

FINAL REPORT



ICT SKILLS MONITORING GROUP

# **E-BUSINESS AND ICT SKILLS IN EUROPE**

**BENCHMARKING MEMBER STATE POLICY  
INITIATIVES**

18 December 2002

*This report is published as the collective view of the ICT Skills Monitoring Group. The views expressed in this report reflect the personal opinions of the members of the ICT Skills Monitoring Group, without prejudice to the official position of their organisations.*

# **E-BUSINESS AND ICT SKILLS IN EUROPE**

## **Benchmarking Member States Policy Initiatives**

### **Table of Contents**

Forewords	2
1 Introduction	6
2 The problem of the e-skills gap: definitions and measurement	8
2.1 The definition of ICT and e-business skills (“e-skills”)	8
2.2 The demand and supply for ICT and e-business skills	14
3 The policy challenge: Why is the e-skills gap a policy issue?	23
3.1 E-skills in the context of the European economy	23
3.2 The specific nature of e-skills	24
3.3 Promoting e-skills: The conceptual framework	26
4 Specific Member States initiatives in support of e-skills	36
4.1 The long-term mechanisms: Schools, universities and vocational training	36
4.2 The medium term mechanisms: Addressing special needs of beneficiaries	41
4.3 The short-term mechanisms: ad-hoc policy responses	43
4.4 Partnership between industry and government	46
4.5 Forecasting and tracking skills needs	49
5 How to best promote e-skills in Europe?	53
5.1 Lessons to be learnt from practical experience	53
5.2 Policy conclusions	56

## **Forewords**

### **Foreword by Mr Erkki Liikanen, Member of the European Commission**

Putting Europe at the forefront of international competitiveness is one of the greatest and most urgent challenges for the European Union. To reach this goal, information and communication technologies and their productive usage will have to play an important role, as an enabler of innovation and to streamline business processes.

This calls for well-trained people. IT literacy needs to be strengthened across all sectors and professional qualifications in order to use information and communication technologies effectively to enhance productivity and thus stimulating growth and employment.

The political challenge of an “Information Society for ALL” can not be tackled in isolation. There is not only competition for talented people between different business sectors but also between different regions and countries. Europe must be as a whole an attractive place to work and to live, in order to attract people who can drive also our economies.

This report shows that numerous initiatives already exist at national, regional or industrial level. However, new forms of co-operation between the different stakeholders are needed. Schools and universities will have to adapt their curricula but at the same time more efforts have to be undertaken to train people and to upgrade their skills on a continuous basis.

The European Commission is willing to continue to facilitate the dialogue among stakeholders. The challenges ahead are complex enough. The Commission will also continue to benchmark national and regional policies in this area and to help to disseminate best practice. There is still a lot to be learned from each other.

**Foreword by Ms Anna Diamantopoulou,  
Member of the European Commission**

There can be no doubt about it – the knowledge economy is the driving force behind the economic future of the European Union and its Member States. Over the past five years, the knowledge, skills intensive and high-tech sectors have accounted for over 60% of total job creation in the EU, yet we are still faced with a chronic shortage of skilled ICT professionals; demand will exceed supply by around 12% per year over the coming years. The message is stark - Europe will be held back because we do not have enough skilled people.

But we are not just talking about the ICT professionals – people in all sectors of employment are expected to acquire ICT skills (with less than a third of them having received any ICT training at all). Yet at the same time there is a growing "ICT poverty gap", with women, the unemployed and low income groups tending to miss out even further on ICT training and access, and therefore on the chance to improve their lot. Can we afford not to equip everyone with the skills needed to operate in the knowledge society?

Fewer and fewer jobs can be filled with only a basic education. Skills to operate computers are vital, and yet the providers of literacy and skills – of reading, writing and arithmetic capabilities – are struggling to keep pace.

Member States recognise this – the Heads of State and Government meeting in Barcelona in March 2002 called for all citizens to be well equipped with basic qualifications, especially those linked with ICT and in particular groups such as unemployed women.

Four main challenges in the ICT field must be faced if the EU is to achieve its objective of becoming the world's leading knowledge economy by 2010:

*Closing the skills gap*

To close the skills gap, we need to respond to the needs of industry. Manpower is needed at all levels: from IT support staff, to sales staff, project leaders, engineers, educators, managers. People who combine technical know-how with business acumen; matching qualifications and skills profiles with the needs of e-Europe – that is the challenge.

*Demographic shifts and life long learning*

Newly skilled young people entering the labour market will *not be enough* to provide the skills that e-Europe needs. Hence businesses must focus on motivating, retaining and re-equipping current staff, and ensure that today's and tomorrow's workers are capable of remaining in the labour market throughout a full working life, and not drift away in their 50's. Europe must also show itself to be more open to the outside world, using the skills of immigrants to plug some of the ICT gaps.

*Investing in children – tomorrow's workforce*

We must invest in our labour force of the future: young people. Full access for schoolchildren to computers, multimedia tools and to the Internet is paramount.

Achieving an interconnection of PCs in schools of one for every fifteen pupils by the end of 2003 (as called for by the Barcelona European Council) is a step along this road. But providing hardware is only half the battle. We must also encourage the use of ICTs as a tool and a resource across all subject areas and make sure that teachers are equipped with the right skills.

*Strengthening gender equality in the ICT sector*

Even though men and women use computers to more or less the same degree at work, the differences arise when it comes to jobs demanding higher levels of ICT education. Especially when it comes to ICT specialists and jobs that are traditionally seen as a male preserve, such as engineering and technical support. We need to step up action to boost the number of women in these areas, from the shop floor to senior management, and encourage more girls and young women into ICT training. At the moment only around 1 in 5 ICT students are women. Until this changes, companies and society are losing out on a valuable resource.

Meeting these challenges means a substantial shift in our priorities to provide the right incentives to people and focus to invest in education, skills and competencies. It also involves a review of how public expenditure is being used to best effect. The EU's resources in terms of Structural Funds have a major role to play here, and it will be important that the focus of these funds in the coming years (particularly with an enlarged EU in prospect) takes sufficient account of the need to invest more substantially in human resources.

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This report on E-Business and ICT skills in Europe is a valuable instrument in the continuing process of improving Europe's capacity to master the knowledge society. I warmly recommend it to a wide readership.

**Foreword by Mr Helge Sander,  
Danish Minister for Science, Technology and Innovation**

Individual decisions to study specific topics do influence the European economy and business life. Right now Europe is facing a shortage of ICT and e-business skilled people, which influences our general competitiveness.

If we want to fulfil the Lisbon ambitions to become the world's most competitive and dynamic knowledge-based economy before 2010 then professional use of ICT is crucial. This is true for all industry sectors and includes the whole European labour force.

To achieve this target it is necessary to produce more candidates with ICT and e-business skills and to make sure that those who graduates from the universities have the skills demanded by the industry. And we need to make it attractive for young students to choose to study technology and science studies in order to expand the supply of future candidates.

The Danish Presidency in second half of 2002 is highly supportive of both the Lisbon Targets and the work in the ICT Skills Monitoring Group.

This report is a necessary step to highlight the importance of ICT and e-business skills and will be the foundation of future actions in the Member States and at a European level. It is a necessity that we create the right framework for developing more and better graduates with ICT and e-business skills.

Hopefully more young people will seek formal training and education in ICT in the future – to benefit for themselves, the industries and to increase the general economic welfare in Europe.

# 1 Introduction

At the European Council in March 2000 in Lisbon, the Heads of State and Government of the European Union set the ambitious target for the EU to become, by 2010, “*the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*”. The intelligent use of ICT and of e-business skills (“e-skills”) is a major enabler to increase productivity and competitiveness, which are at the heart of the Lisbon strategy. This requires a skilled and adaptable labour force.

The EITO 2001 Yearbook and several studies commissioned by the ICT industry highlighted the fact that the European industry is suffering from a significant e-skills gap. This has initiated, at different levels, a policy debate about how to better promote e-skills in Europe, in order to fully reap the potential benefits of modern information and communication technologies. As a follow-up of the informal meeting of the Council of Ministers responsible for telecommunications and for employment in Luleå in February 2001, a specific Task Force on skills and mobility was set-up in June 2001. Based on their report of December 2001, the Commission adopted in February 2002 an Action Plan for skills and mobility”<sup>1</sup>.

In this Action Plan, the European Commission acknowledges the evidence of a “*shortage in ICT occupations and sectors*” as “*one of the biggest concerns of enterprises*”. Although the current business cycle and the economic downturn have somewhat alleviated this problem, the lack of skilled professionals in the e-business and ICT area seems to be a pertinent issue. The e-skills gap may no longer be as threatening as perceived two years ago, however, there is undoubtedly still an ICT skills mismatch as well as the risk that the current situation may result in future problems. This would be the case if the current slowdown of growth in the ICT sector were to result in less effort to further improve the e-skills base. It should be recognised that the use of ICT and e-business is still growing, in particular in user industries that will in future need more ICT experts than ever.

The challenge is to develop, nurture and attract talents as well as to strengthen human capital investment. The current main issues encompass, on the demand side, clearly defining what e-business and ICT skills are needed, thereafter enabling forecasting and scenarios exercises. On the supply side, the challenges lie in the provision of a sufficient volume of skilled labour, with accurate and up-to-date knowledge that matches the demand requirements. Last but not least, the supply of talented and skilled people needs to be scalable and sustainable over-time.

In the scope of the eEurope GoDigital initiative, the Commission has established an ICT Skills Monitoring Group<sup>2</sup> with representatives of Member States to better

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1. Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and The Committee of the Regions : Commission's Action Plan for Skills and Mobility Com(2002) 72. Brussels 13.2.2002

<sup>2</sup> See Appendix A for the list of members of the ICT Skills Monitoring Group

understand the nature of the proclaimed e-skills gap and to identify good policy responses to improve the availability of ICT skills.

It has to be acknowledged that it proved to be very difficult to find a common definition for the e-skills gap. Therefore, the statistical basis for policy initiatives in support of e-skills has to be considered as rather weak. This applies in particular to the problem of identifying and defining the necessary e-skills for user industries or the needs for “digital literacy” in general. It should be assumed that half of the total workforce would need to be trained in order to enable an effective use of ICT and e-business.

Taking into account, that both the nature and the size of the policy challenge remain widely undefined, it is very difficult to identify “best” policies in support of e-skills in Europe. Therefore, this report is limited to an analysis of existing policies in this area, which are considered to represent good examples for addressing the issue of the e-skills gap. More research is needed to benchmark such policies and to draw general lessons to be learnt from them.

The results of this work have been used as input for the discussions of the E-skills Summit<sup>3</sup>, organised in Copenhagen on 17-18 October 2002. On the basis of the findings of the ICT Skills Monitoring Group, a Declaration<sup>4</sup> has been adopted calling for strengthening the efforts in the field of e-skills. This Copenhagen Declaration has been followed-up by the Telecommunication Council by Council’s Conclusions on e-skills<sup>5</sup> on the 5<sup>th</sup> of December 2002.

In particular, the proposal of the ICT Skills Monitoring Group to establish a “European e-skills Forum” has been welcomed by all stakeholders and the Telecommunication Council. The Forum will bring together representatives from Member States, economic and social Partners, universities, and the European Commission. Its objective is to institutionalise an open dialogue between all relevant stakeholders and to catalyse actions to address the priorities in view of helping to narrow e-skills gap and to address mismatches. Therefore, the work of the ICT Skills Monitoring Group, which has resulted in this report, will be further continued and extended, with the view to speeding up the development of new and better e-skills in Europe.

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<sup>3</sup> See <http://www.e-skills-summit.org>

<sup>4</sup> See Appendix B, e-skills summit declaration

<sup>5</sup> See Appendix C, Council conclusions on ICT and e-business skills in Europe

## 2 The problem of the e-skills gap: definitions and measurement

There is strong evidence of the particular role of information and communication technologies (ICT) in driving productivity growth<sup>6</sup>. The use of ICT is an important tool for enterprises to re-engineer their business models and practices. Furthermore, ICTs are considered as an acceleration factor for innovation. The widest possible diffusion of ICT is therefore essential for enterprises to remain competitive. This applies both to new enterprises and to traditional ones. The end of the dot.com era has by no means had a fundamental impact on the effect of ICT on the economy as a whole.

Apart from the dissemination of ICT across all sectors, deep organisational changes are required and new skills are needed to fully exploit the new technologies. What matters most in a knowledge-based society are people and ideas, and the ability to make commercial use of them. One of the main challenges is therefore to identify, measure, forecast, and finally to provide the necessary e-skills to ensure economic and social sustainability.

### 2.1 The definition of ICT and e-business skills (“e-skills”)

The still strong growth of ICT industries and services and the further diffusion of these new technologies throughout many other business sectors are generating new skills requirements. These span from professional skills to user skills and basic ICT literacy, known as digital literacy. It is important to clearly understand these different concepts in order to define and to measure possible skills gaps and shortages, which may result in different policy challenges and solutions.

#### 2.1.1 Professional ICT skills at the core

*Professional skills* are understood as the ability to use advanced ICT tools and/or to develop, repair and create them. The main elements driving the demand for such skills are the growing importance of Internet technology, telecommunications devices and infrastructure and the increasing use of these technologies to re-engineer business processes and to raise productivity.

Until 2001, the ICT sector was among the highest growing segments of knowledge-based employment. Overall, the knowledge-intensive and high-tech sectors were the main drivers of employment in the EU with 60% of all jobs created between 1995 and 2000, and 1.6 million new net jobs in 2000 alone<sup>7</sup>. Employment in “computer and related activities” – one of the several components of these sectors – grew at yearly rates above 13%<sup>8</sup> and itself created 1.16 million net jobs between 1995 and 2001.

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<sup>6</sup> European Competitiveness Report 2002 - SEC(2002) 528 - 21.05.2002

<sup>7</sup> For an extensive analysis of employment in knowledge-based economy see European Commission, Employment in Europe 2002 ISBN 92-89403888-6

<sup>8</sup> According to the LSF-EUROSTAT terminology.

The Eurostat Labour Force Survey data in 2002 estimated that around 1.77 million ICT practitioners are employed in ICT (supply) and ICT (user) organisations<sup>9</sup>. This constitutes around 1.3% of the labour force and can be perceived as a conservative estimate as the occupational groupings used are only a subset of all the types of workers involved in information technology.

As well as classic employment statistics, most commonly presented according to standard occupational groupings, other systems have been developed which attempt to classify professional skills in this field. Two examples are, by domain (such as Networking, Distributed IT, etc.) or by job profiles (such as Software Engineers, Computer Operators, etc.).

- The *IDC (EITO<sup>10</sup>) 'domain' approach* firstly classifies the skills broadly as ICT skills, e-business skills and call centre skills; the ICT skills category is further divided into Networking, Host-based, Distributed IT, Applications, Technology Neutral. These definitions were devised by EITO in order to undertake an in-depth quantitative and qualitative analysis on ICT skills in Western Europe in 2001. According to IDC, demand will be especially strong in three key areas: networking, applications and distributed ICT skills.
- The *'job profile' Career-space consortium measurement* uses a classification system based on the nine SOC-90 categories<sup>11</sup> used in the UK. These categories cover all the 13 "generic job profiles"<sup>12</sup> defined by the *Career-Space* initiative and the main job areas for which the ICT industry is experiencing skills shortages. These core profiles describe the jobs, setting out the vision, role and lifestyle associated with them. The specific technology areas and tasks associated with each job are also outlined, as well as the level of behavioural and technical skills required to carry out the profiled jobs. According to the Career-Space measurement the fastest growing ICT occupations are software engineers, analysts and programmers<sup>13</sup>.

These two different approaches are equally valid, one looking at the problem from the point of view of industry and skills needs (demand), the other from the perspective of the labour market (supply). Both approaches move on from established employment classifications based around sectors, which are naturally easier to define. Both the 'domain' approach and 'job category' approach relate to skills that are needed in the labour force. This is fully reflective of the progression of ICT from a sector, to a set of specialist skills that are needed across all sectors.

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<sup>9</sup> Taken from the CEPIS report "Information Technology Practitioner Skills in Europe" which uses Eurostat data (2000)

<sup>10</sup> European Information Technology Observatory

<sup>11</sup> The Standard Occupational Classification was first introduced by the UK Office for National Statistics in 1990 to provide a systematic and consistent way to group and analyse occupational data collected by government surveys. [www.statistics.gov.uk](http://www.statistics.gov.uk)

<sup>12</sup> The job profiles can be found at <http://www.career-space.com/cdguide/index.htm>.

<sup>13</sup> This suffers from errors that arise from assuming that the European level of employment shortages can be predicted based on a UK classification system

### The Netherlands - The GRIP project

With a move towards lifelong learning and the mobility of workers many questions have been raised about how to interpret jobs, skills and educational profiles in a pan-European environment. Europe has a variety of standards not only between countries but also between regions where the economic, cultural and social environments are diverse.

GRIP is a project in the Netherlands, which is looking at addressing these issues through the provision of a toolkit, which facilitates the comparison of job profiles and educational profiles. GRIP is a means of facilitating and improving communication between employers, HR managers, educational staff, students and others, about all kind of existing profiles. GRIP is a method of analysing profiles, using the toolkit to help make comparable mappings.

Originally in the GRIP project, two profiles were published. One was devised by a group of 27 ICT departments in universities and the other by FENIT, the Federation of Dutch ICT companies. The first set of profiles were followed by a pilot study attempting to map these two different ways of describing skills and competencies.

In November 2001 a second project started, to improve on the original work. GRIP is offering a tool for the better understanding of profiles, wherever their origin.

ICT specialists can be found in organisations across the whole of the economy as many make use of ICT or have 'IT'<sup>14</sup> departments that employ ICT experts. In many countries the number of ICT experts employed outside the ICT sector is much greater than the numbers employed in ICT companies<sup>15</sup>. It is these highly specialised computer skills that are at the heart of the problem and where the majority of data can be found. However, in addition, there are a number of people employed in jobs across other sectors who are using ICTs at an advanced level in their work and are not classified as ICT or computer experts.

#### 2.1.2 User needs for ICT expertise are growing steadily

*User skills* refer to the ability to use or apply ICT tools in general workplace situations that are not related to the ICT sector, such as banking and stores. The rapid diffusion of ICT and the resulting re-engineering of business processes drive the demand for such ICT skills. Supply Chain Management and Customer Relationship Management are examples of activities where professionals with no ICT sector experience have to adapt to the use of ICT solutions to increase productivity and competitiveness. There are currently very few formal definitions of user skills although there is a high level of commitment at the European level and Member State level to increase the number of people with user skills. CEPIS<sup>16</sup> for example is committed to working to achieve 'a high level of user skills within the European workforce', but does not define them explicitly.

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<sup>14</sup> Here we use ICT and IT interchangeably. The IT sector is now often referred to as the ICT sector although departments are often still called IT departments.

<sup>15</sup> Council of European Professional Informatics Societies (CEPIS) report on IT practitioners in Europe

<sup>16</sup> Council of European Professional Informatics Societies

The EITO 2002 report classifies user skills as '*e-business skills*' or skills of those employed in business positions with intensive logical/physical use of the Internet and requiring a wide variety of non-technical skills. EITO 2002 states that there is a high demand for these types of user skills within bricks and mortar companies, especially in the Business to Business (B2B) areas. There is also a need to develop effective online content and this remains a key driver for skills demand in this area.

Although 'user skills' are not just found in the 'user industry', figures from the EITO 2001 report estimate that at the European Union level over 8 million people are employed in the ICT user industries, mainly banking, manufacturing industries, commerce, insurance, communications and business services. Users skills are clearly an area of growing importance across all industry sectors.

Evidence at the national level shows a similar situation. The UK 'e-skills UK Ltd', the industry representative body responsible for addressing the IT and telecoms skills needs of employers in the UK, recently reported in its 'Employers report' that a generic gap in ICT user skills amongst current employees is, after occupationally-specific skills, one of the most significant problems they face. Nearly one-third of employers believe the skills gap has a major effect on losing business or orders, and around half of employers believe that the failure to train is the main reason for the existence of skills gaps. In terms of projections, to maintain the current ICT user levels of 75% means that the number of ICT users will need to increase by 1.6 million by 2009 and to increase this to 95% there would need to be 7.3 million users of ICT in the workplace<sup>17</sup>.

In 2002, the e-skills Italian<sup>18</sup> labour market statistical service Excelsior gave an overview of some of the current statistics associated with shortages in both firms dedicated to providing ICT goods and services and those in dedicated ICT roles in the economy more generally. In general, Italian manufacturers and suppliers will need a total of about 685,000 workers for 2002 of which approximately 3.2% will need a technical profile. This gap adds up to approximately 21,000 ICT skills workers. Additionally, the report states that around another 4.8% of these workers are needed in more general ICT roles, for instance those within ICT services maintenance and assembly/information of technological products or administrative ICT roles.

In Germany, a recent report from the German Institute for Occupational Research (IAB) estimates that around 3 million people work in occupations that use ICT skills in an advanced way as part of their job, representing 8% of the total workforce<sup>19</sup>. As well as advanced users of ICT, technology is of increasing importance in generic workforce settings as well in schools, universities and at home. Everyday activities have been transformed by ICT and as a result there is a growing need for all citizens to acquire a basic knowledge of ICT termed 'digital literacy'.

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<sup>17</sup> These figures include basic ICT users in the workforce.

<sup>18</sup> A service implemented from the Ministry of Labour- aiming to improve the competitiveness of Italian business by delivering statistics focusing on the 'e-skills' available in the current and future workforce.

<sup>19</sup> IABKurzbericht Ausgabe Nr 19 / 21.8.2002

### 2.1.3 Digital literacy and the risk of social divide

*Digital literacy* relates to the ability to grasp and use information as presented on a computer installation (audio, video, text, etc.). Being digitally literate implies being able to search and retrieve information, to navigate and communicate on-line, to participate in digital, and virtual communities. It is perceived as a key element in the battle to overcome social exclusion and divisions in European society.

According to ESDIS, the European Commission High Level Group on the Employment and Social Dimension of the Information Society<sup>20</sup>, basic ICT usage for work increased by a fifth in the EU and more than half of EU workers use computers for their jobs, and this number is continuously growing. Although this number is high and Internet usage has been increasing across all socio-economic sectors, the ‘access gaps’ – for example those between men and women, employed and unemployed, high and low income groups – has grown in absolute terms since 2001<sup>21</sup>. Also, less than a third of the EU labour force has ever received any ICT training and only 4% of low-income earners (3% for female) have ever received training paid for by their employer. The ‘Strategies for Jobs in the Information Society’<sup>22</sup> therefore highlights the importance of widespread digital literacy and set out key areas of progress to help people make greater use of ICT to enter or re-enter the labour market and improve the adaptability of workers at risk of losing their jobs.

These numbers are reflected at Member State level and a recent report from the Bundesanstalt für Arbeit (German Institute for Occupational Research) reported that in Germany, around 50% of the total workforce, use PCs in their jobs. Overall it is, however, difficult to separate figures of ICT users at an advanced level, who are not ICT professionals, from digital literacy figures. In many instances the figures presented only count the number of people who use a PC in the work force per se, without recognising that there are different levels of PC usage. It also assumes that PC users are digitally literate and since 50% of the workforce use a PC and only one third have ever received training, this may not be the case.

A survey<sup>23</sup> was recently carried out for the European Commission (DG Enterprise) which looked at 15 industry sectors. This scoreboard of e-business indicators is based on the European e-Business Survey, a cornerstone of the monitoring activities of the *e-Business W@tch*. The fieldwork of this enterprise survey was carried out in June and July 2002, covering in total, about 10,000 interviews with decision makers in European enterprises.

The survey showed that in nearly all sectors, employees have access to e-mail and the Internet. Among the strongest ICT users are, as one would expect, the telecommunication and computer services sector, followed by a traditional sector in manufacturing (electrical machinery) and a service sector, the insurance and pension funding services. However, only in retail and health and social services do less than 60 % of the employees use e-mail for external communications. These figures apply

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<sup>20</sup> [http://europa.eu.int/comm/employment\\_social/soc-dial/info\\_soc/esdis/](http://europa.eu.int/comm/employment_social/soc-dial/info_soc/esdis/)

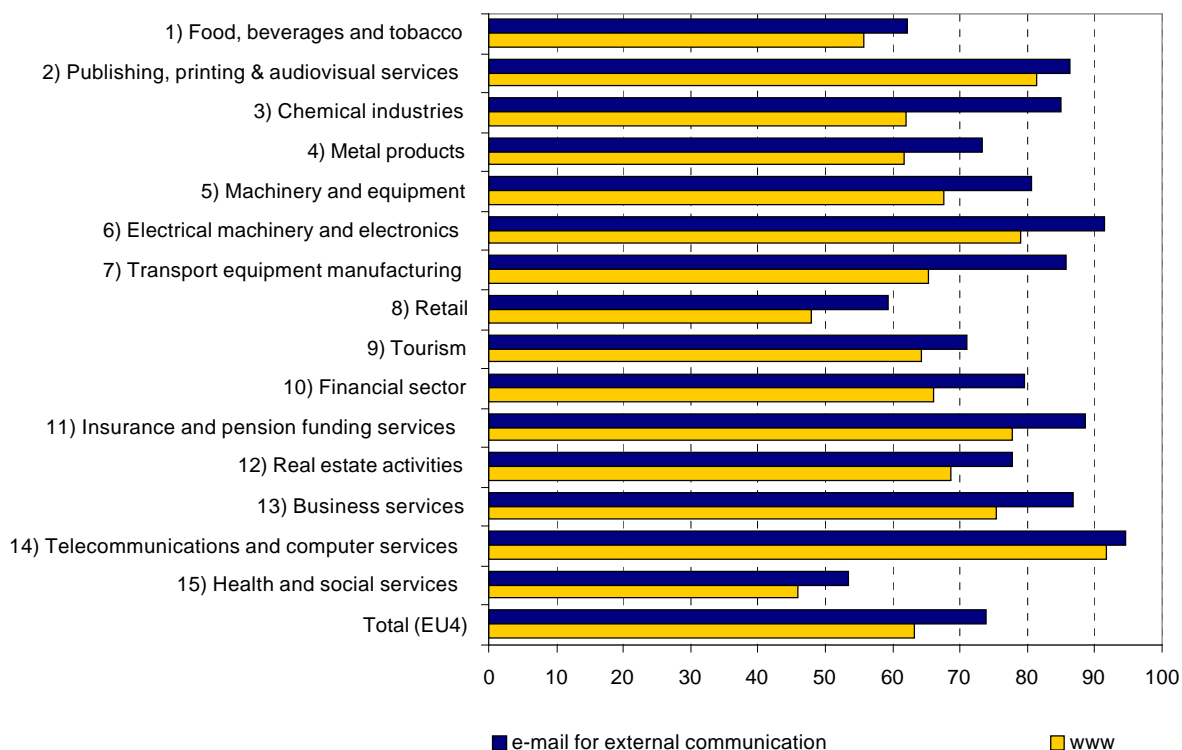
<sup>21</sup> e-Inclusion, The Information Society’s potential for social inclusion in Europe, with data from Eurobarometer June 2001.

<sup>22</sup> Information Society jobs – Quality for Change – ESDIS/02/05

<sup>23</sup> Scoreboard of e-Business Indicators: Benchmarking 15 industry sectors. Chart Annex to the Quarterly Report 3/2002 of the e-Business W@tch

to the four biggest economies in Europe. Overall it is estimated that half of the workforce uses a computer in its work.

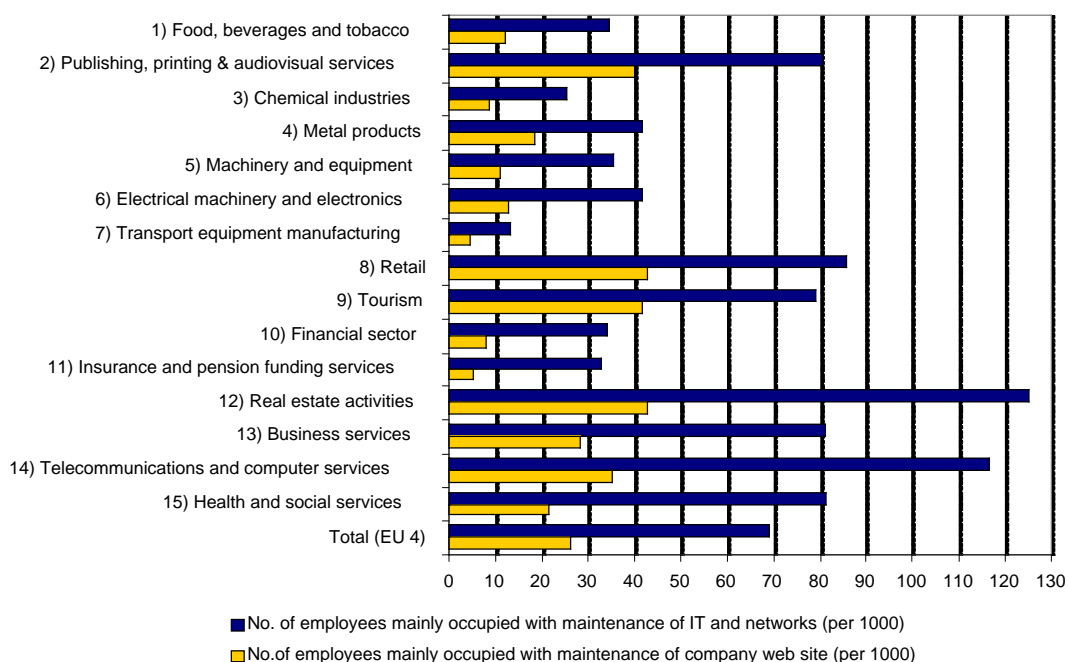
**Exhibit 1** *Access of employees to ICT (% of employees having access)*



Computational base: all enterprises (EU4, employment weighted)

In addition, the results of the survey show that, on average, in Germany, France, Italy and the UK 69 employees per 1000 are occupied with the maintenance of IT and networks, and 26 with the maintenance of company web site. The most ICT intensive sectors are real estate, telecommunication and computer services, retail, business services and health and social services. It is striking that telecoms and computer services do not come first here, and that ICT and e-business are indeed spreading across all sectors. Raising productivity across the European economy therefore implies the further improvement of the ICT and e-business usage and diffusion to all sectors, beyond the ICT sector.

**Exhibit 2** *Average size of the IT / web department: Staff per 1000 employees (2002)*



## 2.2 The demand and supply for ICT and e-business skills

Employment figures over time can give an interesting insight into the trends of supply and demand in industry sectors and therefore the ICT sector. If the number of ICT experts in Europe in employment, the number needed and the number unemployed can be measured then an estimate of the overall gap can be achieved. This chapter brings together some of the available data on employment in Europe, builds a concept of the 'e-skills gap' and gives some of the current 'gap' estimates that are available. Although unemployment figures will also have a bearing on the skills gap, there are no figures available for unemployment in ICT-related jobs across Europe.

### 2.2.1 Employment and unemployment of ICT professionals: the statistical picture

Eurostat figures for 2001 estimate that over 4 million persons are employed in the ICT sector in the European Union. The numbers, however, only relate to occupations within the ICT sector. As many ICT experts work outside the sector, these statistics are much lower than the actual figure. Career-Space<sup>24</sup> used IBM data in 2000 which suggested that there were nearly 6.5 million ICT jobs in Western Europe out of a total of nearly 167 million jobs, or just under four per cent of aggregate employment. The EITO 2002 report also provides another estimate of roughly 10 million people employed as ICT staff in Europe, a much larger number, and even this is considered to be an underestimate since they draw only on big companies for their information and ignore the many thousands of SMEs.

<sup>24</sup> <http://www.career-space.com>

There are no figures at the European level that estimate the number of unemployed ICT experts. However, the recent report on Employment in Europe 2002<sup>25</sup> gives an estimate of layoffs in the telecommunications and ICT industry between May 2001 and July 2002 of around 250,000 in Western Europe. At the Member State level, an example of unemployment figures can be found in the German IAB Study by the Bundesanstalt für Arbeit<sup>26</sup>. In Germany, unemployment figures for ICT professionals in 2001 are not only increasing, but are increasing at a higher rate than any other sector in the economy. There is also evidence to suggest that ICT workers need to have a broader range of skills than just ICT expertise and this is hampering employment opportunities. The survey also shows that although demand for ICT professionals has fallen, it is still high.

Figures from the UK<sup>27</sup> show projections for employment within ICT firms and suggest growth in the industry workforce of around 7.0% over the 3 years from June 2002. Growth will concentrate in ICT firms (9.1%) whilst employment within telecommunications businesses will increase by just 2.5% over the period 2002-2005. Overall employment within ICT manufacturing companies is predicted to decline over the next 3 years by around 2.7% compared to an increase of 8.0% in the ICT services sector. This probably reflects the move from the manufacture and supply of equipment to its use in businesses. During the second quarter of 2002 around 18,000 people were made redundant from ICT industries and around 14,000 ICT staff from all industries. The unemployment rate during the same period was at around 5.7% for the ICT industry and 4.1% for ICT staff across all industries, higher than the national average.

In Spain, a country not so badly affected by the ICT skills shortage, the Enterprise association ANIEL reports that over 20,000 employees within the ICT sector have been made redundant since January 2002<sup>28</sup>. This figure accounted for approximately 20% of all ICT industry employees. However, as well as these redundancies, figures from the PAFET study<sup>29</sup> state that approximately 12,100 'ICT qualified staff' are needed in the market to cover shortages until 2003. This figure is already practically covered with the graduates coming out of the education system (14,000 will graduate in 2003, with university degrees related to ICT). SEDISI<sup>30</sup> another Spanish Enterprise Association, reports a 9.2% growth rate in ICT employment in Spain in 2002.

In conclusion, the lack of coherent employment and unemployment statistics in the European Union means that concrete figures cannot be put forward to indicate the demand for e-skills. However, the rate of unemployment of ICT professionals in the ICT sector seems to be increasing, whilst the demand from user industries is also increasing. This displacement suggests a growing skills gap between the needs of user businesses (business skills allied with ICT experience) and the available labour pool

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<sup>25</sup> Directorate-General for Employment July 2002

<sup>26</sup> IABKurzbericht Ausgabe Nr 19 / 21.8.2002

<sup>27</sup> E-Skills UK Bulletin June 2002

<sup>28</sup> Report July 2002

<sup>29</sup> The PAFET study 2001 forecasting skills needs in Spain was developed by the Department of Telematic Engineering Systems at the Polytechnical University of Madrid, directed by Professor Gonzalo Leon.

<sup>30</sup> SEDISI is a Spanish Enterprise Association

(ICT sector skills). This further suggests that there is a need to develop more business-related skills which are not currently present in the available labour pool.

### 2.2.2 The concept of an e-skills gap

Employment and unemployment statistics, where available, only go part way to explaining the shortage of e-skills within Europe. Firstly, there are differing concepts and survey samples that tend to distort measurements, and national unemployment figures are subject to national rules and administrative procedures. Secondly, the way that unemployment and employment figures are calculated does not take into consideration the growing number of workers who use ICTs in the workforce but are not classified as ‘computer workers’ or working in the ICT sector. Because of the rapid expansion in use of ICT these figures are also out of date as soon as they are published, something that is a particular problem for the ICT and ICT user industries when attempting to track trends.

Another type of measurement that is being used to measure the e-skills ‘gap’ is the discrepancy between the demand for, and the supply of, ICT skilled people in various business sectors in both user and professional skills. This gap is usually quantitative in nature, rather than qualitative. A similar concept which is also frequently referred to is the e-skills ‘mismatch’, the differences between the skills being acquired by people and the skills actually required by employers. The ‘mismatch’ is of a more qualitative nature than ‘gap’ measurements.

The available statistics on the measurement of the e-skills ‘gap’ focus on professional e-skills, representing only a small segment of the e-skills needed by European enterprises. As there is an absence of more general data, in particular relating to user skills in non-ICT sectors and also digital literacy gaps, the data presented in this report is necessarily focused on skilled professionals within the ICT sector. The intention is not to show any prioritisation of problems and data in the ICT industry, it is simply the result of a lack of data.

The *ICT professional skills gap* is being measured by a number of different stakeholders including, the ICT industry, industry organisations (with support from the European Commission) and by some Member State Governments at their National level. There are a number of different methodologies being used by the stakeholders who are measuring the gap. These differences start with the skills definitions outlined in the previous section and include a range of sophisticated methods of economic modelling. These methods sometimes show confusion, as already stated, between the concept of an e-skills ‘gap’ and a ‘mismatch’. The gap is generally defined as a lack of balance and can be represented as:

$$Size_{Gap} = Demand - Supply$$

Where:

*Size<sub>Gap</sub>* represents the size of the gap,  
*Demand* represents the number of demanded people with the relevant skills,  
*Supply* is the number of people having the relevant skills.

In order to reduce the size of a gap, actions can therefore either target a reduction of the demand and/or an increase in the supply. In the particular case of ICT and e-business skills, policies necessarily focus on increasing the supply, since ICT diffusion (which implies an increasing demand) is considered to be an important success factor in taking Europe to the top in global competitiveness.

The issue at hand comprises two dimensions: demand and supply. The current main challenges encompass: on the demand side, to clearly define what e-business and ICT skills are, thereafter enabling forecasting exercises. On the supply side, the current challenges lie in the provision of a sufficient volume of skilled labour, with accurate and up-to-date knowledge that matches the demand requirements. Last but not least, the supply needs to be sustainable over time.

### 2.2.3 Quantitative estimates of the e-skills gap

One of the most cited studies showing evidence of an ICT and e-business skills gap and mismatch is a study published by IDC in 2000<sup>31</sup>. This study forecasts that the size of the ICT skills gap and mismatch will reach 1.7 million ICT professionals and 2 million e-business workers in Western Europe by 2003. These figures have largely influenced the political debate on e-skills since then.

The IDC study identified as the main drivers of future demand the growing importance of Internet technology, telecommunications devices and infrastructure as well as the increasing use of Internet technology as a foundation for business processes. The main industrial growth sectors in Europe in these respects were expected to be services and distribution. However, during the second half of 2001, the global economy experienced a serious economic slowdown with slower economic growth in all Member States and increased unemployment also in the ICT sector. The question is therefore, to what extent has the situation changed since then and how can it be measured effectively?

A new IDC study<sup>32</sup> published in July 2002 provides updated figures. The estimated size of the gap in the supply of skilled ICT professionals stood at 1.1 million in 2001 and is not now expected to reach 1.7 million until 2005. Exhibit 3 shows the projected development of supply and demand for the period between 2002 and 2005. Following this study, a consistent unbalance of supply over demand of 12% may be expected.

**Exhibit 3 Western European Total ICT Skills Shortage, 2002-2005**

	2002	2003	2004	2005
<b>Demand</b>	11,837,533	12,874,484	13,614,357	14,302,430
<b>Supply</b>	10,580,954	11,288,395	11,974,980	12,634,371
<b>Shortage</b>	1,256,579	1,586,089	1,639,377	1,668,058
<b>% Shortage</b>	11%	12%	12%	12%

Source: IDC, 2002

<sup>31</sup> The Economic Impact of an IT Skills Gap in Western Europe IDC 2000

<sup>32</sup> "Despite Weak Economy, Skilled ICT Staff Still Needed in Europe: An IDC White Paper, Sponsored by CompTIA and VUE", 2002.

A decreasing, but still substantial skills gap and mismatch is also predicted by other sources. The Council of European Professional Informatics Societies (CEPIS)<sup>33</sup>, recently published a report “Information Technology Practitioner Skills in Europe”. The future development of the size of the ICT practitioner workforce is explored, using differing employment growth scenarios ranging between 2% and 15%. The resulting predictions (initially based on data for Germany, Ireland, Sweden and the UK, then extrapolated for the EU) have led to a set of cumulative demand figures that are generally lower than the IDC estimates when viewed from the basis of comparable growth rates.

**Exhibit 4 CEPIS Demand Figures for the EU for the Four Years 2001-2005**

<b>Underlying Growth</b>	
2%	583,000
5%	912,000
10%	1,505,000
15%	2,592,000

From these studies and sets of figures, it is obvious that, as already outlined, a commonly agreed framework is missing in order to reliably and predictably measure and forecast the perceived ICT and e-business skills gap and mismatch. This lack of agreed methodology makes it difficult to assess the impact of the initiatives that are taken by the various stakeholders. It is also interesting to note that these figures do not give a full picture of the challenges faced by Europe. Indeed, professional skills<sup>34</sup> are the focus of the cited studies, while user skills and digital literacy are omitted.

**2.2.4 Difficulties in recruiting ICT specialists: a sectoral analysis**

On the basis of work published as part of the European e-Business Survey, a component of the monitoring activities of the *e-Business W@tch*, one can attempt to discern which sectors have so far reported the greatest difficulties in recruiting ICT specialists. The findings are based on the results of sectoral reports published as part of *e-Business W@tch*, which were primarily concerned with the benchmarking of progress of e-business development across sectors and Member States. Where possible, the findings relate to the EU-4 countries (Germany, France, Italy and the UK), which represent more than 60% of the market volume in all the sectors analysed (in most sectors more than 70%).

Obviously using this data to analyse e-skills issues across the various sectors has certain limitations as the raw data is primarily concerned with issues relating to e-business rather than an assessment of the (more general) ICT skills base in particular sectors. In addition the data set on sectors is not complete and the sectoral data are not uniform in format. However, some interesting initial conclusions can be drawn from this work.

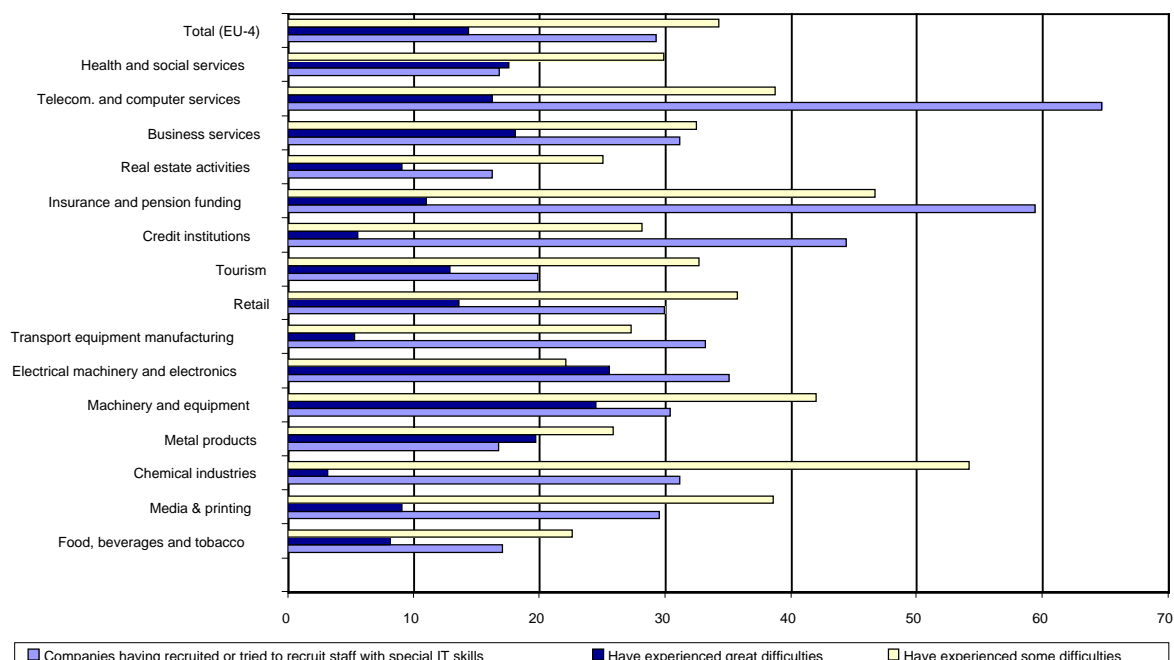
<sup>33</sup> “Information Technology Practitioner Skills in Europe: Study of the Labour Market position, in particular for Germany, Ireland, Sweden and the UK”, CEPIS, May 2002.

<sup>34</sup> Around 80% of ICT staff work in user industries according to Uni-Europa paper “Employment in the European ICT sector and Green-Cards”, 5 September 2000.

Considerable differences can be found across sectors both in terms of demand for IT professionals and regarding difficulties in satisfying demand:

- The ICT services sector (telecommunications, computer services) and the financial sector (credit and leasing institutes and insurance companies) report the highest demand for ICT professionals (more than half of companies having recruited or tried to recruit in the past 12 months). This is despite heavy lay-offs in the ICT sector. Other sectors with a strong demand are the financial sector, the electrical machinery and electronics, and the transport equipment manufacturing. This suggests that the demand for ICT and e-business skills is spread across the whole of industry – manufacturing as well as services – and not only dominant in the ICT sector.
- However, these are not the sectors reporting the most difficulties in finding ICT staff. The machinery manufacturing sectors report the greatest difficulties. In general it seems that sectors less traditionally associated with ICT skills needs have some of the greatest difficulties in recruitment.

**Exhibit 5 Recruitment difficulties by sector<sup>35</sup>**



There are also some differences depending on the size of the enterprises, with a majority of large companies (250+ employees) more or less constantly recruiting ICT professionals, but only a smaller percentage of SMEs. However, there is hardly any difference across the size classes in terms of difficulties experienced in recruiting ICT professionals. About half of the enterprises which recruited or wanted to recruit report great or some difficulties in doing so.

<sup>35</sup> Computational base: (1) all enterprises, (2 and 3) enterprises having recruited or tried to recruit specialists Data are employment weighted, i.e. should be read as "enterprises representing ...% of employees"

	<b>IT skills gap<sup>36</sup></b>		
EU-4 (D, F, I, UK)	Companies having recruited or tried to recruit staff with special IT skills (1)	Have experienced great difficulties (2)	Have experienced some difficulties (2)
0 – 49 employees	11.6	21.8	23.4
50 – 249 employees	27.5	13.5	32.1
250+ employees	50.2	12.4	37.0
<b>Total (EU-4)</b>	<b>29.3</b>	<b>14.4</b>	<b>34.3</b>

The available sectoral data from the *e-Business W@tch* clearly suggests that the importance of the e-skills gap varies from sector to sector. Therefore, a more detailed analysis of the different sectoral needs and constraints is necessary before drawing policy conclusions on how to assist enterprises in closing the gap. This is illustrated by the following examples:

### **Media and printing**

The media and printing sector shows generally high levels of IT equipment usage (above EU-4 average), with large and small businesses providing 100% and 74.3% support of ICT and networking skills development respectively. Results indicate that ICT skills training in this field is in hand since formal training in this sector is not considered to be very important, particularly amongst small firms who may be prevented from engaging in this form of training due to the need for extensive and continual investment requirements. On-the-job learning is the most favoured training strategy particularly by large firms, followed by self-learning activities. Although the proportion of companies trying to recruit was similar to the mean, the level of difficulties expressed (some or great difficulties) was slightly higher.

### **Business Services**

This sector shows comparatively high IT usage rates with 99.6% and 77.2% of large and small firms providing support of IT and networking skills development respectively. On-the-job learning is considered to be the most important mode of training, followed by self-learning and formal training schemes, where 65.1%, 35.2% and 20% of firms rated them as being very important respectively. These findings are fairly consistent with increasing firm size, though self-learning activities for large firms are found to be lower than average. Again, although the proportion of companies trying to recruit was similar to the mean, the level of difficulties expressed (some or great difficulties) was slightly higher.

### **Metals**

Metal product firms in Europe consider the support of ICT skills an important issue with 74.6%, 89.5%, 68.4% and 78.4% of German, French, Italian and UK firms supporting IT and networking skills development respectively. Firms in this sector favour training by third parties, with the exception of Italy, which prefers in-house training. In addition, on-the-job learning is the most favoured mode of training (especially in the UK) with 42.6%, 44.5%, 63.8% and 68.6% of firms in Germany, France, Italy and the UK rating this to be very important. Self-learning activities were the second most preferred mode of training, followed by formal training, the least popular, especially in Italy.

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<sup>36</sup> As above

Interestingly, self-learning was found to be only marginally less important than on-the-job training for all countries with the exception of the UK where almost twice as many firms preferred on-the-job learning to self-learning. The share of firms that have recruited (or tried) to recruit ICT specialists in the last twelve months is relatively small (increasing with firm size with the exception of France where small and large firm recruitment stands at almost three times the recruitment for medium sized firms). However, German and UK small firms have been relatively reluctant recruiters or have found it hard to recruit. At an aggregate level of firm size however, only 1.55% and 1.3% of German and UK firms claim to have great difficulties in recruiting compared to 49% and 33.2% for France and Italy respectively.

### **Machinery and equipment**

Firms in this sector consider the support of ICT skills to be an important issue with a total of 94.4% and 74.4% of large and small firms supporting skill development and enhancement respectively, half of which were undertaken in-house (less preferred by small firms. Support of IT and networking skills development stands at 91.2%, 87.4%, 83.2% and 86.6% of firms in Germany, France, Italy and the UK respectively. The share of firms that have recruited (or tried) to recruit ICT specialists in the last twelve months is fairly consistent across countries – 36.9%, 26.7%, 24.0% and 25.8% for Germany, France, Italy and the UK respectively with only Italian firms claiming to have major difficulties in recruitment (42.9%) compared to Germany, Italy and the UK (20.9%, 20.6% and 24.5% respectively).

### **Electrical Machinery and Electronics**

Firms in the electronics sector consider the support of ICT skills and important issue with 89.4%, 80.3%, 75.8% and 88.6% of firms supporting ICT and networking skills development for Germany, France, Italy and the UK respectively. German and UK firms seem to prefer to offer third party training rather than in-house training which is preferred by France and Italy. UK enterprises are heavily engaged in providing ICT training to employees, however a significantly short supply of qualified ICT-personnel still exists, suggesting that enterprise training efforts cannot fully offset other factors that negatively impact the availability of ICT-specialists in the UK.

However, on-the-job learning is the most favoured mode of training (especially in the UK) with 49.7 %, 55.9%, 65.8% and 79.4% of firms in Germany, France, Italy and the UK rating this to be very important. Self-learning activities were the second most preferred mode of training, followed by formal training. Interestingly French firms rated formal training schemes as less important (3.4%) than Germany, Italy and the UK (11.2%, 29.7%, 30.3% respectively). This may be linked to the French view of self-learning as a much more appropriate learning strategy (48% considered self-learning to be very important). Similar results are found in Italy, though to a lesser degree.

With respect to recruitment, German and French firms have recruited (or tried to recruit) almost twice as many ICT specialists than Italian and UK firms (reflecting demand). However, most recruitment difficulties are found in France and the UK with 24.1% and 23% of firms reporting great difficulties with recruiting ICT specialists. Interestingly, larger firms in this sector appear to have the most problems

with ICT recruitment owing to the increased complexity and sophistication of IT infrastructure.

### **Tourism**

Companies in the tourism sector seem to consider the support of ICT skills and important issue with 67%, 77.4%, 67.4% and 82.8% of firms in Germany, France, Italy and the UK respectively offering some computer or ICT training methods. In-house training is preferred by France and the UK, whilst third party training is favoured by Germany and Italy. Collectively however, firms do not allocate dedicated resources for training but prefer to allow their own employees to use some of their working time for PC and IT training rather than providing overt support. The UK is found to show the highest concern for staff training.

From this short analysis, it appears clearly that grasping the very nature of the e-skills gap is very complex. This phenomenon can indeed take different forms depending on parameters such as business sector, company size, and country. There are also obvious differences at the national level in the way to approach the challenges set by the e-skills gap. This applies in particular to the training mode preferred to raise and adapt the e-skills level of employees: in-house training versus third party training and self-learning versus formal training.

### **3 The policy challenge: Why is the e-skills gap a policy issue?**

The changing world of work and the global shifts in economic development demand constant attention to the creation of new skills to replace those that are no longer needed. Many of the European Member States have policies linked to these changes, often supported by industry sectors or individual businesses who arguably are the ultimate beneficiaries of skill improvements in the workforce.

The e-skills gap differs substantially from these sectoral, or ‘vertical’ policy priorities. The wide ranging ‘horizontal’ effect of ICT and e-skills gaps are being felt across all sectors; without separate and significant policy actions being taken across the European Union, all sectors in all countries will ultimately be affected. For these reasons, the Lisbon summit recognised the importance of taking co-ordinated action above and beyond individual company and member state level as the issue will influence the prosperity and quality of life of European citizens for many decades to come.

#### **3.1 E-skills in the context of the European economy**

At the Lisbon summit in March 2000, the Heads of States and governments of the European Union set the ambitious target for the EU to become, by 2010, “*the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*”.

According to the European Competitiveness Report 2001, the productivity gap between the EU and the US in recent years is in part a reflection of the lower levels of ICT spending in the EU. In the period 1992-99 ICT expenditure in the EU amounted to 5.6% of GDP, the corresponding US figure was 8.1%. Significantly, ICT expenditure in the EU when compared with ICT expenditure in the USA, had fallen substantially from 90% in 1992 to 75% in 1999.

Similarly, the European Competitiveness Report 2002 concluded that productivity growth had still risen in the US in 2001 despite the recession, albeit at a slower pace. The persistence of strong productivity growth in the United States during a year of recession indicates that investment in new technology and innovation assets are producing benefits for the firms that have undertaken them and for the economy as a whole.

The contrasting experience of the European Union and the United States in 2001 shows the importance of technological and other innovations in supporting productivity growth even during weak economic conditions. As a result of these notable differences, European policy-makers see ICT as crucial in stimulating productivity growth, and an important tool in meeting the challenges of environmental, social and economic sustainability. ICT are both a direct source of innovation and a means of ensuring innovative improvements in other sectors. In this context, the shortages and mismatches of ICT and e-business skills evidenced from the limited data available is an obvious barrier to the competitiveness and productivity of European enterprises.

Apart from the strong economic arguments, and the consequent social improvements that they bring, the Lisbon strategy targeted social cohesion as an area that should benefit from the more widespread use of ICT. Therefore, 'e-inclusion' has become a central objective of the EU's employment and social inclusion strategies. The European Social Agenda highlights the job potential created by the emergence of the Information Society as one of the key means of combating social exclusion and increasing digital literacy.

It may be seen that the main impacts of the e-skills gaps and mismatches on the European economy are twofold. Firstly, they are in effect significant barriers to the wider, faster adoption of ICT in the workplace. This is evidenced by the lower productivity figures attributed to the EU in comparison with the USA and the relatively stronger economies in those European countries that show a more significant presence of ICT in their industrial make-up<sup>37</sup>. Secondly, the skills gaps will tend to widen, rather than reduce, social divisions across and within the Member States. Although the nature and more specifically the size of the e-business and ICT skills gap and mismatch is debatable there is little doubt that such gaps exist and that there is a risk they will grow over time.

The issue of the e-skills gap clearly has many different dimensions. They encompass user, professional and basic ICT skills and are seen across all economic sectors. The current focus on the ICT professional skills is a consequence of the ICT industry being the first one to notice the pressures brought about by the ever increasing need for new skills sets and a highly trained workforce. As this trend moves along to the ICT user industry and eventually across all business sectors, more challenges and therefore more solutions will be needed to keep Europe's productivity growing.

### **3.2 The specific nature of e-skills**

The productive use of ICTs calls for more skills, higher levels of skills and different kinds of skills. Whatever the exact numbers, the demand for e-skills is not just about the quantity of skilled people needed, but also their quality. The current and future roles of ICT require not just technical skills across converging technologies, but also commercial and interpersonal skills to match service and products to customers' needs. In this respect, "soft" skills such as communication skills or even artistic skills are becoming increasingly relevant.

The problem of e-skills is complex, with many distinct elements. Some relate to all levels of e-skills, others particularly to professional skills. A normal market-driven economic model would expect that market forces will drive the need for new skills, which in turn will be developed by businesses who need to recruit/train new staff to meet with the market demands for their products. Whilst this model applies in certain sectors of ICT, such as computer hardware and software products, it only applies indirectly to the areas which will result in the greatest potential economic gain – the improved efficiency of businesses in non-ICT sectors.

A market failure therefore exists. Businesses need to upskill their staff and bring in new employees who can help them change the way they work to meet the challenges of the e-economy, but the benefits are not as tangible as investing in a new product or

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<sup>37</sup> Is Growth an Information Technology Story in Europe too? Daveri 2001.

manufacturing equipment. Free market philosophies would say that such businesses will eventually change, or fail, as others seize the opportunity, but action taken now will avert the potentially massive economic implications of simply letting this process happen across Europe.

E-skills have a number of specific features that prevent the supply reacting sufficiently fast and efficiently to imbalances in the market. This is because e-skills are:

- *Generic* – e-skills are now mainstream and affect all industry sectors. As the ESDIS figures show over 50% of the workforce use a PC in their job and this number is expected to grow significantly. Therefore the acquisition of at least basic digital literacy is of critical importance for the competitiveness of all sectors and will help to fight against social exclusion. User skills are also becoming more and more important and are being coupled to managerial and professional jobs that were traditionally outside the ICT sector.
- *A relatively new phenomenon* – the use of ICT within jobs has exploded in the last few years and it is used across all industry sectors to a greater or lesser degree. The fact that these types of skills are still new means that companies, particularly SMEs still need some convincing of their relevance and what positive impacts will be seen as a consequence of introducing these skills or upgrading their existing workforce.

An essential feature of exposing employees to the ‘e-revolution’ is to allow them the widest possible access to e-based solutions, such as on-line training and distance learning. Many enterprises are very restrictive in this respect, for example, the Eurostat survey 2001 on ‘E-Commerce in Europe’ reports with respect to Germany that ‘fears of lost working time due to irrelevant surfing (47%) came higher in the ranking than in most other countries, notably before associated cost concerns’. It should also be noted that many of the European Member States show high levels of internet access in homes. SMEs should capitalise on this level of interest and support, rather than deter, employee interest.

- *Highly technical* – A number of new skills required in the workforce in Europe are highly technical and require specialist or high-level education or training courses in order to deliver them. This issue affects new workforce entrants and the way in which supply and demand are measured. A high level of unemployment in Europe does not guarantee that the demand for ICT jobs can be satisfied due to the time it would take to deliver some of the technical skills necessary. To deliver these types of skills relies on long-term strategies.
- *Highly competitive* – Jobs involving a high level of e-skills generally require other sets of skills to accompany them including managerial, communication and language skills, particularly English. People need to be adaptable, mobile and take on board new skills at a fast pace. There is also a high turnover of staff in the ICT sector and a negative image of job security in the current economic climate. Employers are more likely to dismiss current staff and hire new people than train existing staff to take on new skills required. Therefore employees need to keep up

with the pace of change in the absence of clear ‘on the job’ training strategies in order to sustain their jobs.

- *Highly changeable* – The types of jobs and skills that are in demand constantly change as market forces dictate business trends. In many cases, these skills have to be complemented with other changes: different attitudes to work, new occupational categories, new work relationships and new management systems. None of these changes happen just once: skills are subject to constant change and they impact on the potential competitiveness of the ICT industry.
- *Subject to international mobility* – As a result of the specific factors outlined above (its generic nature, high technical content, high competition, high turnover) e-skills are subject to international mobility. For example a McKinsey study shows that foreign-born workers now account for 20% of all employees in the US information technology sector<sup>38</sup>.

In conclusion, the development of e-skills takes time, involves a number of different actors and requires a new approach to the development of skills. Changes are happening in the formal education sector, in vocational training, on the job training and new work paths. There is a need for short-term solutions as well as long term strategies to create a sustainable skills base across the European economy.

### **3.3 Promoting e-skills: The conceptual framework**

There are a number of different reasons for the e-skills gap. They represent not only policy challenges but also a challenge for enterprises themselves. And this is not only a problem for the ICT sector but for all sectors, both in manufacturing and in services. This calls for new forms of governance, using all existing policy tools – from education and training to enterprise policy – in a flexible but nevertheless consistent manner.

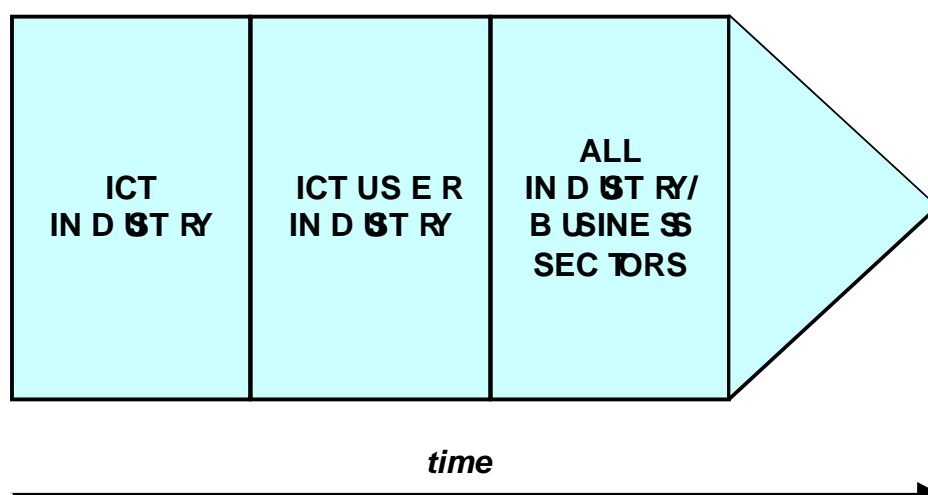
#### **3.3.1 The challenges for industry**

The general trend in the lack of appropriate e-skills has progressed from affecting mainly the ICT industry to affecting all user industries and eventually all business sectors. This phenomenon has led to a far more complicated view of the current challenges faced by industry when dealing with the e-skills gap.

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<sup>38</sup> Brains abroad, Janamitra Devan and Parth S.Tewari, The McKinsey Quarterly, 2001 Number 4: Emerging Markets

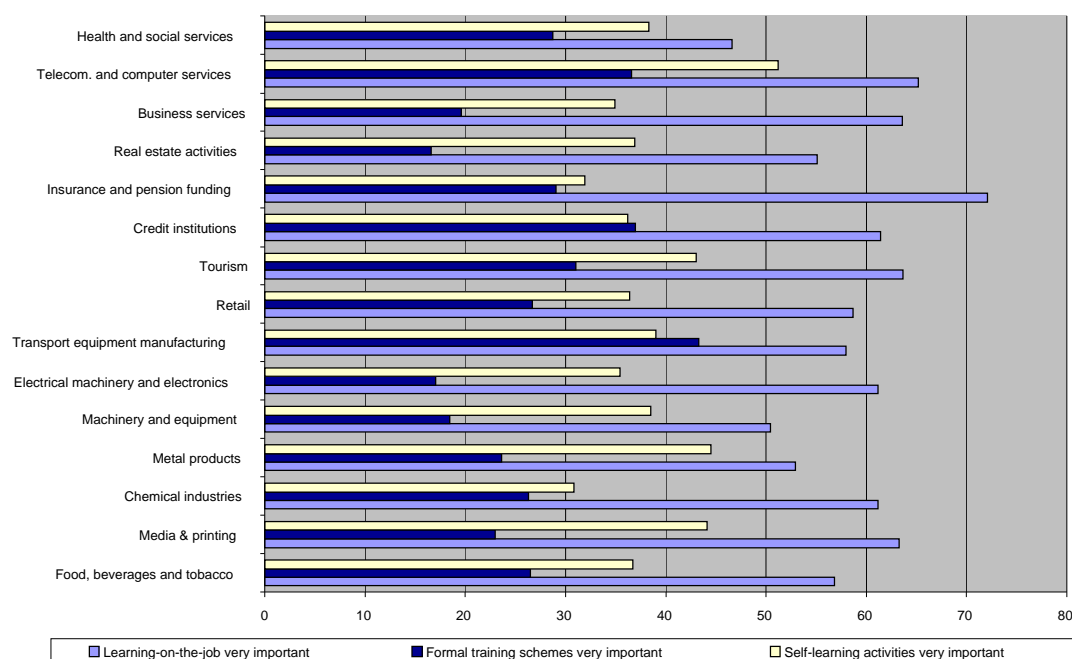
## Exhibit 6 ICT Skills Penetration Through Industry



Currently, the ICT industry shows the highest degree of skills mismatch caused by the constantly changing nature of this highly technical environment. The user industry has a fundamental need for employees who are digitally literate as well as an increasing need for employees with more advanced ICT skills in order to manage and operate new business applications. The ICT user industry also has a high number of ICT professional working in ICT departments or alongside other employees in mainstream roles. All other industry and business sectors are currently seeing an increasing need for the whole workforce to be digitally literate. As new tools and technologies are adopted by industry, this need will grow to include skills in more of the developing advanced tools and technologies, as experienced by the ICT user industries.

Following the results of the survey of the *e-Business W@tch*, enterprises regard "learning on the job" clearly as the most important way to develop IT skills in the company. About 60% of enterprises say "learning on the job" is "very important". Compared to "learning on the job", only about half as many companies regard formal training schemes as very important for their IT skills development. The transport equipment manufacturing sector is outstanding in this respect, with 43% of its employees working in companies which regard formal training as very important. In other sectors, e.g. in the real estate and business services sectors, the importance of formal training is considered much lower. Self-learning activities of employees are rated as very important by about 40% of enterprises (on average), with the ICT services sector standing out (51%).

## Exhibit 7 Perceived importance of formal IT training and self-learning activities



The attitude of industry to training the workforce and employing new talent from the wider labour market pool is key to increasing the supply of e-skills. From the point of view of the potential labour force, there are also issues to consider when considering ICTs as a potential career choice. Currently, the negative image of ICT is a problem and this in turn may lead to an under representation of particular sectors of the workforce within the ICT and ICT user industries.

For example, young people, particularly young women are far less interested in studying mathematics and technology, the very subjects that constitute the basis for all qualified ICT jobs. Women therefore constitute an important target group. According to a report by the Cisco Gender Initiative<sup>39</sup>, the percentage of women in the technical and professional workforce throughout Western Europe is only 19%. IDC recently published the report "Networking skills shortage and how women can narrow the gap"<sup>40</sup> showing that at the end of the year 2000 only 5.6% of Internet networking professionals in Western Europe were women. The report found that many women perceive the field as "nerdy" or "too technical". Also, a lack of strong female role models discourages many from entering the industry. This image does not just put women off. In the UK, an image marketing plan put together by e-Skills UK Ltd<sup>41</sup> highlighted that school leavers, graduates and job changers also express negative opinions of the ICT industry including the culture, working conditions, and the way industry handles lay-offs.

As well as the image, industry also has problems with the skills base of students who do join the industry. According to a study carried out by the Career Space consortium<sup>42</sup> students are not being taught the right skills, and too many of them

<sup>39</sup> The Networking Skills Shortage - How women can narrow the gap - [http://www.cisco.com/edu/emea/women\\_in\\_networking.pdf](http://www.cisco.com/edu/emea/women_in_networking.pdf)

<sup>40</sup> An IDC White Paper Sponsored by Cisco Systems, November 2001

<sup>41</sup> Based on a survey by MORI 2001

<sup>42</sup> <http://www.career-space.com>

break off their studies early. The study showed that the curricula of many universities in Europe simply do not match the requirement profile for the ICT specialists the industry needs.

Addressing the image and the training needs therefore requires action in mainstream education and in workforce training. In general, industry's main priorities focus on the development of workforce training. There are many industry schemes, commercial training providers and recognised certification systems in existence, and governments are already working closely with industry to profitably exploit these existing solutions. The social partners and industry associations extend this training through their commitment to lifelong learning and incentives for organisations to upgrade their workforces<sup>43</sup>. This is particularly important for SMEs who may need extra encouragement to adopt a more effective learning culture.

Influencing the education system was traditionally seen by industry as the domain of the public sector as it elicited longer-term solutions. However, education reform is becoming a major political issue, as a growing number of business and industry associations link the shortfall of highly skilled ICT staff with weaknesses in educational curricula and associated teaching methods. Various business and industry associations have been directly lobbying for education reforms designed to improve the technical skills of school leavers, and to increase the number of school leavers moving on to higher education<sup>44</sup>. Business and industry associations see encouraging students to pursue degree-level education as critical to tackling the current and projected shortfalls in skilled ICT workers.

One flagship example of business working together with education to change curricula is *Career-Space.com*. This project was set up in collaboration with a number of industry representatives, industry associations, universities and the European Commission and is co-ordinated by International Co-operation Europe Ltd<sup>45</sup>. The aim is to put in place a clear framework for students, education institutions and governments that describes the roles, skills and competencies required by the ICT industry in Europe.

As well as formal education and qualifications, there are numerous industry-led certification schemes in existence. The majority of the main ICT industry players have their own training programmes being delivered, for example, Microsoft, Novell, Cisco and IBM. CompTIA<sup>46</sup> provides vendor neutral certifications worldwide and CEPIS<sup>47</sup> is also providing services and certification courses which are vendor neutral.

The majority of the certification schemes are aimed at training in specific tasks, such as network administration and helpdesk support, with the majority focusing on network skills. Some organisations (for example Microsoft and Cisco Systems) are

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<sup>43</sup> Examples include CNAP and Microsoft certifications and the workforce training schemes run by CompTIA.

<sup>44</sup> CompTIA, UNI-Europa, CEPIS.

<sup>45</sup> Career-Space is run with the support of the EC and a consortium of 11 major ICT companies and EICTA

<sup>46</sup> Computing Technology Industry Association: <http://www.comptia.org>

<sup>47</sup> Council of European Professional Informatics Societies

also working closely with national and vocational qualification structures in Europe to offer their courses within existing further education systems.

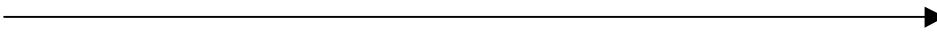
There are also examples of industry consortia working together either as a powerful lobbying structure or to provide training schemes which are aimed at the socially disadvantaged or other more charitable target groups (e.g. JOBS+<sup>48</sup> from CompTIA). CompTIA is widely promoting the need to get industry working with the public sector in order to promote and provide public recognition of Industry ICT training certification<sup>49</sup>.

### 3.3.2 The problem of e-skills: An area of mixed responsibilities

Industry has a clear role in the provision of training and educating the workforce to address the e-skills gap. However, the responsibility does not just fall on industry, and there are already a number of joint initiatives taking place between government, education and the private sector reinforcing the importance of collaboration and co-ordination of approach in order to improve sustainability at national and European levels. The public sector also has its own policy schemes underway across Europe indicating that the public and the private sector understand that the responsibility lies with a number of stakeholders: industry, government, academia and the social partners.

**Exhibit 8 Key challenges in overcoming the e-skills gap**

	<b>ICT industry</b>	<b>Key User industries</b>	<b>All business sectors</b>
<b>Funding</b>	R&D New product development	Training Awareness Demonstration Adopting new applications	Training Awareness
<b>Education</b>	New Degree Courses New curriculum development	Targeted Vocational education and training curricula Certification On the job training schemes	Basic work related education Lower level certification eg ECDL
<b>Skills</b>	High science and technology skills Ability to constantly update on new technological developments New people, new skills	Applications skills More advanced ICT skills	On the job training schemes to deliver general ICT skills Digitally literate school leavers.
<b>Social needs</b>	Social curricula Information Society implications	Information Society implications Global markets	New target groups
<b>Forecasting</b>	Forecasting of ICT professional skills market	Forecasting of ICT professional skills market Forecasting of ICT user skills	Forecasting of ICT user skills needs

**Time** 

Only if all of the different priorities of the ‘industry groups’ were properly addressed would the e-skills gap no longer be a major issue. The breadth of coverage of the

<sup>48</sup> <http://www.comptia.org/workforce/workforce.htm>

<sup>49</sup> The Athens declaration: Continuing actions to bridge the e-Skills gap in the EU 2002.

programmes identified as a result of the research indicates that this is a complex domain with many different actors involved: the EU, Member States, industry, the social partners and individuals. There are also issues of social development, culture and private versus public financing to consider. Finally there are numerous tools which are being used such as education and training, incentives, immigration and forecasting.

Although there are many differences between the Member States, a set of common principles can be identified<sup>50</sup>:

- Policies aim to establish an "enabling" environment that encourages investment in human resources development and training by all stakeholders;
- Policies aim to develop a framework for human resources development and training that is relevant to countries' social and economic context;
- Member States are keen to ensure equal access to human resources development of training for all, irrespective of socio-economic and income status, ethnic origin, sex, age, income level etc.;
- There is a drive to develop partnerships between various stakeholders in the delivery of learning, education and training programmes.

A thread that runs through these common principles is that the policies are mainly economic, educational, or social in origin and therefore a matrix can be drawn up with one dimension being the actors and the other being the types of tools that are employed.

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<sup>50</sup> Adapted from the ILO work on Knowledge, Skills and Employment

### Exhibit 9 Matrix of tools and actors

	<i>Economic</i>	<i>Educational</i>	<i>Social</i>
<b>EU</b>	The creation of common skills profiles and occupational frameworks	Encourage lifelong learning  Enhance understanding of national qualification structures across Europe to facilitate mobility	Promote social cohesion Equal opportunities
<b>Member States</b>	Work with the EU to develop a common skills framework based on existing best practice in Member States  Provide up to date labour market information  Fiscal incentives for skills development  Migration	Add ICT to school education  Improve qualifications for ICTs  Increased training provision for workforce development	Better recognition of professional experience and vocational training  Provide incentives for retraining employees  Encourage underrepresented groups to acquire e-skills (women, long-term unemployed)  Active social and labour market policies  Career guidance
<b>Industry</b>	Work with government to provide up to date meaningful statistics on the skills gap.	On the job training schemes	Work with Member States and Social partners to train the long term unemployed and other target groups in key e-skills for business.
<b>Universities</b>	Work with government and industry to provide skills profiles needed for the workforce in Europe	Provision of e-learning  Provision of new qualifications	Foundation courses and conversion courses  Promotion of the concept of lifelong learning
<b>Social Partners</b>	Work with the EC and Member States to support economic policies	Increased decentralised workforce training provision	Social dialogue between Member States, industry and the EC to encourage new ways of working
<b>Individuals</b>	Willingness to seek employment in ICT related jobs Flexibility in employment	Willingness to engage with lifelong learning Ambition to learn new methods and ICT related skills	Acceptance of ICT and use of ICT in social environments and family groups

This complex picture calls for new forms of dialogue and partnership between stakeholders and for bridges between policy fields in order to have a coherent and consistent approach. Although simple in principle, in practice this will require a re-think of the currently somewhat compartmentalised approaches to these separate issues. To optimise the use of these new technologies and the systems which they support, a new approach to governance will be needed in order to bridge the divides between the three main elements of education, industry and government.

This shift in governance has already been experienced in the telecommunications and multi-media industries, a shift which has been largely driven by the rapid introduction and on-going development of ICT. Here the margins between telephony, television, satellite and radio technologies have been bridged, driven by massive changes in the media content of voice, data and vision transmissions.

#### 3.3.3 How to address the e-skills problem: different policy approaches

The policy responses set out by Member States vary considerably in their level of detail and scope in addressing the challenges of tackling e-skills demand as well as according to a number of economic, social, institutional and historical differences. An

example for this is the dual training system in Austria and Germany, which is based on their historically strong employer and enterprise engagement in education and training. Other countries have stronger school-based systems that have been the central strategy for development in, for example, Finland, France and Sweden.

Even so, the resulting implementation programmes tend to address similar challenges and also tend to cover the full range of professional, user and basic e-skills. Most of the Member States follow a broad approach to stimulating the Information Society in general and this often includes a strong commitment to e-skills development. Although there is generally little priority given to e-skills over and above other Information Society objectives it nevertheless constitutes a significant element in all Information Society policies.

As well as falling under the umbrella of the Information Society, e-skills are also addressed through education, employment and other social policies. There are many examples of policies that prioritise the acquisition of e-skills, including funding provision for education and workforce training, increased graduate training and a priority to address social exclusion. There are also many individual policy actions using a range of short, medium and long-term solutions at the national and regional level across Europe. They address a variety of target groups at all stages of the education and work cycle.

The more southern Member States, particularly Spain, Greece and Portugal, tend to have national action plans which are heavily influenced by the eEurope priorities, supported by direct funding from Structural Funds. Here again there is emphasis on 'Information Society for All', but focusing more on improving access and giving priority to getting citizens and businesses on line. For e-skills, the mechanisms in place are much broader and focus on creating sustainable skills supplies.

As well as these broad political priorities, a number of Member States work directly with stakeholders or agencies that will help them to deliver e-skills. In Belgium, for example, Agoria,<sup>51</sup> the multi-sector federation of industrial technologies is complementing the Flemish and Walloon government approaches to the Information Society through its programmes and actions addressing the need for ICT and e-business skills. Its main actions include increasing access to ICT degrees, improving the curriculum to make it more attractive, encouraging women into ICT, and increasing the skills base within graduates.

In the Netherlands, the priorities of the Government set out in the 'Dutch Digital Delta' are complemented by the work of the 'ICT Taskforce Risseeuw'<sup>52</sup>. The priorities of the Taskforce include improving the image of ICT, creating an improved gender balance, encouraging ethnic minorities, the creation of new education programmes, and increasing ICT in secondary education<sup>53</sup>.

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<sup>51</sup> [www.agoria.be](http://www.agoria.be)

<sup>52</sup> This taskforce is made up of CEO's of ICT producing companies, ICT using companies, universities and institutions of (higher) vocational education.

<sup>53</sup> A case study on the Task Force can be found in the appendices

### **The Netherlands - Taskforce Risseeuw**

The Taskforce Risseeuw in the Netherlands is an umbrella scheme using a combination of short, medium and long-term sub-programmes in order to address the challenges of the ICT skills shortages across all Dutch industries. The Taskforce bases its strategy on the fact that an important condition for addressing the ICT skills shortage lies in exploring and creating new and productive links between educational institutions (schools, universities etc.) and industry. It also emphasises the importance of making use of the current workforce in a more efficient way.

The programmes being run by the Taskforce are numerous. A central programme ICTpoint facilitates synergy between taskforce initiatives and others being run across the Netherlands. ICTpoint is also creating distinctive job profiles to improve understanding of the workforce and training requirements of jobs in the ICT industry.

There is a set of programmes devoted to creating a balance between men and women in the ICT industry. Measures are being created and tested to increase the participation of women in ICT studies and professions. Another set of programmes is dealing with minority groups as potential high-skilled labour force participants. There is also a set of programmes targeting the education system, for example, the ICT Networking Academy Acadoo is a portal for bringing together the specific and dynamic demands of the ICT market and educational institutions.

The programme is managed by industry but fully involves government. This is a model that is becoming increasingly common, particularly with framework policies. It shows that industry itself is a willing investor in the skills challenge. Having the perspective of future employers being fed into education and training is beneficial to large sectors of the population who then get the chance to acquire appropriate skills for working in the knowledge economy.

The UK also works centrally in partnership with its new Sector Skills Council<sup>54</sup> to address the priorities set out in the government White Paper ‘Opportunity for All in a World of Change’<sup>55</sup>. A particular focus is given to training the unemployed and increasing the participation of women in the workforce. The Skills Council focuses on five key areas: New recruits; employer/education linkage; development pathways and standards; future skills needs and SME competitiveness, with a particular emphasis on increasing the participation of women in the ICT workforce. Many of these priorities continue to address the need to make the ICT industry more attractive to people seeking a career.

Germany’s 1999 action programme for the Information Society ‘Innovation and Jobs in the Information Society of the 21st Century’ provided the foundation for major initiatives and developments in Germany. The action programme pursues a number of goals, some of which are directly relevant to ICT and e-business skills development. One major priority in 2002 is the reorganisation of continuing education and training in ICT. The German government is working in conjunction with the Federal Institute of Vocational Training to provide a recognised and certified ICT training course that can adapt to the short innovation cycles in the ICT sector.

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<sup>54</sup> e-skills UK is the industry representative body responsible for addressing the IT and Telecoms skills needs of employers in the UK. E-skills UK receives funding from the UK government departments, the DTI (Department of Trade and Industry) and the DfES (Department for Education and Skills) as well as from industry.

<sup>55</sup> ‘Opportunity for All in a World of Change’ – A White Paper on Enterprise, Skills & Innovation (particularly see Chapter 2 ‘A People First Economy’, paragraphs 2.31-2.37) <http://www.dti.gov.uk/opportunityforall/index.html>

As a conclusion, the various conceptual frameworks used by government, industry and other stakeholders address demand and supply through a number of short, medium and long-term solutions as well as looking at issues of social inclusion and sustainability. There are great national differences in the way that these policy objectives are met. Southern Member States are, in general, concentrating their efforts on medium and long-term training programmes and some of the northern Member States are also employing a number of short and medium solutions such as awareness campaigns, forecasting mechanisms and immigration of personnel with key skills.

## **4 Specific Member States initiatives in support of e-skills**

The specific objective of this report is to provide an analysis of examples of good practice in national policy initiatives in order to put forward lessons learnt and priorities for action that will assist in reducing the ICT and e-business skills gap and enhance the competitiveness of EU industry.

In the case of e-skills, taking into account that both the nature as well as the size of the policy challenge remains widely undefined, it was not possible to identify “best” policies in support of e-skills in Europe. Therefore, this report is limited to an analysis of existing policies in this area, which are considered to represent good examples for addressing the issue of the e-skills gap. More research is needed to benchmark such policies and to draw general lessons to be learnt from them.

For greater clarity, the policies further analysed in this chapter have been categorised into long, medium, and short-term mechanisms, examples of partnership schemes and forecasting and tracking of skills needs. The main purpose of the following analysis is to highlight national examples of policies that have been put in place to tackle the e-skills gap across all the Member States and Norway. The policies identified illustrate the breadth and depth of the tools and approaches that have been taken by Member States to address demand and supply.

### **4.1 The long-term mechanisms: Schools, universities and vocational training**

Long-term solutions tend to relate to lifelong learning systems that will deliver ICT education and training which meet the long-term skills needs of all sectors of society. These long-term solutions can be part of school, higher education or vocational training systems. Thus, long-term mechanisms are looking to produce sustainable solutions to the e-skills demand and supply. They represent an investment in the future and its potential impact rather than a response to short-term needs.

A first category of long-term Member States initiatives is related to schemes within the formal educational system. Making sure that new entrants to the workforce and other potential employees have access to the right skills and qualifications is paramount to reducing the longer-term e-skills gap in Europe. ICT education and training programmes of varying length can be used to fulfil the need, a large number of initiatives were therefore identified that are aimed at schools, higher education, teacher training and related training programmes.

The majority of Member States use the *school education system* to deliver digital literacy at the basic level as part of the mainstream national curriculum. As part of the eEurope initiative, ICT courses are being included in the curricula at primary and secondary levels. This pattern is repeated all over Europe showing that progress is being made towards providing all school children with a basic ICT qualification and giving them the opportunity to use computers as learning tools.

There are good examples of initiatives that are in place in order to encourage school children to consider ICT as a potential career choice. A very interesting example comes from Sweden where they are using ICT specialists to teach in schools. A similar model is being used in Germany where 1,400 ICT "ambassadors" are working in schools to support teachers in delivering ICT in the curriculum and increase the number of people with qualifications in science, maths, design and engineering. This scheme is already being rolled out elsewhere in Europe, particularly in the Netherlands, UK and Austria.

Other long-term strategies that are being integrated into schools include improving the image of the ICT industry for girls. In the UK for example, research by MORI for e-skills UK, the sector skills council in January 2000, compiled in the 'Image of ICT'<sup>56</sup> report, identified that the negative image of ICT professionals was formed between the ages of 11 and 13 years. The report stated that girls have a particularly poor image of ICT careers, resulting in the poor and declining number of women in ICT (now representing only around 20% of ICT professionals). This work led to the creation of a marketing plan, by e-skills UK, setting out the programme of action for the Image 3 Impact Programme and the Computer Clubs for Girls.

#### **United Kingdom - Computer Clubs for Girls**

Girls have a particularly poor image of IT careers, resulting in a low and still declining number of women in IT (now representing only around 20% of IT professionals). One such scheme in the UK trying to address this issue at an early stage is the Computer Clubs for Girls.

e-skills UK is working with global leaders in the music, movie and computer games industries to develop the 'Computer Clubs' concept. The Clubs aim to bring professional and up to date technical skills to girl teenagers through innovative activities such as designing covers for popular girls' magazines, and creating splash animations for pop groups' official websites. The objective is to change misperceptions among a generation of girls and to see substantial improvements in the image of the IT industry as perceived by the young. It will also improve the entry-level of e-skills seen in women, increase the numbers of women entering the workforce with up-to-date skills and help balance the gender mix of young people entering IT-related careers.

Extensive support from industry and sponsors and successful feasibility studies and proof-of-concept have led to a trial with 24 schools in the South East. The aim is to roll it out across the UK.

e-skills UK is a not-for-profit organisation recognised by government as the collective voice of employers on IT and Telecoms skills issues. The company is directed by a Board comprising CEOs/MDs from leading global and national organisations. Projects are undertaken by e-skills UK to improve skills availability to industry; 'Computer Clubs' is a major programme of the organisation, designed to have a profound impact across the UK.

*Schemes in higher Education* are to be found throughout all EU Member States. These programmes have a variety of objectives which include: increasing the number of places available on traditional ICT courses, increasing the number of qualifications available (new courses), adding an ICT component to non-ICT courses and conversion courses for graduates who wish to consider ICT as a possible career.

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<sup>56</sup> Marketing Plan Developed during the Image Project - Research Phase for the UK Sector Skills Council 2001

The UK, Ireland, Germany, the Netherlands and the Nordic countries have well-established initiatives for university students and wider technical training courses. There are also courses that target different sectors of the population. For example, the Netherlands has courses for women, immigrants<sup>57</sup> and asylum seekers and Sweden has a range of courses specifically for the unemployed.

The Danish Government has responded to the growing need for new ICT graduates through the creation of two new universities as a long term strategy to increase the number of people with an ICT higher education qualification over the next five years and beyond. IT University Copenhagen (IT-C) and IT University West (IT-Vest) are teaching and research-based tertiary institutions covering design, communication and media, electronic business, Internet technology, multimedia technology, software development, interdisciplinary ICT and bioinformatics. In France, a similar type of university has been newly created. The new Internet University in Marseilles is providing 45 new qualifications in information and multimedia. This will help rapidly address skills shortages and will also have the flexibility to adapt to market changes.

#### **Denmark - Denmark's IT Universities**

In Denmark, the demand for IT-skilled employers has always been high. In the past this was not a problem as the education and training sector was adequately set up to respond to the challenges of producing a sufficient number of trained professionals for the workforce. This was particularly true of the 90s where in the five years running up to the year 2000, the number of students undertaking IT higher education rose from 3,500 to around 6,500. The demand however continues to grow and there is an expected need for an extra 10,000 IT-skilled professionals in Denmark by 2010. Today the Danish IT sector employs 103,000 people. 60,000 of whom are trained IT professionals. However, 24,000 of the trained IT professionals do not occupy an actual IT position.

IT University Copenhagen (IT-C) and IT University West (IT-Vest) are two new institutions designed to help meet the new demands for trained IT professionals. They are teaching and research-based tertiary institutions. The curricula covers: design, communication and media, electronic business, Internet technology, multimedia technology, software development interdisciplinary IT and bioinformatics.

IT-C offers six two-year MSc IT courses. These courses are offered on a full-time basis and include a research component. Also offered are four MA IT courses. These courses are offered on a part-time basis over three years. One part-time graduate diploma course is also offered. Starting with just 120 students in 1999, the student base was 1,557 strong in 2001.

IT-Vest is a network institution based on resources associated with four regional universities. It offers a series of full-time and part-time Master of Science IT degrees (with or without a research component) and two part-time Graduate Diploma degrees. Its student base is 300.

In the Netherlands, a scheme is being funded through the Taskforce Risseeuw, giving ICT courses at the University level to non-ICT graduates. The demand for the 'ICT in non-specific ICT education' project arose out of the findings of the Taskforce, which noted that companies were concerned that newly-recruited graduates often did not possess sufficient levels of ICT knowledge to enable them to use the hardware/software found commonly in the workplace. This project aims to incorporate ICT elements into subjects that do not traditionally have a focus on ICT to

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<sup>57</sup> Immigrants have a significantly lower employment rate than other EU nationals and also have a significantly higher share of unskilled manual jobs.

create professionals who are aware of ICT and are able to work in an ICT environment.

A key objective of the project is that ICT solutions should be integrated fully into the subject concerned. The project goes deeper than simply providing students with Internet access or word processing skills. Two pilot projects in undergraduate business education were selected, in accounting and marketing. These pilots are being monitored and the results used in designing further projects, in other curriculum areas.

In order to enable the teaching of ICT skills and competences in schools, good equipment is essential, along with the necessary new teaching skills and methods. *Teacher training schemes* are being introduced across Europe, but there is a higher prevalence in the Northern Member States. In Denmark for example, the government is providing extra training in ICT for teachers at primary and lower secondary levels through the “educational IT driving licence – Skole-IT”. In Germany there are numerous initiatives, the main one being to provide ICT basic training to all teaching trainees. At a more advanced level, there is a part time extension course available to trainee teachers in vocational training who wish to further increase their knowledge of ICT. There are also plans to extend this and to provide a course in Universities.

In Austria, a teacher training initiative is run by the Federal Ministry for Education, Science and Culture. Finland has a three level system of training teachers called *ope.fi*. The goal is that all teachers will attain the lowest level, 50% the second level and 10% of all teachers the expert level in educational use of ICT by 2004. In Norway 40,000 teachers will be offered post-qualified education in ICT skills within 2003/2004. Instruction will focus on ICT-use, but also cover issues such as policy on data privacy and “web-ethics”. The UK Government has made a pledge that by the end of 2002 all serving teachers should feel confident and competent in the use of ICT in the curriculum. In Sweden the ITiS initiative (the Delegation for ICT in schools) includes in-service training for 60,000 teachers; a multi-media computer for participating teachers; e-mail addresses for all teachers and pupils.

In Portugal, as part of the Operational Programme for Education (PRODEP III), all teachers of basic and secondary education (150,000) are expected to be trained. In Italy, more than half of Italian schoolteachers (around 500,000) have been involved in training and 13,000 digital literacy courses have taken place.

The lifelong acquisition of new skills and qualifications by all workers is an essential condition not only for meeting the demand for new permanent jobs in the digital economy, but also for adding new skills to existing job functions. In addition, workers who have acquired new ICT related skills in the workplace are able to make use of them at home and at leisure, contributing to the wider digital literacy of society as a whole – the broadest concept of lifelong learning.

The level of *government involvement in providing training initiatives* varies considerably across the Member States. In some countries, such as France, all companies are obliged by law to invest a proportion of their revenue (1%) in employees training and further education. Similar tax levies exist in the Netherlands, Denmark and Norway. Italy is considering introducing such an incentive.

In the Nordic countries and the more Northern EU Member States, government involvement in developing training schemes has been historically greater than in Southern EU countries. For instance, in the Netherlands, a joint paper ("Er is meer nodig" – "More is needed"), which was agreed between the social partners and the government, focussed on ICT skills and included fiscal incentives for employers to train their employees, the introduction of a Personal Development Plan and Personal Development Accounts. This 'account' enables all employees and job seekers to accumulate money for training, such as ICT training. Furthermore, the paper makes reference to numerous training initiatives at the sectoral level. Similarly, in Denmark, ICT training has become a mandatory part of all vocational degrees. In Norway, education financed by an employer is generally exempted from taxation.

There are schemes in place that provide *new qualifications outside the traditional education structure* which are recognised by employers. In Finland, for example, the concept of the 'computer driver licence' has been expanded to create a family of ICT qualifications. The responsible qualification body is Tiece, the Finnish Information Society Development Centre. Since 1996 it has managed a qualifications programme that has awarded licences to over 100,000 people.

Targeted at the general public, Tiece has created three levels of qualification: The basic @-level exam is targeted at all citizens, the A-level focus on those wanting to validate workplace ICT skills and finally the AB-Level which is targeted at those wanting specialised ICT skills. Computer Driving Licence courses and examinations are organised by hundreds of educational organisations all over Finland and have been designed to provide clear guidelines and goals so as to ensure uniform levels of education accordingly. The tests are equal in value over the whole country.

## 4.2 The medium term mechanisms: Addressing special needs of beneficiaries

Medium-term solutions look at reaching out to non-traditional labour pools in order to recruit and train new ICT workers across all industries and at all levels. As well as training non-traditional or underrepresented groups, another medium-term solution is to provide appropriate training to existing staff, especially within SMEs, who often have the ability in-house but do not take the time needed to exploit the current workforce's complete potential.

Medium-term solutions do not look for results tomorrow but nevertheless look to produce an increased supply and a reduction of demand that will fill existing e-skills gaps in the labour market. For this reason they tend to focus on new potential workforce recruits or existing employees that can adapt and learn new skills in a relatively short period of time.

The tools for targeting these special groups vary widely. There are a number of traditional training programmes that are delivered on a community basis, often through local training colleges. One of the major challenges of encouraging socially disadvantaged groups to take part in training is that exclusion issues have to be addressed before the training aspects may be considered. This issue is often addressed through awareness schemes specifically targeted at these groups.

A major tool designed to increase the number of *women* in the workforce is the use of role models. In Denmark, for example, the Cybernova project has the specific objective of identifying the barriers that women may encounter when trying to enter the technology sectors. It uses role models during associated courses and on-the-job training. This scheme was introduced after similar schemes in Sweden and Norway proved successful. Similar role models are also used in the UK. Norway has gone further to encourage women in this sector by adopting a special quota system for women in computer technology studies.

In the southern Member States, schemes are rarely focused on women, but there are many training schemes that have quotas for women. A main target group is the long-term unemployed and several regional schemes were identified which targeted this group.

There are also medium term vocational training schemes in place which target *SMEs* in order to encourage them to retrain the existing workforce instead of just employing new skilled workers. Such a scheme, the Forintel programme in Spain, is tackling both *ICT user skills and ICT professional skills* at the same time.

### Spain- Forintel

In 2001, the Ministry of Science and Technology in Spain established the Forintel programme<sup>58</sup>. Forintel is one of a number of initiatives being run by the Spanish government, which are run in such a way that they complement each other, providing a solid foundation for the building up of e-skills at all levels across Spain. The main focus of Forintel is the upskilling of the existing workforce in both ICT professional skills and the more intangible ICT user skills. It is complemented by another large scale government ICT skills programme which aims to train 14,000 employees in basic ICT skills by 2003.

The professional skills programme delivered through the Forintel programme uses the career profiles that have been developed by Career-Space<sup>59</sup>. By using the Career-Space profiles, the programme was able to devote all its resources to the building of course content. Another advantage of using Career-space is that the programme is helping Europe move towards standardised descriptions of jobs and skills rather than increasing the existing confusion felt by people trying to understand job profiles in the ICT and ICT user industries.

The Forintel programme user training courses cover basic ICT skills focusing on the provision of Microsoft Office and Internet skills specifically within SMEs. The strategic targets of this part of the programme are to integrate the use of technologies into the way that a person works and to encourage the continuation of learning as a concept.

Workforce training and lifelong learning have been extremely difficult to implement in the working culture in Spain and this has been particularly true in SMEs. Hence this scheme is hoping to alleviate some of the barriers associated with investing in training.

In Greece, as part of the 'Greek Go Online' initiative, ICT skills training is delivered through the e-TRAIN programme run nationally by GRNET, the Greek National Network of Research and Technology. The key focus of the initiative is to help accelerate the introduction of e-business practices in SMEs in Greece. It works in cooperation with a number of other campaigns taking place on a national level.

In Southern Italy, over fifty percent of *young unemployed people* have never used a computer and fifty percent have no knowledge of the English language. The IN action programme, promoted by the Ministry of Labour and Social Policies<sup>60</sup> and operated by Italia Lavoro<sup>61</sup>, has set up a programme to deal with both of these skills issues at the same time in order to facilitate entry back into the job market for unemployed youth. The programme is providing ICT training alongside English language training for young unemployed people in Southern Italy.

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<sup>58</sup> With part funding from the European Social Fund

<sup>59</sup> <http://www.career-space.com>

<sup>60</sup> [www.minwelfare.it](http://www.minwelfare.it)

<sup>61</sup> [www.italialavoro.it](http://www.italialavoro.it)

### Italy - IN Programme

The IN programme in Italy, is providing training to 60,000 young long-term unemployed people between the ages of 16 and 32, living in Abruzzo, Basilicata, Calabria, Campania, Molise, Puglia, Sardegna and Sicilia. These people must be registered unemployed for a minimum of 12 months and fifty percent of the places are reserved for women. The programme started in April 2001 and has been running for 24 months. It involves a wide range of stakeholders including 8 regions, 36 provinces, 200 Public Employment Centres, over 300 training centres and 1,000 teachers and tutors. The beneficiaries are over 60,000 young people and over 1,500 businesses.

By May 2002, 84,949 people had applied for the 57,413 available places and 48,221 young unemployed people were involved in the scheme, 63% of them being women. Additionally 9,300 gift vouchers had been awarded so that the participant could buy a PC and the website had attracted over 3.8 million visitors in 12 months.

An area which is not generally covered by the schemes identified is the assessment and *recognition of non-formal and informal learning*, which is important if workers are going to transfer identifiable skills sets to new jobs and across sectors. This has particular significance for older workers, as much of their knowledge may have been acquired outside traditional learning. In Norway the Act relating to Universities and University Colleges has been amended to allow adults over 25 years of age without formal entry qualifications to be admitted to undertake non-formal learning. The individual educational institutions determine whether the non-formal qualifications are acceptable. Finland also has a clear vision of lifelong learning in general and part of the Government's development plan for the 1999-2004 calls for increasing vocational training and new ways of recognising non-formal and informal learning.

#### 4.3 The short-term mechanisms: ad-hoc policy responses

Short-term solutions consist of a number of ad-hoc responses to quickly increase the trained labour force. These include mechanisms of outsourcing and immigration as well as the encouragement of labour force mobility across the European Union. Other important policy measures include the use of public private partnerships and also the forecasting and tracking skills needs so that the appropriate type of long, medium or short-term mechanisms could be deployed, as appropriate.

In some Member States, high employment levels combined with a lack of population growth and low levels of interest in the transferability of skills have called for additional short-term solutions in order to address the skills mismatch. Looking for skilled people outside the country or the European Union is potentially a fast way of both gaining new skilled workers or outsourcing ICT work.

Germany, the UK, the Netherlands and Norway, have been early adopters of initiatives targeting *immigrants of non-EU countries* and several Belgian companies have moved sections of their information technology units to Slovakia, Romania, Ukraine and India in order to overcome their ICT staffing problem. The German 'Green Card' initiative is one of the better known in this field. Since the programme went into effect in August 2000, some 12,500 special five-year work permits have been issued to foreign nationals to help meet Germany's need for qualified ICT specialists.

In Finland, although there is no specific scheme in place, the government has put forward the notion that the lack of skilled workers could be partially alleviated by recruiting more foreign students<sup>62</sup>. In Norway the immigration act of January 2002 made it easier to recruit foreign nationals from countries outside the EEA-area. This change links into the priorities of the eNorway plan, which includes increasing the ICT skills base through immigration.

The UK also had a “Fast Track” Scheme in place, which included a number of ICT jobs on the list of skills in short supply, but in August 2002 the Home Office removed ICT jobs from the ‘skills shortage’ list<sup>63</sup>. Now all posts have to be advertised before skilled people are sourced from abroad. This measure resulted from industry group representation and the fact that reports placed the number of out of work sole practitioners at 30% to 50% of the UK's 100,000 total. In addition 10% of the UK's permanent ICT labour force, equating to around 30,000 workers, were also put out of work over the 2001/2002 period<sup>64</sup>.

Although many large organisations outsource elements of their Internal ICT services, such as hardware maintenance and software support; this is not generally an area where governments make significant policy interventions. The only example identified is the one in Belgium where, as part of the suite of initiatives being run by Agoria, several Belgian companies have moved sections of their information technology units to Slovakia, Romania, Ukraine and India. Although skilled immigrants are generally welcomed by Belgium, investing in the home country of the programmers and software engineers allows nationals to remain within their own environment and culture while being exposed to Western project and business management methods. An added bonus of this approach will result when these local emerging economies start to grow; Belgian companies will have established access to local staff who will by then be conversant with their products and business methods<sup>65</sup>.

A large number of *short-term education and training programmes* have been employed in Europe. Names such as “Rapid Advancement Programme”, “IT Immediate Action Programme”, and their focused objectives indicate the importance they attach to providing a ‘quick fix’ to increase workforce skills. In Sweden, SwIT had the objective of training 10,000 people in intermediate ICT skills, to fill the gap between university-educated computer engineers and ordinary users. The scale of the initiative meant that SwIT became, effectively, a 'national ICT workforce training programme'.

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<sup>62</sup> The report ‘Business Environment Policy in the New Economy’ from the Finnish Ministry of Trade and industry gave equal importance to encouraging more women

<sup>63</sup> Media reports place the number of out of work contractors at 30% to 50% of the UK's 100,000. A further 10% of the UK's permanent IT labour force, equating to around 30,000 workers, were also laid off last year

<sup>64</sup> Information from the UK eGovernment Monitor 2/9/02

<sup>65</sup> Information supplied by Agoria.

### **Sweden - SwIT Swedish IT-Vocational Training**

The SwIT (Swedish IT-Vocational Training) programme was a collaboration between the National Labour Market Board, the Federation of Swedish Industries and the Association of Swedish IT and Telecom Industry. The programme ran from 1998 to March 2000 and the objective was to train 10,000 people in intermediate ICT skills, to fill the gap between university-educated computer engineers and ordinary users. The scale of the initiative meant that SwIT was, effectively, a 'national ICT workforce training programme'.

The initial idea for the programme came out of discussion between the Federation of Swedish Industries and the Association of the Swedish IT and Telecom Industry. The programme also had some strict criteria including that at least 75% of candidates should be unemployed, that the focus should be on providing skills to three target groups – women, ethnic minorities and the disabled. Furthermore the programme should aim to find employment for all participants within 6 months of completing the course.

Training was organised into five competence fields, where the need for personnel was felt to be particularly urgent which were: PC support; Network support; Programming; Applications support and User support.

Between 1998 and March 2000, 11,700 people were trained (the target was 10,000).

An initial evaluation indicated that 62% of those who participated in the programme were subsequently employed in ICT-related posts and 2% were pursuing higher education degrees. Upon completion SWIT had provided training for nearly 12,000 participants. Around 10,000 of these participants were subsequently employed as IT specialists in approximately 3,000 companies.

One (unforeseen) impact of the programme was that its success increased the demand for similar initiatives to support companies in other sectors, who were increasingly using ICT in their business. The government had demonstrated its willingness to provide substantive support for initiatives to meet the needs of industry.

In Northern Ireland, the Rapid Advancement Programme followed a similar model, although on a much smaller scale. The programme started in 1998 and provides ICT conversion training for 250 non-ICT graduates (unemployed and underemployed) per year. Since 1998, a total of 650 graduates have completed the programme.

### **UK - Rapid Advancement Programme**

The Rapid Advancement Programme (RAP) is a small programme run in Northern Ireland to provide IT conversion training on an annual basis.

The programme involves 12 weeks of specialist training, a 12-week work placement and concludes with 5 further weeks off-the-job training. The programme is in place to help attract high calibre non-IT graduates to this growth sector of the IT industry. This in turn will alleviate the shortage of skills at the graduate level within the industry and reduce the numbers of unemployed graduates with the right potential but the wrong degrees.

The programme's approach to learning differs from that of academic institutions in that it involves early specialisation and gaining a depth of knowledge over the 29-week programme. Early in the programme, candidates choose to specialise in one of three streams: Systems engineering; Software development or Web technologies.

The way that RAP chooses the right people for the course ensures the success of the programme. Candidates have to have the requisite competencies and abilities to rapidly re-skill and the process includes online aptitude tests and a competency based application form before an interview. The steering group includes experts from the local ICT sector, Microsoft, Compaq and Prosoft.com who work collaboratively with the programme designers to ensure that the content and the flow of the

programme maximises the resources.

The outputs are measured using internationally recognised, industry-valued certifications ensuring both knowledge transfer and competence in the chosen area. Industry-recognised qualifications from CompTIA, and in particular, Microsoft Certified Professional status are used. RAP also includes a placement offering real benefits to businesses themselves.

In November 2001, B.I.C. Systems Ltd, who delivers the course, in partnership with the Department's management development team, were recognised for the development and success of RAP and jointly awarded a National Training award.

The department and B.I.C have redesigned the programme for 2002/03.

The German government's, IT immediate action plan is a much larger programme addressing the ICT skills shortage by a variety of means – from upskilling of the German workforce to easing access for skilled foreign professionals. The target group is very broad – ranging from school pupils, young professionals, students and employees to the unemployed and foreign professionals. The programme covers all stages from awareness raising to university education.

#### **Germany – IT Immediate Action Plan**

The goal of the Germany IT immediate action plan is to cover the IT skills shortage by a variety of means – from the upskilling of the German workforce to easing the access for foreign skilled professionals. Overall, the programme aims at "creating" 250,000 IT professionals. The Federal government wants to attract 20,000 top IT-professionals from abroad and has already executed necessary changes in immigration and employment law for a period limited to three years (Green Card Initiative) and skilled IT professionals coming to Germany under this arrangement are eligible to stay up to five years. In addition to this limited opening of the labour market, education and training with regard to IT has been enhanced through a number of different activities. The scope of the programme means that it could fit into many different categories, it starts off with short-term strategies but is addressing the shortage in a sustainable way. It also involves public private partnership and includes an increase of the number of available training spaces in IT- and media related professions, the establishment of an IT-training system and the enhancement of the measures already in place through the Federal Institution of Labour (Bundesanstalt für Arbeit).

The programme involves all relevant stakeholders, such as associations, companies and trade unions and also links very well with the action programme of the Federal government, "Innovation and Jobs in the Information Society of the 21<sup>st</sup> Century". The programme is partially funded by the government and partially by companies or other private sector organisations including Microsoft, Oracle and SAP. Also through the European Scholars Programme in Germany, local city labour offices, the army and Microsoft are offering opportunities for unemployed graduates, technicians, jobless IT-professionals and short-service volunteers in the army to become Microsoft Certified Systems Engineers (MCSE).

All groups of society have to be addressed if the programme wants to be successful – awareness raising already starts in schools and continues through to university education or professional engagement. Another interesting insight from this programme is that there are multiple venues for educating IT professionals – formal university education is only one way. Training programmes throughout the country and public-private partnerships to enable training are therefore crucial.

#### **4.4 Partnership between industry and government**

Partnerships between Government, industry and education are evident in schools, universities, in workplaces and in the forecasting and tracking of skills needs

The partnerships do not follow a pre-defined model. Some are driven from the industry side and others from the government side. As stated in an eLearning summit discussion paper '*Public-Private Partnerships* are a relatively new phenomenon in Europe and are not conceptualised in a uniform framework<sup>66</sup>'. There is little general information about sustainable models for co-operation and whether they actually strengthen or undermine public education provision. Particularly as it is often the case that the public sector will provide funding and the private sector will deliver the course content.

Some general observations can be made. In cases where the ICT industry has taken the lead, the programmes often follow a pan-European approach to skills development across all the EU Member States. For example, a scheme from CompTIA, JOBS+<sup>67</sup> has the aim of bringing 200,000 new ICT professionals into industry by 2004. This is a Europe-wide target and includes an ICT Career Awareness programme, training individuals with disabilities, a transitional worker programme, and an 'education to careers' transition programme.

Government are working in partnership with industry to deliver vendor qualifications. In Germany the 'IT immediate action programme' is working with industry and supplying certification from Microsoft, Oracle and SAP. Also through the European Scholars Programme in Germany, local city labour offices, the army and Microsoft are offering opportunities for unemployed graduates, technicians, jobless IT-professionals and short-service volunteers in the army to become Microsoft Certified Systems Engineers (MCSE).

In the UK, (Northern Ireland) the government has teamed up with Microsoft to deliver ICT training for women to work towards the Microsoft Certified Systems Engineer Accreditation. The UK government also has a pilot scheme that is comparing vendor qualifications with NVQs (National Vocational Qualifications) to see which one is more likely to lead to employment. The Learning and Skills Councils and QCA (Qualifications Curriculum Authority) have teamed up with Microsoft to look at the results. In Ireland, the FIT programme, led by industry has teamed up with numerous stakeholders to deliver IT industry training to the unemployed.

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<sup>66</sup> [www.career-space.com/whats\\_new/eLearningSummit1.doc](http://www.career-space.com/whats_new/eLearningSummit1.doc)

<sup>67</sup> <http://www.comptia.org/workforce/workforce.htm>

### **FIT- Fast Track to IT Ireland**

FIT is an industry-led initiative<sup>68</sup> in Ireland that is supported by Government to meet the employment demands of industry in the area of Information Technology.

The objective of FIT is to provide unemployed people with the skills and confidence to take advantage of the job opportunities in the area of IT. The unemployed, women returning to the workplace and the increasing number of refugees all have the potential to acquire the IT skills desired in a range of Industry sectors. FIT in conjunction with government agencies, industry and community groups are all working to realise this potential.

As well as industry and the support of the Irish Government, FIT benefits from a wide pool of stakeholders who contribute actively to the programme including FAS (The Irish Training and Employment Authority), the City of Dublin Vocational Education Committee (VEC) and Dublin County VEC. These organisations are vital contributors in terms of training provision. The participating Dublin Local Employment Service Network (LESNs) and Area Partnership Companies (APCs) play a crucial role in terms of the recruitment and selection of FIT trainees as well as the general local co-ordination of FIT Training Courses. The FIT Initiative is a clear demonstration that pooling resources and energies can achieve much more.

The concept of FIT reflects the input and influence of major IT employers in setting out their labour and skill requirements and the previous experiences from community based training initiatives throughout the country.

Over 1,800 unemployed people have participated in FIT training programmes and over 1,000 ICT employment opportunities have been accessed.

There has also been international interest in the FIT model. As the policy of FIT is to share its knowledge, both at home and abroad, FIT has been presented in Italy to city representatives and community organisations on the application of the FIT model to local employment strategies. As a result a FIT Naples project started in September 2002, funded under the EU EQUAL Initiative. This widespread interest underlines the initiative's potential for continued growth and expansion in meeting the IT recruitment needs of the industry and the wider economy, both in Ireland and further afield.

Partnership in education happens on a number of levels including teacher training, content development, providing courses in secondary education and promoting ICT for girls. Intel and Cisco, for example, are providing global teacher training initiatives but there are also examples of national initiatives and not always at the school level. In Norway for example, FAST Search & Transfer ASA has engaged in a collaboration with the Norwegian University for Science and Technology (NTNU) to help train professors.

The 'Connected Learning Community' is a Microsoft scheme for the integration of technology in education. It aims to provide students and teachers with the skills to access the latest technologies and digital tools. Two examples of the programme are Anytime Anywhere Learning (AAL) and the International Youth Foundation (IYF).

IBM is also developing an "eMentoring programme" in Europe with dual objectives of encouraging use of ICT and also providing a mechanism for secondary school students to learn informally about the ICT industry through insights to their IBM

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<sup>68</sup> The FIT Working Group (Corel, CSC, IBM, Microsoft, Oracle, and Symantec, the IDA, the Department of Enterprise, Trade and Employment and the Ballymun Job Centre) came together with the assistance of the IDA in September 1998.

mentor's job. The programme is structured around specific curriculum projects organised by the class teacher; these are not specifically IT related. This helps students to understand that information technology is not a separate subject but a set of skills to integrate into the learning process. The programme has just been launched in the UK and Spain, and there are plans to implement the programme in several other EU countries. IBM also have an IBM Technology Summer Camp programme which is specifically designed for girls. The camps are week-long summer programmes hosted at an IBM location. The curriculum is centred on information technology. This is linked to the eMentoring activity so that there is an opportunity to continue the learning following the initial summer activities.

There are fewer examples of partnership schemes taking place in the Southern Member States. Cisco is working in Italy to integrate ICT technologies and content into the Italian education system. The company also has agreements with regional governments to promote training in schools and local projects. In Spain, Cisco is working with regional authorities to promote training through the CNAP (Cisco Networking Academy Programme). In Greece, Athens Information Technology (AIT) was recently launched as an industry initiative to provide world class education and research in the Information Society.

#### **4.5 Forecasting and tracking skills needs**

Examples of forecasting and monitoring future skills needs were identified in Ireland, France, the Netherlands, Finland, Norway, the UK, Sweden, Spain, Italy and Denmark. Measuring the sophistication of these tools is difficult as they vary considerably in their detailed data, data capture and target focus.

The UK's detailed work on forecasting brings together industry trade associations, government, professional bodies, practitioners and the academic world and the model is validated extensively by both public and the private sectors. The UK SFIA (Skills Framework for the Information Age) is one of the more sophisticated tools for skills definitions as it works with a matrix of levels of responsibility and accountability on one axis and areas of work on another. This type of framework allows sophisticated skills tracking at a micro-level which may be understood by companies, professional bodies, education and training organisations, government and national occupational standard bodies in the UK.

##### **UK – SFIA, Skills Framework for the Information Age**

The Skills Framework for the Information Age (SFIA) is a UK scheme providing a common reference model for the identification of the skills needed to develop effective Information Systems (IS) making use of Information Communications Technologies (ICT).

At the organisational level, SFIA enables the measurement and benchmarking of an organisation's collective ICT skills and its processes for managing and developing these. It is easily accessible to ICT practitioners and users; employers; education and training providers; and government. The result of using SFIA is the production of a comprehensive model, which describes ICT skills at all levels in an organisation in a language that everyone can understand. Most organisations can use it as the basis for training, assessment, career planning and recruitment. In specialist ICT jobs, it clarifies competencies and the way competencies contribute to the business. In non-specialist jobs, it helps to see how ICT skills contribute to performance.

A group bringing together industry trade associations, government, professional bodies, practitioners

and the academic world have developed SFIA. It has been a collaborative effort, organised by e-skills UK (the Sector Skills Council for IT and Telecoms in the UK) representing all the key bodies involved in the development of skills in the UK.

The framework provides a clear model for describing what ICT practitioners and users do. It is constructed as a two-dimensional matrix. One axis divides the whole of ICT into 'skills'. Skills are grouped for convenience into subcategories or 'business roles'. Subcategories are grouped into six categories or work areas – strategy & planning, management & administration, development and implementation, service delivery, sales & marketing, and use. The other axis defines the level of responsibility and accountability exercised by ICT practitioners and users. Each of seven levels – from new entrant to strategist level – is defined in terms of autonomy, influence, complexity and business skills. The matrix shows the complete set of skills used by ICT practitioners and users. For each skill at each level, 'descriptors' provide examples of typical tasks undertaken.

SFIA is being used by Woolworths, the Ministry of Defence in the UK and Consignia to name but a few. Also a company, Infobase are currently looking at creating an online system for measuring skills based on SFIA.

Another method used in some instances, particularly in Denmark and Finland, is to look at economic 'boom' and 'bust' scenarios which may be projected over the coming years. These models attempt to take into account economic unpredictability and as a result produce a range of forecasts for skills gaps.

The Finnish example currently being undertaken by the Federation of Finnish Electrical and Electronics Industry with the help of the Corporate Foresight Group of the Institute for Advanced Management Systems at Abo Akademi University in Turku.<sup>69</sup> is being piloted at the European level and models employment in the electrical, electronics, telecom and related service sectors.

#### **Finland - ICT Employment Scenarios 2010**

During the Federation of Finnish Electrical and Electronics Industry's time chairing EICTA's<sup>70</sup> Working Group on Skills Shortages in ICT a model was developed by the Institute for Advanced Management Systems at Åbo Akademi University in Finland in an attempt to forecast for the ICT skills shortage. The model focused on two economic scenarios: a boom scenario and a US-led recession scenario and focuses on employment in the electrical, electronics, telecom and related service sectors.

In a Boom -scenario the overall economic development would be favourable. Global economic growth is rapid and the economy has more or less permanently moved to a new higher level of growth. New innovations are emerging (innovation boom) and adaptation of new technologies, product and business concepts is increasing. All sectors of the economy are investing heavily on ICT products and services and the ICT sector's growth rate is above the average economic growth.

Even in the Boom scenario, the ICT sector's development, including employment situation, would not necessarily be similar in all EU-countries due to factors such as the structural differences between countries. Pioneer countries (Nordic countries, the Netherlands) that have invested the most in the new technology would witness the fastest growth. However, generally speaking, the growth in the Boom scenario is so rapid that all EU-countries get their share of it.

In a US-led Recession -scenario the US economy tumbles into a deep recession and pulls the whole world economy with it. Global economic growth is slowing down and the economy moves to a zero growth path. Gradually the GDP figures fall down to negative side.

<sup>69</sup> "ICT Employment Scenarios 2010: The Future Scenarios of the Employment in the European ICT-Sector", Federation of Finnish Electrical and Electronics Industry, 2001

<sup>70</sup> The European industry association for the IT, electronics and communications industries

The scenario means that the ICT sector and markets are declining and the demand of ICT products and services is decreasing. In spite of this recession it is however still possible in this scenario for the growth of ICT sector to be above the average economic growth rate in some countries, but overall the ICT industry would be in trouble. The effects of recession would hit hardest on the pioneer countries and those countries that are engaged in ICT exports. After 5 to 7 years of this depression the world economy would turn again towards faster growth path.

The simplest summary of the scenarios is that in a boom ICT will employ more than 10m Europeans in 2010. In a recession that figure would drop to just over 6m.

While there are employment forecasts made by government agencies and commercial data providers, few project so far into the future for such specific sectors. Few commercial data providers would be willing to make a forecast more than five years ahead. This project is brave enough to do this but is also wise to offer an alternative scenario.

In Spain in 2002, an observatory for ICT employment (OMT) has been established to continue the work of 'the PAFET study', which completed a review of the ICT labour market in Spain. The PAFET study provided current statistics associated with shortages in firms dedicated both to providing ICT goods and services. The objective of the study was to give a prediction of the professional skill needs of Spanish enterprises for 2003, due to the increasing demand for qualified personnel in the field of ICT. The main results from the report, was the evidence of a growing need for professionals with a mixture of skills, who can understand technologies in several different domains of application. It also concluded that companies need to complement the training of their qualified personnel with life-long learning programmes to upgrade the existing workforce.

A similar labour market service called Excelsior<sup>71</sup> has also been set up in Italy to provide current statistics associated with shortages in firms dedicated to providing ICT goods and services and those in dedicated ICT roles in the economy more generally. An analysis of the data presented showed that in Italy the demand of professional profiles with ICT skills competencies is still low.

Other more general tracking is taking place across the majority of the Member States. In Sweden, 'Statistics Sweden' carries out a yearly survey of a sample of employers entitled "The Labour Market Tendency Survey". It provides information about the labour market situation and the outlook for 77 educational and training categories. The questionnaire on which the survey is based asks personnel managers for their opinion regarding the supply of applicants with the education or training in mind, as well as their view on how the number of employees with this particular education or training will change in one and three years respectively. Among the categories covered are engineering graduates specialising in computer technology. Furthermore, the National Labour Market Board publishes the report "Where are the jobs?" based on the County Labour Boards' and Employment Offices' estimates of the demand for within their respective regional labour markets. Occupations where there are shortages in Sweden are identified based on the employers' expected need for recruitment in relation to the employment offices assessment of the supply of applicants fit for the job.

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<sup>71</sup> A service implemented from the Ministry of Labour in 2002- aiming to improve the competitiveness of Italian business by delivering statistics focusing on the 'e-skills' available in the current and future workforce.

The National Labour Market Board has also specifically studied the ICT sector in Sweden. An assessment was made of the supply and demand future manpower and of necessary initiatives for meeting the growing demand for ICT competence. The report was based on 60 in-depth interviews with people in the sector, representing business enterprises, business organisations and higher education.

In Ireland, the 'Expert Skills Group on Future Skills needs' is working on identifying skills needs across a number of sectors: IT, Researchers, Life Sciences and the Construction Industry. The sectors were selected based on their importance to the economy, the severity of shortages and the need for long-term planning feeding back into the education and training system. In France, a similar approach has been taken and has led to a number of professional training schemes being implemented.

In the Netherlands, the 'ICT Taskforce Risseeuw'<sup>72</sup> keeps track of skills shortages by analysing labour market forecasts and delivering proposals to address the problems identified.

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<sup>72</sup> A taskforce made up of CEO's of ICT producing companies, ICT using companies and the chairmen of the boards of some universities and institutions of higher vocational education.

## 5 How to best promote e-skills in Europe?

This report follows a bottom-up approach to addressing the e-skills gap by identifying and analysing existing policies rather than defining 'ideal' policies. The vast range of policies that already exist and that have been presented show that there is little that can be covered at the European level in terms of programme development that is not already being done.

One step forward would be to properly assess these national policies in order to identify and share good practice. This report starts this process and aims to contribute to a better understanding of what is currently being done to promote e-skills in Europe. The policies that have been identified give rise to a number of lessons learned from these practical experiences.

### 5.1 Lessons to be learnt from practical experience

The political priorities and corresponding programmes and actions in place across the Member States indicate that there is already a strong commitment to ensuring that the problems of the skills gap will be resolved. As well as government or public policy-led initiatives, many of the schemes are being undertaken in partnership with industry and other stakeholders, reinforcing the importance of collaboration and co-ordination of approach in order to improve sustainability at national and European levels.

There is also the contribution of industry to be considered. Although these schemes are not highlighted above in great detail, pioneering programmes such as the Cisco Networking Academy and the Microsoft Certifications<sup>73</sup> have contributed to addressing the ICT and e-business skills gap. Industry has also shown a willingness to work in partnership and to give contributions 'in kind' to public programmes.

The ultimate objective of benchmarking policies is to learn from practical experience. The six policy lessons shown below have been drawn from the examples of good practice policies and from the contributions made by industry. In addition, there are a number of good practice 'points of note' detailed which may be of use to those responsible for developing future e-skill policies.

#### **Lesson 1: Defining skills, monitoring and quantifying the skills gap and mismatch is feasible**

A number of organisations have undertaken initiatives that aim to define the skills needed for the development and growth of e-business and ICT and to monitor and quantify skills gaps. Although there is not yet a commonly agreed framework, those initiatives show that a Europe-wide system is feasible.

The assessment of the gap and mismatch between supply and demand needs to be dynamic to follow the trends in a domain evolving at an ever-increasing pace. This is seen as an important success factor to reach sustainability. Sustainability is dependent

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<sup>73</sup> The ICT and e-business skills – Synthesis report May 2002 gives an overview of many of the industry initiatives that are contributing to providing new skills to the European labour force.

on accurately forecasting demand and fluctuations over time, based on addressing needs that are appropriate to businesses.

One idea for facilitating this process would be to bring together European experts in the field in order to discuss these issues. There is also a role for National Statistical bodies in cooperation with Eurostat in the identification of appropriate indicators and implementing mechanisms for measuring the e-skills gap at the European level.

**Lesson 2: Education and training is the principal way to overcome the shortage of e -skills**

Employers and governments need to recognise that education and training offer the long-term solution to the e-business and ICT skills gap and mismatch. It is already widely accepted that the bulk of the demand in enterprises is for a combination of ICT skills and a number of years of work experience. On the industry side, funds spent by businesses in competing for staff who are in short supply could possibly be better spent in training their own staff in aspects of ICT use. Competition would then stem from the use made of the acquired skills to develop new products, and to re-engineer business processes.

There is some evidence that people are reluctant to see ICT as a career, due to the fast changing nature of the skills required and the technical base making it unattractive. Thus, education and training needs not only to provide the technical background necessary but more importantly to develop flexibility and a positive attitude towards the business relevance of these skills through lifelong learning. This call for flexibility and the continuous update of skills is key to the spread of ICT among users and as a means of promoting digital literacy. This is seen as a very important element in influencing productivity growth across all business sectors as well as a means of bridging social divides and of strengthening social cohesion.

**Lesson 3: Policies must be inclusive of the whole available potential labour pool**

Although current assessments of the skills shortage focus rather narrowly on professional skills, enterprises in virtually all other sectors also require e-business and ICT skills. To meet this demand and the variety of non-ICT skills that will permit enterprises to adapt and use 'e-solutions', labour pool inclusiveness will be a prerequisite of the policies in order to seize the opportunities of the knowledge-based society.

For these reasons, skills shortages relate not only to the ICT sector, but also extend to other business sectors. Including other sectors as targets of policy actions is therefore a potential success factor and an enabler to positively influence productivity growth in Europe. Improving the definition of the e-skills needed in user industries and SMEs is of particular importance in this context.

Inclusiveness therefore needs to be tackled as a horizontal dimension across all policies. Beyond defining the required skills, measurements and forecasts, and definition of curricula, promotion of lifelong learning should broaden the coverage and target groups. This also requires recognition of special needs (such as those of women, the long term unemployed, and immigrants).

**Lesson 4: Consider e-business and ICT implications at large**

Although ICT and e-business can be seen as a sector in its own right, it is extremely important to consider it as an integral part of all businesses and sectors. It should be perceived as providing enabling technologies that can bring dramatic changes in business operations, rather than a separate ‘high-tech’ subject area.

Business goals should be seen as improving efficiency and profitability through the adoption of ICT solutions and not as simply the introduction of ICT in its own right. As with reading and writing, training in ICT skills should then be considered as fundamental core strengths of the EU Member States, industries, and individuals. In this context, SMEs represent a special group to be targeted by policy actions.

**Lesson 5: Foster partnership between stakeholders**

Improved dialogue between education, businesses, and users is essential to define needs and to develop appropriate means to tackle them in ways that are mutually beneficial.

Special attention should be given to defining the roles and responsibilities of the various stakeholders in tackling the e-business and ICT skills gap and mismatch issues. Individuals, in particular, should be given more responsibility in the overall effort to ‘upskill’ the labour force.

Public authorities and institutions should recognise their important role as ‘evangelists’ for ICT adoption and skill development. As major employers with an even broader reach to businesses and individuals they must lead wherever possible by setting examples in ICT adoption and use through incorporating e-skills in job profiles and adopting formal certification schemes.

**Lesson 6: European balance to be ensured**

It is generally evident that the more Northern EU Member States are feeling more pressure to fill the gap in e-skills. Survey and data support this and a larger number of programmes focused both on particular groups and generic programmes such as life long learning are in place. This activity is further supported by a greater tendency to use immigration and outsourcing as shorter-term measures to fill the gap. Although some of these actions are evident in the southern Member States, actions here tend to be ‘pre-gap’, in other words the longer term solutions associated with improving the education system and awareness are more prevalent.

This raises an important issue for policy makers. Should the development of ICT capabilities be left to market pressures to gradually create e-skills gaps in the current ‘pre-gap’ countries? Or should the future developing need be better anticipated by introducing initiatives that will address these needs in sufficient time to meet demand? Obviously, considerable time could be saved and economic advantage could be gained if supply could be met slightly ahead of need in these states. To do so will require the comprehensive monitoring mechanisms described earlier, along with flexible and workable policies developed on a partnership basis to make the resulting programmes sustainable as demand increases.

## 5.2 Policy conclusions

Although the prime objective of this report is to analyse the nature of the e-skills gap and to identify examples of good policy initiatives in response to this challenge, some general policy conclusions can be drawn.

Firstly, Member States attach different importance to the issue of the e-skills gap. This is largely due to their stage of economic development and the accompanying 'cascade effect' of ICT adoption.

At the initial stage of national adoption ICTs tend to be restricted to a few larger organisations, it then tends to cascade through supply chains to medium and small businesses in both manufacturing and service sectors. Along side these changes there is usually a corresponding increase in use by citizens. In Member States that are more recent adopters of ICT therefore, there has historically been less pressure to take action through public policies than in those that adopted ICTs early. It is reasonable to assume that as each Member State progresses towards a more widespread adoption of ICTs they will each in turn need to address the growing needs for e-skills through targeted policy actions. The European Union can assist in this process by identifying those policy actions that will need to be addressed by Member States ahead of pressing national needs and which may be created in the European context.

Secondly, most Member States have reacted, in one way or another, to the challenge of the e-skills gap. There is, however, no institutionalised dialogue to discuss the best available solutions. This is demonstrated by the fragmented nature of the available statistics, the lack of any common means of measuring this significant issue in the European context and the dependence of commercial statistics in an area that should be monitored and acted upon at national level. The lack of common data and poor understanding of the issues results in there being no real common ground upon which to discuss e-skills issues, and therefore no platform from which to take consolidated action. For these reasons a European e-Skills Forum should be created as a first step to addressing these issues which are vital to the future economic well being of Europe and its citizens.

Thirdly, the e-skills gap calls for consistent policy responses and a better cooperation between governments and the private sector. Policy development in conventional economic models has tended to address specific needs and market failures as sectors have changed due to shifts in world markets, for example in steel making, coal mining and consumer products. The e-revolution is very different in this respect. The horizontal nature of ICT adoption across all sectors and in every home warrants far-reaching policies that demand the involvement of all stakeholders. No longer can it be argued that governments alone should take action – as for example with trade tariffs. Instead, it is the duty of governments, businesses and individuals, supported by their representative bodies, to act in co-ordinated partnerships that match the far-reaching nature of the problem. The European Union offers the ideal means of amplifying these efforts from national partnerships to international partnerships of European e-skill experts.