TACKLING THE SKILLS GAP

THE SHORTAGE OF IT SPECIALISTS IN EUROPE

PREPARED BY ANDREW BIBBY FOR UNI-EUROPA

OCT 2 2000

WWW.ANDREWBIBBY.COM

Tackling the skills gap - The shortage of IT specialists in Europe
Author: Andrew Bibby, UK

Publisher: Union Network International
Av. Reverdil 8-10
CH - 1260 Nyon 2
Tel: +41 22 365 21 00 - Fax: +41 22 365 21 21

12-2000 / Ref. No 27

Contents

INTRODUCTION

Europe faces a problem. Ambitious plans (such as those in the *eEurope* report adopted at the EU Lisbon summit in March this year) to enable our continent to benefit from the opportunities of the new economy could be jeopardised by a shortage of workers with the necessary IT skills.

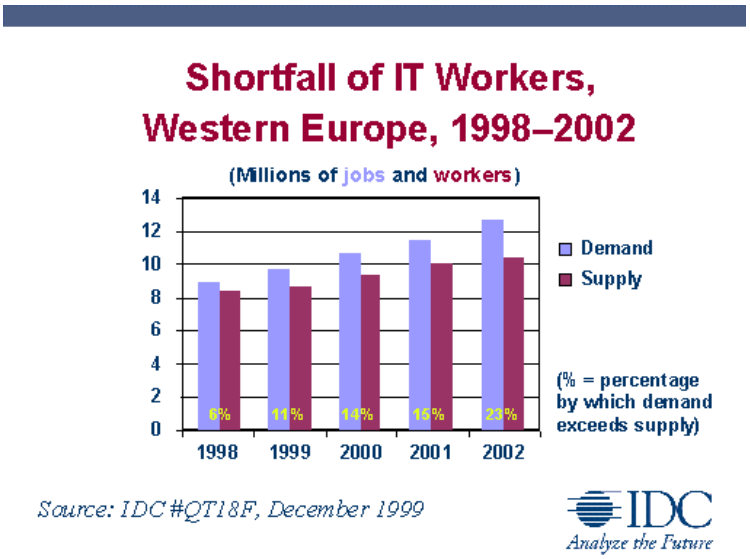
This is the 'Information Society skills gap'. According to the European Commission's recent report *Strategies for Jobs in the Information Society*, the skills shortage is being felt not only within the IT sector - in what it calls 'new Information Society occupations' - but outside the IT sector as well. "The vast majority of big European companies feel impeded by the lack of skills within their organisations," the report claims. "The skills shortage problem is even more serious at the small and medium business level," it adds.[1]

Strategies for Jobs quotes the European Information Technology Observatory 1999 report, which also concerned itself with the IT skills shortage. "Demand for IT skills is far outstripping the existing supply of IT professionals," it warned, suggesting that Europe had been slow to respond to the issue: "While the IT skills shortage has been evolving as a market problem for the last three years in many markets.. little has been done to develop a genuine solution. Only now, as the demand for programmers, systems analysts and computer engineers outstrips the market supply, both customer firms and IT suppliers are realising the formidable task of competing in a human resource constrained market."[2]

EITO's conclusions were based on a significant research project in seventeen European countries (the EU member states, Norway and Switzerland) undertaken by the International Data Corporation (IDC) for Microsoft, the findings of which were published in September 1998. IDC estimated that there were 510,000 unfilled jobs in the technology sector at the end of 1998, the shortfall having been created by a serious shortage in trained and skilled professionals. It then extrapolated forward this finding for the following five years to produce a figure of 1.6m unfilled vacancies by 2002:

"The research anticipates that in-house IT departments in business will grow from 8.3 million personnel in 1997 to 12.2 million in 2002. While assuming current levels of investment in training are maintained, the available pool of trained personnel will rise at a modest 6% per annum. Even though IT buyers intend to use external service providers to handle some of their needs, IDC/Microsoft still estimate the shortfall in available skilled IT professionals to be as high as 1.6 million by the year 2002".[3]

IDC's 1.6m figure for the forthcoming European IT skills shortage has been widely quoted (not least in the EITO and *Strategy for Jobs* reports). In fact, IDC has since updated its research, and now suggests that the IT shortfall could reach 1.7 million by 2003. According to its latest figures, demand for IT skills is expected to grow from 9.47m jobs in 1999 to 13.07m jobs in 2003; the supply of IT professionals will grow from 8.61m people to 11.33m people over the same period. In other words, as IDC's table below graphically demonstrates, the skills gap is set to get worse.[4]



IDC's research remains the most important quantitative attempt to analyse this issue, and we shall return to its findings again in this report. Nevertheless, three initial qualifications are in order.

Firstly, we need to bear in mind that talk of an IT skills shortage is not new. As four academic writers have pointed out, the issue was first raised in the early days of the IT industry: "The problem of IT skills shortage was identified over 30 years ago when the embryonic computer industry realised that it had to educate its customers in how to use its products and that there were no teachers or trainers available with the skills to do so."[5] The writers remark on the curious parallel between a United Kingdom government initiative to tackle the IT skills gap launched in November 1999 and the establishment of a Skills Shortage Committee in the UK in the early

1980s.

A second point to bear in mind is that headline figures such as those from IDC quoted above inevitably hide a more complex reality. We shall explore this point in some detail below.

Finally, the IT skills gap is not a uniquely European phenomenon. Whilst the European Commission is right to be concerned about the effects of the shortage of IT professionals, this is perhaps one aspect of the new economy where Europe is not necessarily at a disadvantage to the United States.

THE SKILLS SHORTAGE IS A GLOBAL PROBLEM

The OECD's 1999 report *The Economic and Social Impact of Electronic Commerce – Preliminary Findings and Research Agenda* included a short review of the evidence for an IT skills shortage from around the world, using a number of sources. It suggested for example that some developing countries may soon experience a shortage of IT skills:

"India has a work force of approximately 160,000 high-skilled software professionals (1996-7). Although it supplies graduates at a pace of about 55,000 a year, this may be insufficient to keep pace with a software industry that is growing at over 40 per cent a year.

"In other countries, local IT development strategies can cre-

ate skill shortages… Malaysian universities are producing less than 6,000 IT engineers a year for an estimated annual demand of 10,000."[6]

However, as the OECD report pointed out, most focus to date has been on the situation in the United States where some have said that there is a 'critical shortage' of qualified IT personnel.

The skills gap was the focus of a survey of medium-sized and large US companies carried out in 1997 by the Information Technology Association of America (ITAA), and a more extensive survey also by the ITAA carried out a year later. This second report concluded that there were about 346,000 unfilled IT jobs in the US at that time.[7]

A more thorough survey of the situation in the US is contained in the lengthy report The Digital Work Force, published by the US Department of Commerce's Office of Technology Policy in 2000.[8] This comes up with predictions not very different from those of IDC for Europe:

"The number of core IT workers is projected to grow dramatically between 1996 and 2006. The Office of Technology Policy's analysis of the Bureau of Labor Statistics' growth projections for this period shows that the number of core IT workers – computer scientists, computer engineers, systems analysts and computer programmers – will grow from 1.5 million in 1996 to 2.6 million in 2006, an increase of 1.1 million. In addition, another 244,000 workers will be needed to replace those exiting these professions.

"Thus, during this period, the United States will require more than 1.3 million new highly skilled IT workers in these occupations – an average of about 137,800 per year – to fill newly created jobs (1,134,000) and to replace workers who are leaving these fields (244,000)."

The report points out that IT occupations have the fastest projected growth rates: computer scientists up by 118% over this period, computer engineers by 109% and systems analysts by 103%. By contrast , the growth rate for all occupations is only 14%.[9]

THERE IS NO ONE SINGLE 'IT JOB'

In analysing these predictions, however, the Office of Technology Policy makes an important observation. It points out that the concept of an 'IT worker' is a very loose one, to some extent dependent on who you ask. If predictions of IT skills gaps are to be meaningful – either in the US and European contexts – it is clearly essential to ensure that we know exactly what we are talking about. We should also be aware that an overall shortage of IT workers does not mean that every worker with IT skills is in a seller's market. The skills gap can mask quite substantial *overcapacity* in some areas of IT.

This is a point which Ulrich Klotz has made forcefully in his writings on the new economy: "For the layman it is nearly

impossible to comprehend the wide spectrum of different qualification profiles often covered by one and the same job title. The situation in software development provides an illustrative example: those who learned the 'tools' of the trade in the early days of computing (programming languages such as FORTRAN, COBOL or even Assembler) can nowadays hardly communicate with someone using today's tools such as Smalltalk, Java or XML… Similar statements apply to the depth of qualifications. People who take a course over several weeks to retrain as programmers refer to themselves as software developers just the same as information science graduates who have spent years learning the architecture and design of complex algorithms… This is not unlike lumping together gas station attendants and car designers because of their shared 'mastery' of the same type of vehicle."[10]

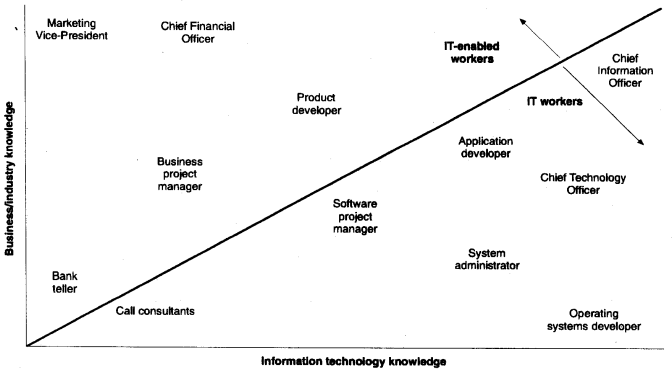
In other words, we can only make meaningful sense of predictions of an IT skills gap if we look much more closely at the exact nature of the jobs under consideration. One problem here is that official labour force statistics have not necessarily changed to reflect the new 'Information Society occupations' referred to in the European Commission's *Strategies for Jobs*. International comparison is also difficult, because of different classifications in Europe and the US.

The OECD's 1999 e-commerce report has suggested that ICT-related occupations can be found in the following official occupational categories.[11]

For EU countries (ISCO 88)	*For the US (US Standard Occupational Classification)*
ICT-related occupations 213 Computing professionals 311 Physical and engineering science technicians 312 Computer associate professionals 313 Optical and electronic equipment operators	**ICT-related occupations** 22126 Electrical and electronics engineers 25197 Computer engineers, scientists and systems analysts 35101 Engineering technicians 34028 Broadcast technicians 25109 Computer programmers 25111 Programmers, numerical, tool and process control 57100 Communications equipment operators 56100 Computer operators and peripheral equipment operators
Information-related workers 411 Secretaries and keyboard-operating clerks 412 Numerical clerks 413 Material-recording and transport clerks 414 Library, mail and related clerks 419 Other office clerks 421 Cashiers, tellers, and related clerks 341 Finance and sales associate professionals 342 Business services agents and trade brokers 343 Administrative associate professionals	**Information-related workers** 55700 Information clerks 59900 Other clerical and administrative support work 57323 Mail clerks and messengers 53200 Records-processing occupations (This category includes brokerage clerks, correspondence clerks, file clerks, financial records processing occupations)
Commerce-related occupations 522 Shop, staff and market salespersons and demonstrators	**Commerce-related occupations** 40000 Marketing and sales occupations

It will be seen immediately that traditional classifications like these, based to a large extent on job titles, do not necessarily help us very much. But an exercise like this brings up another, broader, problem. Increasingly IT-based workers are to be found not only in the ICT industries themselves, but in other sectors – in banking and financial services, in retailing, in publishing, in manufacturing, even to a limited extent in agriculture. As *Strategies for Jobs* points out, "The real job potential due to the dynamics of the Information Society and its new challenges to existing jobs exceed the ICT- sector proper, as already more and more sectors of the economy

incorporate IT applications and services."



One way of representing this is offered by the diagram above, which is taken from a 1999 report for the US Computing Research Association. As the authors Peter Freeman and William Aspray explain, "Each IT-related occupation is located at a single point on the graph. As one moves from left to right, the occupations require increasing amounts of IT knowledge. As one moves from bottom to top, the occupations require increasing amounts of domain knowledge (knowledge of business practice, industry practice, technical practice or other kinds of knowledge particular to an application domain). The diagonal line separates the IT-related occupations into two classes, depending on whether IT knowledge or domain knowledge is more important. If more than half the value provided by a worker involves his or her IT knowledge, then this person is considered to be an *IT worker*. If the person's occupation involves the use of information technology

but it adds less than half the added value to the work, then we regard the person as an *IT-enabled worker*."[12]

This seems a helpful approach to follow, not least because it prevents the anomaly of defining caretakers or office cleaners at IBM or Microsoft as IT workers!

The authors then go on to look at ways of categorising those people identified as *IT workers*. Here they suggest an approach which, rather than looking at job titles, instead focuses on what people actually do. They suggest four categories: conceptualisers, developers, modifiers/extenders and supporters/tenders. They suggest that such a classification works reasonably well for all kinds of IT workers in all sectors, and offer some examples (see table below):

Categorisation of IT jobs	
Conceptualisers: those who conceive of and sketch out the basic nature of a computer system artifact: *Entrepreneur* *Product designer* *Research engineer* *Systems analyst* *Computer science researcher* *Requirements analyst* *System architect*	**Modifiers/extenders**: thos who modify or add on to an information technology artifact: *Maintenance programmer* *Programmer* *Software engineer* *Computer engineer* *Database administrator*
Developers: those who work on specifying, designing, constructing, and testing an information technology artifact: *System designer* *Programmer* *Software engineer* *Tester* *Computer engineer* *Microprocessor designer* *Chip designer*	**Supporters/Tenders**: those who deliver, install, operate, maintain or repair an information technology artifact: *System consultant* *Customer support specialist* *Help desk specialist* *Hardware maintenance specialist* *Network installer* *Network administrator*

Different levels of educational preparation are appropriate for the different categories, the authors suggest. 'Conceptualisers', for example, are likely to have masters degrees and doctorates; by contrast, 'supporters/tenders' are more likely to have technical qualifications and may or may not have a first degree. We shall return to this point later.

THE IDC EUROPE STUDY

Having made this detour across the Atlantic, it is time to return to the key IDC research into the European IT skills shortage. The IDC authors also face the task of trying to categorise different types of IT worker. Their solution, however, is to focus on the *type* of technology which is being designed, implemented, supported or managed by IT workers. They distinguish five categories:

✍ Internetworking environments

Work based on the 'plumbing' of the Internet, what is called by IDC 'internetworking technology'. IDC points out that the Internet, and the underlying Internet Protocol (IP), is becoming the de facto IT platform underpinning business processes.

✍ Technology Neutral Environments

Work which integrates IT processes with more general business processes. Technology-neutral professionals are described by IDC as those who view IT processes and business processes in the same light.

✍ Host-based

Work focused around large servers

✍ Distributed

Work focused around client/server infrastructures

✍ Applications

Work centred on software applications

Within the overall IT industry, IDC suggests that it is in the first two categories that major problems associated with skills shortages will be manifested by 2003. For the three remaining categories, the situation is rather different, with demand here growing at a relatively low rate. Demand for skills associated with traditional mainframe and large servers is hardly anticipated to grow at all, for example. (A reminder that these figures are for EU 15, plus Norway and Switzerland).

Source: IDC

	1998	2000	2003
Internetworking:			
demand	655,593	974,006	1,747,174
% shortage	14%	23%	33%
Tech neutral:			
demand	497,688	739,317	1,693,990
% shortage	5%	9%	14%
Host-based:			
demand	451,806	453,137	479,869
% shortage	3%	3%	3%
Distributed:			
demand	2,407,849	2,783,923	3,068,852
% shortage	5%	10%	10%
Applications:			
demand	4,758,645	5,470,203	6,081,452
% shortage	4%	12%	10%

In other words, whilst numerically more workers will be required in the applications (software) and distributed (client/server) areas, the largest skills gap will be found in the 'internetworking environment'. IDC comments: "Demand for skills centred around communications technology will be widespread. Smaller organisations will need to Internet-enable many of their selling processes in order to be considered as a supplier by larger companies."[13]

The IDC study also looks in detail at the likely IT skills gap in each of the seventeen European countries under review. It suggests that the size of the gap is likely to vary, in some cases quite considerably, between countries.

Total projected IT skills shortage, 2003

Source: IDC

Country	*shortage*	*%*
Austria	85,013	18%
Belgium	72,932	13%
Denmark	24,679	17%
Finland	21,314	13%
France	223,709	11%
Germany	404,951	15%
Greece	2,005	11%
Ireland	9,881	14%
Italy	167,439	13%
Luxembourg	967	9%
Netherlands	118,882	12%
Norway	22,969	13%
Portugal	21,913	10%
Spain	101,011	13%
Sweden	67,092	12%
Switzerland	65,898	14%
UK	329,573	14%
Total W Europe	*1.74m*	*13%*

IDC concludes, "The widening skills shortage in Western Europe threatens to increase the costs of production due to higher salaries, deferred projects, lower productivity, an increase in outsourcing and the use of offshore resources to supplement local resources".[14]

THE DATAMONITOR STUDY

IDC's predictions form the basis of a further study, this time undertaken by Datamonitor, which attempts to quantify the *economic impact* of the IT skills gap. The study, published in 2000, focuses on three areas: the effect on GDP, tax revenues and wage revenues; the effect on small and medium-sized companies (SMEs); and the effect on e-commerce.

Among its findings are the following:

- Western Europe is set to lose €380 bn from the IT skills gap over the next three years, resulting in reduced competitiveness in global markets

- Central and northern regions of western Europe will be more affected than the south

- In total, €100 bn less in wages will be paid over the next three years than would otherwise have been the case

- Governments, public sector organisations and the not-for-profit voluntary sector are most likely to be squeezed out in the search for IT staff

✍ High-speed transformation of enterprises through e-business will result in redundancy of old skills and a bottle-neck of new skills

✍ Net employment gains associated with new technologies will more than make up for labour losses

✍ Many SMEs will be priced out of the market for IT workers, depriving them of the backbone they need to take advantage of e-business solutions

✍ There is no 'magic bullet' solution to the IT skills gap [15]

Datamonitor goes on to make a number of recommendations to help alleviate the skills shortage: "The answer lies in undertaking a wide range of initiatives, both large and small. Companies, universities and governments need to take steps to increase Western Europe's supply of adequately trained IT workers."

CAUSES OF THE SKILLS GAP

Before we look in more detail at possible responses to the skills shortage, however, it is worth considering briefly *why* the current situation has arisen – after all, if we have some analysis of the cause of the problem, it may be easier to identify the best ways forward.

In one respect this question is easy to answer – clearly, as we move towards the Information Society and a new economy

based on digitisation and electronic communication, there will be a rapid increase in the demand for IT-based jobs.

As the US Office of Technology Policy has put it, "The ubiquity of IT can be seen almost everywhere: in the shift of business's equipment investment into information technologies, in the unprecedented emergence of the web as a venue for commerce and communication, and in the proliferation of computers in businesses and homes to name a few. As a result, demand for highly-skilled IT workers leads all other occupations and is expected to continue in the years ahead."[16]

It goes on, however, to finesse this analysis: "The variety and complexity of software and hardware products and their applications, together with the unique requirements of each industry, have created 'spot' demand for workers with unique combinations of IT skills, experience and industry knowledge – expressed often by the employers as needing "the right person, with the right skill at the right time". .. Thus while there is a need to address the growing demand for highly-skilled IT workers, there is the additional challenge of meeting the unique demands of this niche labor market."

The Office of Technology Policy position outlined here probably sums up the standard industry view, which effectively adopts a technological determinist position.

UNI, however, has developed a somewhat different analysis. In the UNI-Europa response to the European Commission's *eEurope* report, it criticises the IT industry for being, at least in part, the author of its own difficulties:

"UNI-Europa maintains that it is the key companies in the ICT industry which were largely responsible for creating this skills shortage of which they now complain. In the first half of the 1990s, the ICT sector suffered a series of devastating re-structuring programmes, which saw thousands of highly skilled ICT specialists made redundant or outsourced into quasi self-employment. The experience of a generation of workers was treated with disdain as companies sought to cut their costs by employing younger, less experienced staff who were paid less (and frequently asked to work long hours).

"If there is indeed today unfulfilled demand for highly qualified workers, part of the explanation could be because the industry failed to adopt a longer-term staffing strategy ten years ago, chasing short-term profits at the expense of long-term development."[17]

UNI goes on to point out that in a number of European countries, substantial numbers of IT specialists - especially those aged 50+ - are registered as unemployed. There needs to be more efforts taken to retain older employees in the workforce, UNI suggests.

RESPONSES TO THE SKILLS GAP
1 : THE DEMAND SIDE

By this stage, it should be apparent that, whilst there certainly appears to be a serious IT skills shortage in Europe, the background to the skills gap is more complicated than some people might suggest. Firstly, the skills gap is a global

phenomenon. Secondly, there are quite acute problems of identifying who is, and who is not, an IT worker, so that any statistics which are produced need to be interpreted quite carefully. Thirdly, overall figures for an IT skills gap hide some quite wide variations, with some IT-related fields experiencing much more acute labour shortages than others. Finally, the skills shortage is not necessarily simply an inevitable consequence of technological development. Assessing the possible responses to the IT skills shortage, therefore, means taking these factors into account and eschewing an overly simplistic approach.

There are, of course, two sides to the skills shortage question – the demand side and the supply side. Most attention is normally focused on the latter – in other words, discussing how to increase the number of people with IT skills in the labour market. There are good reasons for this, not least given that much of Europe is experiencing unacceptably high levels of unemployment.

Nevertheless, the demand side should not be forgotten. Ulrich Klotz suggests companies are effectively coping with the IT skills shortage by reducing their demand – or, put another way, are withdrawing from work which they would otherwise have taken on. This is holding back the overall development of the economy. "It is becoming increasingly common for companies to turn down orders – in some cases large orders – because they lack the required IT experts. In other words, if IT specialists could be found, unemployment could also be reduced in many other occupations and industries."[18]

Companies can also reduce demand by outsourcing IT work offshore. The remarkable growth of the Indian software industry is the most notable example of this phenomenon. The industry has grown from a total turnover of $558m in 1993-4 to $3.82 bn in 1998-9 and an estimated $6 bn in 1999-2000. This represents a growth rate of over 50% a year over the last five or six years. [19]

One reason for this growth is the fact that India offers a supply of trained software professionals, working for wages much lower than those in the US and western Europe. 1998 figures collected in India and reproduced by the OECD show just how marked these differentials can be[20]:

	US (US$ p.a.)	*India (US$ p.a.)*
Help desk support technician	25,000-35,000	5,400-7,000
Programmer	32,500-39,000	2,200-2,900
Network administrator	36,000-55,000	15,700-19,200
Programmer analyst	39,000-50,000	5,400-7,000
Systems analyst	46,000-57,500	8,200-10,700
Database administrator	54,000-67,500	15,700-19,200

The issue of migration of work and the so-called 'death of geography' as a feature of the emerging information age has been widely discussed elsewhere and is beyond the scope of this report. Suffice it to say, however, that the relocation of jobs from high-wage to low-wage areas of the world clearly raises profound and disturbing issues for trade union organisations and members.

RESPONSES TO THE SKILLS GAP
2: THE ISSUE OF MIGRATION

Turning from the demand to the supply side, one possible response to the IT skills gap in the western economies is effectively the mirror-image of the offshore outsourcing approach. This is to increase the numbers of skilled IT professionals in the home market by allowing suitably trained migrant workers to enter to find work.

This is an approach which a number of western governments have been adopting in recent years. In the US, the issue focuses on the issuing of H-1B visas, the visas which allow skilled foreign workers to work in the United States for up to six years.

Prior to 1998, the number of H-1B visas was capped at 65,000 workers a year. Before 1995, only about a quarter of these people were in IT-related fields. However, increasingly the IT sector has been making more use of the visas, and largely as a consequence the annual H-1B cap was reached in August in 1997 and in May in 1998. In 1999, it was agreed to increase the number of visas to 115,00, and plans are now in motion to increase this again next year to 195,000.

The issue of H-1B visas has been controversial, however. The Office of Technology Policy report runs through the arguments on both sides.

"The IT industry led a major effort to increase the H-1B visa

cap. They argued that:

✍ The IT industry needs more skilled foreign workers to help meet skill shortages

✍ An ability to find workers has limited growth in the IT industry, and other parts of the economy that need IT workers

✍ The IT industry needs an international workforce to meet the needs of international markets

✍ The IT industry needs to be able to attract the best and brightest workers from around the world, and

✍ The alternative to bringing foreign workers to the United States is to move work overseas.

"Groups that represent US scientists, engineers, and other technical workers have opposed expansion of the H-1B program, arguing that:

✍ There are Americans who can do the work, but industry wants lower cost labor

✍ The availability of H-1B workers reduces the incentive for employers to hire older US unemployed and underemployed engineers or to actively recruit women and underrepresented minorities

✍ H-1B workers cause wages in IT occupations to be lower than they would otherwise be, reducing the incentive for US residents to enter or stay in these occupations; thus immigration can create a self-perpetuating demand for more immigration

✍ The H-1B programme has been abused by firms, which have brought in foreign workers to work at less than the prevailing US wages"[21]

Something of a similar argument has been going on in Europe, where the issue of 'green cards' has attracted considerable popular interest, for example in Germany and Britain. Britain announced in September this year that it is relaxing its rules on work permits for foreign (non-EU) workers, as a deliberate policy to meet skills shortages in the country.[22]

The UNI-Europa IBITS sector committee meeting, held in September 2000, opposed the use of migrant labour as the solution to the IT skills shortage. Whilst acknowledging that 'green cards' might be inevitable as an immediate and short-term measure, UNI stressed that the following conditions should apply:

✍ Actual demand for non-EU IT professionals has to be proven and work permits must only be issued for qualifications not available on the domestic labour market

✍ Employers and governments must respect their obligation to provide education and training as the principle way to overcome the shortage of IT skills

✍ Priority must be given to IT training measures for women, older employees, and the unemployed

✍ The same terms and conditions as those of the domestic market must apply for immigrants (ie there must be no downward pressure or 'social dumping')

✍ Employee representatives and trade unions must be involved in the procedure to grant work permits

✍ The migration of IT professionals must not lead to a brain drain in their countries of origin

✍ Immigrants must be given a future for themselves and their families in the host country[23]

The challenge for UNI-Europa, at a time when right-wing xenophobia and anti-immigrant feeling is growing in Europe, is to ensure that this position is not misunderstood as support for a 'Fortress Europe' approach to the rest of the world.

RESPONSES TO THE SKILLS GAP 3: AGE AND GENDER ISSUES

As we saw above, UNI-Europa's response to the *eEurope* report includes a critique of the way in which older IT workers were driven out of the industry in the drastic restructuring processes of the 1990s. Many older workers with IT skills are either currently unemployed or are taking early retirement.

UNI-Europa strongly criticises this waste of skilled talent: "It is not acceptable for experienced, capable workers in their fifties, or their forties, or even (hard to believe, but sometimes true) in their thirties to be told that they are too old for the new jobs. This is wasteful not only in economic terms, but in human terms."[24]

One problem is that companies in the IT industry have been more inclined to recruit new workers with the required skills rather than to ensure that their current workers are adequately retrained with those skills. As one journalist has commented, "The vast majority of companies do little to train people to fill IT positions or reassign senior people – they treat filling IT jobs like buying PCs, looking to fill a specific spec sheet for the lowest price."[25]

Put another way, a worker with yesterday's IT skills is seen as redundant as yesterday's IT hardware – to be simply discarded.

The picture may however no longer be quite as grim as this would suggest. Drawing on the experience in Germany, Ulrich Klotz suggests that the idea of a 'youth cult' in the IT industry may be something of a myth. He writes that: "Among IT specialists, the fastest growing age brackets are '35 to 49' and 'over 50'. Of course this could be merely a symptom of the shortage of new talent and/or a consequence of the increasing proportion of self-employment, but similar trends can be seen almost everywhere in industrial research and development centres. Everywhere it is evident that increasingly complex technology tasks call for ever-broader qualifications

and more and more knowledge based on experience."[26]

If there is an issue of age to consider, there is certainly also a gender issue. UNI-Europa points out that only around 20% of employees in the ICT sector are women, a lower proportion than in other parts of the world.[27]

The European Commission's *Strategies for Jobs* document accepts that there is a gender imbalance, and goes on to say that women need to be encouraged to enter the new Information Society professions. It is however short on concrete suggestions. Once again, UNI-Europa offers an analysis of why the current situation has arisen: "The ICT industry unfortunately does not always project an image attractive to younger women, particularly the prevailing 'long hours culture'. Pressure is often put on people either by management or their peers to work long hours in order to be seen to be productive and 'part of the team'. This discriminates against people with family responsibilities…"[28]

RESPONSES TO THE SKILLS GAP
4: THE NEED FOR TRAINING

The idea of lifelong learning and training has strategic importance if Europe is successfully going to make its way forward into the Information Society.

There are two challenges in ensuring an adequately IT-literate workforce. The first is that of ensuring that today's young people have the education and training they will need for work

in an information age. This means ensuring that appropriate skills are taught in schools and colleges, and that Europe's schoolchildren have adequate access to IT hardware and software and to the Internet.

The second challenge is of particular relevance to this report: it is of ensuring at a time of rapid technological change that all members of the workforce have the opportunity to constantly update their skills.

The European Commission's *Strategies for Jobs* recognises that both approaches will play their role in bridging the current IT skills gap "The strong demand for third level/university Information Society specialists currently outstrips the supply of suitably qualified persons. Universities need to forge new partnerships with industry to ensure that courses deliver the skills needed in industry…

"A shorter-term approach to closing the skills gap is the training of non-Information Society graduates (short conversion courses) in Information Society subjects.

"Other Information Society specialists (2nd level education) are also in short supply… School leavers, older workers and the unemployed could avail of many of these courses, particularly as the job uptake is high."

Earlier in this report we looked at the US authors Peter Freeman and William Aspray's categorisation of IT workers into four groups (conceptualisers, developers, modifiers/extenders and supporters/tenders), based on the actual work per-

formed. Freeman and Aspray suggest that different levels of educational preparation are appropriate for the different categories.

Adapting their work from the US to the European educational system, it may be possible to suggest that the typical educational preparation for IT jobs in each of their four categories is likely to be as follows. (Examples of each category were given earlier):

	High school	Higher technical education	First degree	Masters degree	Doctorate
Conceptualisers	o	o	c	F	F
Developers	-	-	c	c	o
Modifiers	-	o	c	c	o
Supporters	o	F	c	-	-

Key: unlikely (-), occasional (o), common (c), frequent (F)[29]

From this it is clear that an adequate response to the need to prepare young people for work in the Information Society will involve action at both secondary and tertiary education level. In fact, *Strategies for Jobs* acknowledges this, in the two formal recommendations it makes to member states[30]:

Recommendation	*Timing*	*Indicators*
Increase capacity and uptake in 3rd level education, maintaining gender balance and matching industry requirements	End 2003	1) Number of 3rd [level] Information Society course places 2) Proportion of women to men in Information Society education
Promote IT courses at 2nd level including the use of industry certified training schemes	From 2000	Number of 2nd level training places

Strategies for Jobs has rather less to say about the need to ensure that today's workers receive adequate retraining opportunities to cope with changes in technology and the changing nature of work. UNI-Europa has however made a number of detailed suggestions in its response to *eEurope*:

✍ Developing a European-wide training scheme for the ICT sector for skilling and re-skilling of employees, aimed in particular at providing funding to employers who may lack their own resources.

✍ Establishing a 'talent bank' – a multi-employer European-wide electronic clearing house to match skills no longer needed by one employer with skills needed elsewhere

✍ Expanding the pool of employees from non-traditional areas available to the ICT sector through skilling of unemployed people, women, older employees etc

✍ Creating a trans-European employer/trade union network to facilitate good practice in recruiting and retention of employees within the ICT sector

✍ Supporting research in order to identify future skill requirements and promote systems of skill certification and a pan-European ICT skill and qualification framework, such as the European Computer Driving Licence (ECDL)[31]

CONCLUSION

In summary, we can say that Europe is already facing the reality of a shortage of ICT professionals. IDC research suggests that the skills gap may grow to as much as 1.7m people by 2003. All the countries of western Europe are affected, though some to a greater extent than others. The shortage jeopardises the growth not only of the ICT sector but of the economy as a whole. The problem is not unique to Europe, however.

There are a wide variety of jobs within the ICT sector, and the skills gap does not affect all areas of expertise and knowledge equally. This means that we must recognise the complexity of the problem and look beyond unduly simplistic answers.

Training and re-training is at the heart of the way forward. Companies need to do more to ensure their existing staff have the opportunity of lifelong learning. Efforts must be made to encourage more women to take up jobs within the ICT sector.

It may be appropriate to conclude with UNI-Europa's action points to combat the IT skills shortage. UNI identifies five points:

✍ The ICT industry has to make substantial efforts to change its image and the perception of work in ICT. The common view is still of insecure jobs, high workload, pressure and stress, long hours, a highly competitive environment,

and no chance of employment for women and older professionals; the industry has to implement improved retention policies and enable a better work/life balance

✍ Industry, social partners and public authorities (primarily the education sector) have to do more both to attract young people and women into ICT and to retain older employees; young people have to be encouraged to take up studies in information technology, software engineering, etc

✍ Training and re-training in ICT has to be provided to the unemployed and those working in industrial or service areas which will become obsolete through industrial change

✍ The implementation of life-long learning will be the key to the Information Society. The European Commission, in co-operation with the social partners and national public authorities, has to solve the problem of how to realise this generally accepted principle in terms of methods, time available and pay

✍ The general climate for entrepreneurship has to improve. There is still too much red tape in place and capital necessary for start-ups is too difficult to raise. This must be changed, since most of the new jobs are being created in new companies.[32]

FOOTNOTES

[1] Strategies for Jobs in the Information Society, European Commission DG Employment & Social Affairs, 2000

[2] European Information Technology Observatory 1999

[3] IDC/Microsoft research shows 1.6m critical IT jobs unfilled in Europe by 2002 – 12% of the total requirement, Press release, 1998

[4] Europe's Growing IT Skills Crisis, IDC executive summary 2000

[5] The IT Skills Shortage, Benita Gibbons, Paul Wilkin, John Wright, Xing Zhang, City University, London, 1999

[6] The Economic and Social Impact of Electronic Commerce – Preliminary Findings and Research Agenda (annex 4.5: The 'skills shortage'), OECD, 1999

[7] Quoted in The Economic and Social Impact of Electronic Commerce – Preliminary Findings and Research Agenda, OECD, 1999

[8] The Digital Work Force, Building Infotech Skills at the Speed of Innovation, Office of Technology Policy, 2000

[9] ibid

[10] New Economy, part IV, Facts on the IT labour market, Ulrich

Klotz, IG Metall

[11] The Economic and Social Impact of Electronic Commerce – Preliminary Findings and Research Agenda,OECD, 1999

[12] The Supply of Information Technology Workers in the United States, Peter Freeman and William Aspray, Computing Research Association, 1999

[13] Europe's Growing IT Skills Crisis, IDC executive summary 2000

[14] ibid

[15] The economic impact of an IT skills gap in Western Europe, Datamonitor, 2000

[16] The Digital Work Force, Building Infotech Skills at the Speed of Innovation, Office of Technology Policy, 2000

[17] People First in *eEurope*: a UNI-Europa response to *eEurope: an Information Society for All*, UNI, 2000

[18] New Economy, part IV, Facts on the IT labour market, Ulrich Klotz, IG Metall

[19] Information Technology Outlook 2000, OECD

[20] ibid

[21] The Digital Work Force, Building Infotech Skills at the Speed of Innovation, Office of Technology Policy, 2000

[22] Rules on entry for foreign workers to be relaxed, Robert Taylor and Jimmy Burns, Financial Times, 29.9.00

[23] Employment in the European ICT sector and 'Green Cards', UNI-Europa statement, 2000

[24] People First in *eEurope*: a UNI-Europa response to *eEurope: an Information Society for All*, UNI, 2000

[25] Quoted in The Digital Work Force, Building Infotech Skills at the Speed of Innovation, Office of Technology Policy, 2000

[26] New Economy, part IV, Facts on the IT labour market, Ulrich Klotz, IG Metall

[27] People First in *eEurope*: a UNI-Europa response to *eEurope: an Information Society for All*, UNI, 2000

[28] ibid

[29] Source: The Supply of Information Technology Workers in the United States, Peter Freeman and William Aspray, Computing Research Association, 1999

[30] Strategies for Jobs in the Information Society, European Commission DG Employment & Social Affairs, 2000

[31] People First in *eEurope*: a UNI-Europa response to *eEurope: an Information Society for All*, UNI, 2000

[32] ibid