E-Skills in Europe:
Matching Supply to Demand

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CEPIS

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This document offers a framework for long-term thinking on the development of Information and Communication Technology (ICT) as the engine of Europe's knowledge economy. Core information is drawn from the findings of Thinking Ahead on e-Skills for the ICT Industry in Europe, *a report published in 2007 for the European Commission by a consortium led by the Council of European Professional Informatics Societies (CEPIS).*

Findings

The rate of ICT innovation, the economic climate and off-shoring are likely to have the greatest impact on future demand for IT practitioner skills by the ICT industry in Europe. A consortium composed of CEPIS, Manchester Institute of Innovation Research (formerly PREST) and Eurochambres estimated supply and demand levels for IT practitioners in 2010 and 2015, having created six foresight scenarios based on quantitative evidence. They believe that the ICT industry could be facing shortages of up to 70,000 IT practitioners per year in Europe, as supply falls short of demand. A fall-off in ICT activity is seen as very unlikely, but should this occur the EU could be facing an oversupply of 1,000 IT practitioners per year.

ICT as infrastructure

We live in an ongoing technological revolution in both hardware and software, one where our lives are more and more dominated by the pervasiveness of ICT, where sophisticated software has fused with telecommunications to conquer the limitations of geography, where we can deliver unique and imaginative solutions to our customers and access business-critical information when we need it and where we need it.

ICT Workforce

Europe's ICT market is worth in excess of €500 billion per year and employs four million people, with the software and IT sector alone accounting for 2.8 million workers. In the decade to 2005, 1.7 million of these jobs were created. Any shortage in the supply of ICT professionals would limit the sector's development.

Behind the progress of this hardware and software is an ICT industry whose innovations are led by speculative curiosity, by market demand forces and by anticipation of our wider needs and desires; and behind this industry are people: the creative professionals who make it possible, the customers who use its applications and the enterprises who conduct business across the marketplace of the Internet.

ICT has become the cornerstone of the modern European economy. It is vital to homes and indigenous businesses across the EU – and is a requisite for attracting foreign direct investment. ICT is the bridges, roads and railways of the highly evolved economy, and the means by which modern states compete to put themselves on the global map. And just as previous innovative infrastructures have required people with the vision to design and build tunnels and skyscrapers, ICT is nothing without a supply of creative and excellent people to design and build new hardware, to write and perfect software, and to dream up the imaginative interfaces that can link previously disconnected technologies.

Europe is evolving away from heavy industry and gearing its resources more towards becoming a matrix of knowledge economies. To ensure its own continued success, our ICT industry must be equipped with professionals who have both the knowledge and the experience to produce the services and products we need. In Europe, we must plan and monitor our policies to ensure that our supply of ICT professionals will meet our future demand: we need the right number of people with the right levels of skills. Anything less and Europe's states will lag behind the rest of the world technologically and therefore slip economically. To avoid playing a smaller international role, Europe must ensure that it has a supply of appropriately skilled ICT practitioners.

E-skills pool: supply and demand

The ICT workforce needs are supplied in a variety of ways. Primarily, people enter the sector having studied courses at certificate, diploma or degree level. These employees choose to study computing for various reasons – including personal interest, desired career path and, crucially, response to national educational strategies. Typically, computer science students follow third-level courses with the goal of taking up lifelong employment in the ICT sector. Their decision to follow such syllabuses is influenced by the availability of courses, perceived job satisfaction and security, likely levels of remuneration and their response to the overall image of the ICT industry.

In times of boom, people will be enthusiastic to commence and complete computer qualifications. A recent example was the dot-com boom, when the Internet appeared to offer endless potential in terms of creativity, mobility and financial reward. Preparation for the 'Y2K bug' and the computer implications of adopting the euro all captured the imagination of people and drew them into ICT. In less certain times, people are more reluctant to embark on specific courses of study – we only have to look at what happened when the dot-com bubble burst in 2000 to see how a workforce can move away from what was once so attractive.

The danger is that such extreme (and unforeseen) swings of interest in ICT can leave the skills market short of qualified people – this is most likely to happen when the market recovers and is in most need of a specialist workforce. Central to this problem is the time lag between study and qualification. Academia generally moves slowly; national educational policy is cautious in responding to estimates of future workforce needs; and serious attempts to study the possible shape of the future take time. It is of limited use to respond to a take-off in an industrial sector while it happens – it requires years for policies to be drafted and implemented, and years again for educational courses to be devised and filled. By the time the much-needed graduates eventually come on stream, the industry may have stopped growing, be less buoyant or have gone into decline – in each case starved of the skilled people it needed to prosper and reach

> **Sources of ICT personnel**
> - *Graduates of higher education informatics/computing courses;*
> - *Graduates from non-informatics courses;*
> - *Existing employees being 'trained up';*
> - *Occupational migrants converting from other kinds of work;*
> - *People with secondary school and other general IT knowledge;*
> - *Graduates from outside the EU;*
> - *Practitioners returning from unemployment or career breaks; and*
> - *Users becoming practitioners.*

the next level. One thing is clear: demand for IT practitioners must be accurately forecast and policies must be implemented to ensure their timely supply. This report by CEPIS meets those requirements by modelling potential supply and demand scenarios for IT practitioners using a mix of quantitative and qualitative analysis.

In modelling the future supply of and demand for IT practitioners, CEPIS amplified demographic decline and the fading interest by students in IT and technology courses, estimating a fall-off in graduations of 30 per cent between now and 2015. Across the EU, there must be compensation for this drop. Otherwise, we will suffer the impact of competition from outside the EU, as we falter within the global economy made possible by ICT technology and skills.

Study

To shed light on the future personnel needs of the ICT industry, a model of the overall environment was devised. Ninety-one stimulants or 'change drivers' likely to impact on the development of the industry in the years up to 2015 were identified. These included social, technological, economic, environmental, political and other forces that together could shape the demand for IT practitioners. Overall, they yielded three dominant influences or 'core drivers':

- ICT innovation rate;
- Economic growth; and
- Off-shoring pace.

Numerous permutations of the positive and negative roles played by each of these three core drivers are possible – the results give rise to various future scenarios. Six of these scenarios were isolated to help clarify thinking about the level and type of e-skills needed in the years to 2015. These scenarios were labelled as follows: Renaissance, Steady Climb, Global, Fight Back, Dark Days, and Decline.

Scenario	Core Drivers		
	Innovation Rate	Economic Growth	Off-shoring Pace
A: Renaissance	Rapid	Positive	Moderate
B: Steady Climb	Moderate	Positive	Moderate
C: Global	Rapid	Positive	High
D: Fight Back	Rapid	Turbulent	Moderate
E: Dark Days	Moderate	Turbulent	Moderate
F: Decline	Moderate	Turbulent	High

FIGURE 1: SIX SCENARIOS ARISING FROM PERMUTATIONS OF CORE DRIVERS

Arising from detailed workshop discussions held in November 2006 with expert EU member state representatives and feedback from leading ICT industry players, the core drivers (innovation, economics and off-shoring) were deemed most likely to produce the first three scenarios Renaissance, Steady Climb and Global). This is based on a detailed consideration of all six scenarios and of detailed figures for the years 2010 and 2015.

Important to our analysis is the close correlation between investment in software and the level of employment in ICT. The ready availability of figures for software investment in EU member states facilitates modelling of the ICT future in each of the scenarios.

For the purposes of modelling the future, economic conditions of 2.5 per cent GDP growth per annum are described as 'positive'; and conditions of 1.5 per cent GDP growth per annum are described as 'turbulent'.

The following graphs and tables summarise labour market imbalance estimates for 2010 and 2015.

	Renaissance	Steady Climb	Global	Fight Back	Dark Days	Decline
Demand	250,000	205,000	204,000	178,000	139,000	101,000
Supply	180,000	175,000	178,000	178,000	139,000	102,000
Surplus/ Shortage	-70,000	-30,000	-26,000	0	0	1,000

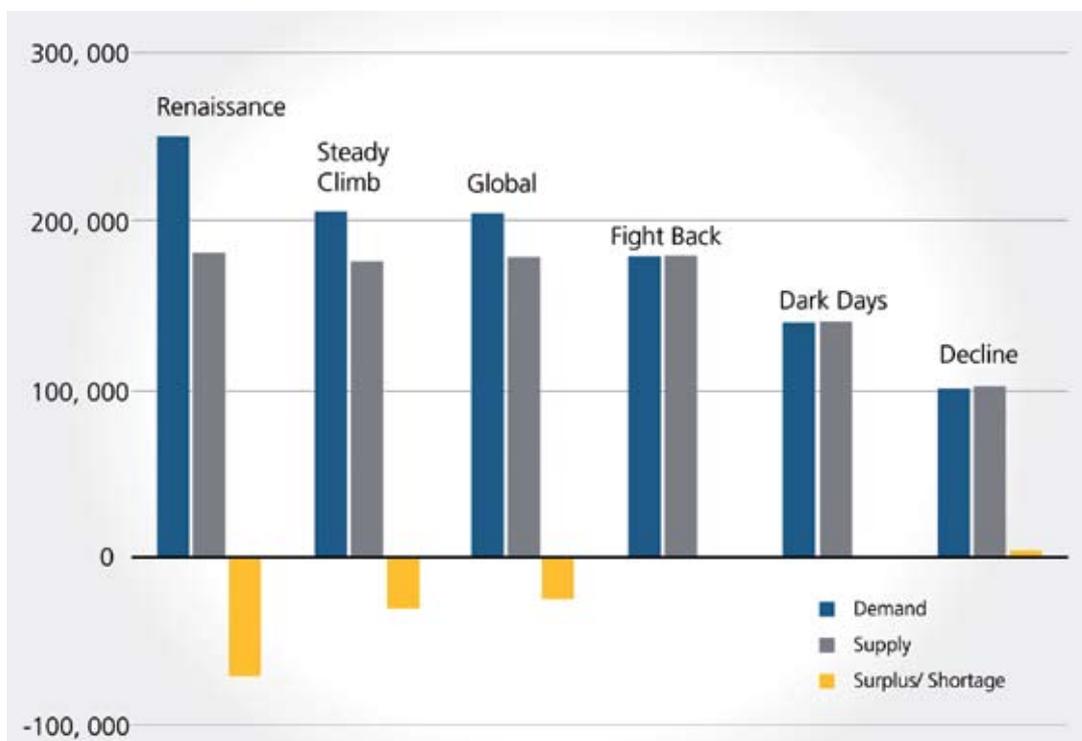*FIGURE 2: IT PRACTITIONER SUPPLY AND DEMAND, ICT INDUSTRY 2010*

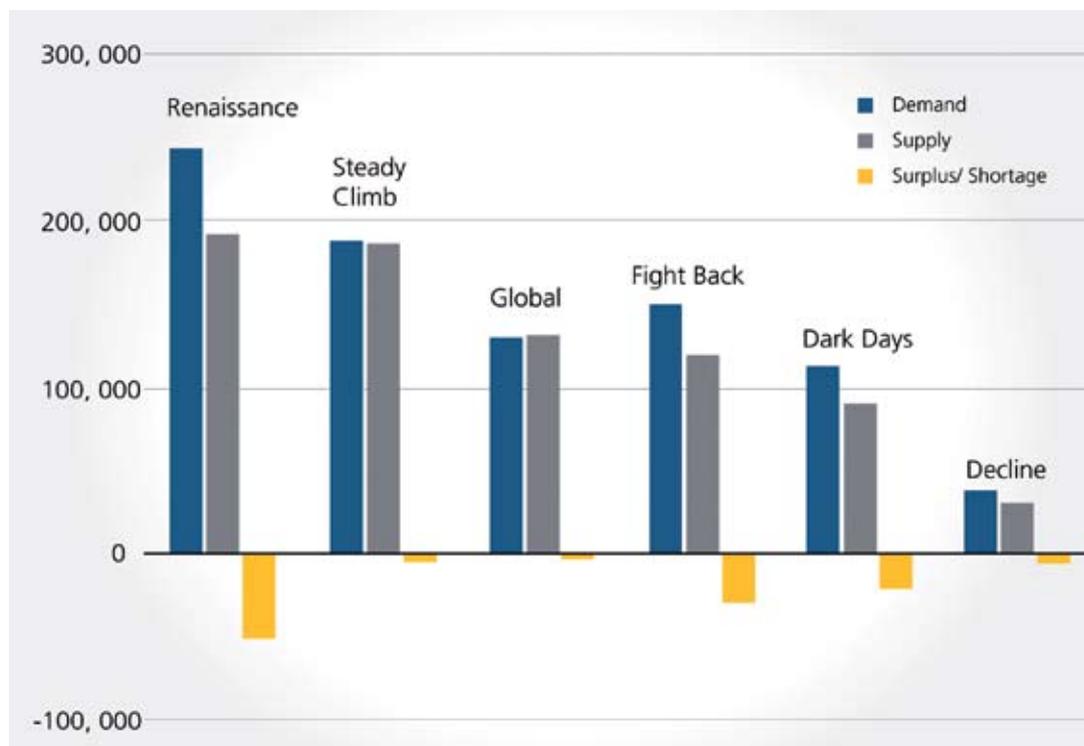|	Renaissance	Steady Climb	Global	Fight Back	Dark Days	Decline
Demand	243,000	188,500	129,800	150,000	111,000	38,000
Supply	192,000	186,000	131,300	120,000	90,000	30,000
Surplus/ Shortage	-51,000	-2,500	1,500	-30,000	-21,000	-8,000

FIGURE 3: IT PRACTITIONER SUPPLY AND DEMAND, ICT INDUSTRY 2015

Positive Scenarios *(most likely)*

The first set of scenarios (Renaissance, Steady Climb and Global) is based on a future where the economic climate is positive. In the context of high levels of growth, ICT becomes an increasing element of many educational courses. While there is an increased interest in IT careers by women, and people will generally tend to remain longer in the workforce, shortages of staff lead to a surge in off-shoring to lower-cost regions outside the EU.

These scenarios reveal that, in 2010, annual supply will reach only 180,000 in a market requiring 250,000 IT practitioners.

By 2015, overall demand is seen as falling to a potential low of 129,800 with a shortfall of as many as 51,000 IT practitioners.

Negative Scenarios *(least likely)*

The second set of scenarios (Fight Back, Dark Days and Decline) is based on contexts where economies grow turbulent, where geopolitical instability increases and where business cycles become erratic. There would be a tail-off in investment confidence and reluctance to adopt new technologies. Off-shoring would initially decrease due to volatility and poor international relations. Eventually, the situation locally within

the EU would be as unstable as the rest of the world and off-shoring would become more attractive on the grounds of cost and a pragmatic acceptance of political instability overseas.

By 2010, the net result of such negative scenarios would be a marginal oversupply of IT practitioners.

By 2015, demand could fall to as low as 38,000 with continuing shortages; or, in a Fight Back scenario, there could be a shortfall of as many as 30,000 IT practitioners.

A call for action

Having created various future scenarios based on quantitative evidence, and having estimated supply and demand levels in 2010 and 2015, CEPIS believes we could be facing shortages of up to 70,000 IT practitioners per year, as supply limitations fail to satisfy high demand.

The figures suggested by these future scenarios make it clear that the ICT industry must not be allowed to develop 'organically' – as this could lead to a situation where the industry had an inadequate workforce, with too few people, and not the right depth of skills. Challenges would also arise if there were too many people – this would lead to unemployment and start a cycle where IT careers would appear unattractive, leading ultimately to a shortfall of skills in the industry as students avoid IT courses.

To get the balance of supply and demand right, policymakers in education, in regional and national governments and at EU level must be very attentive to likely workforce needs. At a policy level, this extends to research and development and to immigration policy; and it requires professional bodies and trade unions to work with policymakers to ensure a greater supply of IT professionals. The ICT industry itself has a key role to play in coordinating these efforts.

On 7 September 2007, the European Commission adopted a Policy Communication on **e-skills for the 21st Century: Fostering Competitiveness, Growth and Jobs,** *proposing a long term e-skills agenda and key action lines for the European Union.*

http://ec.europa.eu/enterprise/ict/policy/ict-skills.htm

What must we do to avoid a future e-skills shortage?

To reduce the risk of running short of IT practitioners with the right degree of excellence in a range of e-skills, all relevant ICT stakeholders must work to:

- Create better awareness of the threats and opportunities in the growth of globalisation of ICT activity.

- Promote improved understanding for both the industry and public bodies of the current quantitative and qualitative levels of e-skills in Europe.

- Foster public-private initiatives to develop understanding of likely estimates of e-skills needs at the European level. This would need investment by ICT industry players and the European Commission, and cooperation in estimating future levels of demand. Such collaboration between industry and policymakers would lead to better understanding of the impacts of cyclical market effects on the supply of and demand for practitioners.

- Train more consistently. E-skills must be imparted more evenly throughout all phases of the business cycle. The pressures of business often make it difficult to allocate enough time to training, while in slack phases, industry is cautious about investing in training.

- Collect comprehensive and reliable data on e-skills at EU level. We also need to improve the quality of cross-coding of national labour force supply data for submission to Eurostat.

- Benchmark EU e-skills against competitor economies.

- Focus on the quality aspects of skill shortages, not just the quantity. The ICT industry needs skills elites and people with the right level of excellence.

- Minimise mismatches between university and industry. More collaborative work between the two is required, along with the introduction of competence frameworks as goals within higher education. Bridges should be built between ICT industry-based certifications and formal education and vocational training courses. At the same time, students should not be moulded just for the immediate needs of the workplace.

- Cultivate a positive public image of the ICT industry. State and industry must work to attract people to study computer science-related courses and pursue ICT careers. Positive coverage of ICT activity and active recruitment drives must do more than counteract 'bad news' such as redundancies in specific companies. The industry must be portrayed as dynamic and rewarding, exciting and desirable. Students contemplating the study of ICT must be helped understand that it is the market environment when they graduate that counts.

- Clarify employment levels as they evolve and use them to continuously gauge the future requirements. Common indicators and measurement criteria must be agreed on and actively sought as part of a process of constant monitoring.

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