

FINAL REPORT



ICT SKILLS MONITORING GROUP

SYNTHESIS REPORT

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

June, 2002

Contents

Introduction	7
General analysis of the situation	9
The European Situation	9
General overview of the Member States situation	25
The situation in the United States	28
Major issues and inhibitors	33
Policy Challenges	36
Defining the focus areas	39
Snapshot of main policies and industry initiatives	42
Awareness	43
Broadening the skills base	45
Upskilling the workforce	48
Outsourcing and immigration	49
Partnership between industry and government	50
Forecasting and tracking skills needs	53
Overview of policies by Member State	54
Industry initiatives	82
US response of government, industry and education	84
Recommendations and Priorities for Action	90
Findings	90
Initial Priorities and Recommendations	91
Development of indicators	93

Executive Summary

Introduction

This report is the culmination of the first stage of work undertaken by the ICT skills Monitoring Group for the European Commission. This work has the objective of providing an overview of the situation concerning ICT and e-business skills in Europe. This synthesis report serves as the first step by providing an overview of the problem of defining ICT and e-business skills. It gives collected data on the skills shortage in Europe and the US and also provides descriptions of the types of policies, initiatives and industry actions currently in place to address these problems.

The identification of key inhibitors, policy challenges and potential policy responses

A clear understanding of the major issues and existing inhibitors is important to identify the policy challenges faced in the European Union and Norway. Improving the availability of ICT and e-business skills involves actions both at European Union and national level, in several areas: education, training, enterprise and labour policies primarily, but also in other domains such as immigration, outsourcing, taxation and research. This work will lead towards a better co-ordination of existing instruments and programmes to increase the efficiency in tackling this Europe-wide problem. Drawing on the data set out in chapter one of this report, the following main issues and inhibitors that have been identified are outlined below.

- Lack of definition of the current skills mismatch
- Lack of awareness of the need for ICT and e-business skills
- Lack of access to relevant skills in entrants to the labour market
- The fast-changing skills requirements within jobs
- Cost and time to develop new skills in the workforce
- Lack of coherent picture of ICT and e-business qualifications
- A need to harness new talent with ICT and e-business skills

The table below summarises the inhibitors identified, the resulting policy challenges and possible policy or industry responses which could be introduced to eliminate the inhibitors to improving ICT and e-business skills in the EU Member States and Norway.

Key inhibitors	Resulting Policy challenges	Potential Policy/Industry responses
Gaps in data and different methods and forecasting techniques	To provide a coherent picture of the demand for ICT and e-business skills across Europe	<ul style="list-style-type: none"> • Identify all current available data for analysis • Undertake a Europe-wide survey using common definitions for skills
Lack of definition of the current skills mismatch	Define the skills gap	<ul style="list-style-type: none"> • Create skills profiles • Redefine needs through a EU wide survey • Map occupational frameworks

Key inhibitors	Resulting Policy challenges	Potential Policy/Industry responses
Lack of awareness of the need for ICT and e-business skills	Publicise the benefits of new ICT skills Improve understanding of the labour market for ICT skills	<ul style="list-style-type: none"> • Programmes to demonstrate some of the skills needed for the workforce • Targeted awareness aimed to encourage equal opportunities.
Lack of access to relevant skills in entrants to the labour market	To broaden the ICT and e-business skills base or Better use by employers of existing workforce Access for all to IT training Create ICT skills agenda	<ul style="list-style-type: none"> • New career focused training schemes • Training returners to work • Retraining existing workforce to acquire new skills for employability • Development of new learning materials • New vocational disciplines, • Changes in the education structure • Attracting skills from emerging regions • Acceptance of industrial accreditation schemes
The fast-changing skills requirements within jobs	Upskill the existing workforce Adequate training programmes for various categories of workers Improve understanding of labour market needs	<ul style="list-style-type: none"> • e-learning or on-the-job training programmes, • Tax Incentives for industry to retrain the workforce, • Provision of advice and guidance to industry • New career based qualifications • Recognition of non-formal qualifications • Certification schemes • Mentoring in-house or on-the-job, • Outsourcing • Immigration
The cost and time of development of new skills in the workforce	Develop ways of improving understanding of the return on investment and competitive advantages of upskilling the workforce	<ul style="list-style-type: none"> • Fiscal incentives • Attract new multidisciplinary workers/ retraining from other sectors • Alternative workforce participants involved in ongoing training Public/private partnerships to help alleviate problem • Development of education and training sources • Outsourcing

Key inhibitors	Resulting Policy challenges	Potential Policy/Industry responses
		<ul style="list-style-type: none"> • Immigration
Lack of coherent picture of ICT and e-business qualifications	Provide an overview of the types of schemes and relevance to business markets	<ul style="list-style-type: none"> • Mapping of qualifications/certifications • Partnerships between certification bodies and higher education • Awareness raising to businesses of the range of qualifications/schemes available • Channel information through business intermediaries on availability of qualifications
A need to harness new talent with ICT and e-business skills	Improve the image of careers in ICT and e-business	<ul style="list-style-type: none"> • Provide incentives for retaining employees • Training schemes for women, returners to work, older workers Industrial placements for women • Awareness raising and seminars aimed at potential new talent by ICT and e-business workers • Improving attractiveness of certification schemes • Tax incentives

Taking these policy challenges forward, the report classifies all the policies and programmes identified under six focus areas which reflect the types of responses that the Member States and Norway have taken to addressing the skills gap. These focus areas are:

- Awareness/improving attractiveness
- Broadening the skills base
- Upskilling the workforce
- Outsourcing and immigration
- Partnership between industry, government and education
- Forecasting and tracking skills needs

Preliminary findings

The preliminary findings based on the data on ICT skills needs in the Member States and an analysis of policies and initiatives that are currently operational suggest that:

- There needs to be a better understanding of how industry takes part in the University system to transfer skills needs.
- For awareness raising the majority of the schemes identified are from Northern Member states and tend to be targeted at women and the socially disadvantaged.

- The majority of schemes that are focused on education and training present no evidence of being responsive to changes in skills needs in the workforce or that there are links between work and education.
- Schemes involved in education and training can be found in university and vocational training, targeted training, schools and teacher training.
- There is no current evidence of assessment and recognition of prior or informal learning.
- Nordic countries and the UK appear to have been quicker at using e-learning to upskill the workforce¹.
- The national governments with forecasting mechanisms in place, to a greater or lesser extent, have their own methods of tracking demand and there is a substantial need for reliable surveys and analyses of the use of information technology within organisations and individuals, to serve as a basis for possible actions. Furthermore, there is also a need to make comparisons between organisations, sectors and countries.
- Immigration is used in a few Northern European Countries as a mechanism for creating a short-term supply of skilled labour. This is not being used across the board and also there is little evidence on its impact or whether is a an option for SMEs
- The UK and the Nordic countries have been early adopters of the ASP model but there is little evidence of policies in place to encourage outsourcing.
- Partnerships do not follow predefined models and some show only aspects of a consultation process rather than a formal arrangement.
- An important area to consider is the work undertaken by corporate universities to ensure that the workforce gain the right type of skills.
- There are methods that can be highlighted, relating to the distribution of money and control to the learners: In France for example, at the local level main industries have the power and money to create new courses for specific training. Another interesting approach in the Netherlands is giving money in response to demand, not supply.

Recommendations

The policy challenges outlined in this report and the schemes that are being covered in response to these challenges give rise to some ideas for priorities or recommendations for further action. There are also principles guiding us: these include, the current European Agenda, the recommendations of the Task Force on Skills and Mobility as well as the simple fact that it is important to try and do a few things well rather than recommend tackling all the challenges at once.

It is important to understand what can be achieved at the European level and whether it will enhance Member State efforts and maximise efficiency, concentrating on what is possible.

The following recommendations are grouped according to three categories:

- Skills, qualifications and competencies
- Labour market external policy issues

¹ Information on the use of eLearning in the UK and the Nordic countries may not be a true representation much of the use of eLearning is company specific not country specific (i.e. 40-60% of eLearning in any one country is being undertaken through a multinational).

- Tools and instruments

Skills, Qualifications and Competencies

- Better definitions of the skills demand across the whole of Europe
- Education and training systems to become responsive to the changing nature of workforce requirements

Labour Market External Policy Issues

- Barriers to mobility and changes in employment to be reduced
- Improved staff development strategies, career changes, lifelong learning and on-the-job training
- Tap into underrepresented labour market sources

Tools and Instruments

- A Common Classification for skills and occupational roles in ICT and e-business - creation of a skills observatory
- A responsive supply side to business demand for skills comprising more dialogue between employers and universities and training systems and new approaches to course curriculum development,
- Coherence in immigration policy

Introduction

In May 2001, the Industry Council welcomed the European Commission's GoDigital initiative and invited Member States and the European Commission to promote ICT and e-business skills in Europe. One of the key activities stemming from GoDigital is to establish, in collaboration with Member States, a group of experts to analyse and monitor the demand for ICT and e-business skills, as well as the supply of a skilled workforce in Europe.

'The objective of the ICT Skills Monitoring Group is to prepare a report of ICT and e-business skills requirements and national policy initiatives and to draw up recommendations. Special emphasis shall be given to the requirements of European enterprises as regards acquiring the necessary professional expertise in the field of ICT and e-business. The analysis will therefore focus on the effects of the ICT and e-business skills shortage on the competitiveness of industry, including traditional sectors, paying particular attention to the needs of SMEs.'

This work fits within the Framework of the e-Economy set out at the Lisbon Summit in March 2000, where the European Union set itself the target of becoming the world's most competitive and dynamic knowledge-based economy within 10 years. It was stated that this goal strongly depends on making the best possible use of Information and Communication Technologies (ICT). The Lisbon strategy reinforced the response to the knowledge-based society within existing processes and launched the eEurope 2002 Action Plan in June 2000.

Also one of the recommendations of the High Level Task Force on Skills and Mobility was that Member States and the Commission should develop ICT skills definitions and make them transparent and available throughout the EU, and back them up with EU-wide standards. Member States should ensure that the demand for ICT and e-business skills and the related curriculum developments are matched against industry requirements.

The ICT skills monitoring group, established in September 2001 by the Enterprise Directorate General (DG) of the European Commission, is not aiming to replicate the current work being undertaken elsewhere by industry, covering the IT sector or the work being undertaken by Member States and DG Education and Culture to address basic IT skills. The group intends to add value to the debate and definition of demand in the European Union by focusing on the monitoring the demand for ICT and e-business skills across all industries². Both government and industry have a stake in this policy area. EU Member State Governments will need to address the skills that are needed to ensure that the workforce is competent and able to address the changing needs that ICT will impose on the future workforce as well as keeping up with general ICT skills demand. Industry will have a stake in making sure that they remain profitable and economically sound by equipping the workforce with the e-business skills that they need to grow their business.

² This can of course include the IT industry but not in the sense of defining the skills profiles already undertaken by careerspace.com

This work will be carried out in two phases.

- The first phase, resulting in this synthesis report. This provides picture of national policies and industry programmes and initiatives which are specifically aiming at helping address the demand for ICT and e-business skills. The objective is to establish as complete a list as possible, and identify focus areas and indicators for further analysis. The are presented in this synthesis report.
- The second phase will analyse and assess these actions with a view to identifying best practices and policy recommendations.

This final synthesis report reflects the discussions with the ICT skills monitoring group and the contributions of the members so far in identifying existing policies and demand for ICT and e-business skills. The synthesis report is not meant to provide a complete catalogue of schemes, but rather to highlight the responses of the Member States and industry to the growing problem of the skills mismatching.

The ICT Skills Monitoring Group will release its final report in September 2002. It has been proposed by the Commission to organise a high-level event – European *eSkills* Summit – on 17-18 October 2002 in Copenhagen in co-operation with the Danish Presidency and the ICT industry. The *eSkills* Summit is referred in the Action Plan on skills and mobility as one of the key events for 2002. The event would be taking place at the premier conference facility in Copenhagen on the 17th and 18th October 2002.

The intention is to present in November 2002 an *eSkills* Summit Declaration and the report of the ICT skills monitoring group, to the European Parliament, the Council (notably the Industry Council on 25th and 26th November), the Committee of the Regions and the Economic and Social Committee.

General analysis of the situation

The European Situation

There is a growing demand for skilled people as a result of the fast developments in Information and Communication Technologies (ICT). The demand for people with ICT and e-business related skills is increasing around the world and the shortage is creating barriers to economic growth and job creation. The digital economy is not confined to a single business sector but is a new economic model where digital technologies and the Internet are ubiquitous across all areas of industry. New technologies are being used by a growing number of companies of all sizes and sectors, as well as public administrations and individuals, and electronic commerce is increasingly becoming part of the regular business practices of European enterprises.

In recent years policy-makers across Europe, including the European Commission, have been stressing the importance of ICT skills for an increasing population of the workforce to maintain and enhance social cohesion. The European Union has shown, through the launch of the eEurope Action plan, and the work of the Lisbon Enterprise Council³, that it recognises radical changes are needed to match both the short-term and long-term supply and demand of workers and skills. The Commission Communication "Helping SMEs to Go Digital" identifies a number of important barriers to industry, particularly for SMEs, in acquiring ICT and e-business skills. There are over 18 million SMEs in the EU, employing 66% of the workforce and accounting for 99.8% of enterprises⁴. Due to the rise in wages, many SMEs are being priced out of the market for bringing ICT and e-business skilled workers on board. Through the lack of support SMEs risk missing out on some of the advantages that IT solutions bring to business processes which would help them to remain competitive.

E-business is in a critical period of development, despite the economic downturn of 2001. According to the "Benchmarking Report following up the strategies for jobs in the Information Society", the need for ICT skills in Europe will continue to increase from about 10 million posts at present to about 13 million posts in 2003, with the result that the skills gap will increase correspondingly from 1.2 million to 1.7 million equivalent posts⁵. Until 2001, the ICT sector in the European Union was clearly 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 2000⁶. After 2001, although growth slowed, and in some sectors of ICT, such as manufacturing and telecom, there were actual jobs lost, there is still evidence of a persistent overall ICT skills shortage which continues to be a significant barrier.

³ The Lisbon European Council in March 2000 adopted the objective of making Europe the world's most competitive and dynamic knowledge-based economy. Enterprise policy is at the heart of this strategy.

⁴ Eurostat – Enterprises in Europe

⁵ Benchmarking Report following up the "Strategies for jobs in the Information Society", Commission Staff Working Document, Brussels, 7.2.2001, SEC (2001) 222

⁶ European Commission, Employment in Knowledge-based Economy

The European Economic and Social Committee (ESC) in its opinion on the ‘Go Digital’ work on ICT skills shortages, states that the lack of experts on ICT questions creates serious problems for the spread of digital technology in the European Union. The problem does not just concern SMEs but the entire European Economy and if educational, professional, technical and political⁷ measures are not taken immediately, this problem will soon become the most serious problem in the EU.⁸

But, with reference to SMEs, the ESC takes the view that there is an acute problem arising from the shortage of ICT specialists. This shortage means that SMEs, particularly those based in the outer regions or outside urban centres, do not often have the necessary support for efforts to gain access to electronic commerce. The shortage also often leads to very high prices for specialists' services, which the SMEs cannot pay.

The ICT and e-business skills gap is not just about the **quantity** of skilled people needed, but more importantly about **quality**. The current and future roles of ICT require not just technical skills across converging technologies, but commercial and interpersonal skills to match service and products to customers' needs.

The definition of ICT and e-business skills

There is currently **no common definition** in existence of the types of skills covered under the banner of ‘ICT and e-business skills’. Industry, government and other official bodies do however have a number of documented definitions in use and use these definitions to derive their own data predictions of the skills shortage. As well as a lack of consistent definition, existing studies on ICT skills shortages differ widely in terms of their methodology and scope. In order to illustrate the challenges being faced, this report first needs to equip the reader with a broad overview of well-referenced definitions and predictions, some of which are complementary, none too contradictory, although this is an area which moves constantly and the economic climate may have changed the situation.

Most references to the IT skills shortage in policy and literature specifically relate to the shortage within the IT industry. Some count the number of IT posts, others have their own definitions of what an IT or e-business skill is, several studies do not cover the needs for ICT and e-business skilled workers in other industry sectors and there is also a clear lack of information on the skills needs in SMEs. Member States who depend on a long-established set of predominant industry sectors (such as car manufacturing) for example, need very specific skills and the percentage shortages vary accordingly. Also e-commerce and the use of the Internet are still not fully applied across all industries and, as mentioned above, particularly not in SMEs unless they belong to sectors which are:

- International in nature (e.g. tourism in Mediterranean countries)

⁷ Increasing the number of students and supporting school which teach technologies, supporting and assisting ICT researchers so that they do not leave Europe, supporting European technological centres, taking long-term measures to promote the supply of the necessary informatics know-how

⁸ Brussels, 22 January 2002 Opinion of the Economic and Social Committee on the Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions - Helping SMEs to "Go Digital" COM (2001)

- Easy for consumers to access electronically (e.g. tourism, media, goods retailers)
- Easy to make aware of the benefits of e-business (mobile, financial transactions, supply chain management)

The European Union, (because of the delays which have occurred, when compared to the US), has the opportunity to study, in a more rational and practical way, the problems arising from the development of e-commerce and of new technologies and to develop suitable strategic actions. Whether ICT are the focus of the job or facilitate it, or the job is inside an industry that produces ICT or in an industry that uses them, new skills will be needed by the workers who's jobs are changing due to the rapid adoption of IT by businesses⁹.

For the purpose of the work being undertaken by this ICT skills monitoring group and without wishing to add more definitions to an already crowded subject, the skills shortages fall into three main categories

- The ICT skills needed for modern life outside the workplace often defined as **digital literacy**.
- Upgrading the **e-skills** of the workforce as business processes and industry structures change.
- The technical skills for the **ICT specialists** needed both in the ICT and related jobs in user industries.

This work concentrates on the latter two involving, e-business and ICT skills.

Sources of definitions and data

In order to set out the framework and methodology it has been necessary to draw on a number of different sources of evidence for the growing ICT skills demand. The sources have used a number of different definitions of ICT skills and these are presented here. It needs to be taken into consideration that many of the studies have been commissioned by the vendor industry, and therefore, some figures may be too generous (see the competitiveness 2001 study) especially as the technological downturn has quickly altered the landscape for the skills shortages.

The OECD report on ICT skills and employment proposes a simple categorisation of:

- Professional IT skills: ability to use advanced IT tools, and/or to develop, repair and create such tools.
- Applied IT skills: ability to use apply simple IT tools in general workplace settings (in non-IT jobs).
- Basic IT skills or "IT literacy": ability to use IT for basic tasks and as a tool for learning.

⁹ Ibid

In the EITO¹⁰ 2001 report, the definitions for skills are:

- ICT professionals: support and develop technological environments in the industries that use ICT (or services vendors selling their ICT professional resources times).
- E-business professionals: focus on supporting business strategies related to the Internet
- Call centre professionals: provide sales and support activities in the emerging phone channels

An important focus of the EITO 2001 study is its emphasis not to equate IS expert skills demand with vacancies in the ICT sector but across all industries.

In the recent ESDIS¹¹ report

IS experts are defined as ICT and e-business specialists, including different education/skills levels – University (3rd level) or technical (2nd level) education or with specialised vocational training.

All of the reports mentioned above, and their definitions are cited in this synthesis report in order to present evidence on the current situation in the EU Member States and Norway. Although the high-tech end receives the most attention, there is also coverage of ‘E-business skills’ and the ‘skills to apply ICT solutions’. Data from national statistical offices is also used in order to illustrate the report, particularly where definitions of occupations are in existence. It is the industry surveys however that tend to give more detailed information on actual types of skills needed (e.g. IDC) but at the expense of comparability and statistical significance.

There are many other reports and studies in existence of equal worth that have not been used in the report¹². This is a fast-changing area of development and studies are being produced constantly. This is particularly the case for industry who demand up to the minute information on skills needs in their sector and cannot wholly rely on national statistics agencies or European organisations, for example, to provide data quickly enough for their industry needs.

Acquisition of ICT and e-business skills

Not only are several broad definitions used to monitor the demand and supply of skills, there is also very little consensus on which specific skills and competencies are necessary for jobs using ICT and e-business skills and how they should be delivered¹³.

In terms of delivery of skills, traditionally, basic skills and qualifications that are necessary to compete in the labour market were acquired in the stages of formal

¹⁰ European Information Technology Observatory – <http://www.eito.org>

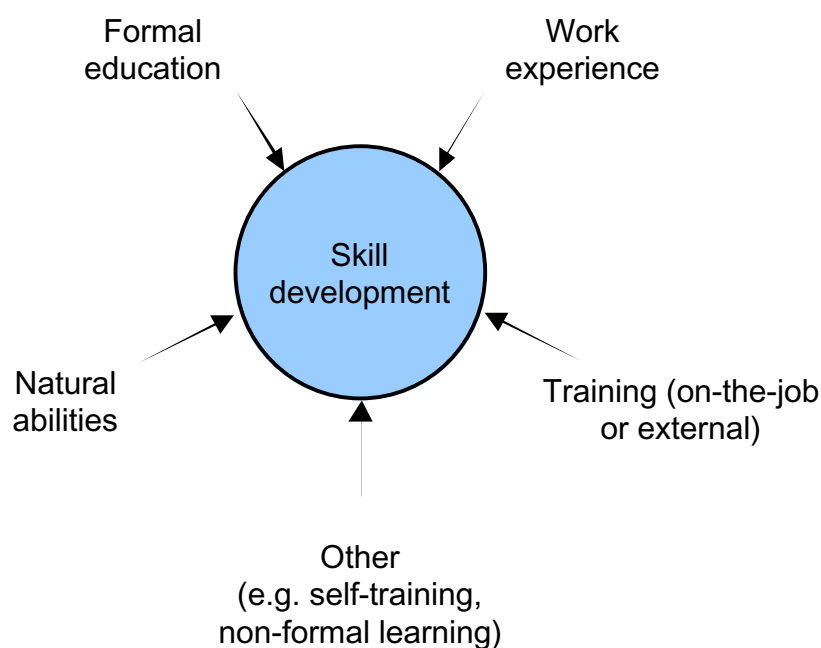
¹¹ Information Society Jobs – quality for change 2002, the Employment and Social Dimension of the Information Society

¹² For example a recent new study by CEPIS (Council of European Professional Informatics Societies) was published in May 2002, too late for analysis in this report, but extremely important, called Information Technology Practitioner Skills in Europe. The report covers the labour market position, in particular for Germany, Ireland, Sweden, and the United Kingdom.

¹³ OECD, 2001

education in school, vocational training, universities, etc. This set the ground for the pathway followed during working life. That schools and higher education are not providing new job seekers with the right skills set is something which is currently being explored by several initiatives in Europe including ‘Career-Space’¹⁴. This also means that enterprises will have to take more of a responsibility in reskilling and training those already in employment and will also have to employ new techniques for learning. In the workforce, training and working must to some extent take place in parallel, interacting with each other.

Exhibit 1 How skills are acquired



This diagram from the OECD report on ICT skills and employment¹⁵ shows some of the routes that skills are being acquired.

The initial stage/starting point for developing ICT skills varies across the different Member States. Generally, in Nordic countries and UK the starting level is higher since, first of all, historically, they have a better knowledge of the English language which has helped the countries to adapt to the Internet and e-learning, US software and resources. Also, the high proportion of technical manufacturing industries together with an earlier approach and interest of the government/industry in promoting and tracking the ICT problems have consequently brought more targeted initiatives (currently, Nordic countries register the highest Internet penetration rates in Europe). Unless the rest of the Member States increase their initial ICT skills aptitudes, using any of all of the possible ‘pathways’ to skills acquisition, there will be a steady increase in the ‘digital gap’ across the EU Member States.

¹⁴ Career Space is a major industry-led initiative led by EICTA and with the participation of 11 leading ICT companies. It is developing job and skills profiles for main job areas in the ICT sector and curriculum guidelines for the participation of 25 European Universities. See: www.career-space.com
¹⁵ OECD 2001

The workforce in general, needs to be delivered new ICT skills on the job, as evidence suggests that the average half-life for technical knowledge at 3-5 years and that complete obsolescence sets in after 6-10 years¹⁶. Workers can to a much smaller extent rely on being able to market the skills they have acquired in the early stages of their life throughout their lifetime but have to constantly adapt them to the demands of the labour market. This belief is behind the encouragement of uptake of lifelong learning, self-training, e-learning and continuous training¹⁷ methods of delivery that are used in many of the policy and industry responses highlighted in this report.

Factors affecting the measurement of the ICT and e-business skills shortage in Europe

There are many factors affecting the precise measurement of the skills gap or mismatch in the EU Member States and Norway, for example:

- Existing studies differ widely in terms of their definition and methodology for estimating the real skills shortage in Europe.
- The diverse nature of the educational curricula across Europe means that it is difficult to judge the future intensity of skills shortages as information is needed on the future supply of the labour force with the appropriate ICT and e-business skills.
- Other training schemes, on-the-job, e-learning, self-training etc also have effects which are difficult to estimate.
- The overall business cycle and developments at industry level affect the demand for particular ICT and e-business skills and are therefore constantly changing. This is particularly difficult to predict in areas of business which rely on very high-tech skills and are constantly changing.

However, the studies that have been done at the European –level and by industry have collected a great deal of data on ICT and e-business skills which gives some insight into the scale of the problem¹⁸.

European-level studies on ICT and e-business skills shortages

The EITO (European Information Technology Observatory) 2001 report provides an in-depth quantitative and qualitative analysis on ICT skills in Western Europe, which has subsequently been updated, for 2002. The report highlights that even though there has been an economic downturn and therefore the skills shortages are less pressing, if urgent action is not taken as the market recovers, Europe will end up in exactly the same situation. Also a ‘skills shortage’ does not necessarily mean new employees with new skills, but also re-training of existing staff and other measures to face the challenge of new technological developments (a mismatch), The skills shortage is particularly acute in the world of e-business. Demand for e-business skills is also not just shifting to more formalised competences, there is also a need to combine technical skills and content/business understanding to create professionals with technological competence and good client-facing skills.

¹⁶ Scheer et al. 1997, quoted in Finke 2000: 5

¹⁷ Other terms used: post-school-learning, further education, continuing education, careers education, outreach education, workplace education, vocational training; see Finke 2000: 97.

¹⁸ For example, OECD. ESDIS. Eurobarometer, EITO, IDC etc)

The EITO 2002 report defines 3 areas of skills ICT skills, E-business skills and Call centre professionals, and for each one gives a definition and a description of the overall demand. These are used later in the report as evidence of shortages in the individual countries covered.

Exhibit 2 Example of trends in demand adapted from the EITO 2002 report

Area	Skills	Description of demand
ICT skills	Internetworking	Networking technology is an area of growth in Western Europe, the need to integrate processes is still seen as a key priority by European businesses.
	Applications	Projects around the implementation of software applications are one of the major drivers of the ICT market particularly in the area of CRM and e-procurement for example. This is an area where it is predicted there will be a growing skills demand.
	Distributed	There is a slow down in the adoption of servers due to the higher cost of hardware investment. There is still a growing demand for skills, particularly for Windows NT
	Host-based	The need to manage and support existing mainframe infrastructure is still essential and new investment and skills remain always a priority.
	Technology-neutral	The demand for technology neutral skills (the deeper knowledge of business benefits of ICT), although hampers by the postponement of investments in 2001 is expected to show an increasing shortage in the long-term.
	E-business skills	Internet strategists
Internet dependent		Internet dependent skills have been impacted strongly by the dot.com failure but the need to develop online content is an area which is a key driver for skills in this area.
Call centre professionals		CRM remains one area of major investment in Europe as companies increasingly focus In customer services and retention to gain their market share.

Two other studies on ICT skills shortages at the European level have been carried out by the **International Data Corporation¹⁹ (IDC)**. According to IDC the demand for ICT professionals was expected to grow from approximately 9.5 million to 13.1 million in 2003, while supply was estimated to grow from 8.8 million in 1999 to 11.3 million in the same period. Consequently, the ICT skills shortage was estimated to reach 1.7 million ICT professionals in Western Europe²⁰ by 2003. In addition IDC

¹⁹ <http://www.idc.com>

²⁰ EU-15, Norway and Switzerland

forecast a demand for 3.9 million workers with 'e-business' skills in 2001 (described as a combination of technical and business management skills) rising to 6.3 million in 2003²¹. The reports conclude that the locus of the problem over the next few years will not be an insufficient supply of qualified IT workers, but a **mismatch due to the growing demand for e-business employees**. This also highlights the need to forecast, not only the shortages of skilled workers, but the demand for the retraining of existing staff within companies and organisations. ICT technologies are bringing new ways of organising and structuring enterprises and therefore previous non-ICT related posts may now be redundant or have been replaced due to introduction of ICT technologies.

IDC also more specifically predict that the demand for skills centred on the **Internetworking environment** will grow most rapidly. The main drivers for this demand are 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 are expected to be other services, non-market services and distribution.

Other skills shortages predicted by IDC are in the **Applications Environment** which are skills in software applications. This areas is rapidly becoming focused around a few key technologies and although the shortages are more difficult to predict due to the rapid uptake of the ASP model (see section on outsourcing), the demand is driven by ERM, supply chain, customer relationship management and electronic commerce applications. The market for client server technology is also growing and is therefore producing a skills shortage in the **Distributed Environment**. These are skills in Windows, Unix, NT and Netware for example. This may however slow down if organisations adopt the ASP model. Another area of demand covered by IDC is in the market for **Technology Neutral Environments**. This is defined as those which do not require specific technical skills, but skills that enable organisations to align their IT investments with the business process. Finally skills in **Host-based Environments**, which are centred on mainframe technology. This is also an area which is difficult to predict and may change with the increased popularity of the ASP model and outsourcing.

Datamonitor²², a business information company which provides data for companies across the automotive, consumer markets, energy, financial services, healthcare and technology sectors, estimates that Western Europe will lose 100 billion Euro in total trade revenue over the next three years because of Europe's inability to fill vacancies in the ICT sector. The areas that are likely to suffer most from the skills shortage are the small and medium sized industry and e-commerce. Bigger companies have resources to invest in the geographies, where skills are available. The supply and demand in ICT is divided between the supplier industries and end users. Drawing upon official statistics and focusing on the ICT core skills Datamonitor have estimated that there are presently just over 6 million people in Western Europe employed in ICT jobs. About 30 percent of these persons work within supplier industries, around 20 percent in call centres and half of them are employed by end-

²¹ No data for supply

²² <http://www.datamonitor.com>

users. Since 1997 employment among ICT professionals has risen by almost 30 percent and has accounted for nearly 30 percent of all additional employment.

Datamonitor, predict that over the next four years demand for core ICT skills is likely to rise by 1.3 million. The fastest growing demand is for **software engineers, computer analysts and programmers, management consultants, ICT managers, and electrical and development engineers**. The ICT industry is investing heavily in R&D and generating growth and jobs in Europe. Datamonitor concludes that the lack of graduates in ICT technology is the main bottleneck for growth and increasing competitiveness in the future.

The ESDIS report²³, which uses evidence from Eurobarometer (the European Commission's public opinion analysis sector), draws on an exchange of views and policy practices among representatives of the Member States in the High Level Group Employment and Social Dimension of the Information Society (ESDIS). The report covers the development of jobs in the information society both at the level of the 'basic user' and the 'expert'.

According to the report, basic ICT user jobs have increased by a fifth in the EU and the lack of ICT and e-business experts remains a real concern²⁴.

In spite of the increase in use, less than a third of the EU labour force has ever received any ICT training²⁵ and of those only a small share receives continual updates. Furthermore there is still too much focus on technical applications and training in contextual skills, necessary for effectively benefiting from IS workplaces, is limited and apart from in the Nordic Countries, the use of computers in work is still under 50% in most of the other EU Member States²⁶. Although ICT usage is increasing throughout the economy, its intensity differs across sectors and the uptake is much lower in small and medium-sized enterprises²⁷. **Digital skills** are more and more a must for the employability and adaptability of all workers.

²³ Information Society Jobs- quality for change

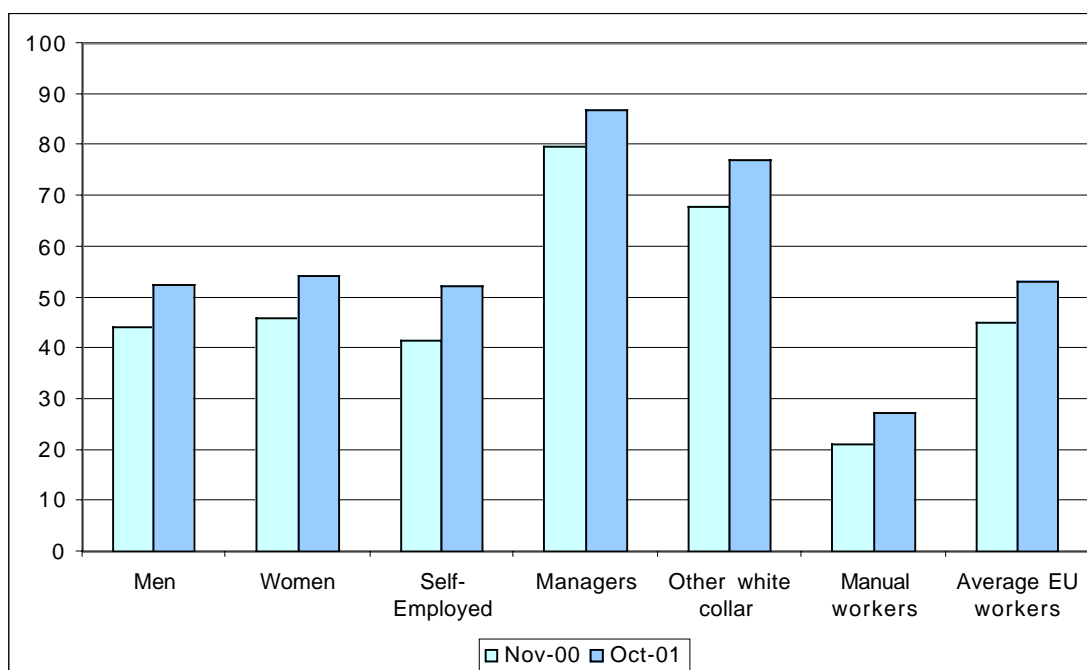
²⁴ Eurobarometer 2001

²⁵ Ibid

²⁶ ESDIS 2001

²⁷ According to the ESC opinion on Go Digital. The ESC agrees that the digital economy creates a constantly rising demand for ICT specialists. The rapid rise in this demand has resulted in a shortage of such specialists, which in turn impedes the use of experts by SMEs, because they are always in demand with large firms which can offer higher salaries and benefits. The ESC takes the view that this problem has taken on alarming proportions and will undoubtedly influence the development of technology in the EU.

Exhibit 3 Computer users for work by gender and occupation (% EU workers by category)



Industry specific studies on skills shortages

Although not necessarily covering the whole picture of the ICT and e-business skills shortage, industry and market research has gone a long way towards documenting specific skills shortages in Europe. These have mainly been in the IT sector but in certain cases also reveal how some of the problems are being tackled and give an insight into how public private partnerships are working. For example, a recent survey undertaken by IDC for Cisco systems looks specifically at the shortage of skilled networking professionals in Europe. The research, which takes account of the economic downturn and slower GDP growth over forthcoming years, shows that an increasing proportion of organisations are leveraging the Internet to improve business efficiency and effectiveness. It also reveals increased demand for networking skills in the SME community as a growing proportion of organisations use networking technology to interface with supplier and partners. **There are also different degrees of networking skills which need to be tackled, particularly in SME networks which are less sophisticated than in big enterprises²⁸.**

Positive impacts on the skills shortage are reported to result from economies of scale generated through outsourcing IT activities, including the ASP model of computing, relaxed immigration rules for people with networking skills and the first fruits of public private training partnerships in the networking skills area. Cisco, IBM and

²⁸ ESC maintains that electronic commerce requires staff with a high level of technological knowledge. The paradox in this case is that while there are many courses for computer technicians and programmers, there are no corresponding courses for SME employees. Their training is generally limited to learning about administrative tools and methods, communication skills and staff management. The training is sporadic and imparted mainly through conferences and seminars

Microsoft are all examples of large companies that have teamed up with the public sector to provide training schemes.

Exhibit 4 Total (Western Europe), Networking Skills Shortages

	1999	2000	2001	2002	2003	2004	5 yr. CAGR
Demand	728,871	949,733	1,096,196	1,388,692	1,660,389	1,870,242	18%
Supply	596,519	746,121	869,578	1,037,214	1,158,572	1,321,905	15%
Shortage	132,352	203,612	226,618	351,478	501,816	548,336	28%
% Shortage	18	21	21	25	30	29	

Source, IDC 2001

Another recent report, also commissioned by Cisco through IDC is analysing the networking skills shortage and how women can potentially help narrow the gap.

The study revealed that at the end of 2000 only 5.6% of Internet networking professionals in 13 major Western European Countries were women.

France showed the highest participation of women in the Internet networking labour market with projections of 12% by 2004. In 2000, the UK, Belgium and Spain had a relatively high female penetration and a low penetration was found in Austria, Switzerland, Norway, Germany, Italy and Denmark²⁹. The report not only gives figures for shortages but also gives an overview of some of the solutions that either are, or need to be taken. For example by changing the perception women have of the sector as a whole and also to give them incentives to stay - which requires collaboration between governments and industry.

Market research organisations are also calculating the size of the skills shortage for ICT specialists. Silicon.com produce an annual survey focusing on the key competencies that e-business professionals need. This survey collected information from over 3,000 respondents in Europe and one of the key findings was that European companies are in greatest need of people with **Java** and **database skills**. Also high on the list were people with **system management** and **XML** skills.

Western European Outsourcing Market

Outsourcing is considered a useful way to provide immediate ICT and e-business skills and processes that a company needs with very little investment of time, money and training. As more of the routine operational tasks of a company become automated, the task of turning them over to providers becomes easier and more economical.

²⁹ More country specific information is covered in Annex A

Fuelling the growth of European IT outsourcing and business process management is the urgent need to prepare for e-business and e-commerce. Also the large-scale adoption of Internet-enabled devices of all types will boost the demand for continual upgrading and ever expanding services which will include new technologies.

According to data collected by INPUT³⁰, the biggest uptake of outsourcing services is in the banking and finance sector, manufacturing, insurance and government.

The most commonly outsourced services are applications services. An Application Service Provider (ASP) will provide a company with a service hosting software applications elsewhere. The ASP model is being adopted most rapidly in the early adopter countries such as the Nordic region and the Netherlands. This form of computing is less labour intensive than distributed ICT and is expected to be one of the ways in which SMEs will be able to address the ICT skills shortage

Other operations that companies outsource in Europe are

- **Business Process Operations**

Business Process Operations (BPO) outsourcing extends the outsourcing concept beyond the IT department to the whole company. The business process outsourcing market comprises various distinct service offerings, for example, payroll services, HR, accounting, procurement, front office etc.

- **Platform Operations**

The platform operations or host-based environments market continues to be driven by the desire to reduce the cost of running mainframe computers and by the trend to phase out mainframes in favour of more distributed IT infrastructures.

- **Desktop Services**

Desktop services are less well established in Europe than in the U.S. In Europe, desktop services outsourcing has tended to be adopted by organisations, such as financial institutions, with extremely critical applications running over LANs or by organisations with a large number of LANs spread over hundreds of sites, such as retailers, where the in-house IT support group has become overwhelmed.

- **Network Management**

The ever-higher bandwidth demands of electronic business and Internet/Intranet applications are driving demand for network management outsourcing in Europe as they are in the U.S.

- **Internet/Intranet Outsourcing**

As Internet commerce grows in popularity and importance, companies are finding that designing, developing, and maintaining cutting edge Web sites and e-business applications is increasingly time consuming and expensive. In response to this development, a new breed of outsourcing services are being introduced to managing high-volume Web sites and their interactivity.

According to research done by IDC, the profile of outsourcing is changing as a consequence of the IT skills shortage and the increase of e-business. Companies are opting for shorter outsourcing contracts, but are signing a greater number and paying more for them³¹. Rapid change in the markets and technologies made companies wary

³⁰ INPUT – a provider of web-based e-business market research and marketing services.

³¹ Information from IDC

of signing up for long-term contracts. This is not altogether a problem for outsourcing providers who can focus on fast changing corporate needs, the only drawback is that longer contracts lead to teams picking up more transferable skills in order to tackle a new companies problems. Through outsourcing, companies may however be handing over their competitive advantage by not developing new skills and technologies in-house. This may not be a problem but it remains important, especially for SMEs to think long-term about their business strategy and how now ICT and e-business skills are going to be developed.

Variables affecting the skills supply

Although the focus of this report is primarily the monitoring of demand, it is not possible to cover demand without addressing the issues of supply, which often provide solutions to the demand side problems. There are many variables that affect the supply of qualified workers in the European Union Member States and Norway, the ones highlighted here being quite general. Firstly, demographic variables, which although are slow-moving compared to shorter-term boom and bust cycles, nonetheless define large parts of the economic landscape. Secondly there is training and education provision and acquisition which enables new skills development. The majority of the policies and programmes that are described later in report are moving towards addressing these factors, some of the most common being:

- **Size of skilled labour-force**

Skilled human labour is a vital part of any economy and any business, small and large. Even with sluggish economies, the availability of skilled human resources remains a key worry - especially as the 'baby-boom' workforce in many nations is nearing retirement, the population of working age people is falling and education, training and migration patterns within and between countries are affected. In the future, it will be tougher in some countries to find skilled employees necessary for their businesses to be more competitive and profitable in the global marketplace. **Non-traditional workers** can make a valuable contribution to the supply of skilled labour with the right training schemes and incentives.

- **Contribution of women to the ICT labour Market**

Women make a vital contribution to competitiveness at all levels of industry and are an increasingly important asset. There has been an overall increase in the number of women entering into higher education in the EU but this is not reflected in the number entering engineering or technology disciplines, and in some countries the proportion is declining. The EU is committed to raising the number of women in ICT careers and to ensuring that no barriers exists that prevent them from reaching the highest levels. In order to address the supply of women, schemes and policies need to be put in place at all levels, from primary education through to workforce development opportunities (e.g. part-time work, childcare).

- **Immigration**

If the EU is to meet the skills challenge in Europe, there needs to be a concerted effort to attract skilled non-European Union workers. The supply is affected by immigration policies within the Member States and the relevant skills being available outside the EU. Several of the Member States have introduced measures to help immigration of high-skilled workers. When Germany started to import labour, the

highest numbers of computer experts were recruited from India, followed by the Eastern European Countries. Industry has also been working with the ‘supply pools’ in Central and Eastern Europe to train people who wish to work in IT in the Member States. In some CEEC countries there is a larger supply of IT graduates than the demand so these countries have become exporters of skills.

- **Labour mobility**

The work undertaken by the **High Level Task for Skills and Mobility** emphasised the need for attaining higher occupational and geographical mobility in Europe supported by better skills and improved transparency and quality of information about skills and job opportunities. The ability to fill vacant jobs is often constrained by occupational mobility and Europeans tend not to change jobs frequently: On average in 2000 only 16.4% had been with their employer for less than 1 year³².

Despite the fact that the European Union has been promoting the idea of a mobile, intra-European labour force, few companies or organisation are currently experiencing any significant success in achieving much mobility or benefiting from the potential of economic union. There are other factors to address here, including language skills, common immigration policies, transparency of job opportunities, transferability of qualifications to name but a few.

- **Training and Education**

Education attainment levels vary widely across the EU. While 60% of adults (25-64) in the EU as a whole have completed upper secondary education³³ the rate varies from 19% to 78% between Member States. At the level of higher education the difference is also stark with an EU average of 20.5 %³⁴ having higher education qualifications. Since this is the knowledge pool for the majority of people who will work with ICT skills, this may reflect the skills currently in demand in the labour market. The supply will however change as workers across Europe begin to have access to lifelong learning opportunities.

- **E-learning**

To supply the digital economy with workers equipped with the right skills, organisations need to respond to changes in skills requirements. Growing workplaces demand information, instruction, and training resources when and where needed. Individuals’ requirements drive the need for just in time learning and performance support tools, both as they perform their current jobs and as they prepare for new challenges. According to IDC, over twenty-seven percent of business skills training in Europe will be provided via e-learning by 2005. This would entail a compound annual growth rate of 108.2 percent for the European e-learning market between now and then. If current methods of training delivery are inhibiting skills acquisition then e-learning could potentially have a large impact. E-learning adoption and development is most advanced in the Netherlands, Scandinavia, and the UK.

However, taking this into consideration, there is little evidence that current methods of training delivery are inhibiting skills acquisition. Although much research exists that says e-learning’s share of overall training delivery will grow significantly (the

³² Labour force survey ‘Eurostat’

³³ Data taken from the High Level Skills and Mobility Task Force Report

³⁴ Labour force survey Eurostat

overall demand or market for training delivery in this sector will grow between 8-12% depending on market and IT sector (IDC reports)), there is no real evidence that says that traditional training delivery methods are inhibiting skills acquisition in the first place. Equally, e-learning by definition requires an e-learning infrastructure and a basic skills/knowledge base in order to take advantage of e-learning – these elements vary widely across Europe and will have an effect country-by-country on the growth rates and effectiveness of e-learning as a medium. Equally, the simple fact that localisation of e-learning (translation) is not taking place in significant or consistent quantities also slows down the implementation of e-learning. Localisation (or the lack of it) is a major factor in the slow adoption of e-learning within Europe.

Drivers of demand for ICT and e-business skills

The availability of adequate information and communication technologies (ICT) skills is evidently an important condition for the competitiveness of enterprises in the e-Economy. The development of e-business applications is increasing the demand for individuals with creativity and higher-level conceptual skills that will enable enterprises to increase productivity and harness ICT to produce greater economic value. Growth, competitiveness and employment are dependent on the successful application of new technologies, while demographic factors, business cycles and rapid technological change increasingly result in quantitative and qualitative imbalances in the supply of skilled labour.

Although overall, the evidence presented shows that there is a definite demand for ICT and e-business skills, an important point made by the OECD report on ICT skills and employment is that a distinction should be made between the shortage of IT workers, for which there is little or no aggregate evidence and the current skills shortage, for which there is some anecdotal evidence. Employers seek a combination of ICT and other skills sets which may not be currently available in job-seekers or in the existing work force. This can be described better as a **skills mismatch** in the current population and is not necessarily a labour market shortage.

Several general trends are identified from research and literature that are shaping the demand for ICT and e-business skilled personnel in all parts of industry and especially in SMEs³⁵:

- **General technological progress**

The general technological progress and globalisation of the economy has increased the importance of ICT and e-business skills. The demand for more skilled workers can be positively correlated with capital intensity and the implementation of new technologies.

- **The growth of the ICT industry**

The technology that underpins the information society, itself forms an industry of considerable size; businesses operating in the ICT sector depend on the availability of skills that are in line with the dynamic requirements of the market. Specific skills that have been acquired in the past are in danger of becoming obsolete extremely fast; they are constantly being replaced by new skill requirements. The new ICT industry is

³⁵ OECD 2001wb; ILO 2001; EITO 2001

also looking for a new workforce with a combination of business and up to date ICT skills that need to be provided for elsewhere,

- **The uptake of ICT and e-business in all industry sectors and the growth of Internet adoption**

E-business is growing in both traditional businesses and in SMEs. It is also contributing to the emergence of **new sectors** within the industry (new products, processes, services) and cross-linkages e.g. into biotechnology or e-government initiatives. This creates new work related to the strategic development and implementation of e-business solutions within the software segment, IT consultancies, service providers as well as directly within the companies applying the solutions. In line with this trend, there is an increased adoption of Internet solutions, new demand for skills and applications and a boost in demand for new skills sets for higher and more advanced stages of technological development in all economic sectors³⁶.

- **The shortening of skill lifecycles and the mismatch between industry requirements and supply of education system**

The shortening of skills lifecycles, and companies continual need for qualified staff who not only understand the technology but also the processes of business is a growing problem for the education system and companies need to invest in training. Without continual dialogue and updating of qualifications, there will remain a problem of skills mismatching between the supply and demand.

- **The applications market**

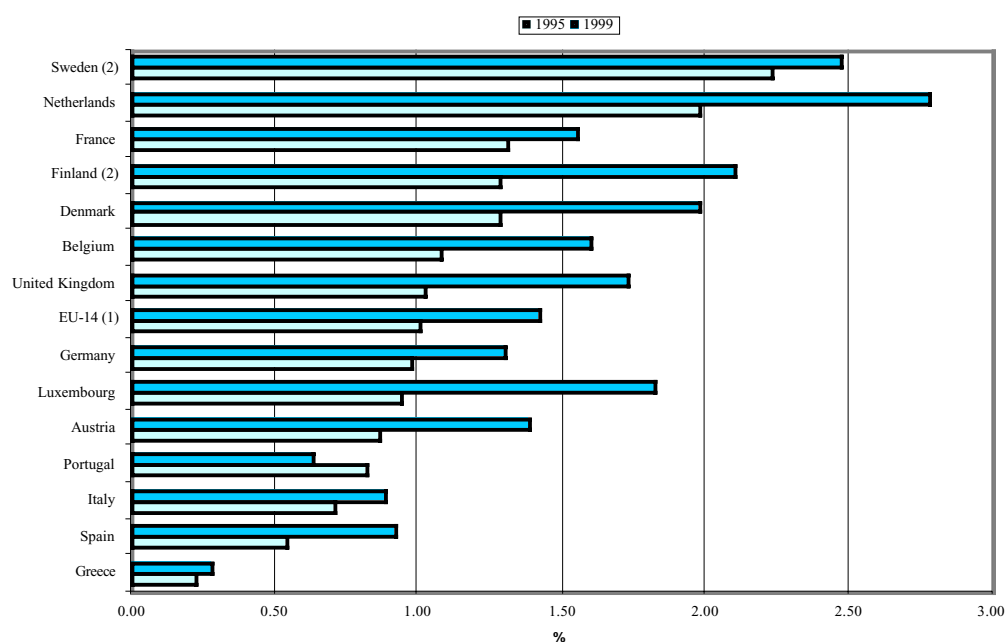
The applications environment increasingly comprises integrated multi-user applications from a variety of vendors e.g. SAP, Oracle, Peoplesoft etc. The applications market is consolidating rapidly and skill requirements are becoming increasingly focused around a few key technologies. Furthermore, the amount of customisation required for today's enterprise-wide applications is falling as rapid implementation methodologies and pre-configured templates are increasingly used. In this context, software remains the fastest growing segment of the ICT sector – with growth rates expected still over 10%.

³⁶ Government may also see itself as a driver of demand by leading by example and implementing e-business solutions. An example of this is making SMEs pay taxes on line.

General overview of the Member States situation

The evidence and data presented at the European level gives a broad overview of the situation. It is not possible to draw concrete conclusions based on the data available about the situation across the EU as the economic, social, cultural and linguistic diversity makes the Member States vary enormously in their situation and responses to the challenges of a demand for new skills. The indicators for the OECD Science, Technology and Industry Scoreboard 2001 – ‘Towards a knowledge-based economy’ for example show the variations in the Member States of the share of computer workers³⁷ in the European Union

Exhibit 5 Computer Workers in the EU – Share in Total Occupations



1. 1997 instead of 1995.
 2. 1995 estimated.
- Source: Eurostat Labour Force Survey May 2001.

High-skilled ICT workers are the most rapidly growing component of high-skilled workers; over the 1997-99 period, Finland had an annual growth rate of about 49%. Only in Portugal, which has a very low share of high-skilled ICT workers, is the share declining. In 1999, high-skilled ICT workers represented between 0.6% and over 3% of total employment in EU member states. The EU average was 1.6% (about 2.4% in the United States). The shares were highest in the Netherlands (3.2%) and Sweden (2.8%) and lowest in Greece (0.6%) and Portugal (0.9%).

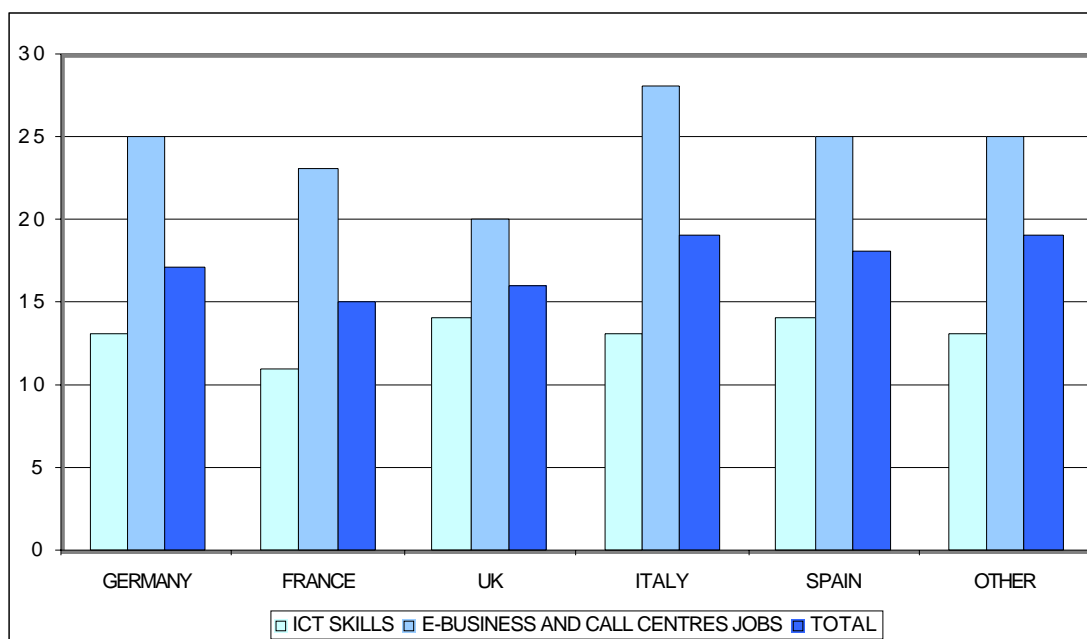
Computer workers represent the largest component of high-skilled ICT workers. Over the 1995-99 period, the gap in computer workers between northern and southern European countries appeared to be increasing.

³⁷ High-skill ICT-related occupations are defined here as ISCO-88 classes 213, 312 and 313, while computer workers refer only to the sum of the first two classes

According to the IDC (2000) study on the skills crisis in Europe, in general terms ICT skill shortages are highest in those countries where ICT also has the highest weight in total employment. On average, the demand for ICT specialists amounts to 5.7 % of total employment in Western Europe. This ratio is almost twice as high in the Netherlands, Belgium and Sweden, while Greece, Ireland, Portugal and Spain display the lowest levels of demand for ICT professionals. Nevertheless, the total demand for ICT personnel is expected to exceed 10 % in the EU by 2003.

According to the EITO 2001 figures, ICT estimated unfilled vacancies in Europe in 2001 were 1.36m, and it is expected to reach 1.69m in 2003. Likewise, e-business unfilled vacancies in 2001 accounted for 0.87m, though this figure will increase more rapidly to reach 3.67m unfilled jobs by 2003. As the chart shows below, from the total ICT skills demand, the shortage of e-business skills is going to increase particularly rapidly in most EU countries. Hence e-business skills are expected to be the most demanded ICT skills in Europe, registering an over threefold increase in shortage by 2003 and according to EITO (2001), EU countries will exceed a 20% shortage of e-business skills by 2003.

Exhibit 6 % shortage of ICT workers in the EU by 2003³⁸



Geographical variations with regards to ICT indicators across the EU can be clustered in different groups of countries. According to data produced by IDC for Microsoft,³⁹ Germany will experience the highest skills shortage in 2003. The Nordic Countries, particularly Sweden and Denmark face relatively high skills shortages largely because they are early adopters of new technology. Most Southern European economies will see continued growth in the skills shortage relative to demand as they adopted technologies relatively late. Also these countries are characterised by a high proportion of SMEs. The UK will continue to see a high skills shortage, as it is a services dependent economy, which places particular emphasis on conducting

³⁸ EITO 2001

³⁹ Europe's Growing IT skills Crisis 2000 IDC

business electronically. The growth of supply of IT professionals in France will keep the French skills shortage below the European average.

Appendix A gives an overview of some of the country specific data available on skills shortages in the Member States and Norway.

The situation in the United States

In the United States, the demand for people with ICT skills has stayed more than healthy, despite the many high-tech job losses resulting from the US's worst economic slump in decades. A chronic and growing shortage of IT workers is being touted by industry figures and business associations as a major threat to the US's future international competitiveness.

After nine years of growth, America's economic bubble burst in 2000. Technology shares slumped and following a sharp economic slowdown later that year, the economy failed to pick up in early 2001. Even so, with the market spending over \$800 billion in 2001, IT was one of the US economy's fastest growing industries.⁴⁰ But with the main economic indicators already looking bleak, the terrorist attacks of September 11th couldn't have come at a worse time. Although not officially confirmed, the US economy is generally considered to have quietly slipped into recession in March 2001⁴¹. The long-term effects on business and extent of the economic damage stemming from the attacks are still being estimated. Already whole industries are in trouble; bankruptcies and unemployment are predictably up.

The recession may prove deeper and longer than most economists (and Wall Street) think. America's industrial production in September 2001 fell by 1% – its 12th consecutive month of decline and the longest plunge since 1945. And the drop in output of 5.8% for the previous 12 months is greater than during the recession of 1990–91.

Indicators, skills needed and trends

Despite the economic change, demand for IT skills has continued to outstrip supply. According to the Computing Technology Industry Association (CompTIA), the shortage of IT workers exceeds 800,000,⁴² and government economists are optimistic about the future. High-tech jobs came top in a recent survey of industries with the fastest wage and employment growth projected from 2000 to 2010. The Office of Occupational Statistics and Employment Projections sees annual growth of 6.4%, with 1.8 million extra jobs being created.⁴³ Other estimates put this figure as closer to two million. This compares with a growth projection for the overall labour force of just 1.1% during the same period.

In 2001 the Information Technology Association of America (ITAA) commissioned one of the largest and most comprehensive studies of the IT workforce ever conducted, *When Can You Start?*.⁴⁴ The results showed that

- one in every 14 US workers was involved in IT

⁴⁰ www.ita.org/about

⁴¹ <http://www.nber.org/cycles/november2001/recessnov.html>

⁴² CompTIA website: <http://www.comptia.org>

⁴³ Office of Occupational Statistics and Employment Projections, www.bls.gov/news.release/ecopro.t03.htm

⁴⁴ *When Can You Start?* Building Better Information Technology Skills and Careers, ITAA Executive summary: www.ita.org/workforce/studies/01execsumm.htm; Order report: www.ita.org/news/pubs/product.cfm?EventID=174

- one in every 12 IT jobs goes unfilled due to a lack of suitably skilled candidates.

The report predicted that 900,000 new IT jobs would be created during 2001. However, this meant that demand for IT workers was down by 44% over 2000. Moreover, as the report was published in April 2001, the research was probably conducted during the end of 2000 and early 2001. Demand fell further throughout 2001, with many highly publicised mass layoffs – and that was before September 11. Nonetheless, demand for IT workers remains strong – especially among non-IT companies, which employ around ten times as many IT workers as IT companies.

According to the Technology Workforce Coalition⁴⁵, an industry association which campaigns for improved IT education and training, the shortage of skilled IT workers is threatening to erode the US's position as global IT leader. It identifies several factors contributing to the shortage

- Demand for IT workers is now strong throughout the economy, not just with IT firms
- Demand is outstripping the supply of newly qualified graduates from universities and technical training colleges
- Both elementary and high school students are showing a bias against mathematics and science classes (Most teenagers are sensitive to peer pressure, and would dread being branded a “nerd”, “geek” or “propeller head”)
- Many unemployed or underemployed people wishing to enter the relatively lucrative IT sector cannot afford the associated training costs.
- The small businesses which employ the majority of IT workers cannot afford to provide the amount of training they would like in order to

The distribution of high- and low-skill ICT-related occupations in the United States and the European Union shows an interesting pattern. Generally, when new technologies are introduced into the production process, demand drops for low-skilled workers and rises for high-skilled workers. However, not all ICT-related occupations are high-skill. Also, adoption of ICT at firm level does not necessarily translate into an increase in the economy-wide demand for higher skills. For example, new technologies may displace middle-level managers, who are typically considered high-skilled workers.⁴⁶

Although the share of ICT workers is growing everywhere, in 1999 the US ICT workforce appeared to be relatively more high-skilled (77%) than that of the European Union (56%). However, the European average hides wide disparities.

⁴⁵ <http://www.techcoalition.org>

⁴⁶ OECD, Technology and Industry Scoreboard 2001, www1.oecd.org/publications/e-book/92-2001-04-1-2987/B.3.htm

Exhibit 7 - Share of high and low skills within ICT occupations within the EU and US, 1999

Share of high and low skills within the ICT-related occupations in the European Union¹ and the United States, 1999



Data on skills shortage

Several government agencies monitor and estimate employment in various sectors. Although their methodologies, strengths and weaknesses vary, all figures show that the number of core IT workers in the US has risen dramatically during the past 18 years. Between 1983 and 2000, their number surged from 719,000 to 2,837,900 – an increase of 294% and several orders of magnitude above the overall US job rate. However, the IT sector embraces a surprisingly wide range of skill levels and occupations.

Exhibit 8 Employment in Computer-related Occupations (2000)

Computer-related Occupations	Employment
Computer and Information Scientists, Research	25,800
Computer Programmers	530,730
Computer Software Engineers, Applications	374,640
Computer Software Engineers, Systems Software	264,610
Computer Support Specialists	522,570
Computer Systems Analysts	463,300
Database Administrators	108,000
Network and Computer Systems Administrators	234,040
Network Systems and Data Communications Analysts	119,220
Total	2,837,900

Source: Bureau of Labour Statistics⁴⁷

According to the ITAA, technical support people remain most in demand by IT and non-IT companies alike, accounting for a quarter of all new positions expected to be created during 2001. Despite this, demand for these professionals was down 65 % on the previous year, when hiring managers cited a need for three times as many technical support personnel as the next closest category, programming and software engineering. The survey results for 2001 showed demand being more evenly spread over eight job categories.

⁴⁷ www.bls.gov/oes/2000/oes_15co.htm

Another survey polled over 1400 chief information officers around the country to gain a snapshot of the specialist areas currently in greatest demand.⁴⁸ The results showed that **networking** and **Internet/intranet development skills** were the most sought after, followed by **data** and **database management**, and **applications development**. The networking specialists typically support companies' efforts to share data will different branches, customers and suppliers nation-wide. This includes network security specialists, whose skills are commanding growing salaries.

Demand for Internet and Intranet developers reflects companies' continued use of the Web as a strategic tool for reducing operating costs, raising efficiency and providing better customer service in an increasingly competitive environment.

The survey also identified the transport and wholesale sectors as the source of greatest demand for networking specialists. Jobs for web developers were particularly strong in the finance, insurance and real estate; professional services; and transport sectors. Latest employment projections for the ten years 2000–2010 (released November 2001)⁴⁹ show that computer-related occupations will remain among the fastest growing employment areas. Eight out of the top 10 are computer related, as Table 2 shows.

Exhibit 9 Projected growth of computer occupations to 2010

Occupation	Employment ('000s)		Change	
	2000	2010	Number	Percent
Computer software engineers, applications	380	760	380	100
Computer support specialists	506	996	490	97
Computer software engineers, systems software	317	601	284	90
Network and computer systems administrators	229	416	187	82
Network systems and data communications analysts	119	221	92	77
Desktop publishers	38	63	25	67
Database administrators	106	176	70	66
Computer systems analysts	431	689	258	60

Source: Bureau of Labour Statistics, Occupational employment projections to 2010

Interestingly, computer programming has been in decline for many years relative to the employment growth in the industry overall. Despite being the largest computer-related occupation in 2000 in numerical terms, computer programming shows only a 16% growth rate to 2010 and doesn't even appear in the top 60 fastest growing occupations. Indeed, during 1983–2000, computer programming grew at a rate close to the overall US job growth rate – in stark contrast to the high overall employment growth characterising the industry.

Latest projections from the Bureau of Labour Statistics⁵⁰ show that by 2010 computer-related occupations will create more new jobs – 2 million – and grow faster than any other sector. Rapid advances in computer technology and the continuing demand for new computer applications – especially related to the Internet and intranets – will continue to fuel demand for skilled IT workers.

⁴⁸ *Hot Jobs Report* (2002), RHI Consulting, www.rhi.com

⁴⁹ www.bls.gov/opub/mlr/2001/11/art4full.pdf

⁵⁰ Occupational employment projections to 2010, www.bls.gov/opub/mlr/2001/11/art4full.pdf

Moreover, three out of five new jobs will be in the rapidly growing business services industries—primarily in computer and data processing services, where the number of computer-related jobs is expected to more than double. In addition, the number of self-employed workers is expected to increase by over 50 percent.

Importing foreign talent

One route taken by companies to resolve the shortfall has been to hire appropriately skilled IT workers from overseas. H-1B temporary visas are issued to foreign professionals who want to work in the US, primarily in the fields of engineering, computer science, biotechnology, academia, marketing, and health care. Candidates must have at least a bachelor's degree or equivalent education and work experience, and may remain in the US for up to six years. The H-1B is frequently referred to as the "high tech visa" because it more recently has been used by firms seeking skilled technology professionals.

The Immigration Act of 1990 established an annual quota of 65,000 visas. The actual number of visas issued between 1992 and 1996 only ranged from 52,000 to 64,000. However, in 1997, the 65,000-visa quota was reached in September and in 1998 it was reached in May. Congress increased the H-1B cap to 115,000 for 1999 and 2000, reducing it to 107,500 for 2001 and back down to 65,000 in 2002. However, the 1999 quota was used by mid-April and the 2000 visas were gone by March.

After considerable industry campaigning, Congress passed the American Competitiveness in the Twenty-first Century Act (2000). The legislation raises the H-1B visa cap from 115,000 to 195,000 for fiscal years 2001-2003. The bill also clears the backlog of visa petitions that have accumulated since the 115,000 cap was reached in March 2000⁵¹.

⁵¹

For a “fresh angle”, see Economist article: Redundant Silicon Valley H-1B workers revolting www.economist.com/PrinterFriendly.cfm?Story_ID=684420]

Major issues and inhibitors

A clear understanding of the major issues and existing inhibitors is important to identify the policy challenges faced in the European Union and Norway. Improving the availability of ICT and e-business skills involves actions both at European Union and national level, in several areas: education, training, enterprise and labour policies primarily, but also in other domains such as immigration, outsourcing, taxation and research. This work will lead towards a better co-ordination of existing instruments and programmes to increase the efficiency in tackling this Europe-wide problem.

Drawing on the data set out in chapter one of this report, the following main issues and inhibitors that have been identified are outlined below.

- **Lack of definition of the current skills mismatch**

Although there is a high demand for ICT and e-business skills in new and rapidly expanding areas, it is not possible to conclude that a severe shortage exists across all job categories. A distinction needs to be made between the '*shortage of ICT workers*' (for which there is little evidence) and the '*current skills shortage*' (for which there is some anecdotal evidence). Employers now seek a combination of ICT and other skills sets which may not be currently available in job seekers or in the existing work force. For example, Internet skills used to just consist of designing and maintaining websites but are now more likely to be the ability to manage high speed networks, customer relations tools, programming, e-business integration and project management. There are numerous training schemes for IT professionals, and for basic IT courses across Europe. There are fewer aimed at retraining employees whose job skills need upgrading to include CRM, e-Commerce, EDI or getting to grips with B to B and B to C.

As the scale of e-business grows, the related skills needed within all industries become more difficult to define. The ICT and e-business arena requires a continual needs/gap assessment process in place, not just within companies but across the economy. Part of this process will involve a continual redefinition of the skills needs and their relationship to jobs as part of a career path. An understanding of what the skills are, how to build them, which one's will require formal means of acquisition and which one's can be integrated into the job will be essential for providing the right skills at the right time.

- **Lack of awareness of the need for ICT and e-business skills**

Current and projected business demand for ICT is far outstripping the capability for the industry to respond. Lack of awareness of the importance of ICT skills occurs both in businesses and in people looking for new employment. Businesses need support in understanding what skills are needed and how to integrate them into the business process and people need to understand what skills are necessary for gaining employment in the new economy and also encouragement so that attitudes towards jobs requiring ICT and e-business skills change. Encouraging new people and businesses to acquire ICT and e-business skills is seen as a core area of policy and programmes.

The ESC, in their opinion on the GoDigital Initiative, state that SMEs do not have the necessary information or training to understand and accept e-commerce solutions,

which require skills not provided in the past by the education system⁵². This is something that can be tackled by awareness raising initiatives.

- **Lack of access to relevant skills in entrants to the labour market**

The lack of access to relevant skills by enterprises and SMEs affect their competitiveness and prevent them harnessing the benefits of ICT to generate greater economic value and productivity gains. There are shortages of workers coming into industry with the 'right' kinds of e-business skills and therefore Europe needs to encourage education, in partnership with industry to respond to the growing need for ICT and e-business skills in the workforce. This includes the universities and higher education, vocational training, lifelong learning and e-learning.

- **The fast-changing skills requirements within jobs**

The demand for the development of new skills is growing so fast that it is difficult for supply to keep up. According to the EITO 2001 report, this is particularly true for the UK, the Netherlands and Nordic region where e-business is most mature. All EU countries will be affected, particularly as industry is encouraged to engage electronically with their customers in order to remain competitive. Also with frequent and difficult to predict changes in what skills are needed, conventional definitions of ICT and e-business are too narrow to meet the demands of the new economy. In order to succeed a vast and diverse set of skills and knowledge are needed. The demand is growing for a combination of skills to understand new technology and business processes. It is important that when developing new skills in the workforce that the EU develops employees with a combination of these new skills. It is also important to remember that all the skills needed for ICT and e-business change rapidly and that a fundamental change toward lifelong learning has to become part of the process of developing the right skills to created sustainable employment.

- **Cost and time to develop new skills in the workforce**

The development of new skills is a challenge for employers, government, education, employees and intermediaries alike. In terms of cost and time, the inhibitors to developing the right skills include the delay in the education system to modernising the curricula, lack of funding, lack of understanding of the return on investment, lack of research, cost of provision of lifelong learning and vocational training opportunities. Other new constraints may include the reluctance of businesses, particularly SMEs to invest in training due to the technological downturn in 2001 and the worry of newly trained staff moving on to higher paid jobs elsewhere in the market. Owners of SMEs need to overcome unjustified fears and traditional, conservative attitudes, and allocate the necessary material and human resources to modernising their firms. Also related to investment in skills is the investment in software and standardisation. Many small businesses are reluctant to invest and train staff in new technologies particularly when there is no guarantee that they have invested in a long term sustainable electronic business solution. There are also barriers to outsourcing for SMEs, as they require up front investment even if it is a viable solution to long-term skills shortages.

⁵² For a more analytical approach to the question of mass training in information society technologies, see CES 244/2000 in OJ C 117 of 26 April 2000 (chapter 5).

This is a challenge that cannot be dealt with in isolation; new public/private partnerships need to be formed to tackle this problem. These partnerships can then effectively get involved in looking at the development of career pathways, communication of skills requirements, development of education and training sources, incentives to retain staff, retraining from other sectors and the responsiveness to the rapid pace of change to ease the burden on individual businesses. Governments can also respond by providing tax or fiscal incentives or free training schemes.

- **Lack of coherent picture of ICT and e-business qualifications**

There are numerous public and private sector training schemes across the globe targeting the ICT skills mismatch. It is particularly clear by industry's action that education is not providing people with the right skills to go straight into jobs. For example, Microsoft, Cisco, CompTIA, 3COM SAP to name but a few, are all offering courses in education to provide either students or employees with qualifications suitable for working within an e-business (over half a million ICT workers around the world have taken training and gained an industry accepted CompTIA certification). Some of the qualifications are also being run through public private partnerships. The Career Space initiative, for example, is a DG Enterprise/IT industry collaboration⁵³ which is promoting the development of the technical and behavioural skills for a knowledge-based economy, the CISCO Networking Academy Programme is teaching students in the US networking skills and IBM has an e-business skills development service⁵⁴ providing a portfolio of training for the IT sector and the business side of a corporate enterprise. Currently there is not a coherent picture of the available qualifications and their relationship to education and the marketplace⁵⁵. Also businesses use a variety of 'standard' applications which all require different training schemes. This means that it is difficult for businesses that wish to train their workforce to completely understand the content and relevance of these available qualifications and certifications to their business.

- **A need to harness new talent with ICT and e-business skills**

The ICT and e-business skills mismatch is not just about the quantity of skilled people needed, but their quality and contribution. The ICT user and supply sector has difficulty attracting certain sectors of the population to work with ICT. For example, from the OECD report on ICT skills and employment, data on tertiary graduates highlights an existing gender imbalance. Other problems are the current lack of women in the profession as role models, the cultural problems and family responsibilities being perceived as incompatible.

Another issue highlighted in the OECD report is the turnover rates of workers with ICT skills⁵⁶. If the turnover rate of workers is high, this may inhibit companies' willingness to invest in training. In a recent McKinsey report, surveying science and

⁵³ www.career-space.com

⁵⁴ http://www-5.ibm.com/services/learning/uk/ls_ebusiness.html

⁵⁵ CompTIA is preparing a global qualification mapping standard – Career Compass. This takes over 300 standard ICT job roles, and maps the required skills and competencies to the available industry-standard certifications available CompTIA is already working with Career Space and several other initiatives around the world – ultimately, a common database of ICT job roles, skills and available training/certification will be built and maintained.

⁵⁶ NRC 2001

engineering graduates in 1994-1996, 47% expected to spend less than 2 years with their first employer⁵⁷.

It is important to enhance the attractiveness of this career to contribute to the pool of potential skilled workers. Providing the right style and content of a service is as important as the technology driving it. Attracting a more balanced ICT workforce is not just key to solving the ICT Skills shortage but to delivering the informed, integrated society that the 'eEurope' initiative aspires to.

The co-operation of government and industry, or industry and education is essential for establishing consensus and understanding of the skills needed to drive forward industry in Europe. It is industry that plays a key role in identifying the key skills gaps and between government, industry and education and can contribute to the formulation of a new policy agenda. There are several points of intervention during education where development of new skills can be incorporated in schools and higher education, on the job-training and in lifelong learning.

Policy Challenges

Following the analysis of the existing inhibitors to addressing the skills mismatch in relation to ICT and e-business skills, a number of policy challenges can be identified. Many of the inhibitors can be tackled through a range of diverse policies and initiatives; others do not solely require government intervention, but are best addressed in partnership with industry and/or education.

There are also inhibitors which are more prevalent in some countries than in others. By mapping the schemes across the EU and Norway, a picture will begin to emerge of the differences in demand across the Member States. It may be, for example, that the main demand in one country may be for basic ICT skills in the workforce and that if the penetration of e-business is low, then the skills shortage has not yet been recognised. Equally in another country there may be a clearly defined need for a particular set of ICT skills due to an investment in skills forecasting and that government and industry are already tackling the problem through a sophisticated set of initiatives and programmes.

At both national and EU level there are many steps in place to address some of the key challenges in monitoring the demand for ICT and e-business skills. Exhibit 10 summarises some of the possible policies responses or programmes that could be introduced to eliminate the inhibitors to improving ICT and e-business skills in the EU Member States and Norway.

⁵⁷ McKinsey in Business 2.0 (2000)

Exhibit 10 Inhibitors, Possible Policy challenges and Responses

Key inhibitors	Resulting Policy challenges	Potential Policy/Industry responses
Gaps in data and different methods and forecasting techniques	To provide a coherent picture of the demand for ICT and e-business skills across Europe	<ul style="list-style-type: none"> • Identify all current available data for analysis • Undertake a Europe-wide survey using common definitions for skills
Lack of definition of the current skills mismatch	Define the skills gap	<ul style="list-style-type: none"> • Create skills profiles • Redefine needs through a EU wide survey • Map occupational frameworks
Lack of awareness of the need for ICT and e-business skills	Publicise the benefits of new ICT skills Improve understanding of the labour market for ICT skills	<ul style="list-style-type: none"> • Programmes to demonstrate some of the skills needed for the workforce • Targeted awareness aimed to encourage equal opportunities.
Lack of access to relevant skills in entrants to the labour market	To broaden the ICT and e-business skills base or Better use by employers of existing workforce Access for all to IT training Create ICT skills agenda	<ul style="list-style-type: none"> • New career focused training schemes • Training returners to work • Retraining existing workforce to acquire new skills for employability • Development of new learning materials • New vocational disciplines, • Changes in the education structure • Attracting skills from emerging regions • Acceptance of industrial accreditation schemes
The fast-changing skills requirements within jobs	Upskill the existing workforce Adequate training programmes for various categories of workers Improve understanding of labour market needs	<ul style="list-style-type: none"> • E-learning or on-the-job training programmes, • Tax Incentives for industry to retrain the workforce, • Provision of advice and guidance to industry • New career based qualifications • Recognition of non-formal qualifications • Certification schemes • Mentoring in-house or on-the-job, • Outsourcing • Immigration
The cost and time of development of new skills in the workforce	Develop ways of improving understanding of the return on investment and competitive advantages of upskilling the workforce	<ul style="list-style-type: none"> • Fiscal incentives • Attract new multidisciplinary workers/ retraining from other sectors • Alternative workforce participants involved in ongoing training Public/private

Key inhibitors	Resulting Policy challenges	Potential Policy/Industry responses
		<ul style="list-style-type: none"> partnerships to help alleviate problem • Development of education and training sources • Outsourcing • Immigration
<p>Lack of coherent picture of ICT and e-business qualifications</p>	<p>Provide an overview of the types of schemes and relevance to business markets</p>	<ul style="list-style-type: none"> • Mapping of qualifications/certifications • Partnerships between certification bodies and higher education • Awareness raising to businesses of the range of qualifications/schemes available • Channel information through business intermediaries on availability of qualifications
<p>A need to harness new talent with ICT and e-business skills</p>	<p>Improve the image of careers in ICT and e-business</p>	<ul style="list-style-type: none"> • Provide incentives for retaining employees • Training schemes for women, returners to work, older workers Industrial placements for women • Awareness raising and seminars aimed at potential new talent by ICT and e-business workers • Improving attractiveness of certification schemes • Tax incentives

The table shows that a wide range of policies are relevant to the removal of some of the problems associated with a lack of quality skills in ICT and e-business. The next section of this report looks at how each EU Member State and Norway, the US and industry are tackling the relevant challenges either on their own or in partnership with other stakeholders. The programmes and schemes identified are tackling shortages within the IT sector as well as other industries affected by a need for an IT literate workforce.

Defining the focus areas

The EU has shown, through launching the eEurope action plan, GoDigital and the work undertaken at the Lisbon Summit, that it recognises radical changes are needed to match both short-term and long-term supply and demand of workers and skills. As a consequence, it is helping businesses to prioritise and articulate skills needs and work with government and educators to establish the required policies and skills development. The ICT skills monitoring group, as an initiative of DG Enterprise, is not aiming to replicate the current work being undertaken elsewhere by industry, covering the IT sector, or the work being undertaken by Member States and DG Education and Culture to address basic IT skills. Special emphasis shall be given to the requirements of European enterprises as regards acquiring the necessary professional expertise in the field of ICT and e-business. The analysis will therefore focus on the effects of the ICT and e-business skills shortage on the competitiveness of industry, including traditional sectors, paying particular attention to the needs of SMEs.

Member States, the US and Industry have devised a wide range of policies and schemes which help to monitor the demand for e-business and ICT skills. Based on the policy challenges already highlighted by the EU Member States and Norway, information on industry-led work and reports from OECD and the High Level Task Force on Skills and Mobility, following focus areas are proposed.

- Awareness/improving attractiveness
- Broadening the skills base
- Upskilling the workforce
- Outsourcing and immigration
- Partnership between industry, government and education
- Forecasting and tracking skills needs

- **Awareness/improving attractiveness**

Current and projected business demand for ICT is far outstripping the capability for the industry to respond. Lack of awareness of ICT as an important e-business skill and the general thinking that it is an unattractive career prospect is a great inhibitor. Encouraging new people to acquire ICT and e-business skills is seen as a core area of policy and programmes. This focus area looks at initiatives which are helping increase level of awareness and attractiveness of acquiring ICT and e-business skills. This is awareness in the general population and within businesses of the importance of ICT skills and will include for example: general awareness raising, targeted awareness aimed to encourage socially disadvantaged and equal opportunities. It can encompass a wide range of activities such as conferences, seminars, targeted events and demonstrators.

- **Broadening the skills base**

There are shortages of workers coming into industry with the 'right' kinds of e-business skills and therefore this focus area is identifying policies/programmes and schemes that adapt and or extend the education system to the growing need for ICT and e-business skills in the workforce.

This focus area will cover schemes that are taking place through the education system and lifelong learning outside the work setting (in schools, higher and further education institutes, universities, online learning). This will include training for returners to work, retraining to acquire new skills for employability, development of new learning materials, new vocational disciplines, changes in the education structure (integration of ICT into the general curricula), programmes set to identify new skills development etc. The training or other schemes can be targeted at the general population or be focused on specific sectors or groups.

- **Upskilling the workforce**

Recognising that by developing new and transferable skills within the existing workforce, the European Union can close the gap between the levels of job skills needed in today's workplace and the actual skills possessed by the workforce.

Lifelong learning is a key driver of change. Competence development plans drawn up within businesses will help employees to update skills and qualifications as well as equipping them with transferable skills required to take advantage of other labour market opportunities. Lifelong learning is essential to tackle skills shortages and mismatches which hold back economic growth.

This focus area will cover all schemes targeted at current workforce skills development. Examples may include: skills profiling - helping employers articulate their skills needs, new e-learning or on-the-job training programmes, incentives for industry to retrain the workforce, provision of advice and guidance to SMEs or industry through demonstration centres, examples of best practice, new career based qualifications (certification schemes), initiatives to improve understanding of labour market needs, improving dialogue between business and education providers, work experience, etc. These schemes can be run by government or industry or through partnerships.

- **Outsourcing and immigration**

In some Member States, the lack of population growth and transferability of skills means that some short-term solutions may be useful to address the skills mismatch. Looking outside the country or Europe is a quick way of either gaining new skilled workers or outsourcing work to companies who already have the necessary expertise. For example, one of the most popular business solution is the adoption of the Application Service Provider (ASP) model⁵⁸ which is a less labour intensive form of computing that distributed ICT and is a way for SMEs to address the skills shortage.

- **Partnership between industry, government and education**

To address the recognised ICT and e-business skills mismatch, policy-makers, industry and education need to work together in partnership to close the gap and to prevent new problems emerging. Industry plays an important role in supporting the European public sector adding its own unique perspective on how to face the challenges posed by the digital economy: of combining forces to produce new solutions will be to the benefit of the whole economy.

⁵⁸ ASPIC, the ASP industry consortium, recently merged with CompTIA, has a website providing information on the ASP industry. For more information <http://www.allaboutasp.com>.

Partnerships that are working with education to define new training and delivery within the education and vocational systems will not only help provide individuals with appropriate skills to address demand, but also build in opportunities for continuous training and the fast acquisition of up-to-date e-business skills.

- **Forecasting and tracking skills needs**

There are few coherent national mechanisms for tracking analysing and forecasting the ICT and e-business skills needs within industries. The majority of data available either relates to the IT sector or to the general population. It is important to have data so that current recruitment difficulties can be tracked and analysed and so that forward looking analysis can take account of employment and technological trends. This focus area will cover and collect any data available at the Member State level relating to skills assessments, or current and future technological skills trends. It will also look at schemes which promote government and industry-specific dialogue (or other key partners) in analysing trends in skills demand.

These focus areas are one way of classifying the types of policies that have come to light during this research exercise. The most important point of the focus areas is that by classifying the policies, it is possible to have a clearer understanding of how Europe creates and maintains a skills pipeline that delivers to enterprises the right skills at the right time and in the right quantity. These are skills to both the ICT sector and the users of ICT, especially SMEs. Some of the issues that it will help to understand include for example, the forecasting of business demand, new approaches to learning content and delivery of learning, the role of business and public and private education providers and how to promote diversity and equality of opportunity for all in the ICT workforce.

Snapshot of main policies and industry initiatives

The first priority of the group was to complete the picture of national policies and industry programmes and initiatives which are specifically aimed at helping address the demand for ICT and e-business skills. For each focus area there are a number of horizontal issues that will be highlighted and information will be collected in the policy/programme fiches filled in by the ICT skills monitoring group members. All the Member States, including Norway have perceived the need for policy actions and have designed large and small programmes to address the different challenges that they are facing. Brief descriptions of the initiatives collected so far are presented in Annex B⁵⁹.

Some very broad conclusions can be drawn from this snapshot of national and industry policies in support of addressing demand for ICT and e-business skills

- The most frequent cited type of initiative is integrated in some way into the education system, either in schools or further education.
- Most Member States have perceived a need to certify IT literacy at the basic level and have introduced National ICT basic skills accreditation (General ICT skills diplomas/carnets).
- Although there is still a need for awareness campaigns, they are more likely to be targeted at under represented sectors of the population rather than general eg for women, older workers, minority groups.
- Encouraging immigration and outsourcing of ICT specialist embodies a short-term solution, which some countries have included among the main solutions until 2003, although the current ICT shortage also often leads to very high prices for specialists' services, which SMEs cannot pay.
- Lifelong learning is seen as an important element in all the development of national policies and is the cornerstone of European education policies and is extending into workforce development. Member States demonstrate a commitment to the provision of continuous, up-to-date training in line with technological developments. (Some countries have enforced companies to invest 1% year profits on training for example).
- Industry are the main drivers in pushing forward certification schemes recognised across Europe although this is often being undertaken in co-operation with government.
- Only some Northern Member States show evidence of implementing e-learning resources to help train the existing workforce.
- There are currently few cited examples of major industry/government partnerships in the Southern Member States.
- Countries with a higher level of ICT adoption are more likely to have more sophisticated or targeted approaches to skills delivery.

⁵⁹ Some schemes and initiatives fit into more than one focus area and where this happens they are mentioned in both. This specifically relates to the public private partnership scheme as this is a mechanism rather than a target area.

- Some countries have introduced specific initiatives addressing ICT disproportionate regional developments, emphasis is on reducing the regional digital gap (France, Italy, UK...).
- Both National Governments and Industry are developing diverse predictive models for measuring the potential demand for skills including boom and bust scenarios.

Awareness

There is still a need for both workers and the potential workforce to be made aware of the opportunities and pathways to occupations involving ICT and e-business. One of the major obstacles to preparing for an ICT career is the lack of knowledge of the skills required and how those skills can be acquired.

Awareness raising initiatives that are highlighting or encouraging the take-up of new ICT and e-business skills seem to have a higher prevalence in the Northern European Countries. Of the schemes cited in this report, only one is from Greece, the others are from Ireland, the UK, Austria, Germany, Belgium, Sweden and Norway.

In Spain, Italy, Greece and Portugal, there are a large number of SMEs and serious resource constraints to the take up of e-business per se. This may indicate that the awareness raising schemes in the Southern countries are still broader and focus on the benefits of e-business to industry and SMEs rather than the promotion of new skills. Where there is a scheme, in Greece, it is focused on SMEs.

Even though the majority of schemes come from the Northern Member States, there are still some of the countries that have no schemes cited. This may indicate a relative maturity in the awareness of skills needs. In the case of promoting women for example, there are no specific schemes cited but France has been proactive about creating a gender balance across all professions. This has led to it being a European Country **with the highest penetration of women in Networking**⁶⁰.

In the Netherlands, there are a large number of other types of programmes underway to address the skills gap, which are covered in the focus area 'broadening the skills base'. These include a certain number of training courses which are targeting women, refugees and socially disadvantaged groups. It is likely that these training courses will have some kind of 'awareness' activity in-built, so although there may not be dedicated programmes, there will be evidence of awareness raising of skills needs. The programmes that have been found so far appear to be 'targeted' awareness raising rather than 'general'.

Two Swedish programmes are targeted at SMEs. These schemes are quite sophisticated with measurable targets attached. The national programme *IT.SME*, co-ordinated by the Swedish Business Development Agency (NUTEK), has the aim of developing IT skills in SME, focusing on the needs of micro businesses (0-10 employees), and encouraging the strategic use of IT in these companies. First results of this programme confirm a strong need for this kind of support at national basis spreading good examples among SMEs all over the country. In Austria, **the "eFIT im**

⁶⁰ IDC report on Women in Networking 2001

e-business" initiative of the WIFI (training institute of the Chamber of Commerce) offers a comprehensive programme including IS awareness, advice and training activities for SME, in addition to several other IS measures by the government targeting SMEs.

In Norway, the Norwegian University of Science and Technology (NTNU) introduced in 1997 a special quota system for women on their computer technology studies. The project soon produced positive results. In the first two years, the percentage of female students increased to more than 30%. In addition, the Government has carried into effect several initiatives to increase the number of female pupils and students to take up IT and technological related skills. Finally "ICT Norway", the largest IT-organisation in Norway initiated in 2002 a special mentor-program to increase the number of women in the IT-sector, titled "OD@".

Three programmes designed and implemented by the German government indicate the emphasis on the potential of young girls and women in ICT and e-business. Together with industry, the German government has started various projects and information campaigns with the goal of ensuring men and women equal opportunities in participating in the information and knowledge society. Interesting initiatives mentioned include **girls@d21** and **muffin21**. To help women select professions, the Education and Research Ministry, in collaboration with industry, the individual German states, and the Federal Labour Office, has also developed a **multimedia lab game** in co-operation with schools and vocational training advisory units throughout the country. In addition, nation-wide information campaigns help young women inform themselves about career possibilities in the IT and media jobs. Nearly all of the high schools (both upper and lower track educational systems) are being contacted and provided with information and material⁶¹ Germany has a relatively low participation of women in networking which is why it may be now focusing on raising awareness of ICT as an attractive career option. Other countries which have a low participation from Women are Austria, Norway and Italy.

The schemes from Ireland are focused at the school level and involve a number of mechanisms including, roadshows, 'bring your daughters to work' days, exhibitions and company visits. The UK has schemes focusing on students and women. All of the schemes outside SMEs are in some way trying to improve the attractiveness of IT and encouraging people to consider it as a career choice.

- Awareness campaigns for schools and school leavers (Ireland, Sweden, UK)
- Awareness campaigns for universities (Ireland)
- Awareness campaigns for women (Germany, Ireland, UK, Norway)
- Awareness campaign for general digital literacy (Norway)
- Awareness campaign for SMEs (Greece, Sweden, Austria)

⁶¹ www.werde-informatikerin.de

Broadening the skills base

Making sure that new workforce entrants and other potential employees have access to the right skills and qualifications is paramount to reducing the skills gap in Europe. There is ample evidence to suggest that a large number of different types and levels of training are needed to address this gap. IT education and training programmes of varying length can be used to fulfil the need to increase enrolment from non-traditional sources of IT workers, such as women, the socially disadvantaged, the unemployed, non-technical backgrounds, older persons and workers seeking a career change. Some of the training schemes which are levelled at the socially disadvantaged also have the hurdle of making it an attractive new career choice.

The largest number of initiatives identified so far are aimed at schools, higher education or in the vocational training sector, and concentrate on providing ICT and e-business skills to a whole new section of the potential workforce. The data collected currently covers 12 countries⁶² and is wide-ranging.

Very few schemes are targeted towards particular types of skills shortages. The only examples are Ireland and the UK who are both running courses for technicians; and Austria is increasing funds for electronics qualifications. In Germany, the Federal Institute for Vocational Training is working towards specific vocational qualifications with the working titles of IT Engineer, IT Manager, IT Consultant, IT Commercial, IT Systems Engineer, and IT Business Engineer. Apart from that, the majority of the courses are targeted toward the general upskilling and provision of IT skills. This may be because industry and vendor qualifications currently provide the more specialised courses and that these can either be combined with the training given in the education system or delivered alone.

Career-Space is the exception to this, an initiative where industry is working with universities to produce new course modules that are directly relevant to the skills needed in the IT industry. In this case, they are developing not only new employee skills but also combining qualifications from engineering and informatics with business and behavioural skills. At present the viewpoint is that very few graduates have the skills to understand not only the technology but to work effectively with the variety of people that are now involved in an e-business. There are no real specific examples of courses being developed that equip graduates with 'business skills', there is evidence of cross-curricula courses but it does not specify what other courses are being offered. There are more examples of these types of schemes elsewhere in the world. In the US and other countries such as Australia and Asia (Singapore), industry is working with Universities to build new degree courses that include industry standard ICT certification schemes and soft-skill education/training, that make graduates very employable with the necessary business skills available on graduation.

• Universities and vocational training

The schemes that are presented here for universities and vocational training fall into four categories:

⁶² Ireland, Germany, Greece, France, The Netherlands, UK, Austria, Norway. Spain, Portugal, Finland and Sweden.

- increasing the number of places available on courses (Greece, Ireland Finland, Austria, Norway, France),
- increasing the number of qualifications available (France, The Netherlands, Denmark, Germany, UK)
- adding IT components to non-IT courses (Greece, UK, The Netherlands, Austria)
- conversion courses (Greece, Germany, Ireland)

A good example of an initiative which is increasing the number of courses and qualification is in France. The new Internet University in Marseilles is providing 45 new qualifications in information and multimedia. This will help address skills shortages at speed and will also have the flexibility to adapt to market change. Another example is in Denmark where two new ICT universities⁶³ have been established for the same reason.

- **Targeted training**

The UK, Ireland, Germany, the Netherlands and the Nordic countries were all early predictors of the IT skills shortage and therefore have more mature initiatives for both university students and technical training courses. This shows, in that the courses cited in this report are now more oriented towards targeting different sectors of the population. For example, the Netherlands has courses for women, immigrants⁶⁴ and asylum seekers and Sweden has a large number of courses for the unemployed.

Denmark has a project called Cybernova which has the specific objective of identifying the barriers that women may have to entering the technology sector and using of role models during the courses and on-the-job training. Spurred in by this success a similar project is being run in Sweden and Norway.

The exception to this is Portugal and Italy who also provide training for the socially disadvantaged, but at a more basic level. Italy, as part of its eItaly programme is focusing on the needs of Southern Italy and reducing the digital divide within the country. This has led to more schemes in the south targeted at the socially disadvantaged.

- **Schools**

Member States that are covering schools initiatives include Germany, Sweden, Portugal, The Netherlands and the UK. A very interesting example of scheme comes from Sweden where they are using IT specialists to teach in schools. The scheme, called '**Transfer**' has the aim of creating an infrastructure for sharing knowledge about IT and entrepreneurship. This will not only teach school children new IT skills but also increase the attractiveness of the industry to school leavers. A similar initiative in Germany is **Deutschland 21**, chaired by Erwin Staudt, General Manager of IBM Germany. The scheme currently has 1,400 ICT "ambassadors" working in schools to support teachers in delivering ICT curriculum and increase the number of people with qualifications in science, maths, design and technology, and engineering. Another programme with 140 "ambassadors" is operating in the Netherlands. The UK Department of Trade and Industry has undertaken a British initiative and an ambassador programme will also be launched in Austria later in 2002.

⁶³ <http://www.it-c.dk>

⁶⁴ Immigrants have a significantly lower employment rate than other EU nationals and also have a significantly higher share of unskilled manual jobs.

There are numerous other schools initiatives that are not covered here that represent part of a commitment by Member States and Norway to give all citizens the chance to acquire digital literacy. In 8 Member States, ICT courses are included in the primary education curriculum and in 12 Member States in the secondary curriculum, therefore progress is being made towards providing schoolchildren with a basic IT qualification and also the chance to use computers as learning tools.

- **Training the teacher**

In order to enable the teaching of ICT skills and competences in schools, good equipment is essential, as are the necessary teaching skills and new teaching methods. Teacher training is key to this provision in schools, and government and industry can play an active role in its development and delivery. Also e-learning has the potential to contribute considerably to the continued training of teachers.

In Denmark, the government is providing extra training in ICT for teachers in primary and lower secondary through the “educational IT driving licence – Skole-IT”. In Germany there are numerous initiatives, the primary one being to provide ICT basic training to all teaching trainees. At a more advance level, there is a part time extension course available to trainee teachers in vocational training who wish to further increase their knowledge of ICT called ‘Innovative Continuing Education of Teachers at Vocational Training Schools’. There are also plans to extend this and provide a course in Universities. In Norway 40 000 teachers will be offered post-qualified education in ICT skills within 2003/2004. The education will focus on ICT-use, but also issues such as data privacy-policy and “web-ethics”.

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 the UK, the Government has made a pledge that by the end of 2002 all serving teachers should feel confident and competently use ICT in the curriculum. Although there are only a few examples here of teacher training, industry is also pioneering its own teacher training courses and these schemes are covered under the section on industry initiatives.

Upskilling the workforce

The lifelong acquisition of new skills and qualifications by all workers is an essential condition not only for filling posts, but also for creating new permanent jobs in the digital economy. This is particularly pertinent in the case of ICT and e-business. It is not enough to just have IT workers who are trained in one set of skills, rather workers must be constantly engaged in learning and upgrading their skills profiles. In many areas this is aided by the proliferation of distance learning technologies, flexible course structures and delivery methods.

Employers also now have a much healthier attitude towards the need of its employees to upskill. They are now less likely to see training just as a cost but also as an investment. There is also an acceptance that training benefits everyone, not just the company concerned. Even if employees move on within two years, they bring those skills to another employer and are probably replaced by someone who has benefited from training elsewhere.

In this regard, measures that lead to a certification in an occupation (retraining measures) and other vocational continuing education measures, in particular the acquisition of additional skills, have been already developed in some Member States. Nevertheless, the level of involvement of governments in providing training initiatives varies considerably across the different EU regions. 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. Thus, currently in France, about 40 % of life-long learning courses for workers relate to training and up-dating ICT related skills.

In Nordic countries and the other Northern EU Member States the involvement of the government in developing training schemes has been historically greater than in most Southern EU countries. For instance, in the Netherlands, a Joint Paper ("Er is meer nodig") agreed between the social partners and the government focussed, inter alia, on ICT skills, including 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 save money for training (which may include ICT training). Furthermore, reference was made to numerous training initiatives at the sectoral level. Likewise, in Denmark, IT training has become a mandatory part of all vocational degrees. In Norway, education financed by an employer is generally exempt from tax.

An area which is not generally covered by the schemes identified so far 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 borders. This has particular significance for older workers as much of their knowledge may have been acquired outside traditional learning.

In Norway however, the Norwegian 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 on the basis of non-formal learning. The individual educational institutions determine whether the non-formal qualifications are acceptable.

The Norwegian Government has, in collaboration with the Confederation of Norwegian Business and Industry (NHO) and the Norwegian Confederation of Trade Unions (LO), initiated a plan to clarify how better increase the older work-force. The goal is to increase the competence among older people and thus increase the general productivity among the business life and industry.

Nordic Member States have been also quicker implementing e-learning resources to up-skill the labour force. The corporate on-line learning offers a new possibility for companies to update and train their employees at lower costs. Some countries including the UK, Ireland and Nordic countries have already started using e-learning resources to train and update skilled employees. The DfES in the UK has also set up a Post-16 e-Learning Strategy Task Force to look at how e-learning can enhance and improve learning opportunities for young people in colleges and lifelong learning. France also recently started developing a network of access points for distance learning, supported by a national portal supplying on-line services and resources for training professionals.

So far, training initiatives have been identified in 12 of the 15 Member States. Most of these programmes include different type of actions:

- Tax relief for companies investing in IT staff re-training as well as mandatory investment for all companies to invest on employees training (France, Denmark, Norway , The Netherlands and soon Italy⁶⁵)
- General ICT skills training for employees: whether they are imparted using e-learning resources (e.g. Nordic countries, the UK, Ireland, France, Italy), bringing ICT trainers to the company to teach employees, (e.g. Greece) and sending the working force to designed ICT courses imparted outside the time work schedule.(e.g. Austria, France, Germany)
- Specialised ICT courses for employees (UK, Ireland and Nordic countries)

Outsourcing and immigration

In some Member States, the lack of population growth and transferability of skills means that some short-term solutions have been introduced to address the skills mismatch. Looking outside the country or Europe is a quick way of either gaining new skilled workers or outsourcing work to companies who already have the necessary expertise. Germany, the UK, the Netherlands and Norway, have been early adopters of initiatives targeting immigrants of non-EU countries.

In Germany, the government has been actively promoting the ‘Green Card’ programme, which aims to attract 20,000 ICT experts from outside the European Union. So far, according to OECD (2000) data, 40 per cent ICT immigrant workers arriving to Germany came from Eastern European, countries, and about one fifth of the rest came from Pakistan and India. In that respect, efforts should be more focused to attract and outsource programmes to Eastern European ICT workers, coming from

⁶⁵ eItaly 2002 programme includes an action following the French initiative but companies are obliged to invest 0.3%

prospective MS since Germany has a stronger competence from the US and the UK to attract and retain workers from the Commonwealth countries.

The UK has been also liberalising immigration policies in a way that encourages skilled professionals to work in the UK. The UK in fact, due to the high IT salary rate, and the predominance of English language, is an attractive country for the migration for ICT skilled workers from outside Europe. From the 45,000 visas gained in 1999, 2000 were for the ICT sector. According to IDC (2000), due to the high ICT salaries the UK is the favourite place for non-Europeans ICT skilled workers.

Likewise, the Dutch government has also encourage ICT immigration offering for a tax incentives to non-nationals experts residing in the country, and in March 2000, the Norwegian Government launched a programme to amend regulations in order to simplify the recruitment of skilled workers outside the EAA area. The regulations will come into force from January 2002 (OECD 2000).

To overcome their ICT staffing problem, several Belgian companies have moved sections of their information technology units to Slovakia, Romania, Ukraine and India.

With regards to outsourcing initiatives, the UK and the Nordic countries have been earlier adopters of Application Service Providers (ASP's), model which is a less labour intensive form of computing that distributed ICT and therefore, however there is little evidence to suggest that policies are in place to encourage outsourcing but it is nevertheless a viable solution to addressing the skills shortages.

Partnership between industry and government

Developing ICT and e-business skills and reducing the skills gap across Europe is a task that is being tackled by both the public sector and industry. The European eLearning Summit, held in May 2001 identified areas for sustainable collaboration and partnership in e-learning between the public and private sector. It also recommended clarifying the extent to which emerging models of public/private partnerships can contribute to the e-learning agenda. The summit led to 10 recommendations which included **addressing the ICT skills shortage**.

Several EU Member States have pledged to take this forward on the agenda, for example, the High level Expert Group in Ireland in its report on e-business in 2000⁶⁶ recommends that a partnership approach be taken towards industry/higher education and policy-makers to promote the development of third level courses in e-business.

The private sector has got involved in several areas of policy and target groups. Many of the schemes mentioned under this focus area are also covered under other focus areas as examples of schemes in education, on-the-job training or help with forecasting skills needs.

The partnerships that are taking place do not follow a pre-defined model and 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*

⁶⁶ <http://www.forfas.ie/publications/futureskills/intro.htm>

phenomenon in Europe and are not conceptualised in a uniform framework. 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.

An interesting area of focus is where Government and Industry are in partnership and are using **vendor qualifications within schemes**. Industry certification has the ability to provide a benchmark that employers can instantly recognise and are therefore useful in giving substance to qualifications. Examples of this include, in Germany where the 'IT immediate action programme' is working with industry and supplying certification from Microsoft, Oracle and SAP. Also through the European Scholars Programme, 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, (Belfast) the government has teamed up with Microsoft to deliver IT training for women to work towards the Microsoft Certified Systems Engineer Accreditation. The UK government also has a pilot scheme which 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 have teamed up with Microsoft to look at the results. This is potentially very interesting, particularly when assessing the relative 'worth' of certain qualifications on the market, and gauging whether government should be providing specialised training courses in ICT and e-business. A scheme from ComptIA, JOBS+⁶⁷ is bringing 200,000 new IT professionals into industry by 2004. This initiative includes for example, an IT Career Awareness programme, a programme to train individuals with disabilities, a transitional worker programme, and an education to careers programme.

A good example of a scheme working with SMEs is SKIN in Germany, a Skill Improvement Network. SKIN is a programme that is primarily driven by the private sector and is very focused on its target group -- people already in SMEs looking to re-train and extend their IT skills. It combines distance network-based learning and local classroom training and the course participants use material from Microsoft's official curriculum and Cisco's Networking Academy programme and access to accreditation.

There are fewer examples of partnership schemes taking place in the Southern Mediterranean countries. Cisco is working in Italy to integrate ICT technologies and content into the Italian education system and also has agreements with regional government to promote training in schools and local projects. In Spain, Cisco is also working with regional authorities to promote training through the CNAP (Cisco Networking Academy Programme). Recently the Athens Information Technology was started in Athens, Greece, an industry initiative to provide world class education and research in the information society.

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

In order to overcome the need for skilled teachers and professors at the university level a Norwegian company named FAST Search & Transfer ASA has engaged in a collaboration with the Norwegian University for Science and Technology (NTNU) which among others include financing a new professorship in ICT. NTNU has in addition several arrangements with the industry, which also includes financing scholarship-holders and adjuncts professors (professor II).

There are currently no Member State examples found of industry working with universities in order to develop course content. The partnership schemes are centred on schools, women, the unemployed, vocational training and awareness (improving the attractiveness of careers).

So far, partnership schemes have been identified in 8 countries. Most of these programmes include different type of actions:

- Helping monitoring future skills needs (Ireland, the Netherlands and Greece)
- Training the long-term unemployed (Ireland, Sweden and Germany)
- Promoting uptake of ICT in the Education System (Germany, Norway, UK, Sweden, IT)
- Promoting ICT skills development in Women (UK, Norway and Germany)
- Assessing vendor qualifications (UK)

According to the eLearning Summit paper on public private partnerships, 7 models were given as examples of public-private partnerships, these are given below and related back to the schemes that have been found working in Europe. There are other schemes that are described under the ‘industry initiatives’ section which are also private public partnerships or collaborations.

- Education – industry links this included business sponsorship and corporate social responsibility.
Examples from the measures identified are training the unemployed, women and general uptake in the education system.
- Partnership programmes – these are definitive public private collaborations, and are focused on researching and developing innovative methods for education and training.
Examples from the measures identified are general uptake in the education system in Germany, the UK, Sweden and Italy.
- Outsourcing of management and services – including supply and maintenance of ICT hardware/software to the public sector and teachers/trainers who provide s u b j e c t e x p e r t i s e .
Currently no specific examples identified.
- Publishing partnerships – involving collaboration or co-operation between commercial content developers and teacher/trainers who provide subject expertise. The development of multimedia and digital broadcasting may require new models of investment and partnership.
Currently no specific examples identified.
- Skills Gap initiatives – often closely linked industries will work together with companies to identify specific skills gaps. The involvement of the public sector can lead to the development of more generic or transferable skills and the possibility of formal accreditation from national bodies.

Examples from the measures identified above include the monitoring of future skills needs in Ireland and Greece

- Leasing capital provision (usually infrastructure or hardware) which is made available to the public sector
Currently no specific examples identified
- Private Finance Initiatives (PFI) – Often large scale capital investment programme involving the building of new facilities or redevelopment of existing institutions co-financed by the public and private sector.
Currently no specific examples identified

Europe needs private public partnerships that are mutually beneficial and have a clear and sustainable model

Forecasting and tracking skills needs

The old models for predicting labour supply and demand are proving to not work fast enough to predict the skills need in ICT and e-business. This means that new forecasting has to use strategies that can be adjusted as time goes on.

From the Member States and Norway we have examples of forecasting and monitoring future skills needs from Ireland, France, the Netherlands, Finland, Norway, the UK, Sweden and Denmark. **It is difficult as first glance to measure the sophistication of some of these tools.** The UK mentions that the work on forecasting is bringing together industry trade associations, government, professional bodies, practitioners and the academic world and the model is validated extensively by both the public and the private sector.

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’ is 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. The taskforce keep track of the skills shortage by analysing labour market forecasts and deliver proposals to address the problems identified.

In Sweden, the Statistics Sweden carries out a yearly survey of a sample of employers, “The Labour Market Tendency Survey”. It provides information about the labour market situation and the outlook for 77 educational and training categories. The questionnaire 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 occupational areas within their

regional labour markets. Occupations where there are shortages in Sweden are identified based on the employers expected need for recruitment put into relation to the employment offices assessment of the supply of applicants fit for the job. The National Labour Market Board has also specifically studied the IT sector in Sweden. An assessment was made of the supply and demand future manpower and of necessary initiatives for meeting the growing demand for IT competence. The report was based on 60 in-depth interviews with people in the sector, representing business enterprises, business organisations and higher education.

Denmark and Finland have developed similar types of schemes which look at ‘boom’ and ‘bust’ scenarios happening over the coming years. These models take into account the unpredictability of the economy and therefore foresee a number of potential future forecasts.

The national governments with forecasting mechanisms in place, to a greater or lesser extent, have their own methods of tracking demand and there is a substantial need for **reliable surveys and analyses of the use of information technology within organisations and individuals**, to serve as a basis for possible actions. Furthermore, there is also a need **to make comparisons between organisations, sectors and countries**.

Overview of policies by Member State

There are over 100 policies and initiatives that have been identified in the first round of data collection. The information on the Member state policies in the last section has been presented by focus area. This section gives the national context for each country and a brief overview of the current actions by Member State.

Austria

The Austrian Government have launched a set of policies on ICT under the initiative “e-Austrian in eEurope”. E-business policy in general is in the hands of the Ministry for Economics and Labour (BMWA).

The Federal Ministry of Economics and Labour has set up seven working groups to look at e-business in the economy, one of which is related to employment and skills.

- **e-location** – business location Austria in the international context
- **e-business** – for a stronger economy (user/provider)
- **e-start-up and capital**
- **e-employment and skills** – training and labour market
- **e-innovation** – innovation, research and new technologies
- **e-content** – the Austrian content industry

Currently 8 initiatives have been identified that a specific measures to address the skills shortage in Austria.

Exhibit 11 Overview of initiatives in Austria

Country	Scheme	Focus area	Description
AT	eFIT im e-business	Awareness	Awareness raising in SMEs
AT	Sectoral Qualifying Initiative of the Electronic Industry	Broadening the Skills Base	Increasing funds for university places
AT	Cisco Network Academy Program	Partnership between industry and government	
AT	IT training for employees in Austria	Upskilling the workforce	IT training for employees
AT	eFIT Austria	Broadening the Skills Base	IT skills for all
AT	IT4U (http://it4u.ocg.at)	Broadening the Skills Base	Database of ICT skills programmes in Austria
AT	Notebook - project	Broadening the Skills Base	Notebook supply for pupils and teachers
AT	^a School online	Broadening the Skills Base	Teacher training initiative

Belgium

In Flanders, the Ministry of the Economy has introduced a “Digital Action Plan” which aims to significantly strengthen the position of Flanders in the digital economy. In Wallonie, the Ministry for the Economy, SME, Research and New Technologies has also come up with several broad initiatives to ensure the transition of all towards the knowledge society.

The following aims have been identified in order to address the skills gap:

- To triple the number of institutions offering evening classes for IT degree students. To update the ICT curriculum to make it more attractive and to halve the graduate failure rate
- To organise campaigns to attract more female students
- To create a brand new 'e-business' degree combining Applied Economics and IT studies.

Currently only 2 initiatives have been identified that are up and running in Belgium, but clearly the actions stated above show a commitment to more schemes to tackle the

skills gap. Also in Belgium several companies have moved sections of their information technology units to Slovakia, Romania, Ukraine and India.

Exhibit 12 Overview of initiatives in Belgium

Country	Scheme	Focus area	Description
BE	Road Show	Awareness	General Awareness Campaign
BE	Cisco Network Academy Program	Partnership between industry and government	Training schemes for Networking Skills

Denmark

In December 2001, there was a change in the Danish Government which means that there are many new policies and government strategies in the pipeline. In the coming months, the Ministry of Education and the Ministry of Science, Technology and Innovation will both release White Papers on ICT issues including ICT skills.

The Ministry of Science Technology and innovation will this year publish a White Paper with the working title “ICT for the Future”. The major themes relevant to Skills are:

- To strengthen the mismatch between supply and demand of the ICT-educated workforce
- Programmes to establish better use of ICT in the educational sector including an upgrade of the use of ICT in both business schools and universities
- Better technological service to companies. Universities and research centres will. Via high-tech learning programmes, supply companies with know-how on ICT.

The government is committed to making Denmark a leading ICT-nation by providing a high standard of ICT knowledge and comprehensive access to ICT in the public and private sector and well as in the field of education. In schools, the government is committed to strengthen the use of ICT in primary schools through funding to subjects, qualifications, ICT-based educational material and a connection to Sektornet, the Danish schools high speed infrastructure. In secondary education, it is committed to providing personal computers and to ensure that all students gain an “IT-Bevis” a licence which will demonstrate the students ability to use advances ICT tools. An initiative called Skole-IT will also provide supplementary training for teachers in primary and secondary school and Skolekom is an electronic forum for dialogue for school.

In the workforce, there are some general policies which relate to the provision of computers and the promotion of e-business. There are tax discounts for companies who want to provide their employees with home PCs and there is a goal that there will be 95% coverage of broadband by the end of 2002. In order to promote awareness of e-business, the Danish State Information Service will make an annual award to digital businessmen who have shown initiative in adapting to a new digital reality.

Also eZone Scandinavia⁶⁸ will contribute to the promotion of e-commerce in Denmark. In the Ørestad region a centre for innovative e-commerce is being established with space for enterprises, educational activities, conferences and other projects.

Currently eight initiatives specifically related to ICT and e-business skills have been identified. Five related to education, one to forecasting future skills needs and the last two are partnerships, where Cisco is delivering its training programme in Denmark and the other part of a regional ICT strategy where an ICT corridor will be established to create networks and eSkills exchange between research, science and companies in Jutland and Funen.

Exhibit 13 Overview of initiatives in Denmark

Country	Scheme	Focus area	Description
DK	The educational IT driving licence - Skole-IT	Broadening the Skills Base	IT qualification for all
DK	Cybernova	Broadening the Skills Base	Encouraging women
DK	IT University West	Broadening the Skills Base	New IT university and qualifications
DK	IT University of Copenhagen	Broadening the Skills Base	New IT university and qualifications
DK	ICT-Barometer	Forecasting and tracking skills needs	Tool for measuring the skills shortage
DK	Cisco Network Academy Program	Partnership between industry and government	
DK	'Better use of ICT at Universities'	Broadening the skills base	Training at universities
DK	Regional ICT initiative	Partnership between business and education	Strategy for ICT for all

Finland

In Finland, the government programme for "increasing education in the Information industry field 1998-2002" includes both ad-hoc measures for promoting know-how and increasing the number of graduates in the near future and permanent increases in the provision of university and non-university professional education⁶⁹. The programme seeks to provide training to 20,000 students.

Also the importance of e-business has been underlined in the policy paper 'Business Environment Policy in the New Economy' issued by the Ministry of Trade and Industry in 2001. Specifically training is pointed out as a priority. It is argued that there is a lack of skilled workers that could be alleviated by recruiting more foreign students and by raising the interest of women in mathematics and the natural sciences.

So far, there have not been many specific schemes identified in Finland. One interesting contribution to the forecasting of future skills needs is a study on the ICT employment scenario where the authors have developed a formula to forecast ICT employment in a "Boom" situation i.e. when the overall economic development is

⁶⁸ www.efokus.dk

⁶⁹ http://www.minedu.fi/minedu/education/prog_inc_edu_infoindustry.html

favourable and in a "US-led recession" i.e. when the US economy tumbles into a deep recession and pulls the whole world economy with it. The essence of the exercise is to define current status, describe a range of alternative futures, decide on the basis of a range of criteria including society, markets, and technology, which is or are the most preferred futures, and then determine the necessary steps to make it happen.

Exhibit 14 Overview of initiatives in Finland

Country	Scheme	Focus area	Description
FI	Information Society Skills for all	Broadening the Skills	Training and materials for the unemployed, elderly and other groups.
FI	Ope.fi	Broadening the Skills Base	Teacher training
FI	Computer Driving Licence	Broadening the Skills Base	IT for All
FI	Opintoluotsi	Broadening the Skills Base	Service for school leavers
FI	Programme for increasing education in the Information Industry	Broadening the Skills Base	Increasing number of training places for IT skills in all higher education
FI	ICT Employment Scenarios 2010	Forecasting and tracking skills needs	Future skills needs

France

Since 1997, France has considered the Information Society a priority and in 1998 the Government launched a wide-ranging action plan to help France enter into the Information Society (PAGSI). The programme is ongoing and the budget to date has been close to 1.4 billion Euro.

The Interministerial Committee for the Information Society in July 2000 pledged 3 billion French Francs to close the digital divide. The measures include:

- Creating an " Internet & multimedia grade " for all pupils
Providing all primary schools with multimedia resources & connecting them to the Internet will be completed by 2002. This effort will be achieved by local authorities with financial back up from the State amounting to 55 million Euro over 3 years. Also all teenagers leaving secondary school will have the opportunity to take the Internet & multimedia grade. This will be extended to all school children leaving primary school as from 2003.
- 4000 additional youth jobs as multimedia trainers

Digital public centres will lead to the creation of 4000 youth jobs as multimedia trainers, amounting to a budgetary spending from the State equivalent to 180 million Euro over the next three years.

- 1.2 million unemployed people will be provided with IT training sessions by 2002. Training session modules including computer, Internet and multimedia training will be provided to all people with the priority being the unemployed. 1.2 million people will be eligible for this scheme by the end of 2002: this measure will cost approximately 150 million Euro over the next 3 years.
- 10 million French francs to providing training centres for apprentices with IT equipment

75.000 youths in apprentice training centres will benefit from training in computers, Internet and multimedia. The Government is financing 50% of the equipment of training centres for apprentices, amounting to 1.5 million Euro.

- Increasing the number of IT professionals

The Government has decided to create an Internet Institute near Marseilles. This institute is the first one in a new Internet Institute network to be implemented by local authorities. All University programmes dealing with IT in its various components will be strengthened, leading to over 30,000 new IT professionals every year. Also 45 new professional computer and multimedia degrees were implemented in September 2000, with an increase of 1200 students. The number of graduates in telecommunication schools will double over the next five years.

Thirty years ago, the government pledged by law that all companies in France must invest a part of the amount of wages on employee training. This part is now 1.5% and ICT skills development benefit largely by this measure, 20% in 1997, 31% in 2000 are now being used in ICT training.

Exhibit 15 Overview of initiatives in France

Country	Scheme	Focus area	Description
FR	Training in IT administration skills	Broadening the Skills Base	Training adults in IT skills
FR	Internet University - Ecole Supérieure de l'Internet	Broadening the Skills Base	New IT qualifications
FR	Network of experts and observatory on employment and the development of work in the information society	Forecasting and tracking skills needs	Future skills needs
FR	PAGSI	Upskilling the workforce	IT training investment for employees
FR	4000 additional youth jobs as multimedia trainers	Broadening the Skills Base	IT training for youth
FR	1.2 million unemployed people will be provided with IT training sessions by 2002	Broadening the Skills Base	IT training for the unemployed
FR	Training centres for apprentices	Broadening the Skills Base	Financing equipment for training

FR	New degree courses in computer and multimedia	Broadening the Skills Base	Increase number of courses
FR	New website for ICT job information for the young	Broadening the skills base	

Germany

The German Action Programme “Innovation and Jobs in the Information Society of the 21st Century” was jointly presented by the German Ministry of Education and Research and the German Ministry of Economics and Technology in September 1999. The Action programme pursues a number of goals, some of which are directly relevant to ICT and e-business skills development:

- The promotion of multimedia in education and training – A public-private partnership “linking Schools to the Internet is providing all schools in Germany with PCs and Internet access. Also Internet competitions and additional campaigns are being staged such as uni@schule 2001 and Surfcheck “linking teens to the web”. With its “New Media in Education” programme, the Education and Research Ministry is helping support the development of a broad offering of advanced teaching and learning software for schools, vocational training institutes and universities.
- The creation of innovative e-business jobs – the Federal Government continues to support SMEs in Germany through its ‘centre of excellence for e-commerce’. In addition, model projects are being developed for e-business in the SME sector.

The above are not covered in the schemes presented in this report as they more generally align themselves with basic skills in ICT and e-business rather than ICT and e-business skills. There are however numerous policies and programmes in Germany which are very focused on the issues of skills. The report has currently identified 13, covering all focus areas and including increasing attractiveness, teacher training, training for the unemployed, vocational training, conversion courses, Public Private Partnerships and retraining. One area that stands out is the concern attached to the attraction of young women into the profession. The German government has together with industry started various projects and campaigns with the goal of ensuring equal opportunities in participating in the information and knowledge society. Also one of the most important initiatives cited is D21, a private sector initiative set up to accelerate the movement of society in Germany from the industrial to the information age. The initiative has more than 300 participants, not only IT providers and various institutions from the political community. The Chairman is Erwin Staudt of IBM.

Exhibit 16 Overview of German initiatives

Country	Scheme	Focus area	Description
DE	Girls@d21 and Muffin21.de	Awareness	Awareness campaign for Women
DE	Joblab.de	Awareness	Awareness campaign for women in schools and vocational education
DE	German Teacher Training Provision	Broadening the Skills Base	Teacher Training
DE	D21	Broadening the Skills Base	Promoting uptake of ICT skills in schools
DE	New Media in Education Programme	Broadening the Skills Base	Training in all levels of the education system
DE	IT immediate action programme	Broadening the Skills Base	IT training for the unemployed
DE	Development of an IT-specific continued education system – Part of IT Immediate Action Plan	Broadening the Skills Base	Vocational IT training and conversion courses
DE	Immediate Action Plan for the further development of the Study of Informatics at Universities in Germany	Broadening the Skills Base	Development of new courses
DE	Green Card	Outsourcing and immigration	Work permits
DE	Cisco Network Academy Program	Partnership between industry and government	Training schemes for Networking Skills
DE	The European Scholar Programme	Partnership between industry and government	Training in sectors of the population
DE	SIT – Satellite-supported interactive telelearning	Partnership between industry and government	Qualification – IT manager New Media for unemployed graduates
DE	IT immediate action programme	Upskilling the workforce	Retraining in employment

Germany has a very advanced and comprehensive approach to the growing demand for e-business and ICT skills, The Ministries are working together with the private sector to produce actions which are being integrated into education and training and working life. There are many more discussions underway and many other ideas for policies and programmes.

Greece

In Greece, the 3rd Framework Operational programme “Information Society” is the major programme of the Greek Government for the implementation of the strategy for the Information Society in Greece. It is an innovative horizontal programme cutting across government departments who are concerned with the promotion of information society in Greece. The policies are described in the report “**Request for information on policies to reduce the digital divide-Greece**”⁷⁰

The priorities are focused in the “Information Society for all” and still have fundamental goals to improve access and infrastructure. Nevertheless some of the areas for action will help tackle the ICT and e-business skills gap:

- Technology diffusion to individuals and households

This action is equipping all schools with the necessary IT, network and audio-visual equipment, creation/upgrading of IT labs in universities and technical colleges, as well as providing public internet access points and upgrading the role of the library in the community as a focal point for access.

- Technology diffusion to businesses

This action will focus of promoting the adoption of new business practices, particularly for SMEs. Particularly relevant is the project “Go on- line” which aims to introduce 50,000 SMEs to the digital economy.

- Government development and demonstration projects

This action is developing infrastructure and access in small towns and remote areas in Greece. It is also importantly supporting the development of broadband services for the public sector

- Education and training initiatives

Development of basic IT skills for the wider population through flexible procedures, and especially for socially disadvantaged groups, in connection with re-insertion into the labour market.

Five initiatives, including the “Go-online project” have been identified as specifically addressing the ICT and e-business skills gap. Two are specifically increasing the number of qualified individuals in Greece. The first is training of 5,000 people in advanced IT skills as the Government has the goal of increasing the number of jobs in the Information Society by 80%. The second is a plan put forward through the Government’s policy committee on information to increase the number of conversion courses for graduates, ensure all graduates receive some IT training and to set up a number of interdisciplinary degree courses between computer science and other departments, The aim is that within 4 years, 15,000 graduates will have acquired advanced IT skills.

⁷⁰ A. Priftis, (Special Secretariat of the Information Society, www.infosociety.gr).

Exhibit 17 Overview of Greek initiatives

Country	Scheme	Focus area	Description
GR	Go online	Awareness	Awareness campaign for SMEs
GR	Training in advanced IT skills	Broadening the Skills Base	IT training for adults
GR	Reducing the skills gap within tertiary education	Broadening the Skills Base	Increasing number of IT courses Additional skills for non-IT graduates Conversion courses
GR	e-business forum	Partnership between industry and government	Future skills needs
GR	Go-online programme	Upskilling the workforce	IT training for employees

Ireland

In Ireland, the Expert Skills Group on Future Skills Needs, hereafter Expert Group, was established in 1997 to:

- Identify the future skills needs of specific industry sectors
- Advise on policy to promote future skills needs
- Advise on the promotion of links and partnerships between education/training sectors and business
- Develop forecasting techniques
- Promote awareness of skills.

The group comprises of representatives of key government departments, state agencies, the third level sector and the private sector. In 1997, it carried out an analysis of future skills needs in the Information Technology sector and has continued to monitor needs, responses and advise the government on policy. These studies contain forecasts of technicians and professionals and policy recommendations as to how skills gaps (IT skills demand less the estimated number of graduates with the necessary IT skills) can be addressed.

The first report, 1998, contained recommendations to increase the number of undergraduate IT places in the third level sector by 5,400. It also suggested that in-company training and net immigration would also help address skills needs. The third report (July 2001) of the Expert Group contains recommendations for action to facilitate the immigration of individuals with the requisite skills needs (IT, construction and researchers in general).

As part of its response to labour market shortages, the government introduced in 2000 changes to its work permit/work authorisation scheme for non-EEA nationals to facilitate the immigration of persons in particular areas of need including in the IT sector. This scheme is demand-driven rather than quota-based - prospective employees identify and recruit immigrants and the state facilitates their entry.

The Third Report (2001) of the Expert Group, in view of changing conditions affecting both supply and demand, contains new approaches to meeting future skills needs. This moves away from fixing quantitative targets to providing five-year investment to:

- Increase access to third level places through expanding part-time education and in-company training.
- Improve completion rates in third-level institutions.
- Increase in post-graduate conversion programmes.
- Renew equipment and facilities.

Additional recommendations aim to:

- Take action at second level to promote IT related subjects.
- Promote partnerships between industry/third level sectors.
- Promote and facilitate immigration.

Exhibit 18 Overview of Irish Initiatives

Country	Scheme	Focus area	Description
IE	Skills Awareness Campaign	Awareness	Awareness Campaign for School Leavers
IE	Role Model Initiative	Awareness	Attracting girls into careers in science, technology and engineering
IE	Science, Technology and Innovation Awareness programme	Awareness	Awareness for Science and Technology
IE	STEPS programme	Awareness	Awareness campaign in Schools
IE	University Science Website	Awareness	Awareness of university programmes and careers
IE	FIT - Fast Track to Information Technology	Broadening the Skills Base	Training unemployed
IE	Schools IT 2000	Broadening the Skills Base	IT at primary and secondary level school
IE	Community Application of Information technology (CAIT)	Broadening the Skills Base	IT in the community
IE	Back-to-Education - Adult ICT strategy	Broadening the Skills Base	Adult education
IE	Equal Skills Initiative	Broadening the Skills Base	Public access to IT
IE	Provision of new undergraduate places in Ireland	Broadening the Skills Base	Increasing university places
IE	FAS action to promote IT skills	Broadening the	Training adults in

Country	Scheme	Focus area	Description
		Skills Base	IT skills
IE	Ireland - Post-graduate conversion course	Broadening the Skills Base	Conversion courses
IE	Institute trainee programme	Upskilling the workforce	Training new technicians
IE	e-Business training initiative	Upskilling the workforce	E-business training programmes for employees
IE	Accelerated technician programme	Upskilling the workforce	Training new technicians
IE	Skillnets - training networks programme	Upskilling the workforce	IT courses for employees
IE	e-Business training initiative	Upskilling the workforce	IT courses for employees
IE	Expert Group on Future Skills Needs	Forecasting and tracking skills needs	Future skills needs
IE	MIDAS (Microelectronics Industry Design Association)	Forecasting and tracking skills needs	Future skills needs
IE	New scheme to facilitate recruitment of non-EEA nationals in designated sectors where skills shortages are acute.	Outsourcing and immigration	Work permits
IE	MIDAS (Microelectronics Industry Design Association)	Partnership between industry and government	Future skills needs
IE	FIT - Fast Track to Information Technology	Partnership between industry and government	Training unemployed
IE	CISCO Academy Networking Partnership	Partnership between industry and government	Training schemes for Networking Skills
IE	Cork Industry Electronic Association Careers Initiative	Partnership between industry and government	Increase awareness of careers in science
IE	Institute trainee programme	Partnership between industry and government	Training new technicians
IE	South East Information Society Strategy (SEISS)	Partnership between industry and government	Regional partnership to promote ICT skills development

Italy

The Information Society Forum was established in 1999 by a Prime Ministerial decree, stating that ‘the development of the Information Society is a major goal of the Italian Government’. The main task of the Information Society Forum is to co-ordinate the drafting of the Action Plan for the Information society, and to promote initiatives for the development of the Information Society in Italy. From the outset, it was conceived as a working forum open to citizens, business and universities.

In September 2001, the Italian Government established the "[Comitato dei Ministri per la Società dell'Informazione](#)", co-ordinated by Ministry of Innovation and Technology and in February launched the new *Action Plan for the Information Society*, in line with the objectives of the *e-Europe 2002* initiative.

This Plan aims to facilitate and accelerate the development and adoption of ICT by:

- Establish a Task Force on Broadband
- Develop training and education on ICT
- Implementing ICT policies for Southern Italy
- Supporting SMEs in ICT development
- Supporting research, education and promotion using available tools, i.e. minimum use of laws, enhancement of co-ordination, promotional and co-financing arrangements
- Fostering competition in the ICT sector.

In February 2002 the “Italian e-Government Action Plan” was launched and the different action and costs was defined. Four hundred and thirteen million Euro has been made available for the implementation drawn from the auctions of the 3G mobile services licenses. The plan is now entering into the operational stage, with the launch of the first call for proposals, addressing the Regional and Local Authorities. Approximately 120 million Euro has been allocated to this call, out of the total 258meuro which is available for local government projects. A second call is scheduled in the late autumn so that the whole sum will be spent by the end of 2002.

Compared to the original plan, more emphasis is now being put on the customer orientation of the innovation projects -multiple delivery channel, user-driven access metaphors (life episodes)- as well as on clearly identifying and measuring results/benefits, and comparing them to costs.

Another important change which is being defined, concerns the national Electronic Identity Card project. Given its complexity and long-term achievements, a parallel initiative is being designed to allow Local Authorities and other public bodies to issue smartcards with a common national interface standard. This should provide for ubiquitous online customers’ authentication and services access, regardless of the access channel being used.

The training actions are aimed at:

- Raising the level of competences in the use of ICT both for those who already have some basic skills and for those who are using computers for the first time
- Increasing the productivity of all those who need to work with the computers;
- Achieve a higher return on investment in IT
- Ensuring that all computer users understand how ICT can be used efficiently and that they are familiar with the problems of quality involved
- Providing skills that enable anyone regardless of level and type of schooling to be part of Information Society.

The training actions are:

- **Basic Training-** This action focused on training public employees as user of IT basic training plan wants to provide computer literacy to all public employees The plans calls for 30 hours of training for every employees both those taking computer literacy courses and those taking more advance training. The training course will follow the pattern of the ECDL which has been adopted as the standards by governments in many countries. At first the basic training skills program will involve about 400 000 public employees with a budget of 125 millions Euro
- **Specialised training-** this action seeks to enhance and updates the specialised skills of the staff who are responsible for running ICT infrastructure wants to improve the level of knowledge of those who already have some basic skills. For Specialised training action the cost is 13 millions of Euro.

Other ICT public training programmes are:

- “IN” Program. Training program on basic skills in ICT and English language for 60000 young unemployed living in the southern regions of Italy (Obj.1 FSE) promoted by the Ministry of Labour and social policies and realised by Italia Lavoro.
- "Note - New Opportunities in Technological Employment", Training programs on net economy profiles for young unemployed with university degree in humanistic disciplines living in the southern regions, promoted by the Ministry of Labour and Social Policies.
- IFTS (Post secondary technical training courses). A national training program on ICT skills promotes by Ministry of Education and managed by the secondary public schools in partnership with university, enterprises and regional authorities.
- Skillpass a programme on ICT training through distant courses promoted by Sviluppo Italia s.p.a.

Many of the schemes identified have part funding from the structural funds.

Exhibit 19 Overview of initiatives in Italy

Country	Scheme	Focus area	Description
IT	Italian e-Government Action Plan	Upskilling the workforce	ICT training for public administrations employees
IT	IFTTS – Post secondary Training in ICT	Post secondary training in ICT	ICT Training schemes for young people
IT	SKILLPASS	Upskilling the workforce	ICT training through distant courses
IT	ICT Training	Upskilling the	Continuos training for

Country	Scheme	Focus area	Description
		Workforce	workforce on ICT basic skills
IT	ICT Training for young unemployed in Southern Italy	Broadening the skill base	Training in ICT and English language. Benefit to buy computers. Guidance and training through traditional courses and distant learning
IT	ICT Training for unemployed in Southern Italy for young people with university degree in humanistic discipline	Broadening the skill base	Training in ICT for unemployed with university degree through distant learning

Luxembourg

The major actor responsible for policy design and implementation in the field of e-business in Luxembourg is the **Ministry of Economy**, who is in charge of the law on e-commerce and its implementation. However in a broader context many other ministries are involved in the implementation of the targets set at the Lisbon Summit and implemented in Luxembourg via the e-Luxembourg plan⁷¹ This plan has been co-ordinated by the ministry of communications but individual ministries have projects under their own responsibility.

A recent study from the Luxembourg federation of industrials (FEDIL) estimates that about 6% of the demand for qualified jobs in the ICT sector cannot be met. This unfulfilled demand also may increase until 2003. The reorientation of education towards ICT related subjects is the preferred long term solution to reduce the shortage of ICT skilled workers. This issue is also addressed in the e-Luxembourg plan. In the short term, the reorientation of available job seekers is actively being promoted.

In addition, since unemployment in Luxembourg is very low, the country must remain attractive for skilled workers from other EU countries (whether cross-border workers or new immigrants) and targeted policy measures exist for specialists that cannot be found on EU level.

One of the action lines under eLuxembourg can be identified as being directly relevant to the provision of ICT and e-business skills, this being to 'put in place new technologies for use in education and research'. This includes more use of ICT in training, teacher training schemes and promoting training in Universities.

⁷¹ <http://www.eluxembourg.lu>

Exhibit 20 Overview of initiatives in Luxembourg

Country	Scheme	Focus area
LU	Increase use of new technologies in training and research	Broadening the skills base
LU	Improve teacher training in new technologies - A project for improved communication between teachers and students	Broadening the skills base
LU	Promotion of training in Universities And new courses and equipment for the Technical Lycee of Arts, Design and Technology	Broadening the skills base

The Netherlands

In 1999, the Dutch Government published a White Paper ‘The Dutch Digital Delta’ offering a framework for the government’s initiatives in the field of ICT. The White Paper deals with 5 ‘pillars’ to strengthen the ICT base:

- The telecommunication infrastructure: encouraging innovation, competition and investment.
- Know-how and Innovation: development technological know-how, supporting ICT clusters, Sufficient ICT personnel: labour market and education.
- Access and Skills: access to information, skills.
- Regulatory aspects: equipping general legislative and regulatory provisions, legal security, fiscal regimes, building confidence.
- ICT in Public Sector: improving external services, the internal performance of the government, model function of the government.

The second pillar is the most pertinent as it deals with ‘sufficient ICT personnel: labour market and education’.

The cornerstone behind dealing with insufficient personnel is the ‘ICT Taskforce Risseeuw’ (named after the former CEO of Getronics, a major Dutch software house). This taskforce is made up of CEO’s of ICT producing companies, ICT using companies (e.g. banks) and the chairman of the boards of some universities and institutions of (higher) vocational education.

The proposals for projects developed by the taskforce concentrate around four, problem areas of the labour market: education; training; the labour market reserves (women, immigrants, partly disabled workers and refugees/asylum seekers), and the internal organisation of a company.

At this moment there are 10 projects under way, some of which are described in this report. The overall management of the scheme is the hands of the Ministry of Economic Affairs.

Exhibit 21 Overview of initiatives in the Netherlands

Country	Scheme	Focus area	Description
NL	IT for women - ICT Taskforce Risseeuw	Broadening the Skills Base	IT Training for women
NL	IT for immigrants in higher vocational training - ICT Taskforce Risseeuw	Broadening the Skills Base	IT training for immigrants
NL	IT for refugee and asylum seekers- ICT Taskforce Risseeuw	Broadening the Skills Base	IT training for refugee and asylum seekers
NL	ICT in middle vocational education - ICT Taskforce Risseeuw	Broadening the Skills Base	New IT qualifications in vocational sector
NL	Dual courses in higher vocational education - ICT Taskforce Risseeuw	Broadening the Skills Base	Additional IT skills for non-IT students in vocational training
NL	IT-components in non-IT studies - ICT Taskforce Risseeuw	Broadening the Skills Base	Additional IT skills for non-IT students in vocational training and universities
NL	ICT Taskforce Risseeuw	Forecasting and tracking skills needs	Forecasting
NL	Cisco Network Academy Program	Partnership between industry and government	Training schemes for Networking Skills

Norway

In Norway, there are several large scale policies being run which include a focus on ICT and e-business skills.

eNorway 2005

Next spring (2003), the Norwegian Government will launch a national IT Action Plan (working title “eNorway 2005”). eNorway is an action plan to present common goals and a common framework for the IT policy in Norway. Competence, e-business and-communication, e-government, e-content, infrastructure (broadband) and security and trust are the main challenges identified in the plan. The Ministry of Trade and Industry, responsible for co-ordinating the national IT-policy is responsible for the plan, with a strong collaboration with several other ministries.

The Competence Reform – “lifelong learning”

In Norway, The Competence Reform is the prime policy framework for lifelong learning. The main objective for the Competence Reform is to help meet the need for competence in society, in the workplace and by the individual. Competence development and lifelong learning must help to provide Norwegian business and society with the competence needed to secure a foundation for the creation of value and the provision of services for both the private and the public sectors. Business organisations play an important role in implementing the reform. There are a number of elements within the Competence reform: A statutory right for adults who need primary and lower secondary education (from Autumn 2002) and statutory right to

upper secondary education since August 2000. In addition, an Act relating to Universities and University Colleges has been amended to allow adults over 25 years without formal entrance qualifications to be admitted on the basis of non-formal learning. Finally the Norwegian public education system will be altered to make it possible to cater to the needs for skills and knowledge at the workplace. A quality reform in higher education is being implemented. Finally, the right for employees to study leave was introduced on 1. January 2001 and is laid down in the Working Environment Act .

In a national as well as in an international context there is a growing awareness of the importance of stimulating and advancing digital literacy of the adult population. Within the reform, a separate project is to be established with the working title “*ICT for Everybody*”. The project aims at raising the general awareness and knowledge of ICT among adults and avoiding new divides between those who use ICT and those who do not.

The VeRDI program - Promoting e-business among SMEs

In March 2001 a new national programme, named VeRDI, for strengthening SMEs competitively and profitability by increasing awareness and by stimulating "e", was launched. Approximately 97 per cent of all Norwegian businesses are small (less than 20 employees). The main goal for VeRDI is to increase awareness and motivation, facilitate the upstart of e-strategy processes, provide knowledge and professional development (best practice), and promote joint measures and infrastructure. The Norwegian Industrial and Regional Development Fund (SND) is the responsible authority for the development and implementation of the program. The program will run from 2001-2005.

BIT

The main objective for the BIT-programme, launched in 1997, is to increase the competitiveness and profitability of SMEs through development, implementing and distributing general IT-solutions for specific trades. The goal is to make SMEs more efficient through the use of e-business. The program includes 22 sectors and has about 200 pilot companies.

Business demand for ICT-skills

Recent years have shown that businesses are dealing with an increasingly international labour market. Employees cross borders and there is a growing competition between employers in different countries to get qualified workers. In particular this can be seen in the ICT sector. A Norwegian research project⁷² conducted in 2000, made an estimate on the lack of different types of ICT skills in the years to come. According to this project, there will in the period from 1998-2003 be a need for as much as 10,000 persons a year with some sort of ICT-related skills. Seen in relation to that only 3,000 students graduate in ICT-related university subjects, and out of these only 500 with a higher informatics based education, the development is negative. What is more, the number of students applying to ICT-related studies at university level has decreased in 2001. At the same time, ICT related university programs seem to have difficulties with regard to attract teachers.

⁷² Norwegian School of Management – BI ”Verdiskaping og internasjonal konkurransedyktighet i norsk IKT-sektor” - Research Report nr. 11 – 2000 (www.bi.no)

The above mentioned study was conducted in a period where expectations of further growth in the ICT-sector was high. Due to recent shifts in economic forecasts, there are reasons to believe that the estimated skills gap is too high. Nevertheless, there is a common understanding that in a longer perspective Norway needs to strengthen and increase the number of third level students in sciences and technological studies. In a shorter perspective, businesses report that there is currently a large demand for employees with specialised skills, such as system-architects, senior-programmers and senior IT-managers.

Nevertheless, what seems to be a general understanding both among the industry associations and in government, is that for the time being it is difficult to give a precise estimate of the lack of IT-personnel in the ICT sector and in businesses in general. What is more, there is a large demand for comprehensive research in this area.

Exhibit 22 Overview of initiatives in Norway

Country	Scheme	Focus area	Description
NO	ICT for everybody	Awareness	Awareness campaign for digital literacy in adults
NO	ICT studies in upper secondary and higher education	Broadening the Skills Base	
NO	Education of IT specialists	Broadening the Skills Base	Increase number of IT training courses in High-school degrees
NO	Elderly workers	Broadening the skills base	Increase the competence among older people and thus increase the general productivity among the business life and industry.
NO	Recruitment of women to studies in Science and Technology	Broadening the skills base	
NO	National study on future skills needs	Forecasting and tracking skills needs	Forecasting
NO	Norwegian Government programme – recruiting outside EEA countries	Outsourcing and immigration	Work permits
NO	New professorship in ICT	Partnership between government and industry	

Portugal

In Portugal, the Information Society initiative Digital Portugal 2000 has two objectives which are extremely pertinent to ICT and e-business skills provision.

- To promote IT training and competence accreditation for citizens, general IT training schemes and certificates through examination. A working group is in charge of defining minimal ICT requirements for school graduates
- To train employees in IT technologies. The parties involved in this objective are: Ministry of Science and Technology (MCT), Ministry of Education and development (MED), Ministry of Employment and Solidarity (MES). The courses are going to be co-ordinated and accredited through the National Professional training system (Sistema Nacional de certificacion profesional).

Other sub- programmes within Digital Portugal which have relevance to ICT and e-business skills are:

- The POSI programme. This is the main programme for Digital Portugal Programa operacional para la sociedad de la informacion (POSI). One of its main objectives is to create competences in IT training accreditation and resources⁷³.
- The National E-Commerce Initiative with one objective to provide education and training for the digital economy and for e-commerce in the context of globalisation of markets, with special emphasis on the adoption of measures for training company managers

There are nine schemes identified so far in this report. There are others that are purely supported through the structural funds that have not been covered. There are also clearly schemes that can be identified from Digital Portugal that have not yet been covered.

Exhibit 23 Overview of initiatives in Portugal

Country	Scheme	Focus area	Description
PT	IT training to promote IT for socially disadvantages citizens	Broadening the Skills Base	IT training for socially disadvantaged
PT	IT training for teachers and other school agents	Broadening the Skills Base	IT training for teachers and other school agents
PT	Certificate in ICT	Broadening the Skills Base	IT professional training for all
PT	Post secondary courses in IT	Broadening the Skills Base	IT training post school

⁷³

www.posi.mct.pt/ www.mct.pt/sociedadainformacao/http://www.cisi.mct.pt/home.html

Country	Scheme	Focus area	Description
PT	The Infojovem Programme	Broadening the Skills Base	IT training for youth
PT	Basic IT skills Diploma (Decree-Law no 140/2001)	Broadening the Skills Base	IT training for all
PT	The Millennium Generation programme	Broadening the Skills Base	IT training for Youth
PT	IT training for 67,000 employees	Upskilling the workforce	On the Job IT training for manager/directors in SMEs
PT	POSI programme – IT training for employers	Upskilling the workforce	IT training for employers

Spain

The Spanish Government launched an action plan called Info XXI: An information Society for All (2001-2003) which comprises a range of activities aiming at the development of the information society in Spain. The plan reflects the objectives of the eEurope initiative and its corresponding action plan. There are two programmes that are part of the Info XXI which are training professionals and employees in ICT skills.

Exhibit 24 Overview of initiatives in Spain

Country	Scheme	Focus area	Description
ES	C-Test	Broadening the Skills Base	Training women in IT skills
ES	Cisco Network Academy Program	Partnership between industry and government	Training schemes for Networking Skills
ES	Formación de profesionales TIC	Upskilling the workforce	On the job IT training for IT professionals
ES	Acciones de formacion dirigidas a trabajadores ocupados (actions targeted to train employees in ICT)	Upskilling the workforce	IT training courses for employees

Sweden

In March 2000 the Swedish Government presented its proposal for future IT policy in the Bill “An information society for all”.

One of the priority areas in the action plan is broad investment in education to enhance competence in the development and use of information technology. Among other measures, the Government has allocated 30 million SEK to an IT competence enhancing programme for small businesses in 2001-2002. The Government has also

allocated 50 million SEK during 2002-2004 for a programme intending to increase the use of IT among companies located in areas prioritised by regional policy. At the same time a special schools programme is underway.

The continued expansion of higher education means that around 4,300 students will graduate from higher education in engineering per year in the three-year period 2003–2005. Many more Bachelor of Science degrees in engineering will also be awarded. In addition, the numbers of people participating in IT courses alongside the traditional engineering programmes, have increased significantly. Elements of IT, and the possibility of choosing specialisation involving IT, have also become common in many higher education programmes. In addition, a number of institutions of higher education have greatly increased their range of programmes, allocating more resources to courses that include a specialisation in IT. Since most graduates will need IT competence in their careers, many programmes include items in which IT is used.

Sweden is very advanced in its efforts to tackle the skills shortage, reflecting its position as an early-adopter of IT. It is addressing the skills shortage from many angles, national vocational training institutes as well as universities are providing more courses in advanced IT skills for all sectors of the population. There are also several schemes which are helping SMEs to upskill their workforce.

Exhibit 25 Overview of initiatives in Sweden

Country	Scheme	Focus area	Description
SE	Train of the Future	Awareness	Awareness campaign for Schools
SE	SVEA	Awareness	Awareness raising in SMEs
SE	IT.SME	Awareness	Awareness raising in SMEs
SE	REG.IT	Awareness	Awareness raising in companies in support area A
SE	Transfer	Broadening the Skills Base	Using IT specialists to teach in Schools
SE	Computer/Activity Centres	Broadening the Skills Base	IT training for unemployed adults
SE	Adult Education Initiative programme	Broadening the Skills Base	IT training for

Country	Scheme	Focus area	Description
			unemployed adults
SE	Training programmes for the unemployed	Broadening the Skills Base	IT training for unemployed adults
SE	Advanced vocational education (AVE)	Broadening the Skills Base	IT training for school leavers
SE	National IT training programme - SWIT	Broadening the Skills Base	IT training for the unemployed
SE	The Labour Market Tendency Survey	Forecasting and tracking skills needs	Forecasting
SE	“Where are the jobs?”	Forecasting and tracking skills needs	Forecasting
SE	Cisco Network Academy Program	Partnership between industry and government	Training schemes for Networking Skills
SE	Itek : Malmo	Partnership between industry and government	Training for the unemployed
SE	SKIN: Skill Improvement Network	Partnership between industry and government	Skill Improvement Network
SE	Train of the Future	Partnership between industry and government	Awareness campaign for Schools
SE	IT immediate action programme	Partnership between industry and government	IT training for the unemployed in employment
SE	Transfer	Partnership between industry and government	Using IT specialists to teach in Schools
SE	Programme to enhance IT competence in SMEs IT.SME	Upskilling the workforce	IT training in SMEs

United Kingdom

The UK is made up of four devolved states: England, Wales, Scotland and Northern Ireland, all with a slightly different emphasis on their policies and priorities for their region. In general, England's policies are represented by the UK, DTI which also extends its reach across the country. But this report, in order to fully reflect the large amount of policy work and programmes being undertaken across the whole of the UK provides additional information on each state in the UK.

The UK – An opportunity for all

In the White Paper '**Opportunity for All in a World of Change**'⁷⁴, the Secretaries of State for Trade & Industry and Education and Employment stated 'our ambition is to make the UK the number one country for the supply of advanced ICT and related skills.' The major themes of the agenda included:

- expanding specialist ICT and other high tech learning programmes in further and higher education. By 2004-05 up to 10,000 students a year will be trained on full time and updating courses;
- introducing a programme to train 5,000 unemployed people over the next three years for technician level jobs in ICT;
- working with business to reverse the serious under-representation of women in ICT jobs. The aim is for the UK to match best international performance with regard to women's employment in ICT.

The agenda to address advanced ICT and related skills takes into account the analysis and recommendations for action of 'Skills for the Information Age: Final Report of the Information Technology, Communications & Electronics Skills Strategy Group', published in November 1999⁷⁵ and the reports and recommendations of the National Skills Task Force and the Government's response to these⁷⁶.

There are a large number of government actions taking place in the UK covering all focus areas. Also the UK has given emphasis to e-learning through the provision of online courses via the Government service Learndirect.

Scotland – The Knowledge Economy Task Force:

Following the establishment of the Scottish Parliament in July 1999 a Knowledge Economy Task Force (KETF) was set up under the Chairmanship of the (then) Minister for Enterprise and Lifelong Learning, Henry McLeish. The KETF report

⁷⁴ '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>

⁷⁵ Skills for the Information Age: Final Report of the Information Technology, Communications & Electronics Skills Strategy Group
<http://www.skillsbase.dfee.gov.uk/Reference/Reference.asp?sect=1&page=4>

⁷⁶ Also relevant to the ITEC skills agenda are the reports of the National Skills Task Force and the final statement on the work of the National Skills Taskforce from the Secretary of State for Education and Employment
<http://www.skillsbase.dfee.gov.uk/Reference/Reference.asp?sect=1&page=2>

was published earlier this year (2002) and contained a number of recommendations intended to improve the level of ICT skills in Scotland, such as;

- Encouraging the Scottish HE and FE funding councils to accelerate the use of ICT in the management, research, teaching and learning functions of all universities and colleges in Scotland (£15 million allocated to these bodies over the year period 2001-2004 for this purpose).
- Involving the relevant National training Organisations (*e-skills*, EMTA and Skillset) to become part of a joint Scotland-wide forum to discuss emerging ICT issues and maintain dialogue with them in the formation and development of relevant courses and qualifications and Modern Apprenticeship (MA) frameworks.
- Requesting the two Enterprise Networks in Scotland to consider what steps can be taken to encourage the take-up of e-learning/e-commerce opportunities (£6 million allocated to the two networks over the period 2001-2004 for this purpose).
- Considering the establishment of an E-Commerce Institute(s) where in-depth knowledge and expertise could be gathered, further developed and readily accessed by companies and individuals (£12 million available over the period 2001-2004 for this purpose, subject to production of a satisfactory business case).

Wales – Transforming the Economy through a ‘Winning Wales’

‘Winning Wales’ is the Welsh Assembly Government’s strategy for transforming the economy of Wales. The strategy recognises the importance of ICT in generating gains in productivity and in opening up new markets and areas of enterprise. The development of ICT skills will be crucial to this. The Welsh Assembly Government’s comprehensive education and lifelong learning programme to 2010, the Learning Country⁷⁷ sets a key aim to ensure that everyone has the skills and understanding to participate and benefit from the information age. Under the umbrella of Cymru Arlein <http://www.cymruarlein.wales.gov.uk> - the information age strategic framework for Wales - the Assembly Government is putting in place a range of action to ensure that the workforce in Wales is equipped with the skills and confidence to use and exploit new technology.

The objectives are to:

- Improve ICT facilities in all training and education establishments and enable effective use of these facilities.
- Encourage the development of essential ICT skills throughout local communities.
- Encourage the development of a coherent framework for ICT qualifications in Wales.
- Encourage the development of bilingual educational and training materials that are relevant to needs in Wales to enable life long learning and support the Welsh National Curriculum.

The strategy outlines a wide range of action to meet these objectives in schools, further and higher education and other lifelong learning sectors. Investment from the New Opportunities Fund of nearly £27m (43.3m Euro) in Wales is putting all public

⁷⁷ <http://www.wales.gov.uk/subieducationtraining/content/learningcountry/tlc-contents-e.htm>

libraries on-line, digitising learning materials and training teachers, school librarians and public librarians. A £75m (120m Euro) programme to develop ICT in schools, further and higher education and other lifelong learning settings complements this.

Northern Ireland - Skills Task Force

Strategy 2010, Report by the Economic Development Strategy Review Steering Group, March 1999, recognises the challenges that globalisation and technological development present to us in setting out its vision for taking forward the Northern Ireland economy. Its vision for Northern Ireland is “to have a fast growing, competitive, innovative, knowledge – based economy where there are plentiful opportunities and a population equipped to grasp them.”

The Northern Ireland Skills Task Force, acts as an advisory group to government on issues related to the demand and supply of skills in the labour market. The Task Force identified the Information Technology sector as a priority skills area where skills shortages or deficiencies would constrain the further development of the sector and adversely affect the growth of the Northern Ireland economy.

It commissioned research to investigate the balance in the demand for and supply of skills in the Information Technology Sector. The Report “A Study of the Northern Ireland Labour Market for IT Skills August 2000 raises a number of issues which need to be addressed to ensure skills are available to enable the growth of the IT sector.

The Department for Employment and Learning (DEL) is committed to developing and implementing policies which ensure Northern Ireland’s existing and future workforce has the appropriate skills which the ICT sector requires.

In pursuit of this aim DEL has set a number of specific targets including:

- By 2004 the creation of 5,400 additional higher education places, with the expectation that a significant number will be in ICT related disciplines.
- By March 2003 to increase enrolments in FE Colleges by 5 per cent over 2001/02 in the priority skill need areas of computing; software engineering and electronics.
- By 2004 to increase the proportions of people in companies who have relevant qualifications by targeting 70 small companies and 40 medium / large companies to undertake programmes to enhance qualifications and skills related to high growth projects.
- By 2004 to take forward the implementation of a comprehensive ICT strategy to ensure the FE sector is equipped to meet industry demands.
- By September 2003 to improve standards and student achievement of full or unit passes at NVQ levels 2 to 4 (or equivalents) by 5% over 2001-02 through a range of quality improvement initiatives.

DEL is committed to helping raise standards of basic ICT literacy, amongst students in education, the workforce and society at large.

Exhibit 26 Overview of UK initiatives

Country	Scheme	Focus area	Description
UK	IT is where its@ and Its your life	Awareness	Awareness campaign for students
UK	IT compass - Encouraging female participation in the IT sector	Awareness	Awareness campaign for Women
UK	IT compass - Encouraging non-IT graduates to participate in the IT sector	Awareness	Awareness campaign for IT training for Non-IT graduates
UK	National Grid for Learning	Broadening the Skills Base	Large project for schools infrastructure
UK	New Technology Institutes (NTIs)	Broadening the Skills Base	Increase number of IT training courses at technician level
UK	IT4ALL	Broadening the Skills Base	Increasing ICT user skills in the population and employment
UK	Rapid Advancement Programme (RAP)	Broadening the Skills Base	IT training for non-IT graduates
UK	Developing vocational specialisation in Further Education	Broadening the Skills Base	Increasing number of IT qualifications
UK	Expert Skills Group on Future skills needs	Forecasting and tracking skills needs	Future skills needs
UK	SFIA - Skills Framework for the Information Age	Forecasting and tracking skills needs	Forecasting
UK	Fast Track work permit	Outsourcing and immigration	Work permits
UK	Pilot Scheme - Developing IT qualifications for the work force	Partnership between industry and government	Assessing vendor vs. government qualification
UK	Logica and the University of East London	Partnership between industry and government	Certification
UK	Millennium leap	Partnership between industry and government	Entry level employee qualification for Women (Vendor scheme)
UK	e-skills NTO	Upskilling the workforce	Assessing vendor vs. government qualification
UK	REaCT – Relevant Experience and Computer Training	Upskilling the workforce	Entry level employee qualification

Country	Scheme	Focus area	Description
UK/Scotland	Training for Work (TfW)	Broadening the skills base	Training for the unemployed over 25s
UK/Scotland	The Scottish Higher Education Funding Council funds the Women in Science, Engineering and Technology (WISET) initiative	Broadening the skills base	Encouraging women
UK/Scotland	Electronics Scotland, - an action plan for the industry	Upskilling the workforce	Improving employability of redundant staff
UK/Scotland	National Training Organisations – eSkills NTO	Numerous initiatives	developing an on-line MA programme; drafting an e-skills strategy ; training FE college staff to deliver ICT courses
UK/Wales	ELWA – National Council Education Learning Wales	Broadening the skills base	Widening access to high skills training
UK/Wales/NI	Modern Apprenticeships and national traineeships	Broadening the skills base	Skills training programmes for young people
UK/Wales	Work Based Learning for Adults programme	Upskilling the Workforce	IT qualifications delivery
UK/Wales	The ICT through learning strategy	Broadening the skills base	Community based facilities for all
UK/NI	Training for FE lecturer	Broadening the skills base	Teacher training
UK/NI	Foundation degrees in ICT	Broadening the skills base	Increasing number of courses
UK/NI	Returning IT Skilled People (Back To Your Future Campaign)	Outsourcing and immigration	Informing expatriates of the job opportunities
UK/NI	Lecturers into Industry	Upskilling the Workforce	Placements of Further Education lecturers within local businesses
UK/NI	Jobskills	Broadening the skills base	Training the unemployed

Industry initiatives

Industry, particularly the ICT industry, has an important role to play in delivering knowledge and know-how to all businesses. There have been a number of initiatives started by industrial organisations (companies and other agencies). These range from provision of computer hardware for schools to delivering elements of the curriculum, to targeted curricula designed to train students in specific sets of skills. In all cases these have been initiated in response to the need to address the skills gap and industry is in an excellent position to respond to the fast-changing skills needs and provide access to the right kinds of skills. Some of the schemes covered may also be examples of public private partnership or collaboration activities. This may however only be part of the target of the scheme or initiative.

Broadly speaking these can be broken down into two types of schemes

- **Certification schemes for the workforce and potential workforce**
- **‘ICT for Education’ initiatives**

Certification schemes for the workforce and potential workforce

Although not a comprehensive list or coverage of certification schemes, the majority of the main IT industry players have their own training programmes which are being delivered, including, Microsoft, Novell, Cisco and IBM for example. CompTIA provides vendor neutral certifications worldwide and in collaboration with many of the large IT companies. CEPIS is also providing services or certification courses which are vendor neutral.

When attached to a particular organisation these schemes support the delivery of a particular organisation’s product (e.g. network technologies). While this is clearly beneficial to the organisation (giving them the ability to sell training as well as infrastructure), these schemes will undoubtedly also have benefits beyond the products in question. They provide a focus for learning more generic skills which students can apply in other environments. Some organisations offer certificates which are not restricted to one system. In some cases, these courses have been designed with the participation of other providers, and are also recognised as ‘complementary’ qualifications for other courses.

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 networking skills. Microsoft and Cisco for example, are also working closely with national and vocational qualification structures in Europe to offer their courses within the 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+⁷⁸ from CompTIA). ‘ICT for Education’ initiatives

⁷⁸ <http://www.comptia.org/workforce/workforce.htm>

Generally there are four types of initiatives or focuses for initiatives relating to education:

- Provision of hardware/software to schools under donation/subsidised schemes.
- ‘Network’ schemes enabling dissemination of teaching material and on-line educational content.
- Training for teachers and teacher certification.
- Training or mentoring of the school children. (These schemes are generally aimed at primary (5-11) age groups and designed to promote the use of ICT amongst pupils and teachers.)

One other training scheme has been identified (ICL) which is providing training and infrastructure in colleges specifically for supporting local SMEs.

Education has a key role in supplying basic and further education possibilities for the growing needs of the industry and research and development activities. Industry has got involved to a greater or lesser extent with all the focus areas covered by EU Member States National initiatives, even in basic IT skills that are not covered in this report⁷⁹.

Many of the industry certifications, if not the particular schemes, are also covered in detail under the next section as the majority of the vendors are American or Multinational companies.

⁷⁹ For example, IBM reinventing education and Microsoft in the Community

US response of government, industry and education

The response of US Government

In the US, as well as industry associations, various federal and regional government agencies working to identify and tackle the root causes of the shortage of IT workers. These include:

- Improving IT and science education at school
- Encouraging more people to gain IT skills and enter the industry
- Incentives for firms to invest more in training their staff, thus enriching the skills base of industry's workers
- Relaxing restrictions imported high-skill labour (H-1B visas)
- Encouraging the use of experienced middle-aged workers in an industry renowned for its relatively young workforce.

The Department of Commerce's Technology Administration (TA) claims to be "the only Federal agency working to maximise technology's contribution to America's economic growth." The TA manages three agencies:

- The Office for Technology Policy (OTP) , which is "developing and advocating national policies and initiatives that use technology to build America's economic strength."
- The National Institute of Standards & Technology, which works with industry to develop and apply technology, measurements, and standards
- The National Technical Information Service, which collects and disseminates scientific, technical, engineering and related business information produced by the U.S. government and foreign sources.

The Office of Technology Policy has launched several initiatives relating to IT education and training issues and resources:

- The High-Tech Workforce Training Programs Survey⁸⁰ is intended to provide useful insights to a broad range of stakeholders -- government policy makers, education and training providers, employers, and IT workers – involved or planning to participate in public and private high-tech education and workforce training programs. The survey, which lasted from September 2001 to the end of January 2002, gathered views and experiences of people on or involved with high-tech training programs. It received 274 responses from employers, IT workers, education and training providers, and agencies and partnerships. The Department's report is scheduled to be published in 2002. (However the survey responses are already available on the OTP's website in a structured and searchable format⁸¹).

⁸⁰ www.ta.doc.gov/ittraining

⁸¹ www.ta.doc.gov/ittraining/review.asp

- The OTP has developed Go 4 IT!⁸², a website providing details and links to training programs for high-tech workers. Described as “a resource for building America’s high-tech workforce”, the site provides information on hundreds of IT education, employment, and training programs. It also allows training organisations to submit their own programs for listing. The Go4IT initiative is effectively a website providing online access to a database of IT workforce programs. Users can search using a variety of criteria, including:
 - program type (education, training or employment)
 - sponsor type (association, college/university, commercial training, private industry, etc.)
 - location (city or region)
 - keyword (academic program, commercial training program, internship, recruitment, r e t r a i n i n g , e t a l .)
- GetTech⁸³ is an educational initiative to encourage young people to prepare for technology jobs. It is a public-private partnership designed by the OTP and the National Association of Manufacturers “to inspire teenagers to prepare for the technology-driven jobs of the future.” The GetTech website⁸⁴ is aimed at young people, especially high school students when they are beginning to think about careers. However, the audience also includes parents, teachers, and career guidance counsellors, as they play a key role in shaping students’ career choices. The campaign is a direct response to industry’s demand for more skilled workers. Consequently it also encourages companies to get involved in their local schools by providing demonstrations, role models and mentors for students.
- OTP Work Force Reports: Building InfoTech Skills at the Speed of Innovation, its August 2000 Update, and Digital Work Force State Data & Rankings, September 2000.

The Department of Labour includes a dedicated Employment And Training Administration (ETA), whose mission is to “encourage business growth through the creation of an agile workforce – one that can respond quickly and effectively to the changing needs of business and the new economy.”

To achieve this, it sponsors and implements various programs designed to “turn individuals into career entrepreneurs by equipping them with the information they need to develop the knowledge, skills and abilities sought after in the new economy”.⁸⁵

- Office of the 21st Century Workforce: Introduced by the Department of Labour in March 2001, its stated goal is “to ensure that all American workers have the opportunity to equip themselves with the necessary tools to succeed in their careers and in whatever field they choose in this new and dynamic global economy.” These changes include a fundamental transformation for all industries and increasingly require higher skill sets and higher education.

⁸² www.go4it.gov

⁸³ www.ta.doc.gov/GetTech/default.htm

⁸⁴ www.gettech.org

⁸⁵ www.doleta.gov/mission.asp

The response of US Industry

Major hardware and software vendors have created certification schemes tailored to specific areas of expertise focusing on their products. These include most of the main players in the market, such as IBM, Compaq, Sun Microsystems, Cisco and others. These are generally the same companies that have also branched out into providing the same training in Europe. Arguably the most significant schemes both nationally and globally are Microsoft's. This reflects the overwhelming global dominance of Microsoft operating systems and "office" applications on personal computers.

Such certification programmes provide recognition of both experience and expertise in a range of technical and consulting specialisation. Such companies' promotional material predictably emphasises the extent to which certified or accredited professionals can enhance their credibility and boost their employability.

In a recent survey, three out of 10 chief information officers (CIOs) stated that they would not hire someone without corresponding certification for a specific IT role.

As well as the standard evaluation of CVs (résumés) and checking of references, 29% of CIOs cited certification and assessment tests as criteria for evaluating both external IT job candidates and companies they may use for IT outsourcing.

Manufacturers' schemes cover a range of specific job roles, such as:

- Technicians and field engineers.
- Installation and technical support staff.
- Systems administrators and engineers.
- Systems integrators.
- Solutions consultants.

However, as well as helping internally, certification schemes also help companies commercially. Once qualified, people have a natural desire to play to their strengths. Whenever a new procurement cycle starts, consultants and engineers with expertise and certification in the products of a given supplier are likely to have a bias in favour of more such products, thus providing the opportunity to capitalise on their training and experience. When such people are able to influence purchasing decisions, this is a powerful advantage for suppliers in a highly competitive industry typified by falling margins.

Compaq admits as much when describing its certification schemes, stating that "as a channel partner, Compaq Accredited Professionals [sic] can help provide a competitive advantage by enhancing sales, deployment and support capabilities". In other words, bringing Compaq more business in preference to its competitors.

Thus, certification schemes can themselves serve as a component in a sales and marketing strategy to promote a new product family. For example, Microsoft has recently introduced a new certification program, the Microsoft Certified Systems Administrator. This credential specifically targets network administrators and other IT staff who implement and manage systems based around Windows 2000, Microsoft's flagship enterprise-oriented operating system.

Once certified, such staff become more likely to favour the deployment of Windows 2000 in other systems, and possibly with other employers as their IT careers progress.

Other suppliers of programmes covered in the annex include:

Information Technology Association of America (ITAA)

- The ITAA claims to be the only trade association representing the broad spectrum of the US's IT industry. It develops and supports various initiatives designed to strengthen the skills base in the industry and influence government policy accordingly.

CompTIA

- CompTIA, the Computing Technology Industry Association, is a non-profit trade association developing standards for Internet-enabled service provision, e-commerce, vendor-neutral technical certification, CRM, and workforce development and training. CompTIA represents over 8,000 hardware and software manufacturers, distributors, retailers, Internet, telecommunications, IT training firms and other service companies in 60 countries, together with thousands of individual professional members.

The **CompTIA Educational Foundation** was established in 1998 to encourage educational advancement for IT staff by improving and developing their skills and capabilities, and encouraging both teenagers and adults to pursue IT careers. The Foundation has since launched **JOBS+**⁸⁶, a vendor-neutral workforce development initiative designed to address the skills gap and critical shortage of qualified, entry-level information technology employees. CompTIA, among other initiatives, also runs a TechCareer Compass⁸⁷, an information and communications technology repository for resources critical in attracting, training and developing properly skilled ICT workers.

Technology Workforce Coalition (TWC)

- The TWC⁸⁸ in the US campaigns for the adoption of IT training tax credits at both the federal and state level. It sees tax credits as an efficient way to provide small businesses with incentives to support training of IT workers. This will encourage such companies to invest in the training and certification of their IT workers, to help them raise performance and productivity. This in turn will strengthen the pool of IT skills and talent in the industry overall.

National Association for Business

- The National Alliance of Business⁸⁹ (NAB) is a national non-profit business association seeking to improve student performance at all levels – from high school through to higher education. Its 5,000 members comprise companies of all sizes and industries, as well as CEOs, senior executives, educators and other business-led coalitions.

America's Learning Exchange (ALX)

- America's Learning eXchange⁹⁰ (ALX) is a web-based service designed to connect users to career development, training and education, and employment resources. It aims to provide access to multiple databases of information about

⁸⁶ <http://www.comptia.org/workforce/workforce.htm>

⁸⁷ <http://tcc.comptia.org/>

⁸⁸ <http://www.techcoalition.org/>

⁸⁹ <http://www.nab.com/>

⁹⁰ www.alx.org

education and training, including institutions, courses, vendors, and consumer information, expanding this to encompass a significant share of the total US education and training offerings. Currently it claims to provide details of 6,500 training providers and 350,000 programs, seminars and courses.

American Society for Training and Development (ASTD)

- The ASTD⁹¹ is a professional association and leading resource on workplace learning and performance issues. Its membership includes more than 70,000 people working in the field of training and “workplace performance” in 100 countries worldwide. Its leadership and members are drawn from over 15,000 multinational corporations, small and medium sized businesses, government agencies, colleges and universities.

Education

Education reform is becoming a major political issue as growing business and industry associations link the shortfall of highly skilled IT staff with weaknesses in both the existing educational curricula and current teaching methods. Various business and industry associations have been directly lobbying for education reforms designed to improve the technical, mathematical and IT skills of school leavers, and to increase the number of school graduates moving on to college education.

Latest projections show the greatest job growth to be in computer-related areas, yet eight out of ten of the fastest growing areas of computer-related occupations require a college degree.⁹² With a projection of two million new IT workers required by 2010, business and industry association see encouraging students to pursue degree-level education as critical to tackling the current and projected shortfalls in skilled IT workers.

Worryingly, results from the Third International Mathematics and Science Study show that the longer US students are in school, the worse their performance in these crucial areas. Although 4th grade school students rank well above average in mathematics and near the top in science, their performance slips to average levels by the time they reach 8th grade. And by 12th grade students’ rank has plunged to the level of developing nations like Morocco and South Africa.

However, figures from the Department of Education show that advanced degrees in high-tech-related subjects have declined by 2% since 1990 – even while the overall number of degrees awarded has increased by 24%. And the number of undergraduate degrees awarded in electrical engineering declined by 37% since 1990.

Consequently, the Business Coalition for Excellence in Education (which is affiliated with NAB) is one of several organisations that has been lobbying for various aspects of education reform. For example, the Better Education for Students and Teachers Act (BEST) focuses on methods for achieving and maintaining high standards, accountability, teacher quality, and excellence in mathematics and science.⁹³

⁹¹ <http://www.astd.org/>

⁹² Occupational employment projections to 2010, www.bls.gov/opub/mlr/2001/11/art4full.pdf

⁹³ Business Coalition for Excellence in Education, www.nab.com/PDF/bcee_fax_figures_jun14_2001.pdf

Outsourcing

As computer systems, networks and related infrastructure have become more sophisticated, they have also become more complex to maintain and manage. The demand for outsourcing has grown as companies have sought to achieve economies of scope and scale by offloading these responsibilities to dedicated specialist firms. This has mainly included computers, networks and operating systems. However, more recently, this concept has expanded to application software, leading to the creation of a new market: Application Service Providers (ASPs). Instead of merely managing the client's software applications, these companies actually host and operate the applications themselves, providing the clients' users with remote access via secure high-speed networks, including the Internet.

However, in a recent study around two-thirds of chief information officers stated that they were forced to outsource some or all of their IT services as a result of staff shortages,⁹⁴ including programming and software development, computer service and support. Almost three-quarters of CIOs wanted to keep these operations in house but had to outsource in order to meet their organisations' needs. A significant number noted that outsourcing was more expensive, required new skills to manage and had a negative impact on customer service.

Despite these drawbacks, 38% foresaw an even greater need to outsource e-business activities (presumably including ASPs). This is significant since e-business systems are integral to companies' core business activities, whereas IT services can be seen as ancillary infrastructure.

Best practice

The Information Technology Certification Security Council (ITCSC) provides best-practice and quality assurance guidelines for IT certification programs. Specifically, it aims to "promote and protect the integrity and value of information technology certifications for test takers, employers, and the industry through enhanced security, standards, and public awareness."⁹⁵ It also seeks to "eliminate practices or unethical activities that result in the granting of certifications to unqualified candidates."

It defines standards and programs to help restrict access to test items and results, thus helping to preserve the integrity and reputation of specification certifications throughout the industry.

The ITCSC develops guidelines on security, protection of content, improved testing management, and related programs that are intended to improve the value of IT certifications for all participating members. The ITCSC was formed by the industry's leading IT certification providers. Its members includes vendors like Microsoft, Novell, Hewlett-Packard and Sun Microsystems; CompTIA; and other training organisations and associations.

⁹⁴ CompTIA, *The Ongoing Crisis in IT Management* (2001). <http://www.comptia.org>

⁹⁵ www.certsecurity.org/L2/vision.htm

Recommendations and Priorities for Action

Findings

Some general findings can be outlined based on the data collected and the analysis so far.

- There needs to be a **better understanding of how industry takes part in the University system** to transfer skills needs.
- **For awareness raising** the majority of the schemes identified are from Northern Member states and tend to be targeted at **women and the socially disadvantaged**.
- The majority of schemes that are focused on **education and training** present no evidence of being **responsive to changes in skills needs in the workforce** or that there are links between work and education.
- Schemes involved in education and training can be found in university and vocational training, targeted training, schools and teacher training.
- There is no current evidence of assessment and **recognition of prior or informal learning**.
- Nordic countries and the UK appear to have been quicker at using **eLearning** to upskill the workforce⁹⁶.
- The national governments with forecasting mechanisms in place, to a greater or lesser extent, have their own **methods of tracking demand** and there is a substantial need for reliable surveys and analyses of the use of information technology within organisations and individuals, to serve as a basis for possible actions. Furthermore, there is also a need to make comparisons between organisations, sectors and countries.
- Immigration is used in a few Northern European Countries as a mechanism for creating a **short-term supply of skilled labour**. This is not being used across the board and also there is little evidence on its impact or whether is a an option for SMEs .
- The UK and the Nordic countries have been **early adopters of the ASP model** but there is little evidence of policies in place to encourage outsourcing
- **Partnerships do not follow predefined models** and some show only aspects of a consultation process rather than a formal arrangement.
- An important area to consider is the work undertaken by **corporate universities** to ensure that the workforce gain the right type of skills
- There are **methods that can be highlighted**, relating to the distribution of money and control to the learners: In France for example, at the local level main industries have the power and money to create new courses for specific training. Another interesting approach in the Netherlands is giving money in response to demand, not supply.

⁹⁶ Information on the use of eLearning in the UK and the Nordic countries may not be a true representation much of the use of eLearning is company specific not country specific (i.e. 40-60% of eLearning in any one country is being undertaken through a multinational)..

Initial Priorities and Recommendations

The policy challenges outlined in this report and the schemes that are being covered in response to these challenges give rise to some ideas for priorities or recommendations for further action. Bearing in mind that the work of the group has not been completed, nor an assessment of best practice in the Member States and by industry, these recommendations are ideas that will be refined.

There are also principles guiding us, these include, the current European Agenda, the recommendations of the Task Force on Skills and Mobility as well as the simple fact that it is important to try and do a few things well rather than recommend to tackle all the challenges. It is important to understand what can be achieved at the European level and how it can best enhance Member State efforts and maximise efficiency, concentrating on what is possible.

The following recommendations are groups according to three categories:

- Skills, qualifications and competencies
- Labour market external policy issues
- Tools and instruments

Skills, Qualifications and Competencies

- **Better definitions of the skills demand across the whole of Europe**

We are still a way away from understanding the employment and economic impacts of the ICT and e-business skills gaps across Europe, mainly due to the lack of consistent definitions and therefore data which is currently available. This is a task which needs to be dealt with in collaboration with all European Member States, Industry and the Education system. The classification of skills would also be a factor in the understanding of the demand.

Employers would then be able assess better their longer-term needs for skills, and communicate these to would-be students, universities and training providers.

- **Education and training systems to become responsive to the changing nature of workforce requirements**

Public policy and other institutions need to encourage further investment in education, training and retraining, and improved information to help focus the choices and activities of employers, universities and training providers, and careers advice for individuals. This work needs to start from the bottom up, investing in basic skills and providing computer training throughout the education system and working life. There should also be provision made for more **conversion courses** and **IT components** in non-IT courses in higher education that directly relate to the needs of industry.

Labour Market External Policy Issues

- **Barriers to mobility and changes in employment to be reduced**

Barriers to employment changes should be minimised, mobility and flexibility encouraged, and good practice widely understood and implemented. This point should build on the recommendations put forward by **the High Level Task Force on Skills and Mobility** and respond to the need for education opportunities for career changes including development of **languages skills** and **recognition of qualifications**

throughout Europe. This will also allow development of new work opportunities in other Member States.

- **Improved staff development strategies, career changes, lifelong learning and on-the-job training**

A wide range of measures are needed to ensure that the current workforce have the opportunities for skills acquisition, not just through availability of courses but through flexibility in areas of wages, working time etc. There needs to be collaboration between Government and employers to identify training need and to ensure that **skills acquired on the job are meaningful and transferable**. Employees should also be encouraged to participate in training programmes and access new learning opportunities. Growing workplaces demand information, instruction, and training resources when and where needed and this can be delivered through **e-learning which should be encouraged** as a tool for training delivery.

- **Tap into underrepresented labour market sources**

Non-traditional workers can make a valuable contribution to the supply of skilled labour. There is a large untapped labour market resource which is beginning to be exploited by the Member States. In order to do this, barriers to joining formal education systems need to be lowered and training and incentives put in place which nurture the available talent and allow it to be developed. This recommendation should aim to increase training and retention of older workers, disadvantaged or minority groups. Particular emphasis should be given to the recruitment and training of women with schemes and policies targeting primary education through to workforce development opportunities (e.g. part-time work, childcare). There are examples and these should be further investigated in order to establish best practice.

Tools and Instruments

- **A Common Classification for skills and occupational roles in ICT and e-business - creation of a skills observatory**

If an increasing number of training courses are being established across Europe, the information base needs to be accessible and comparable on the flow of skills into and out of education and training, about employers needs, recruitment and use of IT qualifications. This includes the need for a common classification of skills and occupational roles in ICT. The information available should be able to be easily classified by skill/level/competence and should also include earnings, careers, and mobility between organisations, sectors, regions and countries, and into and out of the EU, along with well-disseminated examples of good practice towards staff training, development, employment and utilisation. Other issues that this coherence in qualifications impinges on are:

- The recognition of non-formal learning including work force development
- Understanding of the economic dimension of education and employment

A first step would be to develop or contribute to a European **skills observatory** which could be co-ordinated through the Member States to bring local, regional and national information together, It could help monitor trends across the EU, undertake comparative analysis, and prepare regular reports relating to supply, demand trends and imbalances, and advise on future information needs.

- **A responsive supply side to business demand for skills, comprising:**

More dialogue between employers and universities and training systems and new approaches to course curriculum development,

Imbalances can be minimised if universities and training institutions build better contacts with employers. In this way they can better understand the changing needs of the workplace, and develop curricula and teaching methods that are responsive to these needs, both technical and ‘personal’. This is not to argue that all courses should become more vocational, rather that providers should be aware of needs and incorporate **relevant elements in courses**. They should also collaborate more, regionally, nationally and internationally, to seek to focus provision better, and ensure that students have access to state of the art equipment. This recommendation builds on the work of the **Career Space initiative**.

- **Coherence in immigration policy**

It is noted that some Member states have used mechanisms to attract skilled workers from outside the EU as a short-term solution of the supply problem. This supply, once identified is also affected by immigration policies within the Member States. As recommended in the **High-Level Task Force on Skills and Mobility report**, a common immigration policy would ensure an even-handed treatment of migrant workers and contribute to geographical mobility in Europe.

All of these recommendations are put forward in order to help enable all industry, but particularly European SMEs, in accessing and acquiring the appropriate ICT and e-business skills to function in the knowledge-based economy.

Development of indicators and next steps

This synthesis report presents an overview of national EU and US policies as well as industry-led initiatives which equip the workforce and enterprises with the necessary skills to compete in the knowledge-based economy. The goal is to provide an overview of the types of schemes available and will help Member States to assess their policies and put them into a European perspective and to identify and promote good practices.

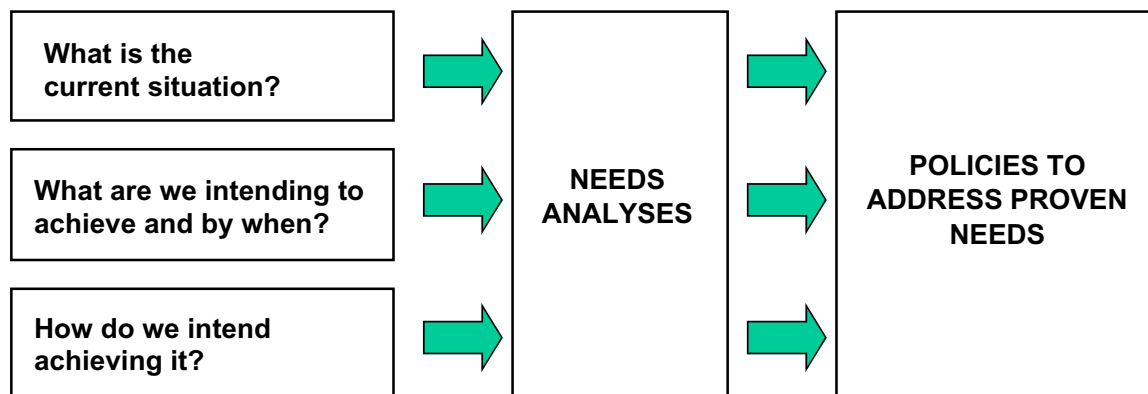
The objective of this first report is to develop the set of indicators, both qualitative and quantitative in order to fully understand the policies and actions which have been developed. It will also complete a picture of the role that ICT skills currently play in the economy, the existing gaps and the driving forces behind the increased demand for ICT skills in Europe

Based upon the discussions in the meetings with the ICT skills monitoring group and the workshop for the ICT skills monitoring group held in Brussels in May 2002. It is proposed that the benchmarking of the policies be undertaken in two-steps leading to the identification of concrete recommendations for action at the European level.

Firstly a framework will be established to understand how each Member State and Norway, defines the current situation, what it intends to achieve and how it intends achieving it. The policies identified can then be mapped to the needs analysis to see what is being accomplished. It needs to be highlighted that the actions that are taking

place should be economically justified, user driven (from the business and workforce) and if possible already learn from best practice elsewhere.

Exhibit 27 User driven economic needs



Once a needs analyses has been undertaken, the policies identified will be analysed and benchmarked against a number of indicators including timeliness, quality, volume, delivery and cost and other relevant policy benchmarking criteria, to find good practice examples across the focus areas.

Exhibit 28 Benchmarking EU Member State and Norway

LEVEL	INDICATORS				
	TIMELINESS	QUALITY	VOLUME	DELIVERY	COSTS
REGIONAL	X		X		X
NATIONAL		X		X	X
EU				X	
GLOBAL	X				

By identifying good practice, this work will not rank the individual actions or evaluate them against any artificial criteria developed for this report. The aim is to lead to a set of policy recommendations, targets and priorities to be presented in the final report.