ICT software and services has attracted much public attention. In the debates it has often been stated that Europeans may fear that global sourcing will have a negative effect on employment and competitiveness of companies in Europe.

The European software and service sector consists of slightly more than half a million enterprises and generates €154.3 billion of value added annually. Employment in the sector has increased steadily since 1996, except for a brief stagnation in 2000-2004, and the sector currently employs 2.6 million persons.

European companies increasingly offshore ICT software and services to countries outside Europe. However, data from Eurostat shows that in spite of an increasing level of offshoring, the EU is currently a net-exporter of computer and information services, and – more importantly – the trade surplus in this service category is increasing.

In 2006, net trade in computer and information services between the EU27 and the world reached €26279 million, while the net extra EU27 trade in services in computer and information services reached €11290 million.



EU recorded its largest trade surplus in computer and information services to Switzerland (€2446 million), while the trade surplus to the USA was €1594 million. The only trade deficits in this service category were recorded for India (€-433 million), Israel (€-25 million), and Uruguay (€-2 million).

These figures illustrate that more global activities are being moved to Europe rather than being relocated to destinations outside Europe. Furthermore the data suggests that Europe so far had a net gain from a globalised market for computer and information services. However, this pattern could change in the years to come due to changes in global sourcing trends and the emergence of new global ICT players. For instance, China's software industry is expanding, and although China's export of computer and information services is still relatively low, the annual growth rates indicate that they could rapidly catch up.

India is one of the main offshoring destinations, but other countries in Asia and South America provide offshoring opportunities to companies that wish to locate activities to destinations with lower cost levels. Although some European ICT companies have located activities to destinations outside Europe, European near shoring destinations in Central and Eastern Europe are still preferred offshoring destinations. Underlying factors are both issues of proximity and the quality of the workforce.

Activities that are being offshored are no longer only standardised low value activities such as call centres and back-end business process operations (incl. data entry and handling, coding, and medical and legal transcriptions). To an increasing extent they also include high value activities such as software programming, design and development. The offshoring of such knowledge intensive activities is a relatively recent phenomenon, but it is estimated that this type of offshoring will increase in the coming years.

The nature and quality of the knowledge base increasingly inform global sourcing decisions,

including multi-location strategies. These changes situate the quality and the availability of the ICT practitioners as a key location factor for high value activities in the ICT services sector. In fact, there is evidence that offshoring of high value activities is increasingly used as a part of 'companies' innovation strategies.

Offshoring of R&D is still relatively limited, and when it occurs it seems most often to be part of a multi-location strategy. The potential innovation gains and growth opportunities to be made from offshoring of R&D to globally recognised hubs with a high level of R&D intensity are still topics to be explored in depth.

### Open innovation – the key to future innovation?

One of the key concepts related to the globalisation of R&D is 'open innovation' defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation". The concept emphasises the need for companies or clusters to open up their innovation processes to external actors in order to promote innovation and thus future competitiveness.

In an open innovation perspective the outsourcing or offshoring of R&D activities to other countries is a means to open up the innovation process and tap into external knowledge resources outside the company or region in question.

Source: <http://www.openinnovation.net/>

### ARM – a global pool of talent

The multinational enterprise chip processor company ARM with head offices in Cambridge, also has offices in India. Currently, the ICT specialists working with innovation in the company are located in Cambridge, UK. However, ARM expects this to change in the future when Indians develop their social and innovative competences further – including a better understanding of Western working practices.

For global companies like ARM the potential pool of labour is global, and the company will hire the best ICT practitioners irrespective of their location.



Preparing Europe's workforce for the 21<sup>st</sup> Century



"Global sourcing and technological innovation have the same effect on employment opportunities and workers' skill requirements; both raise the threshold for what it takes to be employed in a high-wage services economy. However, as the US debate has shown, their political impact is nonetheless very different. While innovation is welcomed and indeed usually subsidized, global sourcing is consistently blamed for every traditional job description changed and every job lost. Hopefully, Europe's leaders will resist this temptation and instead press on with the needed reforms of the continent's labour market and educational institutions. Only this will prepare Europe's workforce for the 21<sup>st</sup> century."

**Jacob Funk Kirkegaard**  
 Research Associate  
 Peter G. Peterson Institute For International Economics, Washington

# Myths and realities

There is a plethora of myths concerning the impact of global sourcing of ICT software and services to countries outside Europe.

One of the most persistent debates that only build on anecdotal evidence is that global sourcing results in structural job losses in Europe. Concerns are that that this could lead to massive welfare losses. However, statistical data and a range of in-depth interviews fundamentally challenge these assumptions.

Employment of ICT practitioners in Europe

Current evidence shows that global sourcing is a two

way street where activities are both being located to destinations outside and inside Europe. Data from the European Restructuring Monitor show that net job losses are primarily results of internal restructuring and automation in Europe – and not results of global sourcing of ICT and services.

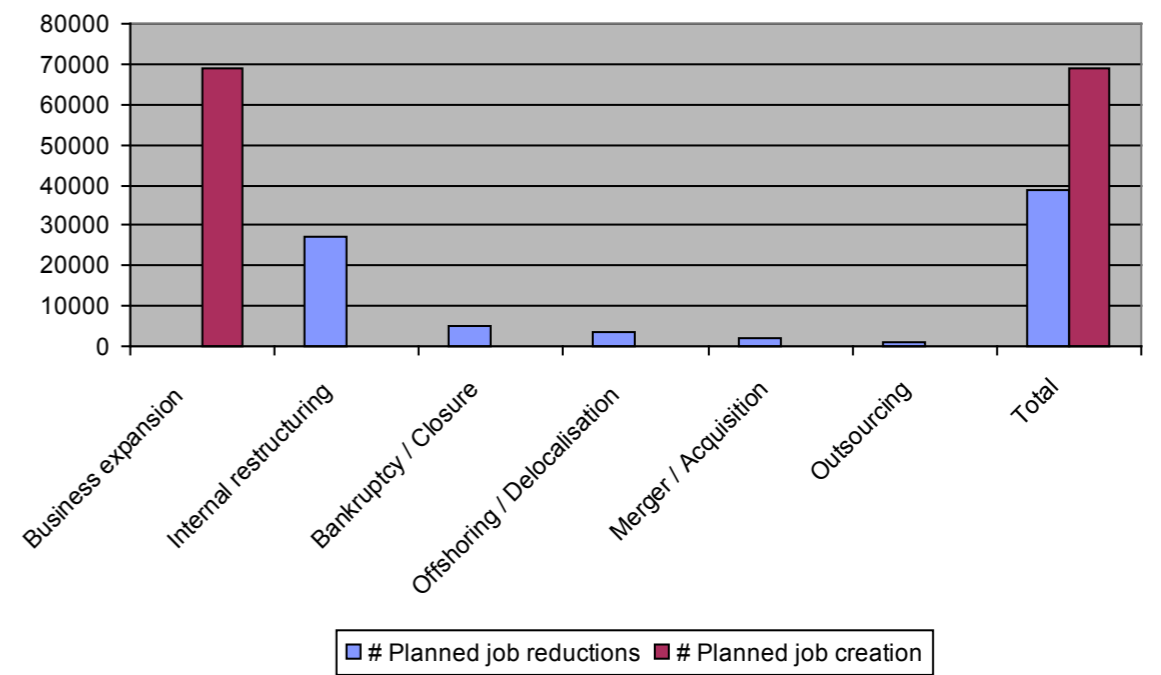
The figures on ICT from the European Restructuring Monitor for the period 2002-2008 reveal that the total job creation outweighs the total job loss, and that the impact of offshoring on employment is minimal compared to the employment impact from internal restructuring and bankruptcy/closure, cf. Figure 2. Overall, introduction of new technologies (e.g. process technologies and automation) and organisational change seem to have a more significant impact on employment levels in the sector than offshoring.

Main challenges for the ICT sector are currently not structural job losses, though the dynamics of the ICT sector show some fluctuations in overall employment levels of ICT practitioners. The key challenge for the ICT sector is rather associated with shortages of persons with the right mix of skills.

In this perspective, there are particularly three broad areas pertaining to the future competitiveness of the ICT industry and to the employability of ICT practitioners in Europe:

- Policies which can spur innovation capacity within the ICT sector
- Efficient and coherent lifelong learning policies
- Public-private partnerships for forward looking and targeted education and training practices

Figure 2. Planned job reduction and job creation (2002-2008)



Source: European Restructuring Monitor

### Future skills needs in Europe

The main impact of global sourcing is most likely to result in a qualitative change in the demand for ICT practitioners, rather than primarily a quantitative change. As routine ICT job functions are most prone to off-shoring, increased levels of specialisation in high value activities could be one of the gains to be made from offshoring. This would not only result in increased demands for employees with higher skills levels, but also with changing skills profiles. Demands for persons with solid technological skills combined with knowledge of business processes and how ICT can enable a reconfiguration of business models are in demand. As some markets become saturated,

the need for employees which can combine knowledge about specific technologies, and how they creatively may be exploited in applications for emerging new markets become of high value in business innovation strategies. However, highly specialised technological skills are at the same time still at high premium in R&D intensive innovation processes.

There are indications that the composition of technological skills needed in Europe in the future are more complex than previously with growing demands for higher order analytical skills.

### The future of software languages

The French open source consultant Xavier Dutoit believes that courses in computer science should not focus on learning specific software languages because the language learnt will be outdated when the students graduate. Teaching computer science has focused a lot on learning the syntax which is roughly equivalent to learning the words of a language. Instead, students should excel in understanding and knowing the algorithm behind syntax because this makes it easier to switch software languages.

Source: Interview with Xavier Dutoit

### Training and education

Skills shortages and skills mismatches have been shaped both by global sourcing, and the dynamics and disruptive changes in the technological base of ICT companies in Europe. It is a challenge to education and training institutions to ensure that their curricula are updated so graduates acquire qualifications relevant to European ICT companies.

Certification is a means to bridge formal education training measures with the broader aims of responsive and agile lifelong learning systems and to ensure the mobility of the European ICT workforce - yet measures of recognition and credit transfer are not yet in place in all European countries.

### Competitiveness of European companies

We do not witness a global division of labour with high end activities located in Europe and the US, and low value adding manufacturing tasks that are located or sourced to developing countries. Rather, European companies are being exposed to increasing global competition in all parts of the value chain. Therefore European policies must build on identified areas of strengths, and they must stimulate innovation and nurturing talent in areas where Europe can compete. The development of strong clusters in Europe with a global market potential may increase the competitiveness of European companies and make Europe more attractive to foreign companies.



## A global pool of talent: Microsoft Innovation Centre

In 2005 the Microsoft Technology Center was opened at the Microsoft Development Center Copenhagen. The center was opened with the purpose of supporting Independent Software Vendors across Europe, Middle East and Africa to develop leading edge software solutions on Microsoft's platform. In 2006 the name of the center was changed to Microsoft Innovation Center (MIC).



One of the main drivers of location decisions of Microsoft's Western Europe's activities has been the offshoring of routine activities and processes to countries outside Europe. The offshoring of activities has not had a negative impact on employment levels in Europe. In fact, the demand for ICT practitioners in Europe has been increasing, according to Kim Nielsen, Microsoft Innovation Lead. However, the demand for skills in Europe has changed as a result of offshoring. The main impact of global sourcing is a shift to demand for higher skills levels among ICT practitioners in Europe. In particular, there is a demand for project managers and IT architects.

Microsoft currently faces a huge shortage of ICT practitioners in many European countries. At Microsoft Innovation Centre they recruit ICT practitioners for positions in Denmark from France, Russia and Ukraine and they also have measures in place to recruit new employees among university students. In particular, the centre needs IT architects and developers. In one case, Microsoft Innovation Centre could not find any candidates for a vacant position in the company and in turn had to discontinue the position.

At Microsoft Innovation Centre there is still a need for ICT practitioners with advanced technological skills in Europe. One reason is that the cultural barriers between Europe and other world regions require that people with relevant technological skills can work closely with the customer and the rest of the project team even though much of the technical work is carried out outside Europe.

The ideal candidate for a position as ICT practitioner at Microsoft Innovation Centre has a good understanding of information technology as well as business processes. Therefore educational institutions must ensure that future ICT practitioners are able to combine technology and business. Closer collaboration between educational institutions and IT companies are central to the future employability of ICT practitioners.

Kim Nielsen does not think that Europe will lose its competitive edge. In his view, Europe will manage the challenge of globalisation through innovation and sound business management.

However, there are a range of topics that both national and European policies must address to ensure the competitiveness of Europe. Policy makers need to:

- Support job mobility between countries – it can be very difficult for foreigners to get access to national labour markets
- Ensure that educational programmes meet industry needs

Non-European employees and their families face many cultural barriers, and Europe needs to be better at integrating foreigners. Microsoft is working hard to ensure the integration of their foreign employees by assisting with integration processes such as contact with authorities, finding a place to live, getting settled, and not least by promoting integration among employees at the workplace. However, there are still significant cultural barriers outside the workplace that foreign employees and their families often have to face. Failure to integrate employees and their families increases the risk that they quickly move back to their home country or move to a country with a more open culture.

# Identifying the challenges

**Global sourcing is transforming the global market for ICT software and services and resulting in changes in global value chains.**

These developments present ICT practitioners, companies, policy makers, and stakeholders with a new business context to which policies and business practices must be responsive.

## Shortages

A shortage of ICT practitioners in Europe could pose a serious threat to the growth and competitiveness of the European ICT sector. In 2008, the World Economic Forum concluded that leveraging ICT is an essential instrument for countries and national stakeholders to ensure

continued prosperity and growth. Therefore, rapid adjustments of education and lifelong learning systems, measures to improve the image of ICT occupations, and efforts to ensure well-functioning and dynamic labour markets, are key priorities to ensure an adequate supply of e-skills in Europe. Policy initiatives linked to the supply of e-skills in Europe need to take into consideration trends in the global sourcing of ICT activities, as global sourcing trends will have an impact on the future demand for e-skills – quantitatively as well as qualitatively.

Shortages of ICT practitioners have been reported in many European countries. Even though such shortages can be related to business cycles and skills mismatches, there is a need to monitor and address these reported shortages to understand their potential impact also in the medium term.

To avoid shortages of ICT practitioners in Europe, companies, unions and policy makers following measures could be of relevance:

- Stimulate that talented youth know about and enroll in ICT studies.
- Providing incentives to the upskilling of floor level workers in the ICT sector, this also include smooth recognition and credit mechanisms between vocational and further education pathways at all qualification levels.
- Retraining non-ICT practitioners for work in ICT software and services, and
- Assist foreign ICT specialists to work in Europe, and facilitate recruitment of non-European ICT graduates (make Europe more attractive, internationalise curriculum, and increase access to labour markets).

## ICT - the key to competitiveness



"Development and use of information and communication technology has become a basic infrastructure for all economic activity. Europe must develop new ICT applications and use them effectively to remain competitive and boost productivity as new firms and developing countries move up international value chains."

**Graham Vickery**  
Principal Administrator, Information  
Computer and Communications Policy Division  
OECD, Paris

## e-skills UK

'E-skills UK' is the British Sector Skills Council for IT and Telecoms working to ensure that the UK has the necessary e-skills to ensure a competitive and thriving economy. Employers, educators and the Government work together in the Council on how best to address skills needs related to IT and Telecoms.

E-skills UK deals with all levels of education and skills development varying from primary education to higher educational levels and retraining of employed IT and Telecom professionals. The companies represented in the board of e-skills UK are both multinational ICT corporations like IBM, British ICT intensive using enterprises and SME representatives. E-skills UK cooperates with business on a range of issues and specific initiatives:

- **Revitalise IT:** A joint employer, government, university initiative aiming to get more students into technology-related studies.
- **CC4G:** Computer Clubs for Girls is a programme aspiring girls in the age of 14-19 to be more interested in computers by facilitating computers activities related to music, design and fashion.
- **Prof IT:** Professionalism in IT is an initiative coined with British Computer Society, Intellect and National Computer Centre working to support UK leadership on the global IT markets.
- **SFIA Framework:** Skills Framework for the Information Age is a common reference model which can be used to identify the skills needed to develop effective Information Systems.

Source: [www.e-skills.com](http://www.e-skills.com)

# Skills mismatches

Ensuring a high quality of the ICT workforce is a challenge for both ICT practitioners and companies.

At the company level, the need for skills will depend on the sourcing and innovation strategy chosen by a company. For instance, companies deciding to hire in highly skilled non-European ICT practitioners will not require the same level of expertise from their domestic workforce, while companies choosing to move out mainly technical activities will require more business-orientated skills in their domestic workforce, and likely also abilities to manage innovation processes involving lead users or partners in a value chain so as to spot new potential application areas of commercial value.

## Hewlett-Packard and Bulgarian Universities partner on boosting IT skills

Hewlett-Packard (HP) Bulgaria has partnered with the University of Sofia, the Technical University and the New Bulgarian University on programmes to boosting IT skills of IT and engineering graduates. Together the universities and HP Bulgaria has offered specially designed teaching modules to help IT and engineering students to acquire some specific and updated skills in line with market demand. One of the advantages of the programme is that it combines lectures with lab exercises.

The initiative has improved the employability of the IT students and HP Bulgaria has benefited from the programme by establishing contacts with potential employees. HP Bulgaria received the Bulgarian Business Leaders Forum Investor in Knowledge Award in 2006 for starting the programme.

Source: HP Bulgaria 2008

# Competitiveness and attractiveness of Europe as a location

Global sourcing is an opportunity for companies to increase their global competitiveness by locating specific activities in regions that provide the right business conditions such as favourable cost level, access to knowledge, a well educated workforce, and strong protection of intellectual property rights.

However, not all companies are able to reap the benefits of global sourcing. Small and medium sized companies (SMEs) in particular do not have the same opportunities to offshore ICT tasks as a means to improve the competitive base and to get access to new markets to the same extent as the larger companies.

Global specialisation and the development of strong European clusters as a way to promote European innovation and competitiveness is another challenge facing ICT practitioners

and companies. Moreover, strong clusters in combination with a highly skilled workforce may attract knowledge intensive companies from other world regions to start up new activities in Europe.

A range of European stakeholders and experts have criticised the European approach to clusters for fostering the development of clusters that are simply too small and localised to be a significant driver of growth. Current European efforts to identify and assess clusters

in Europe are important steps to identifying those that may have a global growth potential, and on this basis potentially re-focus support mechanisms to ensure efficient expenditure of public support for innovation. In addition there is a need to open up local and regional innovation system to input from other regions, and for policy instruments that stimulate the integration of clusters in global knowledge networks.

# The Right Match: Women in Computer Science



Bodil Biering is 32 years old and received her PhD in 2008 in Computer Science from the IT-University in Copenhagen. She currently works as a IT-systems developer at Edlund, a Danish software company delivering services to pension and insurance companies.

There is a lot of talk on how to attract more women to engage in computer science. For Bodil Biering this is very curious. *"Being a researcher in computer science implies great professional stimulation combined with freedom, flexibility and opportunities to work everywhere,"* says Bodil.

## Becoming an expert

The challenge of being a Phd-student is that the level of knowledge often becomes so specialised that not even the supervisor can help the student when a research problem appears to be inextricable. *"But that is also the amazing thing about research: I actually solved some problems which no other person could help me with. I went to conferences and talked to people and got inspired but by the end of the day I was the only one who had that specific knowledge,"* says Bodil.

## One woman among nerds?

One predominant contention is that the nerdy, male-dominated culture of computer science departments deters women from a career in computer science. However, according to Bodil Biering it can also be an advantage to be one of few women in computer science.

*"Research is also about attention and it is easier getting attention being the only woman in a conference of 100 men. Such attention is very conducive for networking – but it also put extra pressure on me to make the best out of my research."*

Bodil has always loved mathematics and particularly mathematical logic, but she never considered a career in computer science. During an exchange programme in Paris Bodil found out that mathematical logic and computer science are closely related. After Bodil returned to Denmark she got in contact with a lecturer

at the Danish IT University about a course in mathematical logic. Bodil's lecturer encouraged her to do a PhD.

*"I would never have applied for a Phd if I had not been encouraged to do so by a lecturer,"* says Bodil.

## More women in Computer Science

The Danish IT University has a lot of young researchers and a dynamic environment. But this is very unlikely to be enough to ensure the future supply of women in computer science – there needs to be a potential pool of recruitment.

*"It starts very early. Girls are introduced to programming as something related to technology rather than something related to maths and logic. That is a pity because girls are very apt at math and logic."*



**Upskilling  
the European ICT workforce**



“Continuous training of workers in cooperation with all stakeholders is a prerequisite for maintaining manufacturing in Europe and keeping pace with the changing technological development in the ICT sector.”

**Caroline Jacobsson**  
Information & Communications adviser  
European Metalworkers' Federation (EMF)  
Brussels

# Opportunities for Europe

**Adjusting to globalisation processes can be difficult for both ICT practitioners and companies in Europe, and it is therefore vital that policy makers and stakeholders cooperate to ensure that all employees are trained and prepared for the future.**

But globalisation also provides opportunities for growth and increased welfare for Europeans. A recent study, “Globalisation and Europe: Prospering in the new whirled order” (2008) finds that the ability to benefit from globalisation correlates directly with the willingness and ability to embrace and keep pace with economic, commercial and technological developments. Not all European countries are well placed to benefit from globalisation, and those that are, according to the study, are those countries that invest heavily in innovation, skills, and research & development, and which actively engage in European and global trade.

A key question concerns priorities – where should Europe invest its efforts and resources? Europe has a strong open source community and benefits from close relationships between the European ICT sector and a range of industrial sectors which have led to the development of advanced industry specific software and applications. According to the EU ICT Taskforce, key European technological strengths include enterprise software; embedded and distributed software; hard real-time design and dependable/fault-tolerant systems; software

engineering; and high-end computing and GRID architectures.

There is a range of national strengths that can form the basis for national or regional specialisation. For instance, Denmark has a very strong environment in mobile and wireless technologies and content production, whilst the UK on the other hand is a leader in exploiting technology to solve business problems. The UK furthermore has several sectors with a clear ICT orientation e.g. financial services and biotechnology. Areas that are highlighted as

potential growth areas include games – both for entertainment and for training purposes (“serious games”) such as training fire-fighters and medical personnel.

Finally, Europe can benefit from the presence of advanced lead users/early adopters which again can lead to a competitive position as an advanced test laboratory. This is a reason why some of the global players for example have located test and development functions in the Swedish/Danish Oresund region despite high salary costs.

**Avalanche Studios**

Avalanche Studios is an independent games developer focusing on original IP or selected high-profile licenses and innovative games technology. The company was founded by three young Swedes in 2003. Avalanche Studios is located in Stockholm, Sweden and currently employs 160 people.

Avalanche Studios released its first game, Just Cause, in 2006 and the game was awarded with several awards. The company also develops games for large publishers, primarily in the US. The competition in the game market is tough and only one in ten games recoups its development costs. However, the company has been very successful in the global market. According to the CEO, Linus Blomberg, Swedish companies are viewed as being reliable with high quality products and services. In the eyes of Linus Blomberg, the company has been successful because of a combination of being creative and innovative, on the one hand, and delivering partial results to publishers according to tight schedules on the other.

Source: Avalanche Studios website, [www.avalanchestudios.se](http://www.avalanchestudios.se); Vinnova website, [www.vinnova.se](http://www.vinnova.se)

# The situation of global competitors

Innovation capacity and the quality of the human resource base are closely intertwined. Therefore the access to highly skilled ICT practitioners is fundamental to companies.

The large number of low-cost ICT practitioners in the developing growth economies and the shortages of ICT practitioners in Europe are often quoted by company managers and stakeholders as one of the primary reasons that companies decide to offshore their activities.

India, China and other growth economies are often portrayed as countries with indefinite human resources. However, the strength of these countries in terms of human resources is according to some sources first and foremost numerical. The Asian Development Bank finds that many countries in Asia are currently experiencing a "skills crisis" due to a perceived low quality of the workforce.

Also, wage levels in India are increasing and this suggests that India is slowly losing its attractiveness as a low cost offshoring destination. This provides other emerging economies with an opportunity to enter the global market for ICT offshoring as they are to an increasing extent able to offer lower wage levels than in India.

The skills situation and the increasing wages levels present India with a double challenge: The potential loss of global competitiveness due to increasing wages is driving Indian companies to offshore activities to other countries as well as move up the value chain by offering more advanced services to clients or by focusing efforts on innovation and specialisation in for instance software to mobile phones, insurance, logistics, health care and agriculture. At the same time, the problems relating to the quality of the

Indian workforce could slow or even prevent Indian ICT companies from moving into these higher value-added segments and activities.

The quality of the human resource base is an issue for India, China and other economies. However, India and China will face other challenges as they strive to move up the value chain. Factors such as insufficient infrastructures, protection of intellectual property rights, and pressures for green ICT are also likely to impact the speed with which India and China succeed to reposition themselves in the global value chains. In addition, according to the OECD, the technological and management gaps between Chinese and foreign firms, weak innovative capabilities and too great reliance on foreign technology means that R&D capacities will have to be boosted many-fold to catch up with global leaders from the US, Europe, Japan and Korea.

## Wipro Technologies

Wipro is a global IT services company headquartered in Bangalore, India. The company currently employs more than 72,000 employees. In 2006-2007, Wipro's revenue increased from 3.5 Bn USD to 5 Bn USD, and the company's main markets are North America (59%) and Europe (32%).

Wipro provide a comprehensive range of IT services, software solutions, IT consulting, business process outsourcing, or BPO, services and research and development services in the areas of hardware and software design to leading companies worldwide. The company is the largest independent R&D services provider in the world with over a half billion USD in revenue from R&D.

In Wipro's annual report 2006-2007, the company has identified a range of skills related risk factors that may negatively affect the company's future growth: shortage of qualified personnel, difficulties for staff in keeping pace with continuing changes in technology, evolving standards and changing client preferences, high employee attrition rates (in particular in the BPO services business), and restrictions on immigration in the US (for instance by making it more difficult to obtain visas) that reduces the company's ability to compete for and provide services to clients in the United States. Finally, increasing wages costs has been one of India's competitive advantages, but wage increases in India may prevent the company from sustaining this competitive advantage and could affect profit margins.

Source: Wipro Annual Report 2006-2007

# Scenarios for the future

The future cannot be predicted, but it is possible to reflect on potential future challenges by developing *scenarios*.

## Scenarios

Scenarios are plausible hypotheses about the future. Each scenario aims to provide a coherent description of the drivers, trends, and events that can influence and change the subject of analysis over a given period. However, scenarios are not predictions, and the scenario analyses and exercises do not aim to predict the future. Rather, scenarios can be considered as an early warning system or navigation tool in the present. Scenario building can also generate ideas and methods for putting into operation insights from case studies and market studies. Consequently, scenario analysis should be regarded as a tool for structured and creative thinking about the future and as a catalyst for strategic conversations and discussions, but not as an end in itself.

Scenarios are plausible pictures of the future that incorporate future uncertainties. The scenarios offer a platform for a deeper understanding of the potential future impact of global sourcing on e-skills in Europe, and may serve as a basis for strategic dialogues at all stakeholder levels.

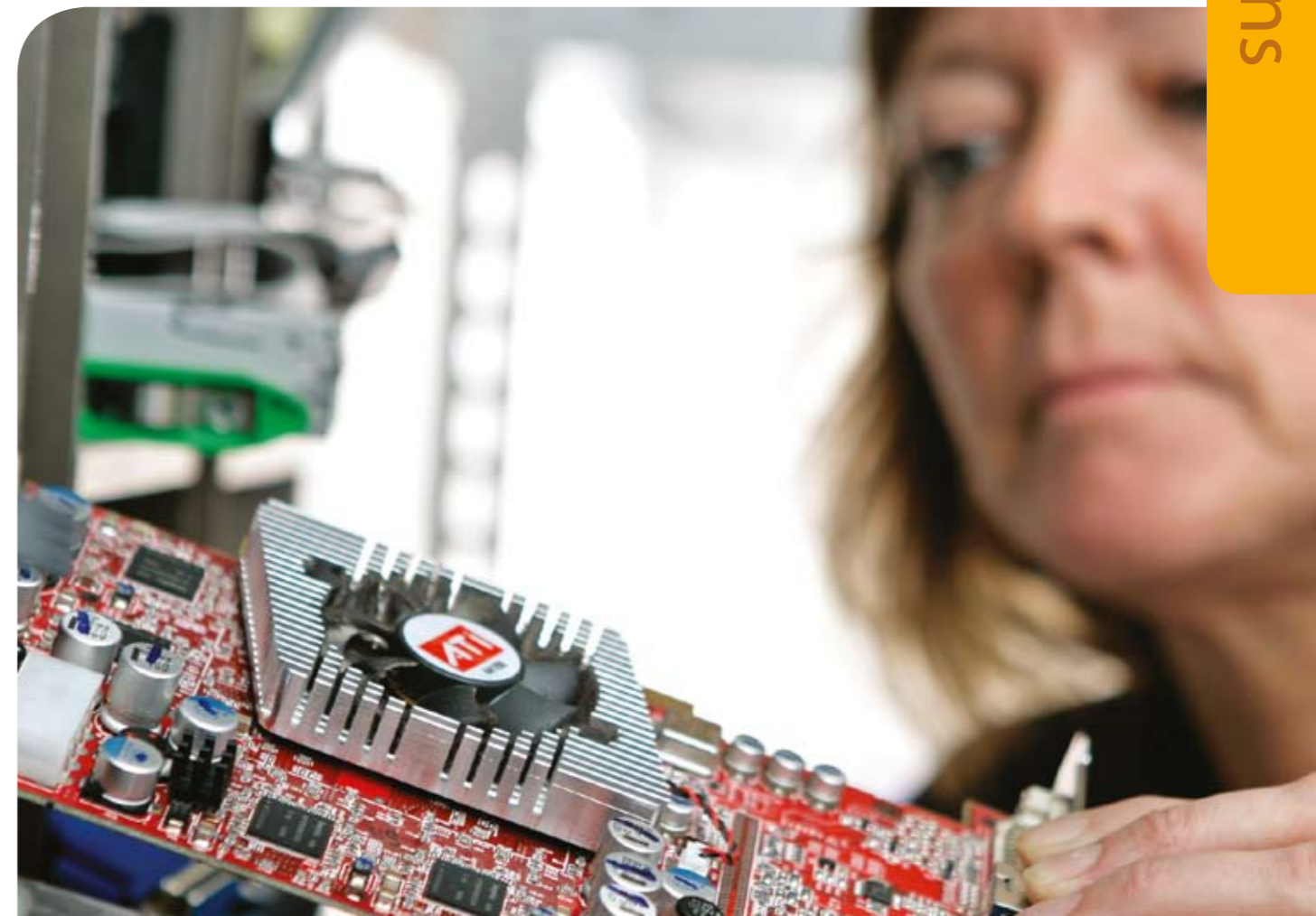
The scenarios presented combine two key uncertainties; variations in market demand for ICT products and services, and variations in the global supply of ICT practitioners. This leads to the development of three scenarios are characterised by:

**Scenario One:** Moderate increase in offshoring

**Scenario Two:** Limited offshoring

**Scenario Three:** High level of offshoring

The severity and nature of the skills gap in Europe vary in the scenarios due to company internal and external factors. Further, the three scenarios each contain scenario-specific policy challenges as well as horizontal themes relevant to all three outlined futures.



# Scenarios for the future

Anticipating change is vital for policy makers and stakeholders to respond to future challenges in a timely and appropriate way.

## Scenario One: Moderate increase in offshoring

This scenario is characterised by a large supply of ICT practitioners outside Europe and a high demand for advanced ICT products and services in Europe. European companies and foreign companies are eager to connect to the European market and expand their business activities in Europe. The pool of ICT practitioners in Europe is limited, and this inhibits business growth. Some foreign companies refrain from locating activities in Europe due to the problematic supply of ICT practitioners in the EU.

Companies in Europe expand recruitment activities of non-European ICT practitioners willing to locate to Europe. Parallel to this process, low-value activities are increasingly offshored to free up capacity. Increasingly, as there is a continuing lack of ICT practitioners, high value activities that are strategically important to businesses are also offshored.

On the one hand, SMEs in the ICT services sector have many new opportunities in this demand-intensive market; on the other hand, lack of internal capacity to recruit ICT practitioners from abroad or to exploit off-shoring limits their growth opportunities.

## Scenario Two: Limited offshoring

This scenario is characterised by a limited supply of ICT practitioners outside Europe and a high demand for advanced ICT products and services in Europe. High demand for products and services makes Europe an attractive market for inward investment by foreign firms – also because of an advanced level of demand in the different market segments. The need for ICT practitioners in Europe has intensified.

The lack of ICT practitioners in Europe seriously hampers growth and market expansion. Countries outside Europe are also affected by a shortage of ICT practitioners, as previous educational strategies have failed in recent years. Massive offshoring of activities or employment of migrant ICT practitioners is therefore not a solution on any larger scale. Offshoring remains minimal and the demand for talent in Europe is intense, particularly by a large group of SMEs within the sector as pressures on wages and creative peer environments have exploded.

## Scenario Three: Extensive offshoring

In the third scenario, the demand for advanced ICT products and services is low due to saturated markets and a stagnating economy in Europe. The supply of ICT practitioners outside Europe is high. Due to the limited demand for products and services, companies look to countries outside Europe for new market opportunities and business expansion. Furthermore, due to the availability of qualified ICT practitioners in the new markets outside Europe, the demand for ICT practitioners in Europe is decreasing. Previous years' investments in ICT programmes finally started to pay off, but now result in an oversupply and rising unemployment level of ICT practitioners in Europe. The most talented European ICT practitioners are recruited by foreign companies to work outside Europe.

# Scenario specific policy pointers

Proactive policy-making will call for a different mix of policy measures across the scenarios in some fields of action, whereas other policy actions will be relevant in each of the distinct scenario futures.

## Scenario One: Moderate Offshoring

Moderate offshoring could impede innovation, since global sourcing can lead to innovation gains. Policy measures could include stimulation and support to company globalisation strategies to harvest the full potentials of a globalised market for ICT products and services. SMEs face a particular challenge of recruiting and retaining high skilled labour in areas where there is a mismatch between supply and demand.

One way forward is reform in education and training systems through comprehensive internationalisation measures to attract and retain more high skilled students as they graduate, combined with measures to expand the student base among young women and in the youth population more generally. Continuous reforms of migration policies for selected groupings combined with supportive enabling policies could make Europe an attractive location for longer or shorter periods as researchers or employees in the ICT sector.

## Scenario Two: Limited offshoring

Should this scenario unfold with its massive shortage of ICT practitioners on a global scale, it will be essential to expand the recruitment basis in Europe through comprehensive and efficient lifelong learning measures targeting the dynamics in demand from the ICT sector as a whole. Although the recognition of prior learning is perceived as a booster to lifelong learning policies, its impact and uptake across Europe and the OECD more widely is still anecdotal, and lack of permeability between education sectors remains a challenge. As pressures from an aging population grow, policies should address retention of the ICT workforce in the sector, both through company-specific measures aimed to improve the attractiveness of the overall working climate for a sector reputed for its long and stressful working hours, and through national fiscal and labour market policies to improve labour market retention.

## Scenario Three: Extensive offshoring

Saturated markets for ICT products and services are no longer considered to be a fluctuating phenomenon by ICT enterprises. Cost-cutting measures furthermore result in a marked oversupply of ICT practitioners across Europe. Proactive forward-looking initiatives both at company, regional, national, and EU level, are central to alleviating the most negative effects of redundancies for individuals and for the affected companies.

# Transversal policy pointers

## The market for ICT products and services is highly competitive.

Deregulation and policies that stimulate demand-oriented innovations are central to the future competitiveness of the ICT sector in Europe, and thus central to employment and employability of ICT practitioners. A broader knowledge base about the type of public policy measures which best stimulate the innovation capability and growth of the sector as a whole is urgently called for to inform priorities and design of national and European R&D and Innovation programmes.

In dynamic and globalised sectors such as ICT products and services, it is difficult to get a coherent picture of current and medium-term e-skills supply and demand in Europe, particularly at the micro level regarding specific occupations within the ICT sector and ICT-intensive businesses. Current statistical methods may give indications of demand that is currently met, but do not provide information on demands which are not met and which result in alternative firm strategies

to address their shortages of ICT practitioners. Because of the global nature of the ICT sector, a forward-looking coordinating platform for understanding drivers and changes over time as a basis for evidence-based policy making is still pending.



Asian Development Bank, [www.adb.org](http://www.adb.org)

European Commission website on e-skills, <http://ec.europa.eu/enterprise/ict/policy/ict-skills.htm>

European E-skills Forum, <http://communities.trainingvillage.gr/esf>

European Information, Communications and Consumer Electronics Technology Industry Association (EICTA), [www.eicta.org](http://www.eicta.org)

Europe Innova, [www.europe-innova.org](http://www.europe-innova.org)

European Software Association, [www.europeansoftware.org](http://www.europeansoftware.org)

Global union for industry, business services and information technology (UNI-IBITS), [www.union-network.org/uniibitsn.nsf](http://www.union-network.org/uniibitsn.nsf)

NASSCOM, [www.nasscom.in](http://www.nasscom.in)

OECD, [www.oecd.org/sti/offshoring](http://www.oecd.org/sti/offshoring)

Pro Inno Europe, [www.proinno-europe.eu](http://www.proinno-europe.eu)

United Nations Conference on Trade and Development (UNCTAD), [www.unctad.org](http://www.unctad.org)

World Economic Forum, [www.weforum.org](http://www.weforum.org)

World Trade Organisation (WTO), [www.wto.org](http://www.wto.org)

World Information Technology and Services Alliance (WITSA), [www.witsa.org](http://www.witsa.org)

A full list of the sources used in this study is available at the project website, [www.dti.dk/global-sourcing](http://www.dti.dk/global-sourcing)

In January 2008, the European Commission, DG Enterprise and Industry launched a study on the impact of global sourcing on e-skills in Europe and the global competitiveness of European enterprises. The Danish Technological Institute was selected by the European Commission to carry out the study.

In the two project reports, the Danish Technological Institute provides an overview of the current debate on global sourcing among policy makers and stakeholders, and analyses the relationship between macro level drivers of change, sourcing trends and strategies and the impact of sourcing on the future supply and demand for e-skills in Europe.

Furthermore, the project team has developed a "global sourcing assessment model" and three scenarios that offer a platform for a deeper understanding of the potential future impact of global sourcing on e-skills in Europe. In addition, the scenarios facilitate strategic dialogues at all stakeholder levels on the type of short- to medium term policy instruments which can best promote future competitiveness, growth, and employment opportunities in Europe.

In this brochure, the Danish Technological Institute presents the main findings of the study and a range of policy recommendations that address the current and potential future challenges presented by global sourcing for European ICT practitioners and enterprises.