

The Internet Economy - An Employment Paradox

A Study into the Network Skills Shortage

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Concerns relating to the extent of IT skills shortage continue to escalate. The increasing need for communications, the Internet, electronic commerce and electronic business all confirm our dependency on networking and the sufficiency of networks. Consequently, the demand for network skilled workers continues to grow year on year at a rate which IDC predicts will significantly outstrip supply. The effects of this will be an ever increasing gap between the supply and demand of skilled workers. This is already leading to inflated salaries and increased turnover, thus raising operating costs and lowering profit for companies. Without a strategy for resolving the network skills shortage, individual countries and Europe as a whole will begin to suffer at the expense of other countries and regions which are already planning more strategically for the future, such as, for example, the US, which in October 1998 increased its allocation of green cards to professionals with IT qualifications and experience.

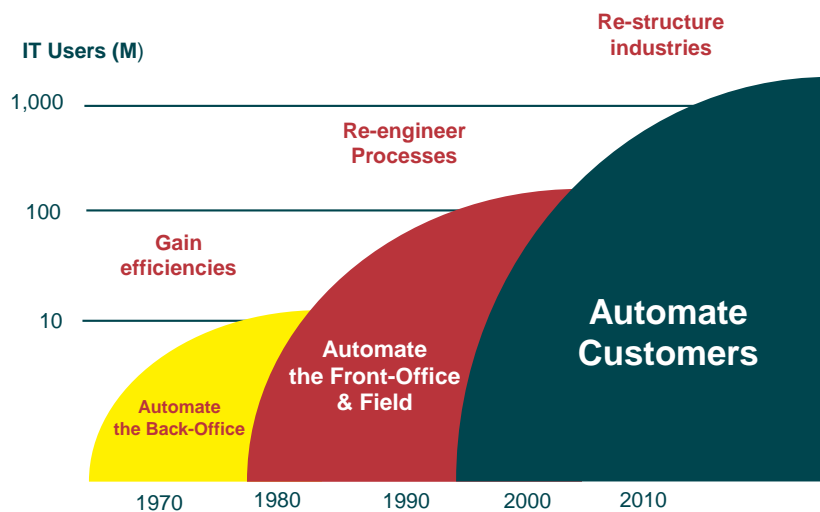
This paper discusses the indisputable rise in usage of IT, the increasingly pivotal role networking will play, the associated growth in demand for skilled professionals, and the likely consequences of not increasing the supply of these skilled professionals.

Exponential Growth in IT Users

There can be little doubt that the Internet is here to stay, and is already impacting numerous facets of everyday life. IDC forecasts that the creation of an Internet economy will result in an exponential growth in the numbers of IT users, from approximately 200 million in the mid-1990s to over one billion in less than fifteen years.

This dramatic growth reflects the changing nature of IT. Initially a tool to gain efficiencies when mainframes were used to automate back office functions, later, with the advent of PC technology, IT evolved to create opportunities for re-designing processes such as those of the front office which became subject to automation. Figure 1 below depicts the sequential waves of IT deployment and their impact on economies.

**Figure1
Towards an Internet Economy and One Billion IT Users**



Source: International Data Corporation, 1999

The third wave, brought about by the Internet, will enable the establishment of completely new businesses, and radical restructuring of existing business sectors, as easy access to new markets removes traditional barriers to entry. Re-structuring of industries will happen as organisations re-visit their core competencies or assets, and leverage these competencies and assets to enter other markets. For example Quelle, a leading mail order based retailer in Germany, launched banking services for its customers (Noris Bank) and has recently extended into provision of travel services as well.

Networking at the Core of the Third Wave

At the simplest level, networking involves hooking two computers together to share files. At the most complex level, it is the organic interconnection of millions of computers that form the Internet and allow universal access to electronic information, data, and interaction. This enables anyone, anywhere, anytime to individually use world-wide computing resources for communication, work, pleasure, adventure, and knowledge. In business terms it has resulted in the participation of a much greater number of enterprises in global commerce. Much like the role that modern telephony has played in creating international business activities and competition, networks have helped create global industries.

Innovation in communications technology is constantly expanding the scope of networking. Apart from the Internet, virtual private networks, distributed computing environments, and the distribution of software components are all exciting developments. The 'network' itself now encompasses wireless as well as terrestrial networks. As bandwidth challenges are addressed, exploitation of technology to enable the adoption of voice and image over data networks will further increase the importance of, and our dependency on, networking.

The future will see networks defined as the backbone of businesses; the concepts of organisational digital nervous systems are already taking root. With the proliferation of the Internet economy, and e-business becoming part of everyday life for an expanding proportion of the world's population, networks will become an essential part of contemporary human existence.

Investments in Technology

Businesses have been the traditional investors in IT, and when one considers the evolutionary trends in the use of IT as described earlier, typically large businesses have been using IT more intensively than smaller organisations. However, with the possibility of accessing customers and new markets being one of the more obvious attractions of the Internet economy, this situation is changing. Indeed, with assertive moves by organisations like DaimlerChrysler(DC), which has recently mandated that all its suppliers, no matter how large or small, must be capable of transacting with DC electronically, increased investment in IT is becoming a necessity rather than a luxury for smaller companies. IDC predicts that the largest growth in the use of IT will come from the small and medium sized business sectors. Indeed, IDC's annual Global IT survey indicates that small and medium sized companies are set to increase their spending on IT from 1.5% of annual

turnover to 4.5% by 2002, representing a three fold increase in the intensity of IT adoption in such a short time. At the same time, deployment of intranets and extranets will drive network intensive IT deployment by large organisations too.

IT Adoption's Dependency on Skills

For most people, adoption of IT begins with the acquisition of hardware and software components, and perhaps some custom development of applications. However, the important pieces that make a solution work are the skills necessary to design, implement and manage the IT environment. Depending on the size of the company, up to 60% of annual IT budgets are spent on skills, by way of salaries for employees working in the internal IT departments and services provided by professional firms. Without the appropriate skills, organisations would find it impossible to use IT.

Skill Shortages: The Difference Between Demand and Supply

So, where do all these IT skilled professionals come from? The most prolific source of human resources for the IT sector has been the network of universities and other institutions of higher education. Typically, IT departments within user organisations, and IT vendors and service providers, have taken in graduates, and invested in training, as needed, to create a resource pool which today we call the IT professional community. Birth rate patterns over the past decades dictate the increase or decrease in size of graduating levels.

Other less significant sources of human capital for the IT sector have included re-skilling from other industries (e.g. manufacturing industry workers retraining to provide installation services), and offshore resources (Eastern Europe and India in particular). The recessionary economic environment in the early 1990s saw a decrease in recruitment, by both user and vendor organisations; this has also contributed to an overall shortage today in qualified and experienced professionals.

Where growth trends in demand outpace the growth trends in supply, a gap forms. It is often easy to consider shortages in skills in the same manner as a gap between the demand and supply of specific skills; in fact these two concepts elicit completely different responses.

The most common reaction to a gap in appropriate skills is to re-train, typically resulting in incremental operational costs. In the case of sustained shortages, i.e. not enough in numbers of appropriately qualified or trained professionals, the action becomes more drastic, typically leading to evaluating outsourcing (which is a transfer of the problem of lack of skills to a service provider!). Other answers include using offshore resources or designing a solution that relies more on an infrastructure rather than a tailored solution, increasingly referred to as hosted applications or new bureau services.

IDC's Resourcing Analysis

As part of its continuous tracking of the IT Services industry, IDC reviews, on a quarterly basis, the level of demand for, and supply of

skilled professionals. From more than twelve thousand interviews with IS managers across Europe, the resource model translates IS spending intentions into the amount of work needed to be done in order to assimilate acquired technology.

IT work is segmented into activities that have to be performed during the planning, implementation, maintenance, management and training phases. For networking environments, these activities would include needs assessment, network design, configuration, capacity planning, optimisation, network monitoring, maintenance and management. This segmentation, along with trends in IT investments, is analysed by company size band for each country, to generate a picture of demand for skills over the years.

Validation of this demand profile is performed by investigating trends among 'intermediaries', typically recruitment agencies. IDC estimates that 40-70% of vacancies (depending on the country) are filled by these intermediaries, and trends in their activities provide valuable validation of the demand profile generated by IT spending patterns. During Q1 1999, IDC analysts researched vacancy and compensation level trends with at least 10 recruitment intermediaries in each of the main countries in Western Europe - results from these 120 interviews were used to substantiate and refine the projections.

The supply of resources was analysed and forecast by researching output levels in the network of universities and other educational establishments. During Q3 1998, IDC conducted a survey of the academic community in Western Europe. The survey sample consisted primarily of administrators with insights on intake trends, evolution of courses and the subsequent employment tracks of graduating students. This data was used to compile baseline trends in the supply of fresh professionals to the IT sector. In addition to data from the academic community, IDC also factored in a contribution (11% of new supply) from the re-skilling of workers from other industries, for example the defence and manufacturing sectors.

Europe's Networking Skill Pool

Based on the demand side methodology described above, IDC estimates the IT network workforce in Western Europe was represented by 657,000 professionals at the end of 1998. At a very conservative average growth rate of 26% per annum in demand for new workers, the workforce will need to comprise 1.6 million by the year 2002 – an increase of almost one million new workers. For the same review period, IDC's analysis of new professionals entering the market indicates a much lower growth of 16%. Both demand and supply can be further analysed into the logical skills of planning, implementation and management, as shown in Table 1 below.

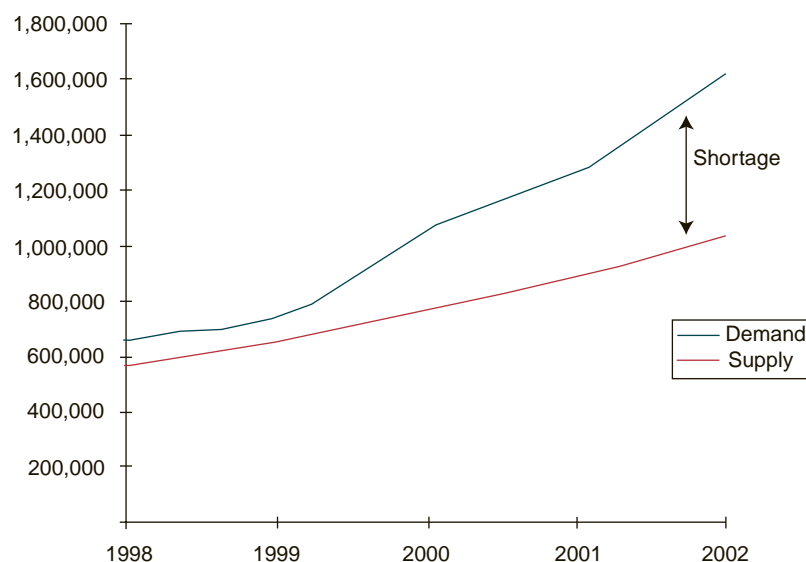
Table 1

| Networking Professionals - Demand and Supply Projections for Western Europe | | | | | | |
|---|--------|-------|------|--------|-------|------|
| Thousands, man years | Demand | | | Supply | | |
| | 1998 | 2002 | CAGR | 1998 | 2002 | CAGR |
| Planning and design | 61 | 346 | 54% | 53 | 97 | 17% |
| Implementation | 275 | 843 | 32% | 235 | 558 | 24% |
| Maintain and manage | 321 | 444 | 8% | 275 | 378 | 8% |
| Total | 657 | 1,633 | 26% | 563 | 1,033 | 16% |

Source: International Data Corporation, 1999

These projections suggest a shortfall of almost 600,000 employees by the year 2002, as illustrated in Figure 2 below.

Figure 2
Networking Skills in Europe – Trends in Demand and Supply



Source: International Data Corporation, 1999

The Shortages are a Problem for Each European Country

It is important to emphasize that the European shortage is very much a problem for each individual member country which it must tackle and resolve. IDC has forecast proportionate skill shortages in each of 17 countries as shown in Table 2 below.

Table 2

Networking Skills – Demand and Supply in 2002, by Country

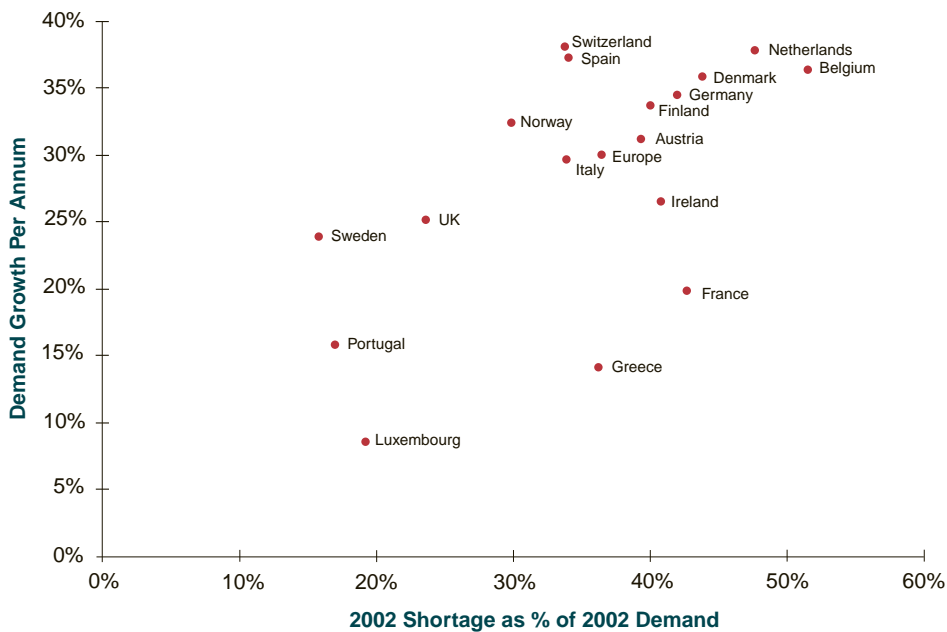
| 2002 | Demand | Supply | Shortage |
|-----------------------|------------------|------------------|----------------|
| Austria | 74,088 | 44,970 | 29,118 |
| Belgium | 67,382 | 32,714 | 34,668 |
| Denmark | 19,804 | 11,134 | 8,670 |
| Finland | 20,577 | 12,344 | 8,233 |
| France | 156,204 | 89,215 | 66,989 |
| Germany | 449,737 | 261,512 | 188,225 |
| Greece | 2,382 | 1,518 | 864 |
| Ireland | 8,567 | 5,074 | 3,493 |
| Italy | 155,387 | 96,640 | 58,747 |
| Luxembourg | 1,469 | 1,185 | 284 |
| Netherlands | 121,637 | 63,634 | 58,003 |
| Norway | 15,414 | 10,813 | 4,601 |
| Portugal | 12,572 | 10,443 | 2,129 |
| Spain | 76,791 | 50,719 | 26,072 |
| Sweden | 44,419 | 37,408 | 7,011 |
| Switzerland | 59,823 | 39,595 | 20,228 |
| United Kingdom | 346,270 | 264,502 | 81,768 |
| Western Europe | 1,632,522 | 1,033,420 | 599,102 |

Source: International Data Corporation, 1999

While the data should raise concern across all countries in the region, further analysis suggests that the urgency of the situation is more alarming in some countries. Two factors stand out as the most critical when evaluating the relative positioning of countries. Annual growth rates of demand are a good indicator of the opportunity for employment (or problem, if skills are in short supply), as is the gap between demand and supply, expressed as a proportion of demand. In Figure 2 below, we have shown the growth in demand along the Y axis and the 2002 gap between demand and supply, expressed as a proportion of demand, along the X axis.

Countries positioned in the upper right hand corner need to pay particularly urgent attention to their networking skill pool. Factors contributing to this situation include current shortages, relatively higher networking adoption rates, and a relatively inflexible skill pool.

Figure 3
Country Perspective of the Networking Skills Issue



Source: International Data Corporation, 1999

The Consequences of the Shortage are Substantial

Throughout the different stages of IT development, those countries with the greatest level of appropriately skilled workers have reaped the economic benefits. Now in an increasingly global electronic marketplace, the physical location of a company has become less of a market differentiator or competitive advantage. However, companies are more likely to locate in areas in which a skilled workforce is readily available.

- Insufficient numbers of trained workers will cause Europe to fall behind other regions in the adoption of IT. This will prevent the leveraging of information technology as quickly or successfully as in other regions such as Asia and North America.

- It is the primary European economic engine – the under 100-person enterprises - that will be most severely impacted by this shortfall. These firms classically rely heavily on the academic institutions for the creation of new skilled employees. They do not have the resources of the larger firms to bring in training companies and consultants to help upgrade the skills of employees, nor can they make the time or money available so that their employees can go on courses.
- A shortage of networking skills will impact the growth of communications, Internet, electronic commerce and electronic business.
- The shortage of skilled labour will increase each year and this will slow economic growth.
- The increasing shortfall will inflate salaries and increase staff turnover thus raising operating costs and lowering profits.
- As the network market grows much of the work will be done by non-western European workers. Many of these workers will come from America, India, and Asia.
- New workers coming out of European schools wanting to compete for higher paying jobs in this market will be disadvantaged. They will need to have networking skills.
- The current and increasing shortage of workers with network knowledge and skill in Western Europe is already causing salary escalation, increased staff turnover, missed business opportunities, and reduced revenue. A concern expressed by numerous companies and agencies is that work, and revenue, will go to the country with the best-skilled workforce.

Acute Need for Formal Education and Training Programmes

IDC's projections in this paper are a conservative forecast based on IT spending growth and an optimistic assumption that the current education systems will produce graduates at approximately four percent of the workforce. Based on a worst case scenario of decreased birth rates, higher than forecast attrition due to early retirement, increased job turnover, changes to part-time working directives, uptake of leave (e.g. for maternity or education), the results will be an unmanageable shortage of both skills and workforce in the European region.

Individual country ministries, agencies, and companies must therefore accelerate partnerships with industry and academic institutions to promote learning.

Software and computer companies such as Microsoft, Novell, SAP, Oracle, Sun Microsystems, and Cisco Systems are intensely interested in increasing the supply of competent workers that can assess, plan, configure, integrate, and deploy products and services effectively and efficiently with exceptionally high levels of customer satisfaction. Much of the knowledge and skill required is only attainable through a formal education. Companies cannot effectively compete using local labour if the basic knowledge and skills are not present.

Certification Becomes a Necessity

One of the most significant consequences of a proliferation of, and dependency on, networks is that the recruitment of networking professionals will be undertaken by mainstream managers. Businesses are asking their employment departments and their agency partners to provide a workforce that is knowledgeable and skilled, but how do you know if someone is really knowledgeable or skilled? One of the ways is to accept that “certification” ensures that the candidate is competent.

Credible certification does indeed assure technical competency – not necessarily a great employee, but at least a technically competent one. The need to have reliable means of assessing applicants’ capabilities will become critical and like the more mature professions of medicine, accountancy and law, networking practitioners too will be arming themselves with certification as a mandatory part of their professional armoury.

An Industry - Government & Academic Partnering Solution

Industry, including several of the companies mentioned earlier, has established relationships with governments and academic institutions to foster the availability and delivery of training that will give students the knowledge and skills they need. However, if graduates do not acquire the appropriate skills, IT / IS employers will:

- need to invest in additional training for new employees
- be forced to pay higher wages for those who do have the necessary skills
- need to be very willing to work with local ministries and academic institutions to help increase the flow of trained graduates at all levels.

Where education ministries and academic institutions have partnered with industry in constructing a curriculum that supports the skill needs of the local job economy, there has been considerable beneficial effect. Countries such as France, Germany, Italy, and the United Kingdom have long had strong partnerships between industry, labour, government, and the academic sector. These partnerships, in general, are helpful. The great difficulty is that they are just not big enough in scope to reduce the skills gap. Industry, labour, government, and academia must implement much broader and larger partnerships in order to meet the skill requirements of the 21st. century.

Conclusions

- Networking skills are now central to IT. Communications, the Internet, electronic commerce, and electronic business are entirely dependent on networking and the sufficiency of networks.
- There is not currently a successful strategy in Western Europe to meet the growing demand for skilled labour, especially in the networking field.
- The shortfall in skilled personnel will increase each year, and can only be influenced by either training more workers, or importing qualified professionals from other regions.

- In addition to the traditional source of annual graduating classes, migration of workers from other industries such as defence and manufacturing will contribute to the pool of new supply of professionals. Additional training for university graduates, and re-training for transitioning workers will require planning and investment.
- The increasing shortage will inflate salaries and increase staff turnover, thus raising operating costs and lowering profit for companies, reducing the job openings for citizens, eliminating much tax revenue for the country, and causing the economy of countries in Western Europe to suffer at the expense of other countries that have addressed the IT skills shortage challenge.
- Left unaddressed, the skills shortage in the IT sector will have a detrimental effect on the growth of the Western European countries, as companies fail to exploit the best available information and communication technologies to improve their competitiveness.
- Looked at positively, effective action to boost the supply of skilled professionals can be a significant contributor to the growth in the region's prosperity - US Federal Reserve officials include this factor in their analysis of the continued well-being of the US economy in the global marketplace.
- Action must be initiated in 1999 in order to capture the opportunities, and divert a potential crisis. Workers must be educated, which requires time.



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