

THE END IS NIGH
1996 IT SKILLS TREND REPORT

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for the

**IDPM - THE INSTITUTE FOR THE
MANGEMENT OF INFORMATION SYSTEMS**

and the

COMPUTER WEEKLY 500 CLUB

“There are three kinds of lies: lies, damn lies and statistics”

- **Disraeli (attributed to Mark Twain)**

“A forecast is a pretence of knowing what would have happened if what does happen, hadn't” - **Avon**

The IT Skills Trends Reports are produced rapidly in order to be both timely and useful. Although previous reports in the series have built an impressive reputation for the accuracy of analysis and prediction, the speed of preparation and issue and the nature of forecasting entail a significant risk of error. Whilst IDPM has tried to ensure the accuracy of this publication, it cannot accept responsibility for any errors, omissions, mis-statements or mistakes and the views expressed are those of the Author and not necessarily of IDPM.

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1996 IT SKILLS TRENDS REPORT

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1. Preface: Methodology and Sources of Information

This is the 5th report in a series started in 1991. The series was adopted by the Institute of Data Processing Management (IDPM), supported by the Computer Weekly 500 Club, in 1994 and the scope and content was greatly expanded. The reports have a growing reputation for the accuracy of analysis and prediction and the practicality of the recommended action plans.

The analyses and predictions are those of the author, not IDPM. Many members have benefited considerably from taking action in accordance with the predictions and action plans contained in previous reports.

The reports contain material of relevance to the following audiences:

- employers considering how to meet their own current and prospective IT skills needs
- training providers considering course content and provision
- individual IT managers and professionals planning their own future
- those responsible for strategic thinking, both corporate and national

The reports derive their unique authority from the collation and cross-validation of material from broadly based and well validated sources which have used comparable (albeit regularly updated) methodologies for many years. The interpretation is based on the known plans and problems of major players, both suppliers and users. The main attributable sources include:

- IT Strategy Services analyses of recruitment advertising going back to 1978 and more detailed material produced since 1987 by Salary Survey Publications (SSP) analysing recruitment advertising in the Trade Press and National and Provincial Dailies.
- The Computer Economics Limited (CEL) Computer Staff Salary Survey which has provided a uniquely authoritative base (usually around 35,000 staff in around 500 companies) for analysing the in-post workforce since it was launched in 1968.
- The BPA (Business Publication Audit) "controlled circulation" analyses of the readership of Computer Weekly (over 100,000 IT managers and professionals) from 1991 onwards.
- The National Computing Centre (NCC) Annual Salary and Members Surveys.

We are most grateful to SSP, CEL, Computer Weekly and NCC for permission to use their material, including analyses not published elsewhere. Those seeking salary information, or more detailed analyses, should use the addresses in section 9.1 to make direct contact.

The interpretation derives from a wide variety of sources. The most significant include:

- the members of the Computer Weekly 500 Club, (the heads of IT in the Times Top 500 and their equivalents in public sector and non-quoted organisations), particularly those who have attended the workshops on skills issues.
- confidential and unattributable material from recruitment and contract agencies and training providers on current trends in both demand and supply, communicated to the author in the course of promoting action on past recommendations as well as researching the next report.
- equally confidential and unattributable material on the product and service strategies and plans of hardware, software and communications suppliers and the implementation and usage plans of major users, communicated to the author in his role as Secretary General of EURIM (European Informatics Market) and Finance Executive and "Specialist Advisor" to the all-party Parliamentary IT Committee (PITCOM).
- the members of the IDPM review panel: practising heads of IT as well as personnel, recruitment and training professionals, journalists and other experienced "IT watchers".

2 Management Summary

2.1 *A crisis also provides the opportunity for fundamental change*

In the absence of effective and concerted action by Government, Suppliers and Users we are entering an IT Skills Crisis that will result in most of the professional IT workforce of the UK becoming casualties in the transition to the Information Society.

IT employers face increasingly severe short term problems in securing the skills they need, both quality and quantity, to handle the conjunction of the Year 2000 Problem, European Monetary Union and the transition to new generations of products and services to enable them to compete in increasingly networked markets.

The collapse of trainee recruitment over the past decade means that those who do not diversify away from the traditional focus on hiring mobile youngsters will have to pay rapidly rising fees to compete for a shrinking pool of experienced IT professionals aged under 35. The proportion of those in post aged under 25 has fallen by two thirds over the past decade and is continuing to fall.

The parallel collapse of all but just-in-time conversion training for older staff means they must take charge of their own career development. There is therefore a strong motivation, particularly for those who no longer believe promises of job security, to exploit opportunities for short term gain. Those who do not organise and/or fund their own reskilling risk being caught when the demand for current generation of skills collapses with the next wave of change.

The UK professional IT workforce can therefore be expected to contract sharply over the next few years, with little or no sign of serious investment in the rather different skills that will be needed to develop the broadband and multi-media products and services of the future. Meanwhile the majority of end-users also receive no IT training.

The UK is, in consequence, likely to become an impoverished have-not, importing content as well as technology, when the next wave of growth arrives, sometime after the Year 2000 and current serial, data processing is swamped by the visual revolution.

The need for action to tackle the Year 2000 problem in parallel with European Monetary Union could, however, be used as the catalyst to transform attitudes towards IT training in the UK and enable the development of the skills necessary, among users of all types as well as among suppliers, for Britain to be a wealth creating hub in the Global Information Society.

2.2 *A Conjunction of Challenges*

The IT skills crisis predicted in previous reports is upon us but is likely to be even worse than previously predicted. The reason is the conjunction of the peaks of the trade cycle and transition to networked "client-server" systems with:

- the World-Wide need to audit how current systems handle the Year 2000 and organise conversion or replacement as necessary.
- the European need to convert financial systems to cater for Monetary Union, whether or not the UK is among the early joiners.
- the re-engineering of the Internet and the consequent probable implosion of proprietary network products and services into "intranets" and "extranets".
- the beginning of the transition to broadband multi-media for marketing, customer support and information services, as well as for leisure and entertainment purposes.

2.3 *The Year 2000 is a supplier problem, not an opportunity*

- Recent concerns over the Year 2000 IS problem have focussed on the need to audit, amend or replace in-house legacy software. But the need to identify, check and/or replace packaged software on stand-alone and/or networked PCs and minis and to identify other equipment with date-dependent embedded software and clock chips will probably present even greater problems.
- This will be particularly so if vendors continue to assume that their customers will be willing and able to adopt strategies of mass conversion to their new products and services. Few corporate systems now stand alone and the task of testing linkages when changes are made commonly dwarves the upgrade revenue to the package or operating system supplier.
- The number of end-users is growing rapidly. Over one in five of the workforce regularly use PCs or other workstations. Many are proficient in the use of specific products and services but over 80% have received no formal training. In consequence they are not well-equipped to handle any change to the routines they have learned "sitting by Nelly" and are unable to use the majority of facilities on the majority of current systems.

- If customers were to be forced to upgrade to new systems to overcome Year 2000 problems massive end-user training programmes will be needed. Given the probable scale of end-user resistance to the cost in time, let alone cash, anything more than minimalist conversion, as was common for decimalisation, is impractical for most.
- Suppliers who attempt to use the Year 2000 problem to force upgrades and changed methods of working on their customers can therefore expect to lose business to those who offer less expensive and lower risk alternatives.
- Meanwhile the need to check the date routines in embedded software and clock chips in a wide variety of equipment (from telephone exchanges to lifts) will cause a parallel boom in demand for software and systems engineers.
- In consequence the current IT skills crisis is likely to follow a path more akin to that in the run-up to decimalisation at the start of 1971 than that in the mid 1980s. Decimalisation was followed by a sharp fall in demand for IT products and services, as well as for skills. IT investments not incorporated in decimalisation projects had been cancelled not postponed.

2.4 *The knock on effects could cripple UK ability to handle the next wave of change*

- Meanwhile the transition to wealth and job creating Broadband Multi-media products and services is likely to be crippled by shortages of the very different sets of skills required and the lack of routes to acquire those skills. There is growing demand for those who mix IT skills with graphics design, marketing and other non-IT skills to help innovative users apply multi-media (whether stand-alone or networked) to transform existing businesses of all types and shapes. The effects of shortages in this area will be exacerbated by lack of action, effective or otherwise, because of the widespread focus on the more immediate Year 2000 problems.
- The scale and nature of corporate re-structuring and outsourcing strategies also mean that a growing number of UK enterprises and public sector organisations have lost both their corporate memory and their *raison d'être*. Their ability to harness the new visual image processing technologies to meet long-run business needs and create whole new markets, as opposed to merely reacting to short term change and using and distributing products and services developed by others is therefore greatly reduced.

- Without a transformation of attitudes and approaches the UK is unlikely to be a major player in the emerging “age of global visualisation”, as parallel advances in image processing and in the visual representation and processing of information combine to enable a quantum leap in the breadth, depth and quality of human thought and communication.

2.5 *There is sharply rising competition for a shrinking skills base*

- Recruitment effort for experienced professional IS staff, most of it targetted at the under 35s, is at an all-time high. It has almost doubled over the past year and the number of jobs being advertised is now nearly four times that at the same time in 1993. Meanwhile the proportions of the professional IT workforce aged under 25 and aged under 35 have both **fallen**. The proportion aged under 25 is now only now 6.2%, compared to 9.7% in 1993 and 18.9% in 1987. This is much larger than can be accounted for by the changing demographic profile of the UK population and is a direct consequence of the continuing fall in trainee recruitment. The fall in public sector trainee recruitment, in particular, is far greater than any increase among suppliers.

2.6 *Finding training is commonly less difficult than acquiring experience or relocation*

- Within the overall IT skills base there are some significant mismatches between demand and supply but the recent sharp growth in just-in-time cross-training to handle specific products and services means that at the technical level the problem is more the availability of opportunities to acquire and demonstrate practical experience than the raw provision of training. The problems with regard to applications and management skills are more deep-rooted.

2.7 *The problem are at their worst in Central London but are rippling out*

- Over half the IT workforce still lives and works in the South East but barely 13% works in London (down from over 17% in 1991) although over a third of advertisements are for jobs in the London area. Recruitment effort is growing fastest outside the South East. Localised skills crises are emerging where Financial Services operations, in particular, have relocated.
- Few outside some of the older mainframe and communications employers appear to have made serious progress in developing infrastructures for location independent working within the UK as opposed to links with off-shore suppliers.

2.8 *Software and service suppliers are fighting for technical staff*

- The software and services sector accounts for just under 40% of IT employment (although it may now account for over 50% of development staff). This is about the same as in 1991 despite the trend towards outsourcing. Reports of rapid employment growth in this sector may be based on the increasing number of contractors who obtain work through multiple agencies. The expansion of some major suppliers, largely as a result of staff transfer, appears to have been balanced by continuing cutbacks in others. Competition for staff between software suppliers is fierce and accounts for over 50% of attributable recruitment advertising, up from 45% last year.
- Most current IS professionals were trained by users rather than suppliers. Some suppliers have recently begun to expand trainee recruitment but this is still well below the levels in the early 1980s. The professional IS workforce is therefore likely to continue to shrink unless many more software and service operations expand trainee recruitment and the IS community moves towards the pattern followed by older professions: with staff "apprenticed" to suppliers (cf law and accountancy) and transferring to users after "qualification". This implies the development of generally accepted industry structures for training and recruitment covering skills and job definitions which are increasingly transient.

2.9 *Users are having to rebuild their corporate IT management teams*

- The delegation of change management to external consultants and the subsequent outsourcing of core functions has left many organisations directionless in the face of further rounds of change. The training cutbacks of the last few years present a major problem for those seeking to recruit staff, whether permanent or contract. Meanwhile the transition to the Information Society will entail the acquisition of new skills sets as whole industries implode and new ones emerge. If everyone is on short-term contract who can be trusted to plan beyond the next budget cycle?
- Organisations which intend to survive into the next century will have to adopt very different policies to those followed over the past decade. There are signs that this is beginning to happen. A number of major employers are beginning to make clear distinctions between the core team, (which must be retained, reinforced and developed), the network of regular partners (which may well include former employees now on retainer) and those hired, whether as staff or contractors, for particular tasks.

- Many, organisations, particularly those which outsourced mainstream computing and end-user support, are discovering that competence in managing both IS implementations and ongoing supply and service contracts is now a core skill, required of all potential senior managers. Some are considering the practicality of career development consortia, whereby individuals move between employers, both suppliers and users, and not just between departments, to acquire the mix of skills they expect to need in the future. Others are hiring back former employees as consultants to recover the “corporate memory” that they have lost.
- The UK supply of experienced project managers and of project and programme management training is poor and there is no sign that this problem is being tackled outside a handful of long established suppliers and users. The high failure rate among large IT projects is therefore unlikely to improve.

2.10 *Individuals should plan on the basis of job insecurity and corporate disloyalty*

- Meanwhile individual IT practitioners must take charge of their own career development. Given the growing scale of subcontracting, to India, China and the Philippines, those wishing to remain in employment after the millennium would be well advised to use the opportunities provided during the current crisis to acquire the new skills sets (including non-IT skills such as languages and graphic design) that will be needed or to fund retirement or a career change.
- Employers wishing to retain their current IT skills base, in the face of sharply rising competition including the head-hunting of whole teams, must act now to rebuild corporate loyalty, if they are not to be held to ransom over the next 18 months. To be credible this must be based on long-term commitments tailored to individual needs. These may include employment flexibility as well as security and a variety of non-financial terms and conditions,

2.11 *Employer responses entail innovation and diversification*

- Employers wishing to rebuild their medium-term IT skills base should focus on attracting returners and mature recruits, both men and women, with family and other commitments. Unless they are happy to accept high turnover among younger trainees, (30-50% after 18 months initial training was common in the mid-80s), they should consider the use of local recruitment policies and training contracts.

- Employers wishing to recruit short term IT skills to handle the Year 2000 problem should use contracts with generous completion bonuses and also focus on older staff: “those too young to remember decimalisation are unlikely to have the experience and maturity necessary”. Those aged under 40 are, not only in shortest supply but are less likely to have the skills, experience and maturity needed for the scale and discipline of systems audit, conversion and testing.

2.12 *Suppliers and users must work together to handle the national crisis*

- IT users and suppliers must co-operate to handle the challenge of mass audit and, as necessary, conversion to handle Year 2000 date problems and the anticipated end-user backlash. This may entail government-led "robust negotiation" (including test cases) with dominant suppliers who expect customers to convert en mass to new generations of hardware and software.
- The need for short order programmes to secure the skills to handle the Year 2000 problems must not be allowed to divert attention from the need to develop those skills that will subsequently be needed to handle the transition to the Global Information Society. Instead it should be used as the catalyst to transform attitudes towards training, particularly towards reskilling those already in the workforce.

2.13 *Government must take a lead or get out of the way*

- Government should adopt the recommendations of the House of Lords Select Committee report "Information Society: Agenda for Action in the UK" and greatly enhance the status and role of the Cabinet committee to co-ordinate action across departments. There should be a particular emphasis on promoting public-private, supplier-user partnership programmes to turn the Year 2000 problem into an opportunity to change UK attitudes towards skills and training.
- Government should also act immediately to improve short-term skills availability and mobility by reviewing the tax position of contractors' expenses, child care, family support and relocation expenses. It should also act immediately to stimulate longer-term, employer-funded investment in training by giving reductions in national insurance and income tax, or other tangible incentives, to those following professionally recognised and monitored skills development and updating programmes and to their employers.

- As the largest UK purchaser of IT products and services and of education and training materials, albeit with procurement fragmented over a multitude of publicly funded organisations, Government should take a lead in stimulating the growth and adoption of effective de facto interoperability standards. This will help remove shortages of complex skill sets as an obstacle to the spread of integrated systems and reduce the cost and increase the availability of distance learning products and services.

2.14 *Professional bodies, unions and trade associations need to work in partnership*

- Whether or not Government takes a lead, the professional bodies, unions and trade associations which serve the IT industry and its employees will be failing their members if they do not come together to promote action and not just debate.
- They need to ensure that as many of their members as wish (and have the aptitude) are given the opportunity to redeploy out of information systems engineering and to acquire the very different skill sets needed for multi-media content production and service delivery.
- Continuous professional development (CPD) programmes provide a framework for organising updating and reskilling exercises, both locally and nationally, but need to be driven by major IT employers, particularly suppliers, to meet the needs of current and prospective customers, if they are to achieve more than limited results in helping individuals develop their skills and experience portfolios.
- IDPM should use the opportunity of the formation of the “IT Sector Partnership to work with others to promote the sponsorship and organisation of CPD programmes by suppliers and users to improve the overall supply of skills, both short and long term, as well as to meet the needs of its own members.

3 A Conjunction of Challenges

3.1 *The Cyclical Crisis*

Except for the decimalisation boom and bust, UK IT recruitment effort over the past thirty years has followed the trade cycle with the magnitude of each boom and bust growing more extreme as each wave of technology change hits the industry.

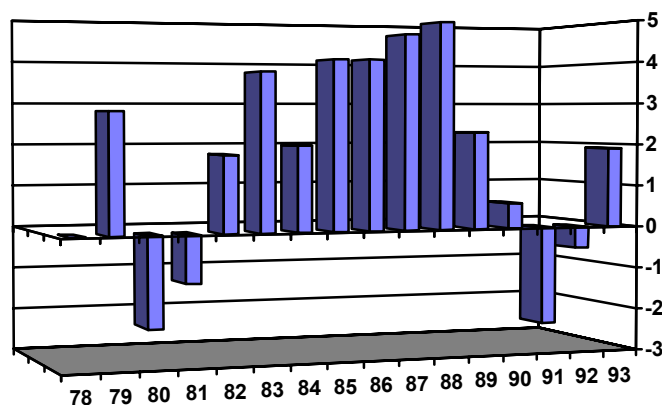


Figure 1: UK Economic Growth 1978-93

Source: UK GDP in Real Terms

The first sign of economic downturn, before it shows in Government statistics, is the scaling down or cancellation of graduate recruitment programmes among those employers who plan ahead. This occurred in Spring 1989, the year in which UK growth halved after the boom of the late 80s.

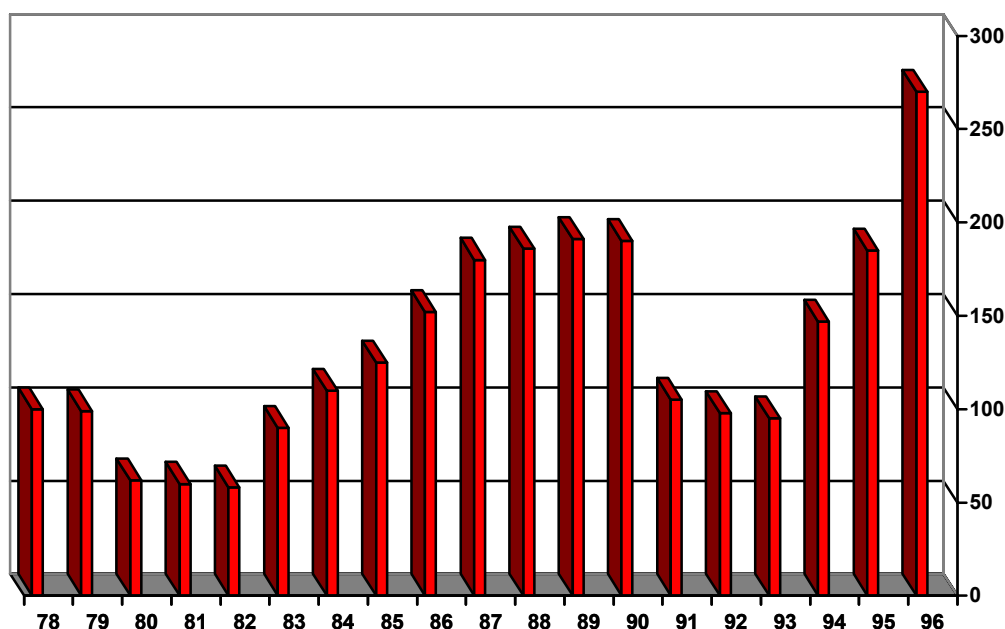


Figure 2: Recruitment Effort 1978-96

Source: IT Strategy Services and SSP Analyses of Recruitment Advertising

Recruitment effort for experienced staff was sustained in 1990 when GDP growth fell to barely 0.6% but finally crashed in 1991, when the scale of the down-turn became publicly apparent and, as we now know, the UK economy actually shrank by over 2% in real terms.

The economy began to recover in 1992 (although it was not believed at the time and the statistical evidence was not apparent until later) and there was significantly increased recruitment effort for those with skills in short supply but overall recruitment effort for permanent staff, as opposed to contractors, continued to decline.

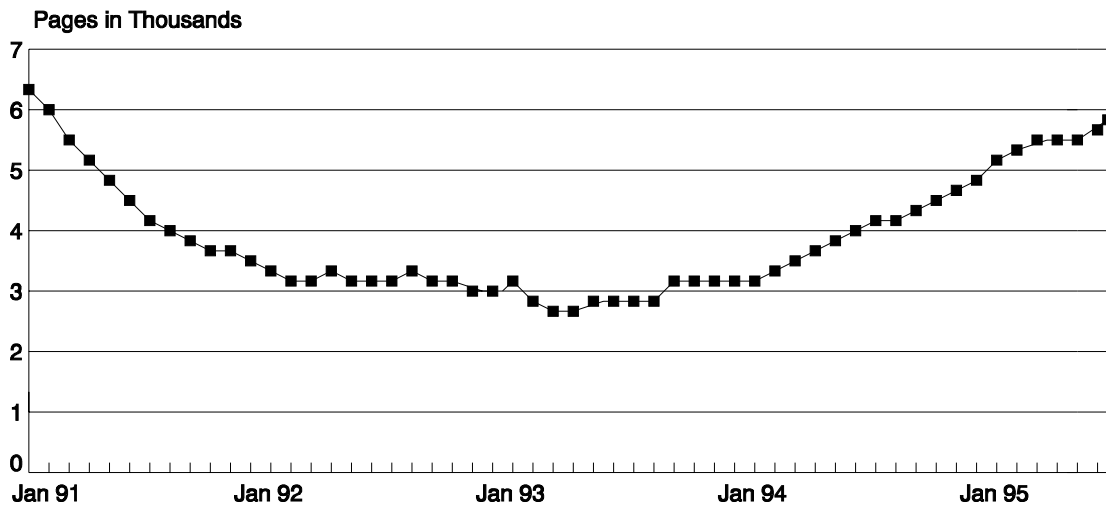


Figure 3 Advertising For Computer Staff Appointments

Source: SSP Analyses commissioned by Computer Weekly.

Recruitment effort for permanent staff and investment in IT training continued to fall during the first year of recovery (1993) although this was the year in which those employers who plan ahead began to expand their graduate recruitment programmes.

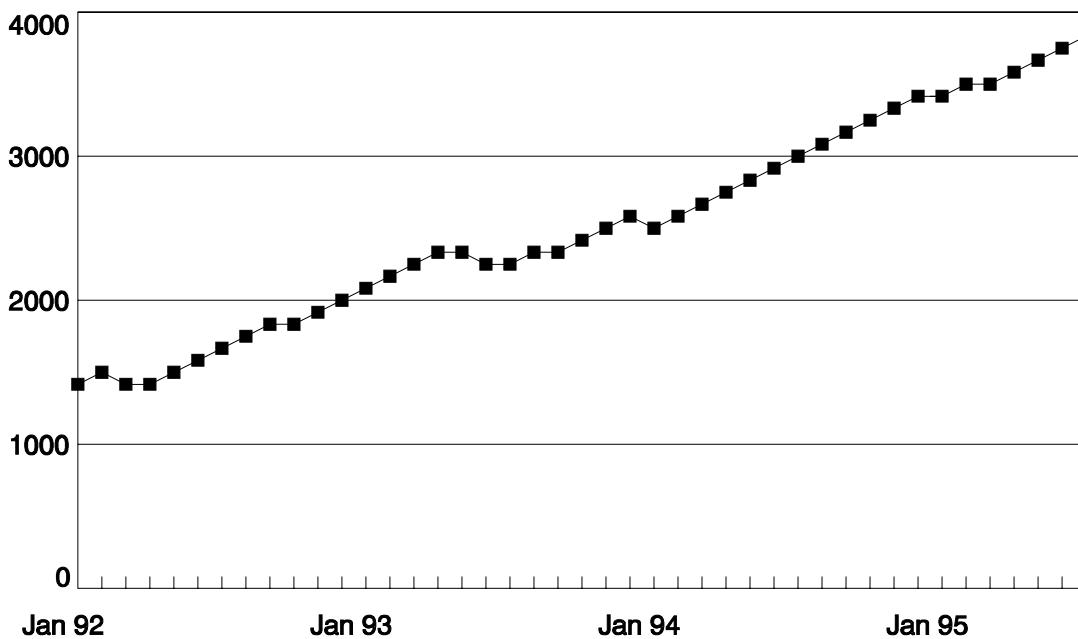


Figure 4 Advertising For Computer Contract Appointments

Source: SSP Analyses commissioned by Computer Weekly.

The second year of recovery (1994) saw a take-off in recruitment effort for permanent staff, initially among suppliers and subsequently among users.

Although the same level of detail, (splitting graduate trainee, contract, supplier and user recruitment) is not available for recession of the early 1980s we can also see that the overall relationship between the economic cycle and demand for IT skills was similar.

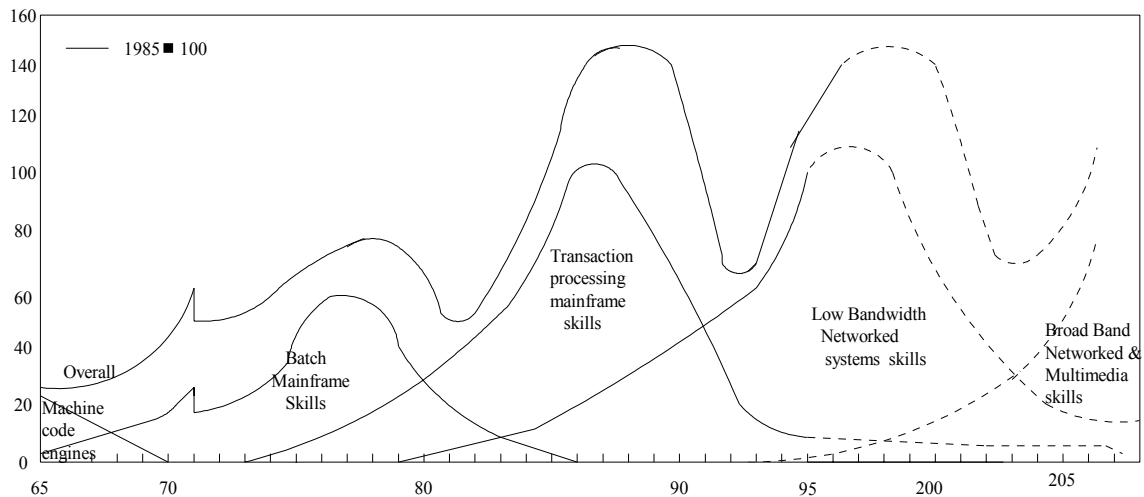


Figure 5 Demand for IT Skills External Recruitment Effort

Source: IT Strategy Services Analyses of Recruitment Advertising and Forecasts

We can also look back to the first IT skills "crisis" in the mid-1960s and, except for the decimalisation blip in 1970-71, see a well established pattern of "boom and bust" with the trauma of transition, as each wave of changing technology and associated skills hits the industry, made more painful by the economic cycle.

Recession accelerates the decline in demand for old skills and delays investment in training for the new skills that are taking their place. The effect of the trade cycle is to magnify the problem and complicate any solution.

The basic cause of the periodic crises is that not enough users take on trainees so that even in recession we can have shortages of skilled and experienced staff in the areas of future growth. The problem is compounded by the low level of refresher and update training given to most of those already in the workforce. Employers who do not train their own staff bid up the price for skilled staff in order to poach from those who do train, whether as permanent staff or, more usually, as short term contractors.

Meanwhile those individuals who have not been able to update their skills find it difficult to retrain and harder still to obtain the necessary practical experience to re-enter the workforce, if they have been made redundant.

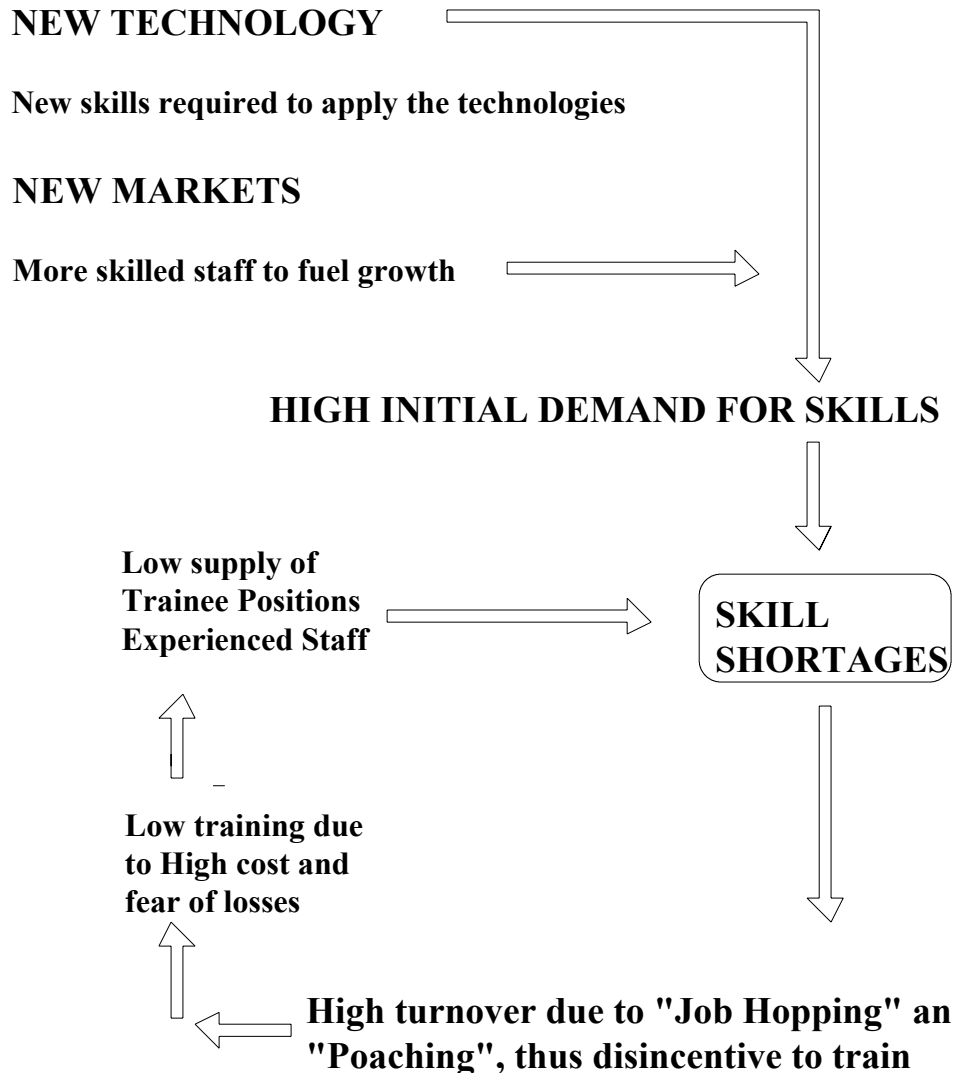


Figure 6 The Vicious Cycle (Theory)

Source: Information Technology Trends. The Report of the 1986 Survey of User Organisations: National Computing Centre.

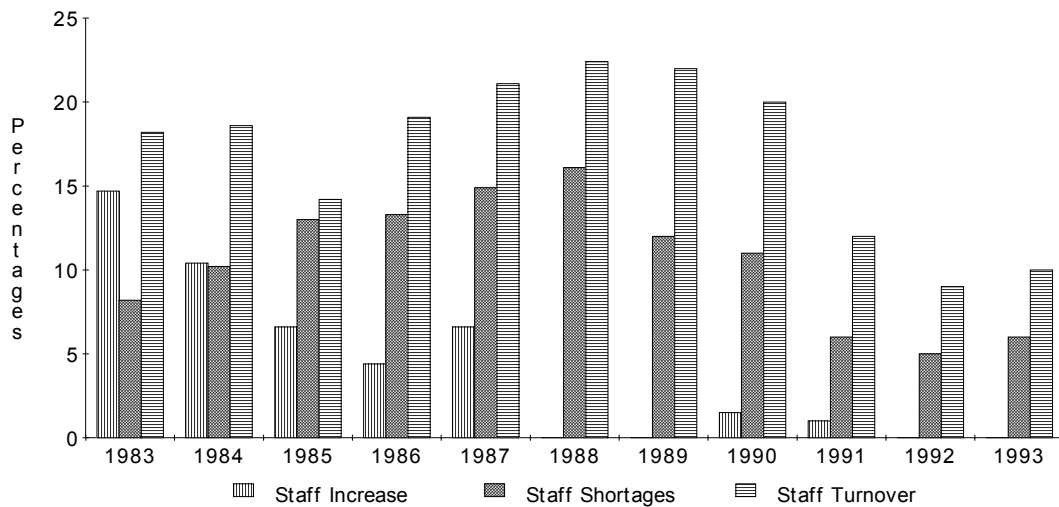
The resultant staff merry-go round means that those who had previously trained staff must often switch their budgets into loyalty bonuses and emergency recruitment in order to retain their staff.

The phenomenon can be seen and measured at its most acute whenever there is a short run demand to a finite timescale, such as decimalisation or the run up to big bang in the City.

This was the pattern for "Big Bang" as measured by the NCC salary surveys.

ANALYST - PROGRAMMERS

1983 - 1993



* = increase of below 0.5% or modest decrease.

Rising staff shortages, causing rising competition for skilled staff and thus turnover, lead to disinvestment in training and a consequent fall in the growth of the staff available for recruitment. By the peak of the crisis in 1988 net growth had stopped completely. The resultant shortages and turnover were "cured" only by the onset of recession.

Previous reports in this series predicted this pattern would be repeated in the second half of the 1990s with the transition to the new generation of workstation, networked and client-server operating systems and the growth of wide-area networking and electronic marketing leading to a mushrooming competition for scarce skills akin to that triggered by Big-Bang in the late 1980s.

Over the past three years we have seen this happening. Recruitment effort has been rising sharply and skills shortages emerging. IT earnings in all parts of the UK were rising significantly faster than average wages with the highest rise in Inner London where the increase in recruitment effort was the greatest. The areas of rising recruitment effort are also those of rising turnover.

The cyclical crisis is now following the pattern of that in the mid-1980s, rippling out from London and South with shortages, turnover and recruitment problems accelerating in almost all parts of the UK.

In his book, *Riding the Business Cycle* (ISBN: 0 7515 1618 X, Little Brown & Co UK 1995), William Houston collated the various theories about long run cycles, (from Kondratieff Waves to climatic cycles as measured by tree rings, ice cores and records of geological disturbances) and their causes (including known movements and juxtapositions within the solar system which might affect the earth's magnetic core and thus change current, climate and weather). The conclusion was that we are in for exciting times with increases in major earthquakes and volcanic eruptions and poor harvests.

It may be a coincidence that world-wide grain prices soared this year with news of crop shortfalls over much of the world but it is not a coincidence that the Koreans and Japanese have been building semiconductor plants in the North East of England and in South Wales. Provided areas of mining disturbance are avoided they are not only inside the EU tariff wall, but they are on some of the most geologically stable platforms in the world.

Add the various the various "end-of-the-world" theories and pre-millennium tension is undoubtedly beginning to affect economic behaviour. Even before allowing for additional factors, like the Year 2000 problems or European Monetary Union, the indications were that this skills cycle would be more exaggerated than the last - with a higher boom followed by a deeper crash.

The enduring nature of the skills cycle is testimony to the ineffectiveness of mere exhortations to invest in training on the part of those who fail to recognise the fundamental business challenges of surviving recession and of responding before the competition to any recovery. The cycle will probably continue until the cost, in time and well as money, of acquiring and demonstrating new skills is brought down by an order of magnitude.

Multi-media distance learning techniques and simulation-based testing have the potential to help achieve this in many technical skills areas. Unfortunately the realisation of the potential is held back by the fragmentation of the potential markets over too many delivery routes, including a multiplicity of incompatible software platforms and distribution networks even when the hardware platforms are standard, as well as over too many under-resourced content providers and too many assessment bodies.

The previously expected cyclical crisis is, however, being compounded by the conjunction of Year 2000 problems and European Monetary Union. These can either be viewed as one-off problems which make it even harder to cope with the underlying task or as a unique peace-time opportunity to force fundamental change - because otherwise we die.

3.2 **Year 2000: World-wide audit-conversion-replacement**

The first factor compounding the cyclical crisis is the need to check and, if necessary, amend or replace computer systems to handle the date changes in the Year 2000.

It is by no means clear how widespread the problems are.

3.2.1 *Critical problem, unnecessary panic or cynical opportunism*

Some systems standards developed in the 1960s, when staff born before 1900 were not unusual and staff who would retire after the year 2000 were being recruited, included routines to handle the Year 2000 as a matter of course. UK payroll and accounting systems have commonly been subject to annual upgrade to handle changes to the UK Tax regime. Updates to handle the Year 2000 were often included during the otherwise slack period in the early 1990s to those packages which had not previously been compliant. A number of major packages and system generators developed in the 1980s and in widespread use today have always included the necessary routines.

On the other hand, a number of operating systems used on PC and Mini based systems, sold in very large numbers to end-users without IT departments in the mid-to-late 1980s, need amendment as do the packages that picked up the date from those operating system. Similarly systems that pick up the date from at least one widely used range of hardware are said to need modification. It is also said that not all products and services currently being shipped by well-known suppliers will handle the necessary date changes until late 1997.

What is clear is that those organisations which do not have comprehensive information on the systems currently in use, whether these were developed in-house or bought externally and whether they are supported through an IT department or not, face a significant audit task before they know whether they have a problem.

Until recently many suppliers saw this as an opportunity to persuade their customers into wholesale upgrades of hardware and software. Many of those who provide software on annual licence regard three years as reasonable notice for the withdrawal of support for past versions. It is, however, becoming apparent that not only do most users not wish to upgrade most of their installed systems, many have no idea what systems they have and some are likely to try to sue those who recently supplied systems which need conversion or replacement.

3.2.2 *The spur to upgrade, downsize, outsource or change supplier?*

More of those who have already converted their legacy systems appear to have used the opportunity to rationalise and downsize rather than to expand. Their IT budgets and staffing have subsequently gone down, not up, as they also embed IT into user departments to avoid the anticipated merry-go-round among professional IT staff.

Meanwhile some major FM suppliers quietly set up Year 2000 Task Forces during the last recession, have already converted most of the systems of their long standing clients and have routines in place to "hoover up" those of their targetted customers who are not well served by their current suppliers. Similarly software suppliers whose products are already compliant are gearing up for major sales drives at the expense of competitors whose customers face forced upgrades to new versions which require significant effort, perhaps including user retraining, and/or are not yet fully tested.

There was a sharp rise in demand for "legacy" skills last year among users in retail and distribution, where "sell by" dates after the Year 2000 had already begun to crash systems. Their recruitment efforts have now fallen away and, provided they can keep those they hired until their audits and conversions are complete, many in this sector may have completed the task before those in other industries have begun. Similar demand in the finance sector rose sharply this spring, again before the recent large scale publicity.

Demand for such skills in the software and service sector has yet to emerge although it is said that one supplier alone is seeking to recruit a panel of 800 experienced staff to convert customers for one product line. The total pool of those with the necessary experience of that product line in the UK is believed to be no more than 600, including those working for that supplier's "value added resellers", developing and installing new systems. Other suppliers are believed to have similar aspirations.

Hence the fear that the Year 2000 problem will lead not to a mass conversion and upgrade but to paralysis and downsizing as those working on new systems are headhunted for emergency fixes.

3.2.3 *Who sues whom?*

In the wake of the St Albans case, in which software under certain conditions was held to be liable to the same "fitness for purpose" test as other products, it will be interesting to see the view of the courts as to how far back suppliers should have foreseen that the software they shipped would have to be capable of handling the necessary date changes. Some observers anticipate wholesale insolvencies if the courts take the view that suppliers, rather than their users, should carry the cost. That will not help the majority of users.

3.2.4 *Legacy conversion aids*

Users will, however, be responsible for most in-house and customised software. Here the quality of documentation and the availability of those who worked on the original development will make all the difference. Suites of programs for scanning and converting Cobol and RPG systems and associated files are being promoted and a number of courses and services are expected to be launched this autumn. Meanwhile many Indian software houses are offering competitive quotes, in both price and quality, for straight conversions (ie no change to specification).

3.2.5 *The end-user systems problem*

The vast majority of systems are, however, in the hands of end-users with no professional IT support (see Section 4.1). Their suppliers are not geared up for the scale of support, training and hand-holding they will need, even if only to do the checks to discover that they do not have a problem. The problems are likely to be worst among the many small and medium sized users who bought off-the-shelf systems with software and support from suppliers who are no longer in business or are otherwise unable to cover the cost of conversion.

Central IT departments who think they have no problem, having checked the systems for which they are directly responsible, may be in for nasty shocks as they receive "demands" for help on systems they did not know existed, as their suppliers are paralysed by requests for help from others and as staff turnover soars in the wake of panic recruitment to plug resource gaps. Those who wish to retain their staff for new developments may need to do so in the face of sharply rising competition from those desperate for staff to convert their own or their customers systems.

3.2.6 *Problem or opportunity*

Viewed through the other end of the telescope, the Year 2000 problem is a unique opportunity for the head of IT to use the need for an organisation wide systems audit to train end-users in the basic disciplines of IT at the same time as enlisting their support for the streamlining, rationalisation and standardisation of all the uncoordinated, unsupported and incompatible local systems that have grown up during the free-for-all of recent years.

Such exercises are likely to be essential given the subsequent need to respond to the enhanced competitiveness of new niche players in all walks of business life who will be able to leap ahead while their more established competitors are busy converting legacy systems, sorting out distributed systems and networks and discovering whether their lifts, security locks and telephone exchanges will still work.

3.3 *European Monetary Union: A re-run of decimalisation, only more so?*

The need to amend systems to handle European Monetary Union is another compounding factor affecting the scale of the current IT skills crisis. As with the Year 2000 issues, it is unclear how widespread the problems really are. Some multi-currency systems in common use already have the necessary routines embedded. Others can have them included quite simply in the course of the next annual upgrade. But multi-currency is not the same as dual-currency and the main problems will be with single currency systems, whether packaged or not, installed by those with no need or wish to routinely handle more than a single currency. Many of these systems are used by small and medium sized organisations with no support other than from their dealer or supplier. The biggest single task will be training them how to handle the conversion.

Even in isolation the effects of EMU would be akin to decimalisation at the start of 1971, leading to a similar boom and bust in demand for IT skills. If the UK stays out of the common currency this is unlikely to greatly assist. It may reduce the immediate problem while prolonging the agony. But UK employers will face competition for contract staff from other EU countries as their IT suppliers become paralysed with the effort involved. It may also be preferable for the EMU systems audit to be handled in parallel with that for Year 2000 and for the software changes to be made and tested at the same time, even if they are implemented later - or not at all.

3.4 **End-User disillusionment**

3.4.1 *The seven ages of corporate IT*

The seven ages of corporate IT were described at a recent NCC members' meeting as:

- Scepticism - of a new untried technology
- Tolerance - of techies with a valuable tool for niche areas
- Enthusiasm - over the potential to transform the business
- Disillusionment - as costs and effort rise but the expectations are not met
- Revolt - as end-users take charge and downsize or outsource
- Enlightenment - as professionals begin to appreciate business needs and end-users begin to understand the disciplines necessary for the effective use of IT
- Partnership - as the boundaries between end-user and professional begin to blur and they work together to meet common objectives

The speed at which organisations move through the stages varies. Those without continuity of staffing and strategy can also loop the loop. The effect of the Year 2000 problems has been to bring disillusionment rather earlier to organisations in which the users were beginning to move from toleration to enthusiasm, to increase the likelihood of revolt among the disillusioned and to complicate the process of enlightenment and creation of partnership. It has sparked a crisis of confidence that will compound the already increasing difficulty in justifying major investments in new systems.

3.4.2 *The outside pressures*

The overall health of the UK economy is the most important of the non-IT factors affecting the scale and duration of the current boom in demand for IT skills and the likely timing and depth of the next crash. This determines how much users are willing to spend on IT, whether or not they believe the claims for the next generation of products and services.

The trend towards outsourcing and term contracts in all walks of UK life (not just IT) and consequent spread of individual uncertainty over future earnings has led to a fall in consumer confidence that will not be cured by any short term cut in taxes and/or interest rates. The UK "savings-to-spend" ratio is undergoing long-term change as we seek to build financial reserves for fear of redundancy and/or the need to fund ourselves through a longer, frailer, old age than the state and/or our children will support.

In consequence the recovery to date has been led by investments and exports, rather than by consumer spend, and there is concern whether the prospective portfolio of private sector funded infrastructure and/or indigenous/inward capital investment projects is sufficient to sustain current growth, other than for the duration of the customary pre-election boom.

3.4.3 *Reluctance to invest except for certain return*

This has increased scepticism as to the value of large scale investment in new capacity, including in new systems which do not have an early and secure payback. Given the widespread finding that IT projects which take more than three years are more likely to be cancelled than to go live, payback inside three years is commonly more important than nominal rate of return.

This has already led to increasing user resistance to the one-way compatible, upgrade policies of suppliers. The 1995 IDPM IT Skills Trends report forecast:

"Given widespread scepticism as to whether the change is worth the cost of the hardware upgrades, the shortage of staff with the necessary skills, the current lack of investment in training and the likely spiralling competition for those with expertise in the new operating systems, the transition process is likely to be much longer than current hype would imply.

"Until the benefits have been demonstrated on new applications and/or among new users many existing corporate users appear likely to delay conversion until all the bugs are ironed out, the necessary aids and services are tested and contractors of known competence are available to provide a smooth transition at reasonable cost."

3.4.4 *The growing backlash against forced upgrades*

The first indication of the accuracy of this forecast was the comparative failure of Windows 95 in the market place. The bulk of the previously expected upgrades to the new workstation and network operating systems may now be overtaken by a combination of the diversion of resources to handle Year 2000 problems and a growing perception that a transition to Internet technology (see section 3.6), whether or not as part of total systems restructuring, may give the target benefits, and more, at lower cost.

In consequence the increased end-user disillusionment caused by the Year 2000 fiasco is likely to reinforce the next cyclical downturn and help lead to a crash in demand for traditional IT skills before the growth in mass demand for multimedia products and "super-highway" based services (see section 3.7).

3.5 *Outsourcing, downsizing and commodity software*

Previous reports in this series have reported on the effects of outsourcing, downsizing and the switch from hand-crafted to packaged software on demand for IT skills. Until the last recession the growth in the number of users outstripped productivity gains as programming and operations became more automated and small and medium sized users, in particular, moved from customised systems to packaged solutions. The overall demand for IS professionals therefore grew faster than supply.

By the start of the last recession, however, the business markets were maturing. Almost all business establishments with more than half a dozen staff had computers (usually PCs) and one in five of the workforce were regular users (West London TEC 1992 research, summarised and published as "The Users have taken over the System"). The IT department had also become a major element in corporate overheads in many organisations and was a target when they sought savings to help survive recession. Larger users increasingly replaced existing systems which required large numbers of operators and maintenance staff and also switched to packages rather than write their own systems to meet new requirements. Even when customised systems could be justified these were more commonly based on integrating existing software products, perhaps from a variety of suppliers, than written from scratch.

In consequence the number of operations and programming staff needed by medium to large users was falling even before they began to consider outsourcing. Outsourcing was also seen to enable suppliers to achieve economies of scale in operations, maintenance, development and support that were denied to users. Despite initial scepticism as to the reality of such savings these are now being achieved. The growth in employment among suppliers appears significantly less than the reductions in employment among their customers (See section 4).

Even when staff are supposedly transferred to FM suppliers on a permanent basis there is anecdotal evidence of considerable wastage during the first two years. It is not just that the new employer quietly sheds those without skills in current demand or the willingness to adapt. Those with saleable skills commonly take a new look at the opportunities open to them and are more open to offers. Thus a number of contracts based on the assumption that existing expertise will be transferred and retained have both led to a short term drop in service and been considerably less profitable than expected. This has, in turn, led to a steady consolidation of FM contracts in the hands of a small group of large suppliers.

Over recent years the main growth in professional IS employment in the UK has therefore been in suppliers who sell or support packaged solutions in large scale demand or who develop customised "integrated systems" for those who can afford them. That is now set to change. The overall number of IS professionals needed in the UK by package suppliers is likely to fall as demand for mainstream packages consolidates around market leaders, support information is put onto Internet web-sites and help-desks are consolidated world-wide. Meanwhile the long-run profitability of most outsource suppliers, particularly those with fixed price contracts, is dependent on achieving reductions in the variety of software they need to integrate, maintain and support and improving inter-operability where variety is necessary to meet customer needs. This also makes it easier to cost and to justify investment in the mass roll-out of new generations of networked systems to serve "the virtual enterprise".

Given the current heavy pressure on user budgets and consequent priority for cost reduction and improved value for money (see section 7.3), the benefits to most suppliers (including of increased sales of hardware and communications bandwidth) from the increased inter-operability of software are thus as great as those to users (who cannot justify the cost of integrating and maintaining current products and services with their evolving and semi-incompatible interfaces).

However, if software components do indeed become as inter-operable as hardware components then the need for large numbers of skilled systems integrators could disappear as rapidly as the need for all those hardware design, production and maintenance staff laid off by equipment suppliers and telecoms operators over recent years.

3.6 *Re-engineering the Internet (Intranets and Extranets)*

3.6.1 *The polarisation between academic, consumer and commercial services*

We are seeing the start of a possible boom in electronic marketing over the Internet. This is likely to transform parts of the retail, distribution, insurance, banking, financial services, travel and transport industries and also have knock-on effects elsewhere. Recent experience with Internet "brown-downs" and commercial services off the air for hours on end is expediting the transition to properly engineered and charged services including Intranets (within the organisation) and Extranets (to link organisations with their customers and suppliers).

Over the past couple of years the US Internet (90% of the whole) has polarised between the under-priced and increasingly overloaded public services (the traditional Internet, running

largely over academic or standby capacity) and the more rapidly growing corporate "Intranets" and charged information services (commonly over commercial circuits with standby and back-up).

Much effort and investment is going into upgrading the infrastructures to support corporate Intranets and external services to customers and subscribers (Extranets) to enable faster response times, improved reliability and enhanced services. Comparatively little is now going into the traditional, non-commercial, Internet which will consequently decline in performance, both relative and absolute, unless deliberately cross-subsidised for educational purposes (the subject of OfTel consultations in the UK) or publicly funded (as with bids for Federal funding in the US).

3.6.2 The scale of US corporate movement from proprietary networks to Internet standards

The use of Intranet technology and standards enables much lower ownership costs, (from development to support and maintenance), for both internal networks and for those which link the organisation with its customers and suppliers. It also allows direct linkage to the Intranets of others, for example for group-working on research and development. In consequence it is a major potential threat to those building and installing proprietary networks. Unless software suppliers succeed in refragmenting the market with "enhanced" (ie non-standard) tools and browsers, this could bring a rapid end to the current boom in demand for the skills to handle and integrate most proprietary network products and services.

The fog of media hype over "surfing the Internet", while those outside the US see only a few islets of commercial reality, has blinded us to the way that Intranets have already transformed whole markets and entire industries in the US. The Internet is like an iceberg. 90%, including most of its real impact on the US economy, is out of sight. We, in Europe, are like the passengers on the Titanic. We see the fog and feel the cold. Then we see the pretty white islands. But if we go too close, too enthusiastically our business is all too likely to be sunk. We have failed to appreciate the commercial realities. For example, the "anywhere office" came to the US aerospace industry ten years ago. The driving force was the need to link computer aided design and computer assisted manufacturing so that Boeing, McDonnell Douglas and their partners and suppliers could shorten product lead times, reduce costs and compete with the Airbus consortium.

We have the wrong market definition of the Internet. We see a semi-anarchic, liberal-academic, network, originally funded to provide standby communications that would survive World War III and now making an awkward transition to provide mass-market, world-wide, information, retail and e-mail. We do not see the closed Intranets that for well over a decade have linked the North American aerospace and defence industries research, production and maintenance teams both with each other and with their customers and suppliers. These Intranets are now spreading rapidly across the rest of US manufacturing industry as a de facto set of standards not just for EDI and e-mail but for all the communications (including broad-band conferencing) to support just-in-time research, development, production and maintenance systems as well as electronic marketing and customer service.

Including Intranets but **excluding** proprietary on-line services that merely interface with the Internet (eg Compuserve) this is **already** a \$30 billion market, growing at 48% p.a. compound. 75% of the Internet business is in building and running closed and largely unpublicised Intranets. The fastest growth area is in equally closed "Extranets" to link suppliers with their **business** customers (eg aircraft manufacturers to the maintenance teams of the airlines or the airlines to their booking agents). Using this market definition, two thirds of all Internet accesses are from the workplace. Over one third of those who regularly use the Internet do not have home access.

The largest part of the current market is server/network hardware. The second largest part is professional services (including transmission facilities and network and applications software) to bolt down secure Intranets and Extranets. This latter market is the scene of a converging "arms race" between traditional on-line service providers (eg Compuserve), Internet Service Providers (eg Pipex), interexchange providers (eg Netscape), telephone companies (including the old Regional Bell Operating Companies, AT&T, MCI etc) and the Cable TV Companies.

3.6.3 *The transition to broadband*

The US business standard is already the T1 line (1 megabit) and there is a well established traffic pattern, 90% outward from supplier to user. There is now a bandwidth race to new markets. First T1 to the small and medium sized business market. Second T1 to the home. Subject to any regulatory challenges (eg regarding audio over the internet) the T1 line is likely to be the standard US small firms and domestic line within about 18 months.

The new communications regime in the US will almost certainly lead to a period of cut-throat competition with unlimited, "commoditised" access offered to new customers by the telephone companies at \$50 - 100 per month and by the cable TV companies at \$30 - 40 per month. Meanwhile large business users will move to ATM and 33 - 35 mbs as the standard. A common target among the competing players is ATM to the cream of the small firms and domestic markets by the millennium.

This is expected greatly to enhance the competitiveness of US industry in general. One widely used forecast estimates a net increase of 3 - 4 million jobs in the US. UK based organisations without similar access will be at a significant disadvantage. Those US jobs may well, therefore, be at our expense.

3.6.4 *Overcoming reliability, security and presentation problems*

Current Internet reliability problems are caused less by the use of standby capacity (now largely confined to the low-cost, academic networks) than by the number of older routers which were designed to handle 15 - 16,000 messages per hour and may now face 50 - 60,000 per hour. These can consequently get confused and paralysed. When this happens they have to be switched off, cleaned (losing traffic) and rebooted.

Other problems are more severe.

The most important is security, security and security: security for the business environment, security for payments and security for the application itself. The biggest problems come when systems are intended to provide easy-to-use "open" access to the public. the problems are far easier where they are not. A great deal of investment and practical experience has been gathered over the years and the practical issues appear much less important than the theoretical issues - provided there are rigorously enforced controls on unauthorised access. Hence the reason that so many current US Corporate Intranets do not allow access from domestic lines or data mobiles. They very often check the line and the security card in the PC as well as the password before they accept even the encrypted traffic.

Then comes the need to make applications visually attractive - to convert surfers into browsers and browsers into customers. The surfer attracted by a striking image should not be turned off by boring text at the next level.

An audience which votes with its fingers can leave faster than one which votes with its feet. But the half-life of visual applications among current target audiences is said to be down to one **week**. That means a massive and permanent updating effort if the Internet is to be used for serious customer acquisition.

But that is only the start of the presentation problem. Current paradigms are also wrong. Most applications need 25 times more content plus major improvements in look, feel and response time if they are to be as effective as a mail order catalogue or newspaper or television advert in capturing the attention of the potential customer - as opposed to enabling the persistent to find out what they want - perhaps. Meanwhile the move from text to image generates 50 times the data throughput, 20 times more cycles and 5 - 6 times the traffic per transaction.

The hottest web-site this spring (Time-Warner's Pathfinder) handled 15 million hits per week and had a theoretical maximum of 16 million. IBM's Olympic Web was designed to handle 15 million hits per day, including on-line ticket sales and live audio-video information. Interface such a Web with a multiplicity of proprietary press feeds, (from the obsolescent to the leading edge), and you have the cause of the well-publicised problems.

But the Olympic Web site has changed US perceptions of what is practical. The consortia that aim to re-engineer the commercial backbones for the growing number of linked US Intranets have won their first hurdle race. They have demonstrated a level of reliability, multiple levels of security and of presentation that is sufficient for most of the applications in current prospect. They also, albeit not so intentionally, demonstrated the need to avoid reliance on interworking with non-standard, proprietary products and services in critical areas.

3.6.5 *The fight between standard and proprietary*

The second hurdle race is the struggle between those who wish to retain the current level of compatibility and interworking between competing products and services and those who seek to use semi-compatible proprietary add-ons to enhance or preserve the market share of their products, be they operating systems, networks, browsers or information services.

If the former succeed we can expect to see continued rapid growth in both the diversity and availability of products and services but a collapse in the share price and consequent investment capabilities of several major players.

If the latter succeed we can expect to see a spread of the same strategies (of version control and upwards-only compatibility to force existing users to regularly upgrade) that we see in the PC and network software markets - and a sharp rise in user costs.

There are, in any case, major standards problems if different types of applications are to be merged as opposed to merely displayed in parallel. There are currently three main sets of protocols covering different types of bandwidth application. Another issue is the difference in working between the development of Internet standards (based on rough consensus on working code) and those of the International Telecommunications Union.

The major obstacle to the next round of market growth is the attempts of software suppliers to lock customers into their applications products. This could greatly increase integration costs and thus delay both user investment and subsequent customer usage.

Alternatively we could see a rapid market expansion if equivalent effort were to go into the development of content production, editing and presentation tools which interwork over agreed, robust, two-way interfaces but just happen to be faster, smarter and easier to use than those of the competition.

3.6.6 *The potential for take-off - provided the integration remains standard*

Despite the problems, Intranets to current Internet standards provide dramatic reductions in the cost of building and maintaining large networks, whether in-house, to service customers or to receive or place orders for just-in-time delivery. Even the Internet standards for three dimensional groupworking, enabling a great many innovative applications, are agreed.

Silicon Graphics 10,000 staff are linked by an Intranet that is run by only 5 staff. Digital Equipment and others have been able to dramatically improve customer support at the same time as cutting costs by the use of closed user noticeboards. And AT&T, CompuServe and other service providers have decided to "go standard" rather than proprietary.

The risk is that standard Intranets and Extranets will replace proprietary operating systems and networks before the software infrastructure is in place to enable the low cost production and distribution of attractive content to meet business needs and generate serious commercial revenues.

If so, employment in the software and services industry could fall rapidly after the current boom because Internet technology will provide cheaper routes to systems integration and customers will see little tangible benefit in doing more than taking the savings.

That will, however, do less overall long term damage to overall UK employment than will happen if fragmentation and duplication of effort continues to delay the removal of the many software obstacles in the way of the low-cost integration of even relatively simple applications, let alone the attractive, high-resolution, low-cost, inter-active, multi-media, networked products that will fuel the next IT skills boom.

3.6.7 *The skills implications*

The first and most obvious skills consequence is a rapid increase in demand for TCP/IP and other Internet technical skillsets. This has been under way for a couple of years and is being met at least as much by retraining existing staff as by recruitment. This is partly because experienced recruits did not exist until very recently but partly because so many organisations, particularly in finance and in retail and distribution, view the Internet as "strategic" - not to be trusted to contractors or others who may leave to join a competitor at little or no notice.

The second consequence is an equally rapid growth in demand for those competent to design and, at least equally important, maintain attractive content. This area is commonly regarded as being an end-user domain rather than one requiring professional IS skills.

The third consequence is a growth in demand for the skills to integrate Intranets and legacy systems. A growing number of large US corporations have found that linking mature mainframe technology to mature Internet standards using equally mature security standards (eg blocking remote access other than by dial back to an encryption modem) can often enable 80 - 90% of the benefits of complex systems integration at 10 - 20% of the software integration cost and even bigger savings on the ongoing cost of ownership (mainly by avoiding workstation and operating system upgrades). Hence the fear of so many US software suppliers that their businesses risk implosion, as Intranets using Internet standards take over much of their former growth markets, unless they can link "browsers" and "intelligent agents" to their latest proprietary operating system standards.

A fourth consequence may therefore be that current proprietary LAN, WAN and client-server skills will not merely have a half-life of under three years but that the final drop in demand could be precipitous, particularly if many of those converting to avoid Year 2000 problems are seen to jump directly and successfully to Internet standards.

3.7 *Integration and convergence - implosion before explosion?*

3.7.1 *The expectations of corporate convergence*

There is much talk of "convergence" between broadcasting, telecoms, publishing, film and programme making, news and information services and computing hardware, software and service providers. Many of the emerging "alliances" also involve aerospace and equipment suppliers, consumer goods suppliers and retail, distribution and financial services operations.

US expectations are that there will be a "post-deregulation Clash of the Titans" in the course of which the 50 or so largest players in the telecommunications, broadcasting, computing, entertainment (including films and games) and publishing industries will converge into four or five competing world-wide groups - each employing armies of specialist sub-contractors. The development and consolidation process will probably be akin to that followed by the US "movie" industry through the 1920s and 1930s with dreams, delusions of grandeur and unrealistic expectations on all sides and many more players going broke than survive.

Across Europe there are a wide variety of alliances as former PTTs, cable companies, broadcasters and publishers prepare for a supposedly deregulated communications world. In the UK there are also expectations of a transformation of banking and financial services (from stock broking to insurance broking and including all types of transaction from electronic cash to pay-per-view accounting) and a wide variety of organisations from banks and building societies to publishers and supermarkets are positioning accordingly.

While there will be a blurring of sector boundaries, corporations which try to cross more than a couple of related boundaries in areas they already understand are likely to lose their way. Instead, having already learnt its lesson the hard way, IBM is expected to continue to provide hardware and software to help run large organisations, including the communications companies themselves and will also provide other management services to the same customer base but will not venture directly into the content or domestic market again.

Federal Express will continue to expand in the electronic marketing area but only to provide services to those selling goods that need physical delivery. Sony and Philips are already in the mass markets for domestic terminals and non-interactive content (eg films and records) and are expected to remain there.

One forecast is of consolidation among the network providers, because of the scale of infrastructure investment needed, and among mass market content providers, because of the degree of product risk. There appear to be no "natural barriers" between the "content providing" industries (on a spectrum from games and fiction through education and training to news and information) but there is a feeling that the successful players will have focused on particular parts of the spectrum. Meanwhile, de facto standards would lead to more open competition among software providers while hardware would be commoditised (like rice). Meanwhile media distribution is likely to remain a separate industry provided the players can retain access to brands.

3.7.2 *The potential of easy to use, visually based technology*

There is an expectation that future service and usability standards will probably be driven by the growing US recognition that at least 80% of the population will never pay for products that are more complex to handle than a TV zapper and that such a device is probably all that is needed to handle the most profitable 80% of applications.

The device (or the domestic phone/PC/TV derivative to which it transmits locally) may well need several thousand MIPS (millions of instructions per second) to handle the accompanying voice response commands but much of the necessary software and technology is already being embedded in telephone "centrex" switches in the US and small firm PABXs in the UK. Such a device should not be confused with recently announced "network computers". These can be better viewed as a "secure" intranet business system - particularly if configured so that they cannot accept software or information other than from "authorised" sources.

Already the raw hardware problems of processing power and bandwidth for the high-resolution, multi-media, networked, domestic, "edutainment" centre are being overcome. From Roger Rabbit, in 1989, through Jurassic Park to Jumanji to Toy Story the graphics generation cost remains about \$100,000 per shot but the quality has improved dramatically. The Nintendo Ultra 64 is expected to have processing and display power akin to the top end Silicon Graphics work station in 1989 but to ship for the couple of hundred dollars.

That is all the games buyers will pay. It also contains the slots for domestic T1 (and beyond) lines for on-line broadband multi-media when these become available - because the games buyers will not pay for both the line subscription and another box.

We hear a lot in the UK about the interactive video pilots of BT and the cable companies but Sohonet, (driven by a consortium of competing post-production houses in Central London who need broad-band communication direct to their best-paying customers, the film producers of Hollywood), is probably more akin to what is to come. Already operational, it is an ATM based network running at 155 mbs but plans are in hand for upgrade to 622 mbs. More-over it is driven by live commercial need, not by suppliers looking for a market.

3.7.3 *People problems and software incompatibility*

But while technologies and organisations may be converging the people are finding it much harder and there are many clashes of culture and profession to be handled. Much of the production and distribution technology will contain complex embedded software but the management styles and techniques that will be needed for multi-media content production appear more akin to those of film production, where a wide variety of skills need to be co-ordinated to timescale and budget to produce a one-off for mass replication and distribution. Meanwhile the content distribution operations are more likely to draw on the transmission skills of the broadcast, telecoms and cable companies and the content selection, promotion and distribution skills of the film industry and of publishing.

But until production and distribution costs have been brought down by several orders of magnitude, to enable a wide variety of low cost material for niche markets alongside high cost mass-market blockbusters, the investors will remain uncertain whether they will become rich or bankrupt until after the event, unless practices "to make the markets more predictable" are sanctioned by the FCC, Justice Department and Courts in the US and by the equivalent "Regulators" in the UK and Europe.

The main technical obstacle is the exponentially more complex software needed to process voice and image over interlinked networks of modular platforms. The resolution of the software problems is complicated by the parallel need to meld the cultures of IT, telecoms, broadcasting, publishing and artistic presentation to create products and services that customers will buy at prices that will make the investment worthwhile. As Arno Penzias, head of research for AT&T puts it: "The real problem is getting people to communicate, all the rest is mere technology."

The proprietary instincts of many software suppliers are delaying progress in this area but sooner or later these will be overcome and whole industries and markets will be transformed as the television, video-recorder and multimedia PC merge into a domestic work-station that will make the children of 2010 look on a current CIM (Compaq-Intel-Microsoft) system much as the children of today look on a Sinclair ZX80. The secure, multimedia, corporate groupworkstation will, in parallel, have an equally profound effect on commercial and industrial structures.

3.7.4 *Cost problems*

Commercial experience to date with high-cost broadband and/or full multimedia is at best equivocal. The difficulty is to find products and services which will generate the revenue to cover the cost of both content and delivery. One project was a technical triumph but a commercial catastrophe as customers clogged the point-of-sale, browsing through a superbly informative, responsive and attractive system, (which mixed local CDROM, full inter-active disc and an on-line transaction service), rather than making purchases. Other trials are finding that willingness to pay does not correlate with the sophistication of the service.

Current digital technology is often less attractive than the analogue technology it is targeted to replace. Current CDROMs are inadequate for moving image if the consumer comparison is with a VHS video cassette. Even the newest operating systems are orders of magnitude too slow for more than the display of "vignettes" of low resolution moving image mixed with still pictures, text and data. Even the proposed new standards compare poorly with current analogue video quality. JPEG crackles with transmission errors and has to be down-loaded to disc for full motion replay. Under similar error rates MPEG and even MPEG2 have an oddly smeared effect, as though water has been thrown on the screen and wiped off. They also require special cards and separate fast forward and reverse tracks.

The cost of generating original video material, as opposed to reformatting existing archives, also remains high. The cost of storing it digitally for on-line transmission may also be uneconomic for some years to come. It may cost only \$2-300 to digitise a movie but it still costs \$5-600 per copy to store it on a jukebox of 2.1 gigabyte hard drives (six movies per drive) for access by "video dialtone" over an inter-active cable network - the US equivalent of the video-on-demand pilot being run by BT. Hence the interest in promoting "near video-on-demand" with the choice limited to the current top 10 titles, time-shifted, rather than on-line access to a library of 5,000.

Meanwhile the mail-order catalogue, illustrated book and/or entertainment video are still too cheap and user-friendly compared to the CDROM equivalent except where rapid price/product changes, complex indexing and/or inter-action are involved.

Low resolution multi-media electronic mail-order, maintenance manuals, distance learning material, sales aids and games will all generate sharply growing revenues and employment over the next few years and grow through the next recession but the explosive growth of wholly innovative, high resolution, products and services generating hundreds of thousands of new jobs is still in the future.

3.7.5 *And when the problems are overcome ...*

The production and use of a wide variety of low-cost products and services to exploit high resolution image technology will almost certainly be one of the main driving forces behind the next IT skills cycle but the transition is likely to be traumatic. Unless much faster progress is made towards overcoming software interface problems there is a risk that current IT related employment will collapse several years before the new broadband, networked, multimedia markets take off. The new products and services will also draw on very different skill sets.

The profundity of the changes likely, when current software problems are finally overcome and the new markets accelerate into maturity, were discussed in May 1996 at a workshop organised by Nortel on the consequences of current trends in the visual presentation of information.

Tom West, author of "In the Minds Eye" and founding director of the Visualisation Research Institute, gave examples of great minds, (Leonardo da Vinci, James Clerk Maxwell, Nikola Tesla), who thought first in images which were then converted to drawings, models and mathematical notation. He then used examples of the use of sophisticated graphics and multi-media to convey very complex information, such as how storms build up, (with multiplicities of complex mathematical models represented in both series and parallel using novel juxtapositions of familiar techniques).

A possible conclusion is that the domination of western scientific thought by printed papers and mathematical formulae might be viewed as a short lived phenomenon, much akin to that of the introverted world of medieval scholasticism. Mankind built castles, cathedrals and cities for several centuries, navigated the world in complex sailing ships and even built steam engines and railways for several decades before the widespread adoption of mathematics as a notation for complex thought.

The drawings of Leonardo da Vinci incorporate an understanding of stress and dynamic forces that was not expressed mathematically until late in the 19th Century. "Today you only learn how to draw if you attend art class". Stephenson did not learn how to read and write until his multiplicity of railway projects grew too complex for him to negotiate and supervise personally. It was not until the 1950s that we fully understood why some of Brunel's finer bridges carry their own weight, let alone that of the trains.

The rise of mathematics parallels the rise of electrical engineering yet much of it is based on working out the ideas of men like Faraday, who could not master mathematics at all, or Einstein whose mental productivity tailed off as his mastery of mathematics grew. Today words and mathematics are emphasised throughout our education system. How ironic if the final flowering of "the age of mathematics" were to be the production of complex computer-based analytical tools to enable the multi-dimensional visual modelling of problems too complex to comprehend, let alone explain, mathematically.

3.7.6 *The demand will be for multi-media artists rather than information systems engineers*

The Computer Graphics group of the ACM (the main US computer society) is now larger and more active than the rest of the ACM added together, as they try to master the use of computers to generate two and three dimension pictures, both still and moving. Once the techniques are mature they are likely to have dramatic effects on the presentation of complex scientific content but may have even more dramatic effects on the methods and pace of innovation by unleashing the full mental capabilities of those who cannot master mathematical notation because they do not easily think in serial, non-visual logic.

Meanwhile responsibility for using the techniques to generate non-scientific content will almost certainly pass to "producers" and "directors" with content authors, visual designers and audio composers (drawn at least as much from the arts as from the sciences) having more status than the IT professionals who help develop and maintain tools and infrastructure and provide technical support.

Given that so few of the "information systems engineers" of today are likely to be employed in the networked multi-media industries of the future it may be as well that the intake of graduate trainees has fallen well below replacement level (see section 4.2).

But the UK content production industries will be in serious trouble unless the growing number of "media studies" students are indeed being trained in the basic disciplines that will be required and given the necessary grounding to rapidly master the new technologies and techniques that will be required.

That will require a much higher priority to be given to the activities of the "Industry Training Organisations" (ITOs) covering broadcast, film, photography (which also has responsibility for digital imaging in the eyes of the Department for Education and Employment) and publishing (currently split between books and periodicals). The planned structure and strategy for the relevant ITOs needs a comprehensive review if the fragmentation of training provision for the multi-media related skills is not to be as big an obstacle to UK success in the Global Information Society as the similar fragmentation of regulatory responsibility across DTI, DNH, the Home Office and their plethora of tame, and not so tame, quangos.

In the mean time those IS professionals who wish to make the transition will have to assemble and demonstrate their own portfolios of relevant skills.

4. The Current IT Skills Base

4.1 *Fewer professionals, many more and, more diverse, end-users*

4.1.1 *What is IT*

There are many definitions of IT:

- “just a posh term for word processing” (a secretary)
- “the metatechnology behind the Global Information Society” (a guru)
- “Data Processing with delusions of grandeur” (a user director)

Heads of IT in large organisations are now commonly responsible not only for policy on corporate computing and communications but also for decisions on a growing range of products and services where the only common factor is the use of digital technology for information processing and communication.

For the purposes of this report "professional IT skills" include those necessary to develop and to support the application and use of the broad range of products and services that might be the responsibility of the "head of IT" in a major user. Thus an electronic marketing operation might embrace satellite data broadcast to radio modems to update point-of-sale smartcard readers, as well as radio or cable based local and wide area networks to collect data from both fixed and mobile locations. This presents product and service integration problems when suppliers have compartmentalised visions and fail to recognise the need to provide well documented, stable and standard interfaces to products and services supplied by a wide variety of other suppliers.

But non-professional IT skills are at least as important. Research by West London TEC (summarised in "The Users have taken over the system", 1992) indicated that over 20% of the UK workforce regularly used computers (mainly PCs) and that over 90% of user organisations had no IT department. Even among establishments with over 200 staff barely a third had an IT department.

Even where there was an IT department end-user IT support was usually provided by the dealer or supplier, less commonly by a third party or by other users and rarely by the IT department. Parallel research by the Regional Technology Centre North indicated that the person responsible for IT in most establishments was a secretary or administrator.

4.1.2 *Falling professional IT employment in all but software and service suppliers*

Employment in the software and services sector has risen dramatically over the past three years but much, perhaps all, of the rise comes from traditional hardware and communications suppliers reclassifying large parts of their business and the mass transfer of those previously in large user IT-departments, particularly in the public sector, to facilities management suppliers.

000s in employment	1993	1994	1995	1996
Communications Hardware Suppliers	126	122	114	115
Computer Hardware Suppliers	63	63	44	44
Communications Services	182	169	153	144
Computer Software and Services	151	157	210	223
Total	522	511	521	526

Figure 7 Trends in Overall UK IT Supplier Employment 1993-6
Source: Labour Market Gazette and Employment Trends.

Note that the software and services sections of many traditional computer suppliers were reclassified from "Hardware" to "Software and Services" in 1995

The Labour Market Gazette indicates that the growth in employment among software and services suppliers has been balanced by falls among hardware and communications suppliers. The Holway Report database indicates a higher rate of growth among software and service companies (21,500 over the past year compared to 15,000) but this includes a number of large transfers of staff from users to FM suppliers since the DfEE returns for March.

Richard Holway (The Holway Report 1996, ISSN 1351 - 3524) believes that 1995 was the year in which the balance of employment between users and suppliers tilted and that more IS professionals are now employed by software and service suppliers than by users. If so this would mean that the current number of IS professionals employed by users is now under 200,000 compared to around 340,000 at the peak of the last IT skills boom in 1988.

There is no reliable source of data to confirm this but recent NCC members' surveys indicate that the number of staff in the average in-house IT department has been falling at around 10% p.a. over recent years. The Compass benchmarks (covering around 1,500 companies since 1990) give a similar pattern with the average number of staff at a UK mainframe site falling by 42.5% in the period 1990 to 1995.

000s	1992	1993	1994	1995
Users	72.1	72.4	71.7	65.5
Hardware Manufacturers	6.6	5.3	4.9	2.6
Computer Services	27.9	29.9	30.7	37.4
Communications Services	2.3	1.9	2.0	3.8

Figure 8 The readership of Computer Trade Press

Source: BPA Analyses of Computer Weekly Readership by employment sector

The controlled circulation readership of the trade press is targetted at IT managers in users, including those who now manage outsource contracts rather than in-house departments, but adds credibility to the view that shrinkage in the size of the average IT department is not balanced by growth in the number of IT departments and that the numbers of full-time professional IT staff employed by users is now in absolute decline. Analyses of the age and experience profile of those in post with both users and suppliers (see section 4.2) indicates that recruitment by IT employers of trainees has not recovered since the recession and that the pool of experienced staff is therefore falling.

Given the low rate of trainee recruitment this means that the professional IT skills base within the UK, however IT is defined, is shrinking at a time of sharply rising demand.

Meanwhile the employment of support staff by user departments has increased but many of these are part-timers and a significant proportion of end-user support is provided by other users.

4.1.3 *Increasing diversity in the user applications to be supported*

The level and nature of the IT skills possessed by end-users varies greatly but almost all is acquired informally. The West London TEC research indicated that two thirds of users provided no IT training at all and under 20% provided off-the-job training. The watershed for providing off-the-job IT training appeared to be 100 staff, but subsequent studies among large employers indicates that this is commonly limited to short courses when systems are first installed.

There are therefore likely to be serious problems in the majority of small and medium sized users if changing the date routines to handle the Year 2000 requires more than a simple fix to existing systems that can be made by their supplier, by their supplier's dealer, or by the average untrained end-user, inside the hour. Unless the opportunity is taken to train end-users to do their own checking and conversion and to transform their attitudes towards acquiring a far higher level of IT skills (and pigs might fly) most will not be willing or able to learn how to apply most of the new products and services without considerable professional support.

As yet few users are developing or supporting multimedia sales aids or virtual reality product demonstrations in-house, but several of those at the IT Directors' Forum in Spring 1994 had commissioned such systems on behalf of their organisations and more saw this as an area where they would need to acquire in-house skills. The production of multi-media content is best viewed as a sophisticated end-user IT skill, akin to those possessed by design engineers using current CAD systems.

Multi-media is likely to be one of the areas of critical skills shortage within the next few years alongside the supply of IS professionals competent to develop, install and support the systems, tools and networks used.

Meanwhile the use of digital control and logging systems in products, processes and networks is generating enormous flows of data which may be of value for planning and management, as well as for control. But the tiers of middle-managers who might have sifted, collated and interpreted the data into information and knowledge have been removed. The tools for "data mining" may be in place but the training and background that will enable the data-miners to tell gold from dross and to present their results in ways that lead to relevant and effective action are unclear, let alone in place. This is also among the emerging shortfalls in end-user IT skills.

An emerging problem is that, while the technologies of IT, telecoms and electronics may be converging, the cultural backgrounds and disciplines of the professions are not. Telecoms engineers live with and understand transmission delay and the need for robust and stable software platforms and multiple levels of resilience, even for supposedly tested and reliable systems. Meanwhile most IT and software engineers, increasingly more important in creating and maintaining the telecoms infrastructure as well, retain a touching faith in the infallibility of error correcting digital systems - if only they can get the specification and testing right.

Professor John Midwinter ("Convergence of telecommunications, cable and computers in the 21st century: a personal view of the technology", Nortel, 1996) has commented: "It will be fascinating to see how one interfaces the conflicting cultures of a software industry where partially incompatible upgrades are offered every six to 12 months and are its financial lifeblood, with a telecommunications industry in which a 40-year-old telephone usually still works perfectly well alongside the latest model: both operate to nearly identical standards and genuinely new services come infrequently but universally."

4.2 Growing older with considerable wastage (age and sex profile)

4.2.1 The effect of the collapse in trainee intake

There is a common view (mainly outside the IT world itself) that IT is a young profession. In the late 1980s and early 1990s many staff aged over 45 were made redundant, particularly by traditional hardware and telecommunications suppliers. The parallel reduction in trainee intakes means, however, that the residual workforce is both ageing and shrinking.

% of Workforce	1987	1993	1994	1995	1996
< 25	18.9	9.7	7.6	6.5	6.2
25 - 29	26.7	27.0	24.4	22.4	20.9
30 - 34	21.3	24.0	25.0	25.2	24.6
35 - 39	16.4	16.9	18.2	19.2	19.8
40 - 44	9.7	11.6	12.3	12.9	13.7
45 - 49	3.6	7.6	8.3	9.2	9.7
> 50	1.2	3.8	4.2	4.6	5.1

Figure 9 Profile of IT Department Staff by Age
Source: Computer Economics: May 1996

The contrast between 1987, before the recession, and 1996 is dramatic. The proportion of the professional IT workforce aged under 25 has fallen by over two thirds. The growing proportion of those in all age groups over 40 is less remarkable given the large numbers of trainees who entered the profession from the late 1960s to the early 1980s.

The scale of the potential future shrinkage is apparent if it is assumed that about half the under 25s are really trainees (although many fewer carry the title trainee or junior) and the proportions of trainees are compared with those in 1978: 16.3% (NEDO Report Computer Manpower in the 1980s), 1985: 12.1% (NCC using similar methodology and base to that used by NEDO) and 1987: 8.9 (Computer Economics for the IT Skills Agency using add-on questions to the regular 1987 quoted in the table above).

% of readers	1992	1993	1994	1995
< 2 years	4.4	3.1	2.4	2.4
2 - 5 years	21.3	18.8	13.8	10.6
5 - 10 years	29.0	31.0	30.6	28.8
10 - 15 years	20.0	21.0	21.7	22.5
> 15 years	23.9	24.9	26.3	29.3

Figure 10 Years worked in computing by readers of the trade press
Source: BPA Analyses of Computer Weekly Readership

Analysis of the readership of the trade press shows no compensating diversification to recruit mature trainees. The proportion of readers with under 5 years experience is falling at about the same rate as the proportion of under 25s in the CEL panel. That with under 2 years experience (ie trainees) is falling even faster.

This year there is evidence of a small increase in trainee intake by software and service suppliers but this is barely to the level in 1992, well short of that in the mid-1980s let alone that necessary to replace wastage. There is also strong evidence that FM suppliers which acquire large numbers of staff transferred from users are, at least in the short term, cross-training in preference to taking on younger staff. Contractual conditions under TUPE often give them little choice.

There are other negative aspects to the fall in recruitment among 18-24s year olds. Unemployment in this group appears to be rising across the economy as a whole. While IT literacy among school-leavers has improved dramatically much is said to be "nerdish": an obsession with games and technology rather than using IT to achieve results or meet user needs.

Many employers comment that too few of the 18 - 24 age group have the attitude, let alone the experience, aptitude or wish, to undertake user support, the fastest growing area of IT employment whether within IT suppliers, users or end-user departments.

There is similarly widespread concern among IT recruiters with regard to the relevance of the skills acquired by many of those following publicly funded FE, HE and university courses. A recent skills audit in an FE college revealed that the technical support staff were more up-to-date than the lecturing staff. This is not surprising given the sharp rise in teaching workloads to handle increased numbers on lower per-capita budgets and the consequent lack of time, let alone resource, to keep the latter abreast of the technology.

The consequences are, however, very serious. The falling rate of placement into employment from many publicly funded reskilling courses is one consequence. Another is the rising drop-out rate, particularly among mature students, as they realise that the course will not significantly increase their employability.

There is some evidence of increased trainee recruitment this spring, particularly among software house and communications suppliers but there is also a need to check how many of the employer grumblings are restatements of long-standing prejudices and how many are symptomatic of new and increasing problems.

In particular, given the pressures to greatly expand adult education (whether for one-off reskilling or as part of the switch to life-long learning), it is important to check whether the rising drop out rates are a natural result of such expansion or, as has been alleged, symptomatic of a malaise that must be tackled if ill-considered expansion is not to be a cruel waste of time, for the students, and of money, for the taxpayer.

4.2.2 *IT employers discriminate less than government or schools*

Analysis by Gender shows that the proportion of women in IT at all levels and in all age groups has, at long last, started to rise and pay differentials are beginning to narrow. This appears to be the result of reduced wastage and recruitment diversification (age and background as well as sex) by employers. Pre-entry discrimination (ie in the education system) is again increasing.

	Females as % workforce		Average Age		Female Earnings as % of Male	
	1994	1996	Male	Female	1994	1996
Head of IT	4	6	45	43	90	103
Other IT Management	9	13	43	41	92	91
Systems	20	22	38	36	91	92
Analyst Programmer	23	22	34	34	97	96
Programming	23	24	30	31	96	98
Technical Support	11	13	36	35	87	85
Customer Services	28	27	35	34	81	85
Operations	14	15	33	33	88	87

Figure 11 Summary of IT Staff by Function and Gender
Source: Computer Economics: May 1996

While women are paid less on average, save at the very top, they also tend to be younger than their male counterparts because so many have to choose between career and family.

	% of Females in Workforce				Females Earnings as % of Average			
	1993	1994	1995	1996	1993	1994	1995	1996
< 24	20	22	22	24	96	93	93	95
25 - 29	24	24	23	24	97	95	94	93
30 - 34	22	24	24	25	92	93	93	93
35 - 39	20	20	21	21	90	89	89	89
40 - 44	17	19	19	20	81	82	83	85
45 - 49	16	17	16	19	72	74	74	78
> 50	16	16	17	19	69	68	69	72

Figure 12 Age Profile Analysed by Gender
Source: Computer Economics: May 1996

Analysis by age shows the way in which many women, forced to choose between career and family, either leave the industry entirely at an age when they are approaching peak earning capacity (35 - 39) or go part-time (the explanation of the rising earning differentials from 35 onwards).

An analysis of BCS women members by the Women into IT Foundation in 1989 showed that those who did not take a career break at all were often earning 30-40% more than those who had, even when the latter had returned to work full-time. It should be added that the correlation was with the career break rather than with the presence or absence of children. The need to look after elderly relatives, rather than see savings consumed in residential care fees, is also a growing factor in the pressure on older women to work only part-time.

No other western country is known to follow the UK policy of having child care neither tax-deductible nor publicly funded. A recent study by Patricia Morgan ("Are families affordable?": ISBN 1 897969 44 9, Centre for Policy Studies 1996) indicates that since the 1950s the tax liabilities of families with children have increased at four times the rate of those of single people and that since the late 1970s the proportion of income paid in taxes (direct and indirect, including Child Benefit) has again increased significantly for a couple with children. It has fallen for those without children. Meanwhile the value of Child Benefit is now about half that of the combined child tax/family allowance of the late 1950s.

The Secretary of the Singapore Computer Society has stated that she regards the UK tax regime as the main reason for the differences between the UK and Singapore - where IT (rather than law or accountancy as in the UK) is regarded as the "career of choice" for the most able and ambitious women graduates.

Singapore ("The Intelligent Island") may have the highest proportion of women in IT (over 50% in systems analysis and programming) but many other parts of the world have well above the 22% in the UK. These factors, however, apply almost equally to professions like law and accountancy where women now account for the majority of trainees. What is different about IT is the damage done before UK females even enter the IT industry.

4.2.3 *The effects of discrimination in schools*

There is a steady fall in interest in computing among girls at each stage of the education system before university. Only with the greater success of girls in obtaining places on computing courses and computing jobs on graduation does the process begin to reverse. The following analysis of university admissions shows the success of WISE (Women into science and engineering) in attracting girls into science and the other engineering professions at the expense of IT.

Year	Mathematics	Chemistry	Physics	Engineering	Computer Science
1978	31	12	21	4	24
1979	31	15	23	5	24
1980	32	13	26	5	23
1981	32	15	26	7	22
1982	34	14	27	8	22
1983	33	15	28	8	18
1984	32	14	30	8	15
1985	32	17	30	11	10
1986	32	17	30	11	11
1987	31	16	34	11	10
1988	33	16	32	12	11
1989	33	16	33	13	13

**Figure 13 UCCA Statistics for Female Students as a Percentage of Entrants:
University Courses in Mathematics, Physics, Chemistry, Engineering and Computer Science**
Source: UCCA

The causes of the problems in schools are well understood as are the actions needed. "Bridging the Gap" (WIT 1989), "Women into Computing - Selected Papers 1988 - 90" (Springer Verlag ISBN 3-540-19648-X) and "Information Technology Matters - for Women and Girls Too (The Fawcett Society, 1990) provide good introductions to the subject.

The Women into IT (WIT) Campaign, with its DTI-funded information service and employer supported careers workshops, enabled a temporary improvement in the intake of girls onto university IT courses from 1989 onwards. But the endemic stereotyping of IT within the UK education system resumed its inexorable course when government support ceased. The campaign office and information service, which had been handling over 10,000 enquiries a year from schools, careers services, individuals and employers, had to be closed for lack of funds. The proportion of UK girls applying to study computer science courses subsequently fell back to 10% for the 1995/6 intake. This is a return to the pattern before the impact of the WIT programme of industry supported workshops and careers information for girls, their teachers and their careers advisors.

Since the proportion following equivalent courses is barely half that 20 years ago and compares to nearly 30% among overseas applicants, a range of 30 - 40% (and rising) in some Mediterranean countries and 45% (and rising) in the United States, we can also conclude that the problems are cultural rather than genetic.

A similar regression to that in computer science can also be seen among applications from students of UK origin for hybrid courses, like Information Systems and Business Management, where girls initially accounted for over a third of applications, down to 26% in 1994/5 and under 26% in 1995/6.

The current fragmented efforts to redress prejudices within the UK education system (eg the heavily over-subscribed events run in the London area by the IEE and the Worshipful Company of Information Technologists) are too limited in size and geographic cover to have significant national effect. The situation will almost certainly continue to deteriorate without government support for the necessary infrastructure to spread awareness of what can be done and to inform careers services and teachers of the opportunities for girls.

The problems are not the result of discrimination by employers. The modest increase in the proportion of younger women entering the IT industry in recent years is largely because many of those who continued to recruit trainees through the recession deliberately diversified their intake to cover arts and business graduates and to accept transfers from user departments to redress deficiencies and imbalances in the output of the educational system.

A number of other analyses indicate the scale of the consequent loss of talent to UK IT employers. Women account for only 12% of the Trade Press readership (down from 14% in 1991 but analysis by one of the leading firms of consultants which regularly recruits IT staff at all levels through both the Trade Press and the Nationals has found that women commonly account for a significantly higher proportion of job offers (18 - 19%) than they do applicants (14-15%).

One of the worlds leading FM suppliers has commented that some of its best account managers are women and that the quality of those who apply to join them is such that, on average, 80% of female applicants receive job offers compared to under 20% of male applicants. Some of their best account managers are women, who tend to be better at managing customer relations and avoiding difficulties and less interested in building reputations by fire-fighting exercises to manage problems that should not have arisen in the first place.

Their problem is that only 15% of applications come from women. This seems to bear out a common finding that women are often more experienced and able than their CV indicates, (understating their achievements), while men are often less able (exaggerating theirs). It also fits with the view among a number of observers that only the most able and determined of girls resist the prejudices of their teenage peer groups.

It is, therefore, unfair to blame employers for the low proportion of women who enter the IT workforce but the fact that many of those organisations which are most imaginative in their use of IT to meet commercial objectives and/or consumer needs have a higher than average proportion of women in post suggest that the others are seriously losing out. The proportions of women are commonly higher in the growth areas, including the support and use of IT outside the IT department. The 1994 IT Skills Trends report quoted data from the Training and Enterprise Councils indicating that around three times as many user support staff were employed outside IT departments as within them and that that the majority of these were female.

4.2.4 Variations by sector

There are significant variations by sector in the proportions of women in the professional IT workforce, the proportion who make it to the top and their pay as a proportion of the average for that grade and sector. Thus there are proportionately more women in the public sector but they are less likely to make to the top than in IT Services or Food and Distribution and, at all levels, are significantly less well paid than their equivalents in other industries.

	Chemical	Finance	Food & Distribution	Public Sector	Engineering	High Tech	IT Services
Management	3	10	13	12	5	15	21
Systems	19	23	25	27	10	22	19
Analyst Programmer	30	23	23	26	22	18	19
Programming	23	25	23	35	23	19	16
Technical Support	11	14	11	17	14	10	11
Customer Services	26	27	29	30	26	25	25
Operations	21	15	12	18	26	8	18
All Functions	21	23	21	28	20	21	21

Figure 14 Women as a % of employees by seniority and sector
Source: Computer Economics: May 1996

	Chemical	Finance	Food & Distribution	Public Sector	Engineering	High Tech	IT Services
Management	142	102	80	86	68	125	107
Systems	108	100	99	94	97	100	100
Analyst Programmer	114	99	97	93	104	115	101
Programming	118	101	96	114	103	105	88
Technical Support	108	103	104	89	86	96	96
Customer Services	116	101	93	93	85	130	95
Operations	94	108	94	107	89	98	90
All Functions	112	102	100	90	91	113	97

Figure 15 Women's average earnings by sector as a % of overall WOMEN's average earnings
Source: Computer Economics: May 1996

The wide variations, particularly those at the extreme (as between female IT managers or customer service staff in "Engineering" and in "High Tech" (including computing and communications suppliers) are more the result of salary variations between sector than differential discrimination although the latter is also a factor - particularly in engineering.

	Chemical	Finance	Food & Distribution	Public Sector	Engineering	High Tech	IT Services
Management	109	109	89	89	92	105	91
Systems	106	100	98	91	100	98	103
Analyst Programmer	107	100	91	89	110	107	103
Programming	116	102	93	110	100	110	96
Technical Support	115	102	99	87	88	104	99
Customer Services	110	101	94	95	92	122	97
Operations	101	108	91	96	100	108	89
All Functions	113	102	96	90	99	109	97

Figure 16 Average earnings (male and female) by sector as a % of overall average earnings

All Functions	86	87	90	88	81	91	87
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Figure 17 Women's earning as a % of average earnings by Sector
Source: Computer Economics: May 1996

Women at the top and in systems analysis do significantly better in IT Services and High Tech companies than in most user sectors. The implications are profound for those whose survival, let alone success, depends on linking IT objectives, policy and implementation far more closely to the mainstream of their business. It is no coincidence that a number of major IT employers have a clear target of being among the "employers of choice" not only for ambitious young women but also for older high fliers and high achievers who now wish to combine career and family.

Those who are concerned that the quality of corporate thought is declining as executives are overloaded with 70 hour weeks, endless mobility and constant communication by e-mail and cell-phone need to consider how better to harness some of the talent that is turning away from such a life-style. This will entail a fresh look and time and location independent working, including to handle responsibilities under the Disability Discrimination Act.

4.2.5 Detailed analysis of Skills by gender over time

	Females as % of sample		Average Age		Female Earnings as % of Average	
	1994	1996	Male	Female	1994	1996
IT Manager	4.1	7.3	45	44	90	95
Development Manager	8.7	13.0	43	40	98	95
Technical Services Manager	4.3	5.7	39	42	111	90
Customer Support Manager	7.2	11.0	43	40	90	95
Admin. Department Manager	38.5	41.4	45	34	72	71
Business Systems Manager	12.7	16.4	41	41	96	102
Systems Manager	11.8	15.7	41	41	100	95
Technical Support Manager	5.6	11.9	42	39	88	98
PC Support Manager	17.8	20.3	42	35	98	105
User Support Manager	14.8	15.0	41	40	90	91
Operations Manager	7.3	5.7	41	38	98	97
All Management	8.9	11.7	42	40	92	93
Senior Consult	11.8	14.7	40	38	96	98
Project Manager (Bus Sys)	18.6	16.1	40	37	98	96
Senior Bus Systems Analyst	21.5	24.5	37	35	93	97
Business Systems Analyst	42.1	30.1	34	34	101	98
Project Manager (Sys Des.)	16.5	20.0	41	39	96	96
Senior Systems Analyst	21.2	22.5	38	37	98	97
Systems Analyst	28.7	27.2	35	35	97	97
Junior Systems Analyst	32.1	30.8	29	30	98	91
Trainee Systems Analyst	25.0	22.5	25	27	92	103
Systems	20.2	22.0	38	36	91	92
Project Manager Anal-Prog	17.7	17.9	37	37	98	96
Senior Analyst Programmer	23.2	19.5	36	36	98	96
Analyst Programmer	23.2	23.4	33	34	99	98
Junior Analyst Programmer	26.5	26.2	28	31	97	101
Trainee Analyst Programmer	-	29.4	25	25	-	99
Analyst/Programming	23.0	22.0	34	34	97	96
Principal Programmer	14.7	8.3	40	37	99	106
Senior Programmer	19.7	22.2	35	37	97	98
Programmer I	21.8	22.6	31	33	97	98
Junior Programmer	27.5	25.2	28	29	102	100
Trainee Programmer	25.2	26.9	25	26	100	104
Programming	22.7	23.5	30	31	96	98

	Females as % of sample		Average Age		Female Earnings as % of Average	
	1994	1996	Male	Female	1994	1996
Chief Comms Analyst	7.3	4.8	39	37	88	87
Senior Comms Analyst	8.5	7.7	37	37	93	95
Comms Analyst	14.6	15.5	34	35	93	88
Junior Comms Analyst	38.2	46.7	29	35	92	97
Chief Systems Programmer	9.7	8.2	40	35	96	96
Senior Systems Programmer	11.5	10.6	37	35	96	95
Systems Programmer	13.7	14.1	33	36	95	93
Junior Systems Programmer	17.2	14.7	30	31	90	88
Senior Technical Consultant	5.9	6.2	40	38	93	91
Chief Technical Analyst	11.0	12.1	38	38	93	96
Senior Technical Analyst	15.4	14.3	36	34	97	95
Technical Analyst	17.5	20.9	32	33	94	91
Junior Technical Analyst	34.4	30.7	27	31	100	100
Assistant Technical Analyst	22.2	25.0	26	33	108	102
PC Support Supervisor	25.7	25.8	36	34	95	96
Senior PC Support Analyst	21.1	17.8	35	33	95	95
PC Support Analyst	31.3	24.7	31	31	96	96
Junior PC Support Analyst	34.2	26.2	27	29	103	100
Network Services Supervisor	8.1	11.0	39	34	93	93
Senior Network Engineer	7.6	14.5	38	35	93	96
Network Engineer	7.8	13.6	33	32	101	85
Junior Network Engineer	19.5	17.9	31	32	98	89
Technical Support	12.0	12.9	36	35	87	85
User Support Consultant	9.7	22.4	40	37	97	99
User Support Supervisor	10.6	16.0	39	37	93	97
Senior User Support Analyst	14.1	16.9	38	38	95	93
User Support Analyst	21.9	25.3	34	34	93	94
Junior User Support Analyst	38.0	40.2	30	34	97	98
Assistant User Support Analyst	53.4	44.2	26	31	101	101
Help Desk Supervisor	60.0	47.1	38	35	88	91
Senior Help Desk Analyst	45.6	42.6	36	36	92	90
Help Desk Analyst	59.3	47.3	33	33	95	91
Help Desk Assistant	71.2	62.4	28	33	98	96
Customer Services	27.9	27.1	35	34	81	85

	Females as % of sample		Average Age		Female Earnings as % of Average	
	1994	1996	Male	Female	1994	1996
Production Supervisor	30.6	33.3	39	39	91	80
Senior Production Analyst	27.9	19.3	40	38	89	81
Production Analyst	46.0	32.4	35	35	93	89
Junior Production Analyst	62.3	44.2	35	38	100	99
Shift Controller	6.1	7.9	39	38	86	88
Shift Leader	10.8	12.1	35	35	95	96
Lead Operator	16.8	13.9	33	35	93	95
Operator	14.9	20.4	31	32	98	95
Junior Operator	13.8	20.5	28	30	99	101
Operations	13.0	15.1	33	33	88	87
Administration Supervisor	55.4	53.6	41	38	87	85
Senior Administrator	57.1	62.3	42	37	84	87
Administrator	71.3	72.6	36	34	92	93
Junior Administrator	80.0	75.7	30	30	99	96
Administration	61.8	64.6	39	35	83	84
All Functions			35	35		

Source: Computer Economics

4.3 *Downsizing and devolution*

4.3.1 *Smaller in-house sites and budgets*

As indicated in previous reports the role of the IT department and the structure of employment in the IT industry underwent fundamental change in the period 1989 to 1994. Employment in programming and operations halved while that in user support has trebled. Downsizing, the switch to packaged systems and the rise of "user power" had more impact than outsourcing, open systems or "client-server". National Computing Centre data indicated a 10% p.a. compound reduction in the size of the average IT department but that the consequent overall fall in IT related employment was less than the rise in user-support jobs outside the IT department.

The readership of the trade press is light among end-user staff, many of whom relate more to the application than to the technology, but analysis of the controlled circulation readership of Computer Weekly shows clearly the effects of downsizing on the "IS Professional" community.

There has been a sharp rise in the proportion working alone or in sites with fewer than 10 IT staff and a fall in that working in departments with more than 200 staff.

	1991	1994	1995
1 - 10	14.4	22.9	21.7
11 - 19	3.4	3.5	3.8
20 - 49	7.5	7.7	8.0
50 - 99	9.1	10.1	11.1
100 - 199	11.8	12.7	12.9
200 - 499	18.5	16.9	17.0
500 - 999	12.4	9.6	9.7
1000 +	21.0	16.4	15.8
Unknown	1.9	0.2	0.0

Figure 18 Trade press readership by size of site
Source: BPA Analysis of Computer Weekly Readership

A similar analysis also shows global evidence of the shrinking numbers employed by organisations with medium sized DP budgets (excluding staff costs). Most growth in IS employment is in small departments while in large organisations an effect of outsourcing is that IT budget can grow while the number of in-house staff is falling.

	1991	1994	1995
Under £10K	39.1	43.6	46.5
£100K - £1m	23.9	21.7	23.3
£1 - 10m	27.1	24.4	18.4
Over £10m	13.2	10.3	11.8

(Excludes those where information not available)

Figure 19 Trade Press readership by size of organisational IT spend
Source: BPA Analysis of Computer Weekly Readership

Analysis (below) of the products or services that readers have authority to recommend or purchase shows a significant rise in the ability to recommend or buy hardware purchases, of all types, but particularly of PCs.

%	1991	1994	1995
Hardware:			
Mainframes	7	6	9
Minis	17	19	23
PCs	41	48	60
LANs	23	30	34
WANs	10	13	16
Software:			
Applications	48	59	58
Tools	44	47	47
Systems	36	46	44
Services:			
3 rd Party Maintenance	13	15	22
Training	22	21	26
FM	-	4	5

Figure 20 Trade press readers with purchasing influence
Source: BPA Analysis of Computer Weekly Readership

Meanwhile the devolution of authority to influence software purchases, which spread over the three years to 1995, has begun to narrow. This combination of trends can reasonably be interpreted as the spread of policies which allow the local authorisation of purchases of "commodity" hardware to run only corporately agreed software. Influence and authority over the purchase of training and 3rd party maintenance has also spread but remains well below that for hardware and software.

The increased authority to purchase mainframes is a reflection of the fact that the latest mainframes are commonly more cost-effective and robust for many types of applications than the more fashionable, but also more complex, client-server systems. It is also less difficult to get the skills to make effective use of them.

4.3.2 The changing structure of the professional IT workforce

In looking at the changing structure of professional IT workforce there are a number of sources of authoritative information. Each uses slightly different definitions and covers different audiences. The National Computing Centre annual surveys of "Salaries and Staff Issues in Computing" cover almost entirely user installations. The trade press readership analyses and Computer Economics Salary Survey Panel cover both users and suppliers.

%	Actuals				Forecast	
	1991	1992	1993	1994	1996	1999
Management	17.6	17.6	19.3	17.4	16.1	15.2
Systems Analysis	12.5	12.5	14.4	13.7	14.1	14.6
Analyst/Programming	22.3	23.2	21.9	22.2	22.6	22.3
Programmers	10.8	7.4	7.3	5.8	5.6	5.7
End User Support	7.9	8.1	7.9	10.3	12.2	13.5
Technical Support	6.5	8.1	8.0	8.9	9.3	9.5
Network Support	5.1	4.9	4.2	5.5	6.5	7.1
Operations	17.3	18.3	16.9	16.2	13.4	12.1

Figure 21 The changing profile of the IT department 1991 - 99 NCC data
Source: National Computing Centre "Salaries and Staff Issues in Computing" 1987-1992

Past NCC data on the profile of those employed in in-house IS departments has shown clear and consistent patterns over time. Programming and operations were falling over time. Support, of all kinds, was growing.

There are differences of methodology between the NCC data and that from Computer Economics (see below). The Computer Economics panel is fairly constant over time, 5-600 employers, including suppliers, returning data for, on average, around 60 IT employees. This allows matched comparisons and tracking. The NCC data is from an annual survey, response rate usually around 10%, using the National Computer Index as a base, with an average of around 20 IT staff per respondent.

The head of IT in a large Midlands engineering user summed up the difference as follows: "I use Computer Economics to compare salaries with my peers, both locally and nationally. I use the NCC data to compare with smaller users, particularly locally."

There are also differences of definition. The Computer Economics "Systems" group includes many included in "Management" in the NCC survey, for example "Project Managers". Thus the balance between those classified as Managers and those shown as "Systems Analysis" or "Systems Group" is different in the two surveys - even before allowing for the fact that smaller departments have proportionally more managers.

	1993	1994	1995	1996
Management	7.9	8.5	8.2	8.9
Systems	20.3	21.1	24.0	23.1
Analyst/Programming	22.8	21.3	20.6	23.1
Programmers	10.5	9.2	7.6	6.4
Technical Support	11.8	12.9	12.9	13.5
Customer Support	13.7	15.8	17.0	18.1
Operations	13.0	11.2	9.7	9.1

Figure 22 The changing profile of the IT department 1993 - 6 CEL data
Source: Computer Economics Ltd, May Surveys 1993 - 6

The similarities in the trends indicated are, however, clear.

The proportion of systems analysts skills and analyst/programmer is relatively constant. The proportion of programming and operations staff is falling. The number of support staff of all types is growing.

The main difference is that in 1994 NCC members expected IT management teams to continue to shrink. This has not happened. They are growing again with the need to actively manage outsourcing arrangements.

If we compare the NCC and Computer Economics data with the controlled circulation readership of the trade press there are further differences of definition. Nearly 50% of the readership of the Trade Press are employed by suppliers, where the employment profiles are different. The trade press readership is also light among lower level user support and operations staff (both so small as to be included in "other").

	1991	1994	1995
Management	13.5	21.2	29.2
Systems Analysis	12.3	12.7	10.2
Analyst/Programming	24.5	21.3	17.2
Programmers	10.6	6.9	5.3
Systems Programmers	3.2	2.2	1.8
Technical Support	11.3	13.0	9.1
Network Staff	2.8	3.2	2.9
Software/system Eng.	5.1	5.0	5.1
Consultancy	6.7	4.8	7.1
Sales and Marketing	2.6	1.2	1.9
Other	7.4	8.3	10.2

Figure 23 The changing readership of the IT trade press 1991 - 95
Source: BPA Analysis of Computer Weekly Readership

The rapid growth in "Management" in the Computer Weekly data reflects the mushrooming growth of small and/or decentralised computer support and service operations, in-house, external and in user departments. Few such operations are included in the NCC data which largely reflects employment in traditional IT departments.

Over 20% of the Computer Economics Panel are, however, employed on the supply side and some of the differences in structure between suppliers and users are explored below (Section 4.5).

The drop in the programming base is common to all analyses. This means that the sharp rise in demand for programming skills to do software audits to handle the Year 2000 problem will probably lead to very rapidly rising shortages and spiralling turnover over the next few years. This can already be seen among programming and technical support staff (see section 4.7).

4.4 *Analysis by claimed skills*

4.4.1 *Roles performed*

The analyses above have been based on pigeonholing those in the IT industry by broad definitions based on their current job title or primary role. In practice an increasing number have multiple roles. Thus under 2,000 of the readers of Computer Weekly see End-user Support as their primary role but over 12,000 see it as their second role. Similarly under 1,500 see Training as their primary role but nearly 6,000 see it as their secondary role.

The low priority given to end-user support and training by most IT professionals may be a prime reason why they are held in such low regard by many users and may also be linked to the mindset which fails to recognise how large a proportion of current software is regarded by such users as "barely fit for purpose" or "not merely user-unfriendly but actively user hostile".

The following analysis is based on the current primary and secondary roles performed by Computer Weekly readers.

000s of mentions	1992	1993	1994	1995
Head of IT/DP/MIS	14.0	15.8	19.6	14.3
Other Director i/c IT/DP/MIS	5.4	6.1	6.4	5.7
Manager of IT/MIS/DP Dept	-	-	-	17.5
Systems & Programming	35.5	37.9	34.4	32.5
Systems Analysis	28.1	32.5	30.0	25.7
Programming (Dev/Apps)	24.8	29.8	26.4	21.6
Systems Programming	10.8	12.4	11.1	9.6
Technical Support	30.2	33.9	32.4	30.2
End User Support	10.2	17.3	16.3	14.7
Networking	12.0	14.3	15.0	13.3
Telecoms	5.8	6.3	6.6	5.8
Software Engineering	8.1	9.1	9.0	8.1
Systems Engineering	3.1	3.6	3.5	3.4
Operations	5.8	5.1	5.6	5.1
DP/IT Consultancy	13.5	14.4	12.5	14.4
Sales and Marketing	4.8	2.8	3.2	4.0
Training Education	5.2	8.6	7.7	7.2
Database Admin	3.7	6.4	6.2	5.9
Business Analysis	5.6	9.6	9.3	9.1
Systems Audit	9	1.7	1.6	1.5
Other	6.5	3.5	5.0	5.3

Figure 24 Job functions performed by readers of the trade press
Source: BPA Analysis of Computer Weekly Readership

The apparent drop in 1995 in the number of "Heads of IT", "other Directors with responsibility for IT" and those with "Systems & Programming" and "Systems Analysis" responsibilities, is more than explained by the introduction of a new category for "Managers of IT/DP/MIS Dept".

This analysis also shows a much less sharp drop in programming skills, if programming is counted as part of a portfolio of skills rather than the prime function.

After a rise in 1992-3 most non-management roles other than DP/IT consultancy show a fall. This is consistent with a perceived increasing polarisation between core teams, (whose prime role is to manage delivery, whether sourced internally or from outside), consultants (whose role is increasingly to manage expectations and relationships) and teams working on systems development, implementation and support.

4.4.2 Analysis by programming and software skills

The controlled circulation readership of the trade press is focused on those currently in the workforce. The drop in Cobol, 4GL and RPG3 skills in the year to December 1994 correlates with known redundancy programmes for older staff in a number of major suppliers and users. This group will almost certainly need to be identified, contacted and, if possible, brought back into the IT skills market to help tackle the year 2000 problem. This age group commonly also learned Assembler, Fortran and Pascal although none of these has been in major demand, commercially, for many years.

000s of mentions	1992	1993	1994	1995
Basic	56.8	59.8	57.5	51.0
Cobol	52.9	54.0	48.7	44.4
C	32.4	36.1	36.1	36.4
SQL	16.8	32.4	34.7	35.9
4GL	31.9	35.9	33.5	31.5
Pascal	28.5	29.5	27.4	26.0
Assembler	29.5	30.8	28.8	24.0
Fortran	24.7	24.8	22.5	21.1
C++	10.2	14.2	17.3	20.3
PL/1	8.6	8.7	7.7	7.6
RPG4/400	2.7	5.0	4.8	6.7
RPG3	6.4	6.6	5.8	5.1
ADA	4.4	4.6	4.6	4.1

Figure 25 Programming languages which readers of the trade press have used
Source: BPA Analysis of Computer Weekly Readership

Another feature is the rate with which the apparent supply of some skills can grow (SQL and RPG400) compared to others where demand similarly outstrips supply (C++) but growth is, proportionally, much lower. This can also be seen (below) with regard to systems software. It relates to whether the structures and methodologies are similar to those behind already acquired skills. Thus those with RPG3 skills can cross train to RPG 400 far more easily than those with C can cross train to C++. Those with a good technical skills base can usually acquire new technical skills very rapidly, provided these do not require a new way of thinking.

The shortage of young trainees and the time they take to become competent in their initial skills set gives added value to policies of cross-training older staff with already related skills where this is practical.

000s of mentions	1992	1993	1994	1995
Windows	31.9	66.4	80.0	98.8
MSDOS	79.0	84.2	86.3	93.1
UNIX	36.7	41.5	46.3	62.3
Novell	13.6	25.8	31.9	46.7
LANS	12.4	21.7	24.3	45.3
TCP/IP	-	-	-	37.9
VMS	25.3	26.4	25.7	32.1
Visual Basic	-	-	-	26.0
OS/2	15.8	17.7	20.3	24.3
Oracle	13.1	15.6	17.7	24.2
MVS	21.8	21.1	19.3	23.3
CICS	18.6	19.0	17.5	21.1
WANS	-	-	-	19.1
X25	8.3	13.2	13.6	18.1
SSADM	11.0	20.2	19.8	17.4
DB2	11.7	12.8	12.8	16.0
CASE	8.8	15.5	15.4	15.5
OS400	-	-	-	12.0
Ingres	7.1	8.5	8.9	11.0
Informix	-	-	-	9.6
Clipper	-	-	-	8.0
IMS	4.6	8.2	7.6	7.6
Sybase	-	-	-	5.5
Powerhouse	--	-	-	3.5
Synon	1.4	2.3	2.2	2.7
Progress	-	-	-	2.6
SAP	-	-	-	1.6

The definition of “systems software” in this table mixes very disparate products.

Figure 26 Systems software used by reads of the trade press
Source: BPA Analysis of Computer Weekly Readership

The rate of expansion in the period 1993-5 of claims of experience correlates with a known boom in the short course market for a number of those skills. Others (eg DB2, MVS and VMS) imply a return to the workforce of those laid off in earlier years. The rapid expansion and subsequent tailing off in SSADM skills fits with its encouragement as a standard for government systems and the subsequent departure from the IT workforce of those who did not wish to be outsourced.

The small number claiming SAP skills helps explain the premium they command in the marketplace, given not only the sharp rise in demand to date but that likely over the year ahead for software that is known to be already "Year 2000 compliant".

4.5 *Analysis by location*

Traditionally over half the professional IT workforce has lived and worked south of Northampton and east of Swindon. The relocation's of the 1980s did not significantly change this pattern although there was a significant move out from London along the eastern end of the M4 corridor and, to a lesser degree, to the M25 ring.

	1991	1994	1995
Greater London	17.0	12.4	13.1
South & East	38.8	40.8	40.1
SW & Wales	10.1	10.8	10.6
Midlands	12.4	13.3	13.7
North	16.8	17.2	17.3
Scotland	4.3	4.7	4.5
Northern Ireland	0.6	0.8	0.7

Figure 27 Readership of Computer Weekly by location 1991 - 95
Source: BPA Analysis of Computer Weekly Readership

4.6 *Turnover, commitments and mobility*

As predicted in the 1995 report we are seeing a sharp rise in turnover, particularly among analyst-programmers, programmers and other technical staff with skills in particularly short supply.

	1995	1996
Management	4.0	5.9
Systems	6.6	7.9
Analyst/Programming	11.3	11.0
Programmers	9.8	15.4
Technical Support	3.6	8.0
Customer Support	7.4	8.6
Operations	5.2	5.9

Figure 28 Resignations by function group
Source: Computer Economics Ltd, May Surveys 1993 - 96

This data masks some very sharp variations by size of organisation and age and sex of individual.

Resignation rates in organisations with under 50 IT staff (11.3%) are much higher than those for organisations with over 500 staff (7.3%). Rates among males aged 25 - 29 are higher than those for females of any age and over three times the rate for women over 45.

%	1995	1996
Under 25	8.5	11.5
25 - 29	12.4	14.9
30 - 34	10.4	11.2
35 - 39	5.6	8.3
40 - 44	3.6	5.1
Over 45	3.2	4.2

Figure 29 Resignations by age
Source: Computer Economics Ltd, May Surveys 1995 - 96

Within the long standing split between young graduates who move after being trained and older staff who are less mobile but also less likely to receive training there is also a gender split. Women are less likely to resign, be made redundant, transfer within IT roles, retire or be made redundant. Women are also more likely to transfer out of IT but remain within the organisation, to go part-time or to die in service.

Other research indicates that those who grew up locally and went to the local college or university stay more than twice as long with the employer who trains them and that turnover among the disabled and other disadvantaged groups is similarly much lower.

Those who want to reduce staff turnover among trainees and younger staff should therefore consider ignoring traditional stereotypes and focus recruitment on those groups with known lower turnover rates. Those who wish to reduce overall turnover should focus on the older age groups in general, not merely retraining those they already have and those who already have relevant skills and experience but also recruiting mature trainees.

%	Male	Female
Under 25	12.0	10.1
25 - 29	15.7	12.4
30 - 34	11.7	9.6
35 - 39	8.1	9.2
40 - 44	5.2	4.8
Over 45	4.2	4.1

Figure 30 Resignations by age - split male/female
Source: Computer Economics Ltd, May Surveys 1995 - 96

There are also marked geographic variations in staff turnover.

	Inner London	Outer London	Rest of UK	National
Management	4.8	3.5	4.0	4.0
Systems	9.4	6.4	5.9	6.6
Analyst Programming	18.0	10.2	10.7	11.3
Programming	13.7	11.2	8.5	9.8
Technical Services	5.3	3.4	3.2	3.6
User Support	7.6	7.9	7.0	7.4
Operations	7.1	8.3	7.3	7.5
Administration	4.0	3.4	6.5	5.2
All Functions	10.1	7.9	7.5	8.0

Figure 31 % Turnover by function group: London v the rest of the UK 1995
Source: Computer Economics Ltd, May Surveys 1995

The very strong rise in recruitment effort for staff to work in Central London (Section 6.3) has so far produced modest results in attracting staff back from the rest of the South and East but done little to reverse the overall move away from London over previous years. Instead it initially produced sharply rising turnover among those prepared to tolerate London's decaying transport infrastructure.

Over the past year recruitment effort (see section 6.3 for regional analyses) has risen most strongly in Outer London and by less than the national average in Inner London. Staff turnover outside Inner London has risen in response while that in Inner London has actually fallen.

	Inner London	Outer London	Rest of UK	National
All Functions	8.5	10.4	9.5	9.5

Figure 32 % Resignations by location 1996
Source: Computer Economics Ltd, May Surveys 1996

Despite the image of youth and mobility, IT professionals are more likely to change employers than to transfer within the organisation, let alone move to a new region to stay with an employer (except in the software and hi-tech industries).

	Inner London	Outer London	Rest of UK	National
All Functions	4.2	3.4	2.4	3.0

Figure 33 % Transfers within IT 1996
Source: Computer Economics Ltd, May Surveys 1996

The 1994 Computer Weekly readership survey indicated that nearly two thirds of respondents were willing to consider relocation but over 85% owned their own house or flat, although they were more likely to be unmarried or childless than their contemporaries in other professions. More felt that home-ownership restricted their choice/flexibility than felt constrained by the schooling of their children or the career of their partner. Given the effects of negative equity and the current punitive taxation of relocation expenses the effect of the housing market in significantly reducing the mobility of an ageing IT workforce cannot be ignored.

The mobility of married employees with children is further reduced. Thus at times of rising shortage we see the emergence of local "staff wars" between rival employers in the same travel to work area. We also see those seeking large numbers of staff opening satellite offices in areas with a good supply of skilled staff and/or organising "flexi-" and "tele-" working programmes.

Where users need additional technical staff there is also evidence of a growing trend towards the use of regular contractors to avoid the problems of relocation in a stagnant housing market. Where permanent staff are needed there is some evidence of a preference for local recruitment, even though the skills may not be available locally. For example a survey in 1992 by North Nottinghamshire TEC indicated that 70% of recruitment effort was internal or local although nearly 40% of IT employers found it difficult to recruit staff with the right level of skills locally.

4.7 *The growth of self-employment*

The number and proportion of self-employed across the UK workforce as a whole has increased sharply over the past 20 years. It has been estimated that there are currently 45,000 self-employed IS professionals working through agencies and "associate consultant" programmes. It is very difficult to check the number or whether self-employment is growing because so many contractors work through a number of channels.

Government statistics suggest that overall self-employment grows during recession and falls recovery. Anecdotal evidence suggests that IT is not different, that the majority of IS contractors did not choose to become self-employed and that many would prefer to return to permanent employment, had they the choice or confidence that it was indeed permanent.

The transfer of most new IS employment opportunities to software and service suppliers with "hire and fire" policies means they do not have the choice. The uncertain future of many employers means that they rarely have the luxury of choice either. It is said that the current average length of stay of sales and support staff in communications suppliers and integrators is under six months. Those who are not hired and fired, as contracts come and go, leave anyway.

5. The Emerging Career and Employment Structures

5.1 *The scale of change*

5.1.1 *The end of "one education for one career for life"*

As has been said in previous reports in this series "The half life of most IT skills is now only 3 years and is falling. Current training and experience provide only a toe-hold in the job market. Most skills content will be obsolete inside 5 - 6 years leaving only the basic discipline." Meanwhile many employers have abandoned all attempt to plan for their own future skills needs, let alone to help their employees plan their own career paths.

But it is not just the precise skills in demand that are changing. The whole IT careers infra-structure has collapsed over the past decade as the result of a combination of forces. This collapse is not peculiar to IT and is far more profound than the mere replacement of one functional career hierarchy by another. 1996 is the "European Year of Life-long Learning" and both the UK Secretary of State for Education and Employment and, perhaps more significantly, the Permanent Secretary at DfEE are speaking publicly on the issues in response to Opposition plans for multi-media based adult distance learning programmes (the University of the Workplace). It is not clear how far the realisation of the implications has permeated.

The Graeco-Roman tradition, first encapsulated in Plato's Republic, of one education for one career for life, has become the exception rather than the norm. Most members of the IT profession will not merely have to retrain several times in their life-time, they are more likely to zig-zag between roles currently covered by different professional structures (from engineering to accountancy) than to follow any coherent path within a single profession. At the same time the distinction between leisure activity (photography, music or video) and profession is also becoming increasingly blurred for many.

The changes are neither sudden nor unforecast as far as IT is concerned. The need for employers to rotate staff between IS and user departments was reported in "The Management Training of Computer Staff" sponsored by ICL and the British Institute of Management in 1972 and serialised in Computer Weekly in the Autumn of 1973. The recommendation was that experience in the computer department should form part of the career rotation for all management trainees and that at any given time at least half the systems analysts and project managers in the computer department should be users or general managers on career rotation.

There is now an immediate need for exercises to identify the basic disciplines for the production and delivery of multi-media products and services (including content) and how best to organise programmes of training and experience to develop those disciplines at the same time as imparting specific skills that are in foreseeable, but probably transient, demand.

5.1.2 *Age related careers*

The implications for non-IT education and training structures were examined in a paper at the Univac annual press seminar in 1981. This was subsequently published in the proceedings of the conference, "Intelligent Systems, the unprecedented opportunity" (Ellis Horwood, 1983) and, with political recommendations added, as "Learning for Change" (Bow Group, 1983).

This paper put forward the concept of "age related careers":

"Given the uncertainty as to the duration of requirement for specific trades, should we not prepare our school leavers for those jobs known to be in current - but temporary - demand, while reserving certain careers, where demand is likely to be constant, for older generations who because of family commitments are no longer so mobile, who may take longer to retrain and who must therefore plan further ahead?"

- Flexibility for the young
15 - 30: Mobility with transient skills
- Security for the family
30 - 45: Executive/Managerial
- Academe for the mature
50 - 80: Education/Social Service

"Thus the school leavers would be prepared for the currently fashionable jobs and those jobs requiring rapid learning or geographic mobility. As the individuals mature and seek to settle down they would retrain for a more stable executive or managerial career. Social careers, such as educating or caring for others, would be reserved for those with experience of all the vicissitudes of life."

The paper used the mythical life story of a school-leaver of 1990 to illustrate the analysis:

"... retrain four times, none of them at his employer's expense because each time he is going into a very different career. Each time, partly because he is getting older and has more family commitments, it takes him longer, until his final academic cum leisure cum retirement post ... after his youthful job mobility, at 45 he settles for a collection of part time sources of income, including teaching and social cum political activity, rather than disrupt his family life and move again."

The Bow Group version of the paper alerted politicians to the urgency of the need to halt the crippling loss of pension rights as a result of multiple job changes. The introduction of career development loans was a response to the need to enable "retraining at reasonable cost, social cost as well as economic cost ... at any stage of life, independent of the desires, means or needs of the current employers".

The necessary changes to trades union and professional structures, to social security regimes and to the education system, as multiple career (not just job) changes and portfolios of part-time jobs become commonplace, have proved far harder to handle.

5.1.3 *The End of Information Systems Engineering as a large-scale, full-time, profession*

The adoption of a structure based on roles rather than jobs for the new British Computer Society (BCS) Industry Structure Model (ISM3) was a major step forward in thinking on the part of a chartered professional body but we also need to recognise that full-time, professional "information systems engineers" are now a rapidly declining sub-set of those responsible for specifying, designing, developing, installing, operating and maintaining computer based systems. Similarly much, perhaps most, of the embedded software that now controls all types of manufactured product is no longer produced by full time "software engineers", let alone by members of the BCS or IEE.

It is not just that a growing proportion of IS professionals has been transferred from in-house IT departments to facilities management operations. The overall number of IS professionals in employment has been shrinking rapidly as the over 45s are laid off and no-one takes on trainees. A profession in which employment peaked at about 350,000 in the mid-1980s may well be down to no more than 100,000 or so after the lay-offs that will follow the current boom. The mix of skills and disciplines needed to develop and integrate attractive multi-media products and services appear so very different that this cannot really be viewed as an extension of IS although many individuals and companies are looking to make the transition.

The telecommunications, broadcast and hardware engineers and technicians, who make up the majority of employees in the supply industries that are converging with computing, face a similar scale of change.

5.2 *The forces driving the pace and direction of change*

5.2.1 *Corporate implosion*

The successful application of IT has led to an overall implosion of corporate employment. Much of the analysis and information processing that used to require whole tiers of middle management now resides somewhere inside a computer system. The on-line "supply chain management systems" that link supermarket checkout, distribution warehouse and supplier have, for example, removed armies of clerks, administrators and their managers, not only in retailers and distributors but also in suppliers and transport firms. Similarly in banking and insurance the moves to automated teller machines, credit cards and on-line transactions and telephone banking and insurance quotation have led to massive staff cuts, including among the managers whose decision support systems were to be networked and supported. The results include rising tension and stress as the human buffers that previously filtered and re-routed communications, and allowed senior executives time to think, are replaced by mobile phones, pagers and voice-mail.

In an address to PITCOM, (the Parliamentary Information Technology Committee) on June 6th 1996, Dr Arno Penzias, Chief Scientist at Bell Laboratories, said that no computer could replace a single human being. What they did was to replace whole departments of human beings. The effective use of "groupware" commonly leads to the reduction or elimination of the group as its task is streamlined, optimised or built into the software.

Organisations that have many fewer managers and employees need many fewer workstations on their networks and are less well able, let alone less well disposed, to help plan the careers of those responsible.

When staff are cut and locations are closed the need for systems to serve them is reduced accordingly. The first large UK computer network project to be scaled down and then scrapped because of the closure of the locations it was to serve, was that of British Steel in the late 1970s. Many more have followed since then.

5.2.2 *Industrial implosion*

The convergence of computing, communications and broadcasting, information, education and entertainment into world-wide groupings with armies of specialist subcontractors is likely, in the long run, to create more jobs than are lost but whole sectors of the current IT industry are likely to disappear on the way. Other convergences, among IT-using industries, will have similarly profound effects.

It has been forecast that over the next decade the financial services industries worldwide, (including banks, building societies, insurance companies, stock exchanges etc), will implode into a dozen or so integrated processing hubs, surrounded by local and world-wide multi-media networks to attract, generate or capture the whole gamut of financial transactions - from stockbroking to pawnbroking, from supermarket check-out to pay-per-view TV, as well as all the buying, selling, credit control, security and settlement in between.

This process will take time and give many lucrative consultancy and contract opportunities but the IT professionals serving this, the largest single user sector in the UK, will need to remain employable through a whole series of take-overs and mergers in the course of which the suppliers of hardware, software, services, including of integration and facilities management, may lose even more than the in-house teams - if they are on the wrong side of the "merger".

5.2.3 *The end of "corporate loyalty"*

Britain was the first culture to "evolve" the concept of the limited company as a means of handling long-term, high-risk investment. That concept entailed moving from loyalty to an individual leader, family, tribe, guild or village to loyalty to an abstract corporation. Britain is also the first culture to try to move direct from a world of large organisations, with structured hierarchies based on jobs for life, to a world based on networks of short term contracts. Even the United States has not been subjected to such sudden change, partly because it has always had a far more diverse set of employment structures.

The supposed reason is to achieve efficiency and flexibility in a world of unprecedented and unpredictable short-term change. The practical effect is to severely weaken the concept of corporate loyalty and responsibility without putting anything in its place. The "learning enterprise" may no longer need blind loyalty ("if you want loyalty get a dog") but it does need the commitment that will lead to constructive criticism when proposed decisions appear misguided and "dedication beyond the call of contract" when the going gets rough.

Employers must recognise that few able staff will stay for ever but that if they take no responsibility for the careers of their employees, let alone for their health, welfare or family life, then their staff must extract the maximum in remuneration and time-off to fund and organise this for themselves.

5.2.4 *Pre-empting the Social Chapter*

Attempts by European governments to impose "corporate loyalty" (alias job security) on employers who face an uncertain future have commonly led them to avoid taking on new staff and sub-contract instead. While "opting out" has so far enabled the UK to avoid continental rates of unemployment (with short term jobs created through winning some of the sub-contracts against competition from the Far East and Eastern Europe) the prospect of the future imposition of the "Social Chapter" has also expedited UK outsourcing programmes, even when these do not otherwise make economic sense.

As is so often the case, well-intentioned government policy is having the opposite effect to that intended.

5.2.5 *"Hunting Groups" and "White Knights"*

Organisations built on short-term betrayal cannot survive. Until such time as new models of loyalty to the "virtual" organisations of the future have emerged we will see the growth of "networked hunting groups" based on personal relationships. Thus it is common in financial institutions in Central London that when a head-hunter recruits one key member of a team the rest follow. Similar patterns are well-established or emerging in other industries, from audio-visual content production to software and service operations.

In contrast we can also see the "white knight syndrome": the rapid development of strong loyalty to their new employer among those transferred to a facilities management organisation or outsource contractor which is seen to live up to its promises with regard to career development.

5.2.6 *The delaying effect of "proprietary" versus "standard" battles*

The rate of increase in power and speed in raw technology is still impressive but the pace of "cosmetic" change in the combinations of hardware and software being shipped is probably delaying, rather than expediting the application of that technology to meet user needs. The revenue from "routine upgrades" may be vital to sustain supplier revenues as the production cost of systems of any given power plummets but the cost to users, as resources are absorbed in "maintenance", is much greater.

In his Nortel Briefing on convergence issues Professor John Midwinter commented: "The reasonable user today might thus well conclude that introducing new software upgrades, which do not provide equally easy forward and backward compatibility, and especially which do not do so completely automatically except for giving a warning when some new gizmo cannot be implemented, is tantamount to blackmail."

Over the next few years the fastest area of employment growth in IT will continue to be in software, services and "systems integration". The competition among such organisations for staff will be such that many will need to offer career development paths in order to retain existing staff, let alone attract new recruits. However, the future profitability of many of the largest firms in this sector now entails the reduction of support costs for systems which integrate products from a variety of suppliers who are accustomed to regularly "upgrade" their offerings. Their interests and those of some of the most powerful suppliers of proprietary (ie non-standard) products are therefore diverging. The mass roll-out of the next generation of truly innovative IT products and services is likely to be delayed until this conflict of interest is resolved.

The first market sign that discontent could turn into backlash was the comparative failure of Windows 95. The expectation among suppliers that users will embark on wholesale upgrades to handle Year 2000 problems may turn out to be badly misplaced. If forced to convert many are more likely to downsize than to invest in changes that offer no obvious business benefit.

Meanwhile the transfer of many large corporate purchasing decisions to a small number of FM suppliers has changed the balance of negotiating power across much of the industry. Overall computing costs will fall sharply and implementation timescales shrink if this power is used to force the adoption of two-way compatible, de facto, common interface standards as the norm, with one-way compatible proprietary add-ons as options only

5.2.7 The rise of user power and business IT

Another factor for change is the rise of the IT-literate end-user. Somewhere over 20% of the UK workforce as a whole are IT users. They greatly outnumber the IT professionals in the workforce.

Some require IT skills to a higher level of sophistication in their areas of use than many who regard themselves as professionals. Most are trained and/or supported by colleagues who are also not IT professionals. The issues with regard to the IT skills of secretarial and administrative staff, managers and other non-IT professionals are, for most users, more important than those with regard to the small groups of IT staff, if any, that they employ. Training them how to use new products and services, whether formally or by trial and error, is commonly the largest item of cost in the adoption of new systems.

User managers increasingly control their own IT budgets, whether or not they have free choice or can only purchase products and services from agreed sources or that fit within an agreed corporate infrastructure. They increasingly expect that which they buy to be robust, easy to use and "fit for purpose". Such expectations have now been reinforced by the UK Courts with the case of *St Albans v ICL*. IT professionals must therefore learn to treat their users as customers (to be wooed) not victims to be tolerated. This trend is being reinforced as the expertise of user departments is reinforced by the increasing movement out of IT departments of those whose interest is in the business rather than the technology, particularly if outsourcing is in the air.

5.2.8 *Increased global competition*

Increased global competition affects many areas of current and prospective IT employment, directly as well as through the pressures it places on user objectives and budgets. The Indian software industry is understood to be growing at about 40% p.a. Many Indian software houses are now fully competitive on quality (with the use of ISO 9000 expanding rapidly). Their prices are well below the Western equivalents and their next round of expansion is expected to be funded from the profits on the growing number of Year 2000 conversion contracts they are winning in both the UK and the US. Meanwhile the use of Chinese and Philippino data entry operations by new market entrants is transforming the economics of database publishing with the potential for players to emerge from nowhere to compete with established market leaders.

The potential for the majority of technical IT-related jobs to move off-shore is massive. If the task can be adequately specified, (eg transporting a legacy system from mainframe to client-server or PC/LAN with little or no change), an Indian software house may already be able to bid at 20-25% of the UK/US price for comparable quality.

Even if the job requires on-site attendance and local support, it is now common for the local supplier to sub-contract those tasks which do not require close contact overseas. More recently the scale of subcontracting to China has increased dramatically, including for scientific abstracting and information collection and collation as well as for complex programming, particularly that requiring object-oriented thinking - which comes naturally to the classically educated Chinese.

But these are only the first of the effects that "globalisation" will have, before most of those currently in the IT workforce reach normal retirement age. Information collection and processing jobs that do not require scarce skills can be located where labour rates are lowest. "High-added-value" tasks that require scarce skills can be located where there is the best supply and/or in the most attractive places to live. Transactions can be "sourced" from the areas with the lowest sales taxes and profits taken in those with the most attractive corporate tax regimes.

5.2.9 *Opportunities and incentives for global career mobility*

There are probably more Britons working in the American film industry than in the British. Similarly many of those with key roles in the US IT and communications industries moved there for a similar mix of career and life-style reasons. UK suppliers who win major orders in North America commonly relocate there for a mixture of marketing and tax reasons - with the bonus of local access to leading edge technology. Much of the UK-owned electronic publishing and information services industry (eg Reed Telepublishing) is now based across the Atlantic for the same reasons.

One of the effects of the European Union is that a growing number of citizens live in one state and work in another. This has many fiscal and social consequences as has been learned from the Malaysians who commute to work in Singapore and the French who commute to work in Switzerland, let alone the Palestinians who commute to work in Israel. Unless some of London's transport problems are sorted out it may soon be easier to commute to the City from the Pas de Calais than from Peterborough.

5.2.10 *The Spread of Flexi-Teleworking*

The combination of flexible working (from home, office and/or data mobile) and the Internet means that a growing number of IT professionals may "work" in a number of supposedly sovereign states, not merely in Europe but world-wide, in the same day or even hour.

The best paid flexiworkers often include senior IT professionals who were able to retire early in good health with contacts, skills and experience in current demand and who aim to reserve physical travel for pleasure, rather than to fight fires or meet deadlines

We are seeing a sharp rise in flexiworking: working from a home office linked to the corporate systems but having regular physical meetings with colleagues and/or customers and using company premises and facilities for what cannot be done economically from home. A significant part of the rise in demand for "groupware", wide area and other networking and communications skills is to provide the technical support that is necessary. This is also a major driving force in improving the usability of many communications products and services. User interfaces which look fine to an "Internet junky" can result in "short-order personal outsourcing" if they confront a senior manager logging in from home, airport or customer premises.

Flexiworking is, however, very different from teleworking: where the individual does not regularly communicate other than electronically or by post. Given the growth of low cost world-wide networking a grim fate awaits the teleworker without the skills and/or knowledge to give a competitive advantage over the Indian or Chinese post-graduate bidding to do the same task. The key factors affecting the desirability or otherwise of working from home for individuals include the distance from colleagues/clients, the scarcity or otherwise of the skills they possess and the means of enhancing/updating their personal skills base.

Individuals who intend to telework regularly from outside easy "travel to meeting" distance from colleagues and/or clients, without maintaining a skills and knowledge base that will ensure their personal competitive advantage, risk becoming trapped in old-fashioned rural squalor rather than enjoying the ideal of a beautiful lifestyle. "Travel to meeting" distance is better measured in hours than in miles. Thus a Scottish island with an all-weather air taxi service can be seen as "closer" to London than many parts of England and Wales. It is no coincidence that many of the new Internet-based businesses are based in locations which may be geographically remote but have excellent air transport.

5.2.11 *The rise of cross-profession and cross-culture skill sets*

Some of the changes under way give IT professionals the opportunity to diversify their skills to increase their future employability but many also require such diversification. In particular most of the likely areas of long term professional IT related employment growth require mixes of computing and communications skills, both hardware and software, that are both in short supply and difficult and expensive to acquire.

The economics of all forms of training are, however, being transformed as home-based students can access multi-national teleconferences and multimedia "narrowcasts" and providers, including publishers, programme-makers and examining bodies, increasingly compete world-wide for paying students and customers. Conversely there is a major employment opportunity in the development of education and training materials and services which look beyond National Vocational Qualifications, GCSEs and the National Curriculum to the world-wide English-speaking community: what price a National Curriculum in a global world". IT courses and materials designed for the UK domestic market are now almost unsaleable outside it. By contrast those designed for the Singaporean market can be sold world-wide.

Another potentially lucrative growth area requires the acquisition of legal and technical skills to help distribute (including licensing, protection, revenue collection and enforcement) digitised intellectual property where content assembly may be groupworked among participants scattered across several continents and/or simultaneously pirated world-wide. Already a number of IT professionals have done very well by changing careers, including acquiring new sets of qualifications as necessary. Others will do even better producing and running the systems and services to police and collect royalties from the licensing, copying and/or performance of multimedia products and services.

There is also sharply increasing demand for network security skills to help reduce the vulnerability of large, network-dependent, centralised organisations (eg banks, manufacturers and retailers) to systematic fraud (including that based on reprogramming swipe cards, portable phones and data mobiles) and/or sudden and catastrophic collapse - whether from system failure, fraud or market panic. The professionals who specialise in this area already do very well. A classic example is the many disaster recovery services that need regular maintenance and testing but will, hopefully, never be used in earnest. A rapidly growing area is the hackers turned detectives but "quis custodiet custodiet?" (who guards against the guardians).

The largest areas of long term growth require a mix of IT and non-IT skills and there are signs that many of the non-IT skills are more difficult to acquire. If so, more of the new jobs will go to end-users who acquire IT skills than to IT professionals who seek to diversify.

There is a growing demand for those who mix IT skills with graphics design, marketing and other non-IT skills to help innovative users use multi-media, whether stand-alone or networked, to transform existing businesses of all types and sizes. IT professionals with language skills (Mandarin, the written language of China, and Cantonese, the most common spoken dialect, plus Spanish, Arabic and Japanese not just Visual Basic or HTML) will also command a premium.

English may be the lingua franca of the Internet but, as image and voice replace text on the broadband Intranets of the future, those who can also help design and edit the content of fully inter-active multi-media to service, for example, the world-wide Chinese and Hispanic communities, will command a much higher salary than those who can only provide technical support for the infrastructure.

5.2.12 *Summary*

The forces driving the pace and direction of change are operating in different directions along different dimensions. They will affect different industry sectors and types of organisations in different ways and to different timescales.

The approach required to handle the changes in prospect is akin to that required of Captain Cook, required by the Admiralty to navigate an unknown ocean, surveying from the Arctic Circle to the Tropics. He had to create and maintain a team with the commitment, skillset and mindset to handle anything, however unexpected, to achieve the agreed targets, whatever wind, weather and fortune might throw at them and to continue the mission, whether or not the captain survived. Captain Bligh was almost certainly his equal as a navigator but failed the team maintenance test on a much simpler mission.

5.3 *The new career frameworks*

5.3.1 *The convergence of the infrastructure professions*

The traditional professions of computing (including "information systems engineering"), communications (including both telecommunications and broadcasting), electronics (including all forms of digital control systems both hardware and embedded software), publishing (including graphical design and printing) and even visual arts (including digital imaging) are becoming increasingly intertwined.

The underlying technologies have converged. Some of the disciplines have also converged. Some should converge, but have yet to do so. Some are never likely to do so.

One of the widest gulfs to be bridged is that between information systems and telecommunications. To quote Professor John Midwinter (Nortel briefing number one, 1996) again: "It will be fascinating to see how one interfaces the conflicting cultures of a software industry where partially incompatible upgrades are offered every 6 to 12 months and are its financial lifeblood, with a telecommunications industry in which a 40-year-old telephone usually still works perfectly well alongside the latest model."

It will not only be fascinating. Such a convergence is essential if sufficient users are to make the transition to the new generations of hardware and software that will underpin the Information Society. These require the seamless integration of infinitely more complex software modules that are necessary for the current relatively slow speed, low bandwidth, products and services.

5.3.2 *The likely non-convergence of the infrastructure and content professions*

Another gulf is that between the infrastructure providers (whether of hardware or software) and the content providers (from authors and composers to artists and graphic designers). This must be at least narrowed, if not actually bridged, if UK sourced product is to meet the needs of the potential mass markets of the future and generate growing employment with a wide diversity of new, regularly updated and attractive, multi-media services rather than implode around the mere digitisation of current high volume information and entertainment services.

In 1991 at a conference on "Electronic Publishing: Threats and Opportunities", Sir Keith Skinner, the retiring chairman of Reed Business Press, pulled the rug on the then fashionable concept of "hybrids" with a thoughtful and challenging after-dinner speech.

Hybrids, who were masters of neither technology nor publishing were likely to produce bland, boring and unsaleable products. The best that could realistically achieved was to teach the first class in each separate discipline sufficient about the other disciplines for them to communicate with their peers under a management regime that would allow creative tension to be productive rather than destructive.

More recent events, such as the FEI-EURIM Superhighways Symposium in 1994 (which cut across the boundaries of computing, communications and broadcasting on both the technology and applications), have served to confirm the perspicacity of Sir Keith's remarks.

Thankfully the PITCOM study tour to look at US Superhighways policy in 1995 identified that the culture gulfs were not peculiar to the UK. The bad news was that the more open and commercially driven US society was likely to be more effective in finding bridging mechanisms than the status and bureaucracy driven professional bodies of the UK and Europe.

The career structures of the multi-media community are likely to be more akin to those of Hollywood, (including for the elite camera men and technicians who commonly earn more than all but the best known stars), than those envisaged by the most forward thinking of the UK professional bodies, let alone those envisaged by the stalwarts of the Engineering Council.

5.4 *Career "portfolios" rather than "paths"*

The almost total cessation of trainee recruitment makes it difficult to identify whether any coherent long-term career paths are yet emerging but we can see five broad career "portfolios":

- technical - including the development, use and support of tools, techniques and packages.
- applications - from the analysis of business needs through the selection of technologies to meet business needs to the management of implementation projects.
- support - including ensuring end-user and customer satisfaction where applications draw on products and services using a variety of technologies from an even wider variety of suppliers.
- management - of relationships, multi-disciplinary projects and people, not just of technology.
- "independent consultant" - ranging from freelance programmers with aspirations to former IT managers with memories.

Each grouping cuts across traditional professional boundaries in different ways.

5.4.1 *Technical - Digital Engineering*

The technical career path is the only one that approximates to the traditional IS careers model. It is probable that this will indeed evolve in the direction of other engineering professions with recruits normally trained by suppliers, not users. As with some other engineering professions the majority of individuals will subsequently follow career paths that zig-zag between employment with suppliers and with users, interspersed with spells on contract work. If so, their problem will then be to keep abreast of changing technologies, including to make opportunities to acquire hands-on experience.

Typical followers of the technical career path may move between, for example, systems programming and technical support but their orientation is likely to be towards the technology rather than applications or people. If promoted to management roles these are likely to be running technical teams and/or looking after products/services in terms of facilities, throughput and response times.

It is also probable that the barriers between the various types of hardware engineer (telecoms, radio and electronics) and software engineer will decline as the former increasingly acquire software skills and embedded systems account for a growing proportion of programming employment. It is said that in Germany, (with its much stronger manufacturing industry and where the average executive car contains the equivalent of over forty 1980s mainframes), three times as many programmers are already employed producing embedded software as work in the Information Systems industry, including both suppliers and users.

If UK manufacturing industry continues to recover and the Indian software houses continue to focus on information systems we can probably expect a similar pattern to emerge here.

5.4.2 *Applications - process management*

Many of the first generation of systems analysts had originally been trained in organisation and methods or administrative accountancy. The idea that programmers might progress into systems analysis came later. But as far back as 1971 the National Institute of Industrial Psychology identified that the aptitudes required of systems analysts were different from those required of programmers. Many of the subsequent problems between IT departments and their users came from the common mistake of promoting good programmers to systems analyst roles and expecting them to appreciate the non-technical aspects of system design, particularly those concerned with user interfaces and organisational behaviour. We have similarly paid a heavy price for placing more emphasis on technical skills and experience than on what is now called "process management" in the career development of most systems analysts and project managers.

Those responsible for applications require understanding of user priorities and behaviour plus personal grounding in the business sectors where they wish to practice, producing solutions to meet demands that evolve over time. They need to be motivated by the challenge of applying technology, whether leading edge or not, to achieve business objectives. Those who carry the title systems analyst or analyst programmer but are more interested in opportunities to use the latest technology are more suited for the technical career path.

"Applications" may be better viewed as a role than as a career path.

Just as the barriers between hardware and software engineers are likely to fade away so the distinctions between in-house business systems analysts and IT experienced users are likely to become blurred. At the same time many software and service suppliers are creating sector specific operations, often employing mixed cadres of former users and management consultants. Meanwhile those in charge of in-house projects are at least as likely to be drawn from the departments the system is to serve as from an IT department.

Attempts to give general business and user applications training to IT professionals commonly have a chequered history. The necessary in-house skills in this area are more likely to be acquired either by reviving the "grand tour" approach to management development (with all user managers expected to acquire the necessary understanding and practical experience at some stage in their careers) or by recruitment from those major consultancies which never dropped this approach.

5.4.3 *Support - a role rather than a career?*

Support is also better viewed as a role than as a career path. There is a clear split between technical support, requiring in-depth knowledge of specific products and services, and applications support, requiring understanding of how a variety of products and services from different suppliers are brought together to meet a given need. The former is commonly a role carried out with more or less reluctance by technical staff. The latter is most commonly provided part-time by other users. Many of those involved in full-time support, from running help lines through training and advice services to technical writing, came from secretarial, administrative and other non-IT backgrounds.

Support staff are the cement that bind an IT department or a supplier to its customer base, and vice versa. Those who neglect the morale and welfare of their support staff have commonly taken the first step towards being "personally outsourced". It is vital to ensure that their needs and aspirations are met. These often have more to do with social conditions and family obligations than "mere" money. A growing proportion of support staff are now on flexible working terms and conditions using increasingly sophisticated network and groupwork technology to provide location independent services.

If support staff are used intelligently as the "eyes and ears" of the marketing and/or account management team many problems can be avoided and earlier warning can often be obtained of the need for, and likely direction of, change.

5.4.4 *Management - hybrids or mongrels*

Three broad IT management roles are emerging:

- Agreeing strategies and objectives and ensuring the latter are met
- Managing service contracts and relationships, whether for supplier or customer
- Providing technical advice and/or running technical teams

In the 1994 IT Skills Trend Report these were called "the Businessman", the "Systems and Service Manager" and the "Chief Technician".

There is also a growing need to manage project based teams which bring together individuals with diverse skills and backgrounds and cut across organisational boundaries, both within the organisation and between suppliers and customers.

Much has been said over recent years about the need to develop "hybrid" managers who understand both business and IT. The idea is not new but the very concept of hybrids masks the principle that IT competence should now be part of portfolio of all would-be Directors. As mentioned above there was a strong view in the early 1970s that systems analysis and project management should be part of the general career rotation for corporate high-flyers. This is now bearing fruit with a growing number of user managers having had line IT experience at some stage in their careers, an influx of managers from user departments into IT, often initially help implementation and/or service management, and the increasing transfer of IT staff to user departments, initially again often to help with support and/or implementation. Signs of progress, however, are not enough.

There is a need to ensure that many more managers, at all levels, understand both IT and the business(es) and application(s) if the organisation is to get satisfaction, see value for money and survive, let alone come back for more.

There is a serious shortage of those competent to manage large scale projects, perhaps critical to corporate survival, where the objectives and priorities may change at least as rapidly as the technologies available.

It is a commonplace that systems which take more than three years to deliver are more likely to be cancelled than implemented. Pressure is now common for major change to be delivered at 12 - 18 months notice. Such pressure demands that change is rationed, phased and controlled with unnecessary complexities and diversions, including supplier-driven software upgrades, avoided. That requires management teams, not just individuals, who understand both the business and the technologies and have the confidence and "clout" to bang heads together in suppliers as well as user departments.

It really is therefore essential that IT experience forms a part of the portfolio of every senior manager, whatever their nominal professional background. Many more large projects will continue to fail if they do not have informed backing from the top and are known to include some of those identified by the Board as possible future Directors in the delivery team.

At a more routine level the skills to procure, manage and monitor the development and delivery of cost-effective IT related projects, products and services of all shapes and sizes need to be spread much more widely. Neither project nor service management are well covered in the UK course market. Both need far more urgent attention than that currently given to IT "awareness".

5.4.5 *Independent consultants - lone wolves or impartial advisors*

The proportion of self-employed contractors in the IT industry has been growing rapidly over recent years for a variety of reasons. They range from free-lance programmers with skills in particularly short supply to those who have retired with substantial pay-offs and can afford to provide genuinely impartial advice, even if it kills the prospect of follow on assignments. Most work either through contract agencies or the growing number of "associate" programmes used by major consultancies to handle peak loads.

Many were made redundant from mainframe and telecommunications suppliers in the period 1989 - 93, cannot afford to retire and are struggling to acquire new skills that would increase their employability. Given current skills shortages and the increasing shortfall among the under 35s this group is an increasingly important resource, provided their skills can be refreshed.

But the current reliance on this group to handle short term peaks, without entering into retainer agreements to protect customers from potential multiple booking problems or making arrangements to provide relevant refresher and update training, is a growing source of weakness. When the market turns down or the skills in demand changes many individuals will have no reserves to retrain or cover the fallow period unless they have exploited current demand for their services to the full.

There is a need for all concerned, at every level, to explore new approaches in this area. This need also applies in the other professions with which IT is converging. Even though most IT contractors view the idea of working through a single union and a single agent as anathema it may be that they much to learn from how the media professionals handle their diets of feast and famine. It may also be that the time has come for professional bodies and trades unions to work much more closely together to meet the needs of those in contract employment and not just those in so-called permanent employment.

The weakness of the in-house teams in many users, struggling to ensure value for money and fitness for purpose from their suppliers, has created a need for "independent consulting systems engineers", with a role akin to consultant civil engineers, to help customers negotiate and police the contracts they place with their systems integrators or outsource providers. A number of groups are emerging to meet this need. Some are partnerships of previously sole consultants. More significantly perhaps, some large management consultancies appear to be deciding to no longer bid at all for implementation contracts so that their recommendations can be seen to be impartial and they can, instead, bid for the monitoring contract.

If this trend continues it is likely to reinforce the polarisation of IT career progressions between a more conventional technically oriented "engineering" profession and a heterogeneous collection of application oriented zigzags. Those who follow the zigzag path are, however, more likely to end up controlling the user budgets and deciding the objectives and priorities, if not necessarily the choice of technology to meet them.

6. The Current and prospective demand for technical skills

6.1 Soaring demand for specific skills

6.1.1 Overall Trends

Recruitment effort for experienced staff, as measured in pages of job adverts, has again risen by over a third over the past year and has reached the levels at the peak of the last IT Skills Crisis. The scale of demand and rate of increase is, however, uneven.

	1994	% growth	1995	% growth	1996	% growth
Overall	86.2	+ 31	1117.8	+ 37	163.5	+ 39
Management	5.0	+ 130	6.4	+ 28.5	9.1	+ 71
Systems Analysis	8.3	-	10.3	+ 25	12.7	+ 24
Analyst Programming	28.6	+ 29	42.4	+ 48	65.9	+ 55
Programming	10.6	+ 15	11.0	+ 4	12.0	+ 10
Consultants	4.3	-	6.7	+ 56	8.5	+ 28
Database	1.9	(6)	2.3	+ 21	4.3	+ 90
Technical Support	3.4	-	4.1	+ 18	7.7	+ 89
PC Support	5.1	-	7.1	+ 39	9.4	+ 32
Network	5.3	+ 16	9.5	+ 78	11.4	+ 21
Software Engineer	8.8	-	9.4	+ 7	12.3	+ 31
Training	1.1	-	1.4	+ 27	1.8	+ 27
Operations	0.8	(30)	1.9	+ 141	2.1	+ 11
Sales	1.6	-	1.8	+ 13	1.5	(17)

Figure 34 000s of Jobs Advertised and Rate of Growth in the year to June 30th 1994 -96
Source: SSP Analyses commissioned by Computer Weekly

The sharpest rises in demand are for Database and Technical Support staff followed by Managers and Analyst-Programmers. Demand for the "catch-all" category of Analyst-Programmers accounts for just over 40% of the total, up from about a third two years ago. After a sharp growth last year, albeit from a very low base, demand for operations staff is almost static as is that for purely programming skills. Recruitment effort for sales staff has fallen. This fall would fit with the growing perception among customers of an industry that is having increasing problems delivering the promises it has already sold.

There are sharp variations within some of the above categories.

Demand for Senior Network Analysts and Support Technicians has almost doubled while that for more junior network staff is static or has fallen, giving an overall pattern of modest growth.

Overall demand for sales staff may have dropped but demand among communications suppliers, particularly suppliers of communications integration products and service, has soared this spring with an unholy merry-go-round of bidding for individuals with little or no knowledge of either the technology or customer needs and an apparent lack of attention to even basic induction training.

	1994	1995	Proportion of ads for job category	1996	Growth on 94	Proportion of ads for job category
Overall	8.4	13.4		26.0	X3	
Analyst Programming	2.9	5.2	12%	15.0	X3	34%
Network	1.6	3.2	12%	3.3	X2	23%

Figure 35 000s of Contract Jobs advertised
Source: SSP Analyses commissioned by Computer Weekly

The number of adverts for contract jobs has risen at nearly double the rate of recruitment advertising effort as a whole and now accounts for 16% of the total. The rise is concentrated on analyst programmers and network staff. Contract adverts now account for over a third of all adverts for analyst programmers and nearly a quarter of adverts for network staff.

6.1.2 The Top Ten

Inside the "Top Ten" skills over the year to June 1996 requirements for Windows NT skills have quadrupled while those for C++ are up over 70% and for Oracle are up over 60%. Growth for Visual Basic is levelling off, probably as skills become much more widespread (section 4.4). Novell is up 43%, DB2 is up 33% and CICS is up 21.1%.

	1989		1991		1993		1995		1996		
Cobol	18641	Cobol	9054	C	12882	UNIX	17172	+ 43	UNIX	23965	+ 39
C	8388	UNIX	7441	UNIX	12016	C	16097	+ 25	C ++	20361	+ 72
CICS	7753	C	6915	Window s	6904	C++	11805	+ 352	C	19429	+ 21
UNI X	7287	RPG	4976	Cobol	6734	Cobol	11333	+ 68	Oracle	16031	+ 61
MVS	6419	CICS	4419	Oracle	6042	Window s	10510	+ 52	Window s	13796	+ 31
RPG	5924	Oracle	3187	RPG	5965	Oracle	9926	+ 64	Cobol	12480	+ 9
VMS	4968	VMS	3090	LAN	3480	RPG	7525	+ 26	Vis Bas	10499	+ 19
VME	4860	MVS	2401	Ingres	3199	Vis Bas	6215	+ 333	RPG 400	8926	+ 19
4GL	4392	LAN	2299	SQL	3079	SQL	5983	+ 94	SQL	8873	+ 48
DB2	4264	MSDOS	2674	Novell	2807	Novell	5780	+ 104	Win NT	8361	X 4

Figure 36 Top Ten Skills
Count of Mentions in Trade and National Press Recruitment Advertising
Source: Salary Survey Publications - Quarterly Survey of Appointments Data and Trends

Outside the TOP TEN requirements for a number of skills have risen sharply. "Office" (now Number 15) has more than doubled and TCP/IP (17) is up over 50%. Object Oriented skills (23), largely among software houses, has more than trebled. SAP (36) is up only 20% although it quadrupled from a small base in the year to 1995. This either indicates a tailing off in the growth in external recruitment or a focus on contractors or head-hunting for high value skills in very short supply. Unattributable comment from agencies and large users indicates the latter.

Comparison of the TOP 20 skills for the Quarter to June 1996 with that to June 1995 (see first table in section 6.2) reveals that demand in some areas is now growing faster than the analysis for the Year to June might indicate while the growth in demand for other skills is slackening.

Thus the growth in demand for Windows NT skills continues to soar, C++ and TCP/IP continue to grow strongly and demand for Visual Basic and UNIX has accelerated this spring. Meanwhile overall demand for CICS has stopped growing and that for Cobol has fallen. There are, however, also a number of strong variations by sector (see section 6.2).

6.1.3 *Hardware skills*

Most analyses of demand for IT skills focus on Information Systems needs rather than the hardware side of the IT industry but recruitment advertising for electronics skills is still growing faster (up 38% on last year more than double the year before) albeit from a smaller base.

Demand for design and production engineers continues to grow strongly as a result of the revival of the UK as a centre for electronics research and production but the sharpest rises in demand this year have been for test and service engineers to support the competing cable and telecoms infrastructures and for project managers, sales staff and engineering managers.

The growth of radio WANs and LANs has placed particular pressure on the supply of radio frequency engineers. Although the rate of growth in recruitment advertising has slowed on last year this shortage is likely to become more severe with the anticipated growth in the use of data broadcasting (from price changes to retailers to race results to bookmakers) alongside mobile data communications (from order entry to vehicle tracking).

	1994	1995	% Increase	1996	% Increase
Hardware Engineer	.6	1.0	67	1.1	18
Project Engineer	.2	.2	(2)	.3	29
RF Engineer	.7	1.0	55	1.6	49
Electronic Engineer	.9	1.8	98	2.4	33
RF Design Engineer	.7	1.0	43	1.3	31
Design Engineer	1.9	3.4	74	4.4	31
R & D Engineer	.3	.5	66	.6	16
Test/Measure Engineer	.4	.9	133	1.3	51
Production Engineer	.7	1.2	89	2.0	60
Technicians	.3	.3	30	.4	14
Comms. Engineer	1.1	1.6	46	2.2	35
Other Engineer	.3	.2	(29)	.2	3
Project Manager	.2	.2	(1)	.4	81
Senior Manager	.4	.6	32	.9	58
Sales & Marketing	.9	1.5	66	2.3	62
Lecturers/Teachers	.1	.1	39	.2	49
Software Engineers	2.6	4.5	74	5.9	33
Field Service Engineers	.4	.6	65	1.1	81
Other	.1	.1	25	-	-
Total	12.6	20.7	64	28.6	38

Figure 37 000s Jobs advertised in year to June 1996
Source: SSP Analyses commissioned by Computer Weekly

The rate of increase in recruitment advertising for software engineers in the electronics trade press has fallen while that in the computing trade press has risen. This appears to indicate that while the techniques, skills and attitudes in demand may be different the underlying aptitudes are similar (as suggested in the report last year) and that the rise in demand for embedded software skills is being met by cross-recruitment and conversion training. This image of convergence is reinforced by some of the recruitment advertisements from companies who want staff to work on both information systems packages and embedded software for the communications hardware and networks over which they are to run. Senior staff are expected to have IS or telecoms experience and work on one or other while junior recruits are expected to join a common pool.

The demand for staff to identify whether the date routines in embedded software and clock chips will handle the Year 2000 does not yet appear to have impacted electronic recruitment patterns. If and when it does, the results could be dramatic. There is a thin base available for recruitment unless many of the tens of thousands shed from the computer and communications manufacture and service sectors before and during the recession are to be enticed back from retirement and "refreshed" to short order.

6.2 Driven mainly by software and service suppliers

6.2.1 Differences between users and suppliers

The variations in demand for specific technical skills by industry sector are growing. There are also growing differences in demand for generic skills by sector.

	Total % Change 95/6		Computer Industry % Change 95/6		Users and Unclassified		
Unix	6655	+ 48	3691	+ 83	2694	+ 19	*
C ++	5497	+ 68	3292	+ 80	2187	+ 53	*
C	5190	+ 20	3153	+ 37	2037	+ 13	*
Oracle	4336	+ 54	2113	+ 57	2223	+ 52	
Windows	3785	+ 74	2110	+ 46	1675	+ 8	*
Cobol	2988	+ (7)	574	(13)	2414	(4)	
Visual Basic	2933	+ 62	1440	+ 49	1493	+ 77	
RPG 400	2311	+ 16	410	(25)	1901	+ 30	
SQL	2656	+ 50	1427	+ 59	1229	+ 1	*
Windows NT	2725	X3.75	1497	X 3.9	1228	X 3.6	*
Novell	2443	+ 46	958	+ 90	1485	+ 27	
DB2	1533	+ 15	259	(23)	1274	+ 29	
CICS	1466	+ 1	-	(> 5)	-	+>20	
LAN	1632	+ 18	626	+ 4	1006	+ 30	
Office	1328	X 2	366	-	962	-	
Sybase	1248	+ 23	628	+ 79	620	(6)	*
TCP/IP	1240	+ 66	580	+ 66	660	+ 65	
Lotus	1013	+ 20	356	-	657	-	
Ingres	949	+ 16	522	+ 49	427	(3)	*
Access	848	+ 12	429	+ 24	455	+ 3	

* = skills where more than 50% of the advertisements are from suppliers.

**Figure 37 The Top 20 Skills in Current (Q2 96) Demand
Split by Computer Industry and Users (including Unclassified)**

Overall recruitment advertising on behalf of suppliers (see below) has risen more slowly (35%) than that for users (41%, including where the destination is not known) but this masks significant differences. The growth in recruitment advertising by software houses is over 41% while that among hardware Suppliers is only 18% and that for communications suppliers has fallen sharply to grow by only around 11% over the past year (it doubled in 1994-5).

Demand for CICS, DB2 and RPG400 continues to grow among users, including for staff to convert legacy systems, but is falling among software and service operations. If suppliers are to offer help to users in this area, as some plan, they will have to expand their skills base very rapidly. If they were to do this by recruitment among those already in the IT workforce, as opposed to bringing back those who left the industry during the last recession, the resultant turnover among user staff could seriously jeopardise their existing plans for handling Year 2000 problems let alone new systems development.

Analysis of recruitment patterns for legacy skills by sector reveals that the peak of recruitment by retail and distribution and by manufacturing companies was in the year to June 1995. Their recruitment efforts in this area are now falling while those of finance and insurance companies, in this area, are growing strongly. This fits with a pattern of those needing to amend systems with sell by dates finding and tackling the Year 2000 problems significantly earlier than others.

6.2.2 Analysis by sector

Analysis of recruitment effort by sector reveals further differences.

000s Year to June	1995	1996	%Growth
Hardware Suppliers	2.1	2.5	19
Software Houses	33.8	47.9	42
Communications	7.9	8.8	11
Finance, Insurance & Law	17.6	17.5	(1)
Retail & Distribution	5.3	6.8	28
Media & Entertainment	1.1	1.6	45
Construction & Engineering	1.7	1.9	13
Manufacturing	1.7	3.6	X2
Utilities & Energy	0.4	0.5	34
Public Sector	2.7	3.1	15
Other/Unidentified	43.6	69.3	59

(ie over 200%)

Figure 38 Recruitment by Known Sector

The main driving force in the market is competition between software houses for staff. Recruitment advertising for posts in manufacturing companies is growing fastest but from a fairly small base while that for finance, insurance and law, while easily the biggest user sector, is relatively static. Recruitment effort by media and publishing operations is growing steadily. This is expected to be the one sector which will continue to show major growth in IT related employment through the next recession but most of the new jobs in this sector are going to demand graphic design and artistic skills more than technical IT skills.

40% of advertised jobs are not identified by sector and the proportion of these is growing.

	Proportion of trade press readership December 1994	Proportion of 1995 identified job ads
Hardware Suppliers	4	3
Software Houses	28	44
Communications	2	10
Finance, Insurance & Law	19	23
Retail & Distribution	7	7
Media & Entertainment	-	1
Construction & Engineering	11	2
Manufacturing	8	2
Utilities & Energy	3	1
Public Sector	11	4
Other/Unidentified	7	

Figure 39 Proportions of identified recruitment advertising compared to employment base

Comparing the proportions of the employment base in 1994 by sector with the proportion of job adverts in the Year to June 1995 for those sectors shows just how thoroughly the skills "crisis" is driven by software houses competing for staff. With the exception of communications (including the cable companies) no other sector generated a larger proportion of job ads than its current proportion of the workforce. Most generated considerably less.

The very low proportion of recruitment advertisement from the Construction and Engineering sector can be correlated with Computer Economics data indicating that Engineering also has the highest rates of redundancies and resignations. Within this pattern the highest redundancy rates (6.3%) are among staff working on DEC systems while the highest resignation rates are among those working on IBM AS/400. Engineering is also the one sector where the demand for RPG400 is well above that for Unix and has more than doubled over the past year. The merry-go-round of AS400 skills within the engineering sector is one of a number of sector specific crises caused by sharp variations in the skills in demand.

Software	Hardware	Comms	Financial	Ret & Dist
C++ UNIX C Oracle Windows Visual Basic SQL Windows NT Novell Cobol	UNIX C C++ Windows Oracle Cobol DB2 Telon Novell Windows NT	UNIX C LAN C++ TCP/IP Novell WAN X 25 Windows Oracle	UNIX C++ Cobol Oracle C CICS Visual Basic Windows NT DB2 Sybase	Cobol DB2 UNIX CICS RPG400 Novell Windows C++ Visual Basic LAN
Pub/Media	Manufacturing	Engineering	Utilities	Public Sector
C Visual Basic SQL C++ Oracle Windows Novell UNIX Office Access	C Windows C++ UNIX Paradox RPG 400 Object Or. Windows NT LAN MSDOS	RPG 400 UNIX LAN Oracle Lotus C++ Windows Novell Visual Basic Powerbuilder	UNIX C++ Oracle RPG 400 C Windows DB2 Windows NT LAN Lotus	UNIX Novell Oracle Windows LAN Office MSDOS TCP/IP C SQL

Figure 40 Top Ten Skills by Sector
Source: SSP Quarterly Survey: July 1996

There are some very marked sectoral differences in both the scale and rate of growth in demand for specific skills.

Thus demand for C++ skills from software houses has almost doubled and is also rising very strongly among users in manufacturing, engineering, the media, publishing, retail and distribution. Meanwhile demand for C++ is static (almost no growth in recruitment effort over the past year) among users in financial services and the public sector and among computer manufacturers and communications suppliers. This cross tallies with the view that "Object Oriented" is now a "mature" technology as far as financial services applications are concerned but has much more potential in package development, embedded software and in applications with a high degree of image processing and visual content.

CICS and DB2 show almost exactly the opposite pattern to C++ with the growth in demand coming mainly from users in financial services while recruitment effort by users in retail and distribution has fallen and that in other sectors is, by comparison, negligible.

Similar variations can be seen in demand for RPG400 skills. Here the growth comes almost entirely from engineering, manufacturing and retail and distribution. Other sector specific skills in growing demand include Paradox and Powerbuilder.

%	Resigned	Redundant	Transfer	Other	Total
IT Services	8.4	0.5	6.0	0.9	15.8
Hi-Tech	10.8	0.8	4.2	1.1	16.9
Finance	8.9	1.8	3.4	0.9	15.0
Food and Dist	7.7	1.0	5.3	0.5	14.5
Chemicals	9.2	2.9	4.8	0.5	14.5
Engineering	12.3	5.1	2.9	0.4	20.7
Public Sector	7.1	0.3	2.3	2.7	12.4
Other Industries	11.9	3.0	1.8	1.0	17.7
Total	9.1	1.6	4.0	0.9	15.6

Figure 41 Staff turnover analysed by sector
Source: CEL Panel April 1996

Resignation rates by sector correlate better with redundancy rates than with pay. The public sector pays barely 90% of average but has both the lowest resignation and redundancy rates and is the only sector where retirement, the largest component in "other" is significant. Resignation rates also have an inverse correlation with the proportion of women in the sector. Only 19.6% of IT staff in engineering companies are women compared to 28.2% in the public sector.

There is little correlation between resignation rates and salary levels. Engineering (99%) pays close to average. Chemicals pays highest (113%) followed by Hi-Tech (109%) but these also have above average resignation rates. Interestingly the IT services side offers below average salaries for permanent staff (97%) but also offers the best career prospects, indicated by the rate of internal transfer.

6.3 *Centred on London but with specific hotspots outside*

There are significant variations in growth of demand by location as well as by sector.

	1992	1993	1994	1995	% Growth	1996	% Growth
Inner London	8.3	8.2	13.5	20.6	+ 53	27.9	+ 35
Outer London	11.7	10.3	12.1	16.4	+ 36	24.2	+ 47
South and East	26.0	24.7	31.3	41.4	+ 32	57.1	+ 38
SW & Wales	4.4	3.7	5.8	6.9	+ 20	10.6	+ 52
Midlands	5.5	6.1	6.6	10.6	+ 60	10.0	(5)
North	6.1	5.5	6.6	10.6	+ 61	13.1	+ 24
Scotland	2.7	2.4	4.0	3.7	(9)	6.5	+ 77
Other/General	5.5	4.9	6.3	7.5	+ 19	14.0	+ 87
Total	70.0	65.0	86.2	117	+ 37	163.5	+ 39

Figure 42 000s of Jobs advertised in the year to June by location
Source: SSP Analyses commissioned by Computer Weekly

Last year the strongest rate of growth in recruitment effort was in Inner London while the volume of recruitment advertising for jobs in Scotland fell. This year the strongest growth is in Scotland, followed by the SW and Wales and Outer London.

In each area the growth in recruitment effort by software and service operations is well above that on the part of users. Thus recruitment effort on the part of software operations in the South West and Wales is up nearly 90% and that for those based in Scotland has risen four-fold.

The South and East outside London still accounts for the bulk of recruitment effort but the rate of growth in recruitment effort is close to the national average.

A comparison of the location of the volumes of advertising with the location of the readership of the trade Press indicates the current geographic intensity of competition for staff.

	Proportion of trade press readership December 1995	Proportion of 1995 identified job ads year to June 1996
Greater London	13	32
South and East	40	35
SW & Wales	11	6
Midlands	14	6
North	17	8
Scotland	5	4
Other/General		9

Figure 43 Proportions of identified recruitment advertising compared to employment base

Although the rate of growth in recruitment advertising may be faster outside London it is from a very much lower base. The main competition is for staff to work in London. The further North one goes the lower rate of competition. Going West is no longer such an attractive option if the objective is to find a location with less competition for staff.

Northern Ireland does not appear on the chart because, although it accounts for approaching 1% of the readership of the Trade Press, recruitment advertising for staff to work there is negligible. It is the one part of the British Isles with an IT skills surplus, albeit only a few hundred. This is because it is also the only part of the UK where investment in IT skills development and training was continued through the recession as a matter of public policy.

The effects of competition on staff turnover, particularly resignations, can be seen from analyses of data from the Computer Economics panel.

	Inner London	Outer London	Rest of UK	National
Management	4.8	3.5	4.0	4.0
Systems	9.4	6.4	5.9	6.6
Analyst Programming	18.0	10.2	10.7	11.3
Technical Services	5.3	3.4	3.2	3.6
User Support	7.6	7.9	7.0	7.4
Operations	7.1	8.3	7.3	7.5
Administration	4.0	3.4	6.5	5.2
All Functions	10.1	7.9	7.5	8.0

Figure 44 % Resignations by function group
Source: Computer Economics Commentary May 1995

So far this year overall resignation rates in Inner London have fallen slightly while those outside have risen.

	Inner London	Outer London	Rest of UK	National
All Functions	8.5	10.4	9.5	9.5

Figure 45 % Resignations year to May 1996
Source: Computer Economics Commentary May 1996

As mentioned elsewhere, however, these averages conceal marked variations by age, sex and specific skills and location.

It is noticeable how little location-independent recruitment effort there is. The use of flexiworking based on neighbourhood offices or home-based working appears largely confined to independent contractors and to long-service staff in well-established organisations which wish to retain experienced staff and reduce city centre overheads.

7. The current and prospective demand for management skills

7.1 Overall trends

Turnover among Heads of IT in large organisations peaked at over 30% per annum in the Year to June 1994. It fell slightly in the Year to June 1995 to around 25% and has fallen to under 20% over the past year. Analysis of turnover in the United States also indicates a greater degree of stability but there are exceptions. One company has got through five Heads of IT in two years. Not all left the company but IT is now recognised in that organisation as a "Hot Seat", not to be accepted unless you have already pre-planned your next posting.

In general, head of IT remains a high risk position but analysis of the Computer Economics Data also indicates that turnover at the top of the tree is falling, except in Central London where, over the past year, more IT Managers have been made redundant (11%, mainly among users in the financial sector) than have resigned (7%). Over the UK as a whole, however, IT managers are now more likely to jump (6% resigned in the Year to May 1996) than to be pushed (3% made redundant).

The SSP analyses of recruitment advertising reinforce this picture of greater stability at the top. The recently appointed Heads of IT are now rebuilding their in-house teams. Software and service suppliers are strengthening the management of their development and delivery teams. Both groups are also recruiting managers to handle a rising tide of new projects, large and small.

Year to June	1995	1996	%
IT Manager	162	154	(5)
Systems Development Manager	111	193	+ 74
Computer Services Manager	22	68	X 3
Office Systems/ PC Manager	223	334	+ 50
Programming Manager	49	60	+ 22
Operations Manager	27	19	(29)
Technical Support Manager	82	85	+ 3
Communications/Network Manager	86	147	+ 71
Project Manager	590	1037	+ 76
Total	1352	2097	+ 52

Figure 46 Recruitment effort for IT management posts
Source: SSP Analyses of Recruitment Advertising

Overall recruitment effort for heads of IT has fallen (but see section 7.2 for variations by sector) and the market is dominated by the growth in demand for project managers.

Analysis by sector and location (see 7.2) indicates that almost half of the recruitment effort is for project managers to work with software houses in London and the Thames Valley. The next largest area of demand is to work for finance sector users in Central London.

Previous IT Skills Trends reports have reported on the poor supply of project management training in the UK and the lack of supply of experienced project managers. There are no signs that this problem is being tackled seriously outside a handful of long established suppliers and users. The high failure rate among larger computer projects is therefore unlikely to improve.

7.2 Variations by sector and location

As already mentioned, management recruitment is dominated by the software and service suppliers need for project managers. This is followed by demand for project managers in finance, manufacturing, retail and distribution and among hardware suppliers. There is also a significant public sector recruitment effort for office systems and PC managers, particularly in London and the South East.

Demand for IT managers is highest in retail and distribution and the public sector where outsourcing accompanied by the departure of the former head of IT has led a number of organisations to discover the consequences of having no in-house expertise at the top.

	Hardware	Software	Comm	Finance	Ret & Dist	Media & Pub	Engineering	Manufacturing	Public Sector
IT Manager	-	21	7	4	34	4	14	17	28
Systems Development	-	25	7	31	33	8	17	16	31
Computer Services	1	10	2	14	5	4	1	6	16
Office Systems/PC	-	16	4	7	25	18	12	9	69
Programming	1	24	-	-	1	-	-	12	-
Operations	3	2	-	-	7	-	-	1	-
Technical Support	-	23	6	10	9	-	1	2	-8
Comms/Network Manager	-	3	28	22	4	-	2	5	7
Project Manger	42	612	15	104	60	18	7	63	22

Figure 47 Recruitment advertisements for managers by identified sector: Q2 1996
Source: SSP Analyses of Recruitment Advertising

Only software suppliers and manufacturing companies are recruiting programming managers. Manufacturing includes a growing number of firms with in-house teams developing embedded software to control their mainstream product lines.

Finance, retail and distribution and the public sector also have significant recruitment programmes for systems development and project managers. A growing proportion of these have responsibility for mixed teams of supplier and user staff (Sections 5.3.5 and 7.3.2).

	Inner London	Outer London	South/ East	Wales & West	Midlands	North	Scotland
IT Manager	29	20	47	11	16	21	10
Systems Development	40	20	52	20	33	18	10
Computer Services	21	10	16	4	5	8	4
Office Systems/PC	71	47	71	14	25	27	8
Programming	9	3	28	13	5	2	-
Operations	6	-	1	6	2	4	-
Technical Support	37	10	28	2	6	2	-
Comms/Network Manager	28	15	85	-	11	5	3
Project Manger	274	121	345	41	127	98	31

Figure 48 Recruitment advertisements for managers by identified location Q2 1996
Source: SSP Analyses of Recruitment Advertising

Note that the tables by identified sector and identified location do not cross tally. Many advertisements do not give organisation, sector and location although most give either sector or location. Recruitment adverts are particularly coy when such information might alert the incumbent to the fact that their post is being advertised.

Among the areas of particularly strong growth in recruitment effort in Spring 1996 were:

- Heads of IT in retail and distribution in the Thames Valley
- System development managers for financial services users in Central London
- Manufacturing users in South Wales
- Software suppliers in the Thames Valley
- Office systems/PC managers in Central London
- Programming managers in software houses and manufacturing
- Communications and network managers in the Thames Valley
- Project managers for software houses and manufacturing users

7.3 *Changing challenges and roles*

7.3.1 *The currently perceived challenges*

Section 3 refers to a conjunction of challenges at the national level. This section covers perceived challenges at the corporate level. Most relate to issues covered in sections 3.4 and 3.5 although Year 2000, EMU and Intranets are also moving rapidly up the list of priorities this autumn.

Nearly 250 of the IT Directors who participated in the IT Directors Forum on the Oriana in May 1996 responded to a Computer Weekly survey on the Top Three challenges they faced. The sample is light on heads of IT in the Finance Sector (commonly invited to attend City IT instead) but their priorities are believed to be broadly similar. The question was free format but most of the answers could be readily grouped into issue areas. The overall top four were:

- The relationship between IT and the business (129 mentions)
- Controlling and justifying costs (85 mentions)
- Keeping ahead of technology (68 mentions)
- People and staffing issues (54 mentions).

Meeting the needs of the business and being seen to meet those needs comes any easy first. Controlling, and where possible cutting, costs comes second. Upgrades and new technology came a poor third and may be about to be overtaken by people and staffing issues.

In her analysis of the answers (Computer Weekly 8/8/96), Julia Vowler quoted many of the responses. These may be regrouped in order of significance as:

Doing the business eg:

- Working more closely with the business planning area
- Getting technical issues across to general management
- Becoming involved in strategic decisions
- Business ownership of systems
- Ensuring awareness of how IT can improve competitive advantage
- Changing the culture of both business and IT departments so as to respond faster to change
- Gaining the ear of the Chief Executive
- Board appreciation of the opportunities available through the innovative use of IT
- Senior executive sponsorship and support from internal business users
- Persuading the Board that what they have is cost effective and good value for money
- Using IT to integrate the business with its suppliers
- Educating senior management to understand and use existing IT rather than pontificate about future IT

Counting the cost eg:

- Correctly sizing the IT function to meet the new environment and respond to the future
- Reducing cost drastically
- Lack of capital budget
- Resource limits
- Reduction in funding and staff costs
- Value for money
- Ensuring that IT is cost effective and brings business benefit
- Where to cut costs without impairing effectiveness

The technology treadmill eg:

- Keeping up with the rapid technological changes
- Making decisions without a crystal ball
- Controlling the change to new systems; controlling suppliers; controlling enthusiasm
- Coping with the increasing amount of upgrades from XYZ (two suppliers named)
- Integration
- Investigating new technologies and their relevance to our business
- Cost-effective migration from legacy systems with full service maintained over the transition
- Forecasting network capacity needs and recabling to meet them
- Robust flexible and affordable IT infrastructure
- Effective management of supplier relationships
- How to communicate cheaply and effectively with large numbers of locations: Intranet

People eg:

- Obtaining and keeping the required skills
- Keeping the team knowledgeable and enthusiastic
- Maintaining staff morale and improving productivity
- Performance measurement and output improvement
- Providing faster turnaround of development and quicker benefits to the organisation

End-User Performance, Satisfaction and Power eg:

- User-friendly access and use by non-computer literate staff
- Getting users up the learning curve on new systems: training, confidence and ownership
- Persuading users not to go their own way
- Reducing desktop anarchy
- Exercising the right mix of control and empowerment
- Integrating "personal" and "enterprise" computing
- End user resistance to change
- Encouraging users to approach with problems not solutions
- Realising and accepting that users' knowledge of the desktop (eg Windows 95) may outstrip our own

This analysis puts the lower priority given to technology upgrades further into perspective. Many heads of IT feel these are to be avoided whenever possible unless they bring tangible business benefit. A more recent (September 1996) survey of Computer Weekly 500 Club members indicates rising concern at the cost of ownership of systems that are subject to regular supplier-driven software upgrades. This later survey also indicates rising concern over staffing problems, particularly among users in finance and insurance, but the main priority is to improve relations with the business, protect existing budgets and resources and be seen to deliver results.

This helps place in context the comments in previous reports on the evolving roles of the different types of in-house IT manager and their respective strengths and weaknesses.

7.3.2 *The evolving debate on the role of the head of IT*

The 1994 IT Skills Trends report identified three broad types of IT manager:

- The "Business Manager" - responsible direct to the chief executive and/or main board for applying IT to core business functions and/or managing fundamental organisational change.
- The "Systems and Service Manager" - running a team to help user managers to get value for money from a network of suppliers, both internal and external.
- The "Chief Technologist" - providing an opportunity watching and evaluation service in organisations where IT is core and managed by IT experienced line directors as part of the mainstream of their businesses.

That report also noted that it was becoming common for responsibility for setting IT policy and monitoring provision to be separated from responsibility for delivery. This distinction is becoming particularly important as organisations which outsourced too much discover they now lack the in-house resource to monitor performance and ensure effective corrective action in the event of problems. The consequences can be even more expensive if the organisation then employs external consultants who may be tempted to discredit the current contractor (with a view to displacing them here or in other clients) rather than to work harder to rebuild the relationship and ensure the customer's needs are met in the most cost-effective way practical.

The weakest of the roles is that of "Chief Technologist". This is also the least common. As soon as the incumbent spots a "real" opportunity he (nearly always currently a "he" in this role) must either change role and actively help with implementation or watch others acquire the practical experience that he is no longer maintaining. Either way, those with this role have a problem in keeping up to date, unless they spend so much time away from the office that they risk losing touch with their business colleagues. It is, however, the most enjoyable for those whose interest is in the technology rather than the business and who see themselves as consultants rather than managers.

The majority of those with the title IT Manager or Director are "Systems and Service Managers". They may be expected to advise the Board on policy but many have little say in strategy or objectives. They can be in a particularly difficult position if the organisation decides to launch an assault on corporate overheads and cuts central staffing below that necessary to keep abreast of industry developments at the same time as expecting the team to monitor supplier performance and help users get value for money from current suppliers and/or technology.

The "Business Manager" role appears higher risk but may actually be low risk, provided the incumbent is fully in touch with business needs and can ensure that the IT "team" regularly delivers more and better than was expected. The key appears to be to maintain a sufficient portfolio of centrally budgeted and managed projects and responsibilities to enable in-house skills to be maintained and updated, including the skills to manage and get full value for money from external consultants. The more IT managers are seen to be directly responsible for projects which have visible impact on the bottom line the safer they are - so long as they are also seen to deliver.

The 1995 IDPM IT Skills Trends report commented on the further polarisation of roles that would follow the outsourcing of off-line, back office, support systems, the development of new front-line, integrated, customer-contact systems and the growing realisation of the potential transformation of whole industries around supply-chain networks that integrate marketing, manufacturing, delivery and service. Not only is the reliability and resilience of current IT systems becoming critical to the survival of many more businesses but participation in discussion on forward IT strategy is becoming critical to the personal survival of many Board members.

Hence the many meetings and debates on the role of the IT manager. Those who intend to survive are working on their personal strategies and reskilling programmes. The cautious are developing their support networks. The aggressive are building their hunting teams.

Those meetings have continued into 1996 but the focus is changing as the tasks and roles become clearer. There is a growing polarisation between those helping the use of new technologies (from smartcards to intranets) to transform the nature of the organisation and those monitoring or managing the delivery of agreed services, whether by in-house departments or external suppliers.

By 1996 the debate was moving on and the IT Director Forum skills workshops focused on the nature of the teams planning, implementing or running IT systems within the organisation. Within many organisations the distinction between professional IT managers and IT experienced user managers is, at long last, breaking down.

Most major projects now involve mixed teams drawn from users and suppliers. It would appear that as many are managed by users with technical and administrative support from IT professionals as are managed by in-house IT project managers. While an increasing number of roles may be contracted out, there appears to be general agreement that organisations which outsource the setting of objectives and measurement of performance have lost control and are in grave danger both of being exploited and of losing their way.

7.3.3 *Management skills problems*

The main management skills problems identified by the hundred or so participants in the IT Directors Forum Skills workshops in 1995 were (not necessarily in order of priority):

- "Programme Management": the ability to run complex programmes involving many projects, cutting across organisational boundaries and involving staff and contractors from different backgrounds and/or negotiating and monitoring outsourced projects and services involving novel technologies and/or services.
- Retaining and updating in-house systems architecture skills, in order to be able to assess proposals from suppliers and monitor performance.
- The management and support of communications networks, including the identification of what is currently practical with regard to reliable, high-performance, broadband communications
- Relationship management, including links with suppliers with high staff turnover as well as of in-house services for end-user departments

- Developing and managing the awareness of user managers, so that they have realistic expectations and are competent and willing to "own" their systems as appropriate.

A common thread was the need to update and enhance the skills of the existing management team in the face of the many pressures on time which make attendance at the longer conferences and seminars, let alone conventional courses, impractical.

The participants also identified a need to find alternative ways for managers, including user managers (who now fund, "own" and operate ever more key systems) and the core members of the in-house IT team, to keep themselves up to date and to acquire new skills as and when they are needed.

All of these concerns appear to remain valid in 1996 although it is now becoming clear that the immediate priorities vary quite widely between organisations.

The management of outsourcing

Outsourcing may be a cost-effective way of overcoming constraints with regard to temporary needs and/or technical skills but failure to retain a strong residual team to negotiate and manage outsource suppliers is lead to increasing problems. Contracts with consultants, systems integrators, facilities management operations and other types of outsource suppliers all need to be actively managed if corporate objectives and business benefits are to be cost-effectively achieved. The best relationships are "win-win partnerships" but the very term "partnership" is much abused. It implies shared risk as well as shared benefit and many contracts are effectively "cost-plus", particularly if changing business needs call for changing service levels and/or flexibility over and above that forecast when the original contract was agreed.

A prime need is therefore to develop the in-house competence to agree strategy, set objectives and monitor performance, using external resources but not losing control. Many of those who outsourced have since discovered that they seriously underestimated the need to retain a cadre of high level skills in-house to assess proposals from suppliers and to monitor performance. In the public sector there now appears to be a rule of thumb that about one in five of the IT department that is to be outsourced should be retained in-house to set objectives and police delivery. There is less uniformity as to whether those staff should remain in a central IT function or be transferred to user departments.

Little attention has yet been given as to how the residual team is to keep its skills up-to-date let alone how it will be refreshed and reinforced as its members are transferred, promoted, leave or simply grow old and retire.

This problem will become critical if the in-house teams become embroiled in fire-fighting exercises over Year 2000 and can no longer prepare for the scale of organisational change likely when value-chain networks lead to the implosion of whole industries around "electronic market places" which transform customers expectations and behaviour as well as the economics of selling, production, delivery and payment (in whatever order).

Front line support

Meanwhile users of all sizes also have growing concerns over the management of front-line support: where understanding of the business, empathy with the end-users and knowledge of application specific mixes of products and services are usually more important than in-depth product knowledge - which it should be possible to get from the supplier.

Network and relationship management

Problems with regard to the skills to manage and support communications networks are common to both users and suppliers as are business analysis and account management skills. High turnover among sales and support staff presents problems for both suppliers and users. Users commonly value continuity of relationships more highly than their erstwhile suppliers appreciate.

The needs are both to help external suppliers to cement long term relationships with customers and to help users police satisfaction with their new external suppliers. This entails developing the skills to negotiate with a wide variety of external product and service suppliers and to monitor their performance, including in working with each other.

Project and programme management

A wide variety of organisations from Arthur Andersen and EDS through IBM and ICL to AT&T and BT now compete to offer integrated solutions, often because they can no longer make money on their core operations and believe that being prime contractor for a "total solution" will be more profitable. Most rely on hierarchies of subcontractors for anything beyond their traditional bread and butter skills and, in consequence, are having to recruit project managers to manage their own mixed teams, drawing together staff from a variety of disciplines and organisations.

Very large users also have a problem finding individuals able to run complex programmes which involve many projects, cut across organisational boundaries and involve staff and contractors with different technical and cultural backgrounds. If this problem is not addressed London will have great difficulty in remaining a major hub in the Global Information Society.

Already we are seeing systems that require multi-lingual negotiation and documentation being run out of Paris, Brussels or the Netherlands because our IT professionals no longer speak anything other than English, and all too often even that not very well. Meanwhile nearly everyone else can speak English while addressing their customers in their own language. Many UK organisations appear to have forgotten that "you buy in the language of the buyer and sell in the language of the customer". Hence the Japanese balance of payments surplus. They do not need tariff barriers. The fact that no-one sells to them in Japanese is sufficient.

7.3.4 *Who can be trusted for what?*

Given the large numbers of senior staff and directors now on term contracts who are accustomed to use external consultants for tasks previously done in-house, many organisations have a growing problem of loyalty. All organisations are built on personal relationships. However, it is now common, even in service oriented organisations like hospitals and utilities, for regular contractors to have more continuity than the supposedly permanent staff who hire them - let alone the Directors and others on service contracts who come and go at the top.

Who can be trusted not only to plan ahead and agree strategies and objectives but also to recruit, train and keep the team that will implement those plans, including the short order changes needed when those plans have to be changed to short order?

The IS profession may be evolving in the direction of Civil Engineering and the use of "consulting engineers" to help plan and control major projects but, if so, where will these be drawn from and who will remain in-house to set the objectives?

This problem is particularly acute in the public sector where the emergence of new models for service delivery (eg Agency Status and PFI) have not been accompanied by adequate consideration of responsibility for the stewardship of taxpayers funds.

This problem was addressed in a conference in 1994 on "The Proper Conduct of Public IT Business" organised by IDPM for the Parliamentary IT Committee (PITCOM). The proceedings are contained in Volume 12 Number 3 of "Information Technology and Public Policy", ISSN 0266 85 13. An IDPM SIG with a membership which included many heads of IT in the public sector subsequently produced guidelines which were formally welcomed and commended by the Chairman of the Public Accounts Committee and published in Volume 13 Number 2 of "Information Technology and Public Policy" and in Volume 5 issue 2 of the IDPM Journal, ISSN 0265 5306.

8. Action Plans

8.1 *Employers: outsourcing is not enough*

Even those who aim to outsource their entire IT function need to retain a cadre of expertise to agree policy and monitor performance. The skills necessary are among those in the shortest supply and take time to develop. They are among those currently being aggressively head-hunted because too few of those with the appropriate experience respond to advertisements from users who ran down their in-house teams and realised, too late, that they had gone too far.

Many of the following actions for employers are little changed from the 1994 and 1995 IT Skills Trends reports but the order of priorities is different. Staff turnover was then rising but a higher priority was given to improving relations with customers (including end-users) and suppliers (to help ensure the customers were satisfied). Turnover is now rising sharply and will soon approach crisis point for many employers. Staff retention and the golden hand-cuffs therefore come first.

But those who merely look to short term retention and neglect the need, in parallel, to begin developing the skills they will need after the current boom is over, will find themselves unable to make the transition to the next generation. They will be among the first to go under in the course of the transition to the Information Society.

8.1.1 *Review your retention strategies*

36 out of 42 top users recently interviewed by US research group Forrester said they were losing staff because of money. Forrester recommended that 20 - 30% of short term pay should be a bonus tied to performance. Most research into staff turnover indicates, however, that by the time experienced staff begin thinking of salary rather than career or security it is too late. They will probably leave anyway.

The first action is to involve those you wish to retain in "confidential discussions" on how to retain key staff, themselves included. That will give them more confidence that they are part of the long term team than any other action. Given the speed and efficiency of most corporate grapevines it also increases the probability that those you are content to lose will be gone before you need to discuss terms.

The second action is contact your outsource suppliers to find how they are planning to retain the key staff working on your account or whose expertise you are likely to need in the foreseeable future. Some of them have well established and successful strategies for retaining those they want while "losing" any dross acquired by mistake or under TUPE. But others, including some well-known names, have already been shown to be highly vulnerable, with whole teams leaving to short order.

The third action is to plan or panic according to what you have learned from the first two.

Identify which skills are needed in-house over what timescale

Concern over the possible imposition of the European Social Chapter, either piecemeal by the European Court or more rapidly by a Labour Government, means that many employers are reluctant to take on permanent staff or wish to transfer current staff to the payroll of someone else. Contracting out can also be a more effective means of securing a supply of those technical skills where demand and turnover are rising fastest, although there is reluctance to contract out business analysis and/or front-line user support.

But a core of skills commonly needs to be retained in-house, if only to be able to negotiate properly with external contractors. The importance of this residual in-house skill base and the need to keep it up-to-date, has been seriously under-estimated by many of those who outsourced in recent years. Hence the rising competition for such skills.

It is a high risk strategy to employ outside consultants to negotiate with external suppliers if there is no competent and effective in-house expertise to ensure they are well briefed and managed to meet the clients' needs. Even before the Year 2000 panic many in-house teams were already too small and committed to other tasks to be effective in managing consultants and contractors with their own agendas and/or plans for the client, even if individual team members may have the skills to do so.

The alternatives are either to strengthen the in-house team or to identify a cadre of consultants who are not only competent and independent but have no relationship, strategic or otherwise, with any potential supplier, contractor or subcontractor - the IT equivalent of the consulting engineers in the construction industry.

Chinese walls are not enough. Those bidding for US Federal programme/project planning, procurement or monitoring contracts are commonly barred from allowing staff to move to those who may bid for implementation work, let alone from having commercial relationships with such suppliers. There may be a good case for following similar policies in the UK but the possible trade-off between independence and competence also needs to be considered.

It is important not only to distinguish between those who are needed in-house but also between those who need be retained in-house only until current projects, eg Year 2000 conversions, are complete and those who are needed for much longer, whether to help police the seven year FM contract just agreed or to plan the next generation of systems. Generous end-of-project bonuses and an end-of-project retraining/outplacement plan may be sufficient for the former but the latter need more. Rolling service contracts, as for main board directors, should be considered for those whose departure would be particularly unfortunate. Even where the objective is to retain staff in-house, contingency plans should also be made for short order outsourcing in the event of a successful raid by head-hunters.

Start updating and reskilling the core team NOW

Unless and until you start developing the skills you will need to plan and police the next generation of systems your core team will have doubts as to how serious you are about retention. A major issue over the next few years will be how hard you are willing to work to retain which staff. Your skills development and staff training programmes should be seen as a key part of the retention package.

You need to identify the individuals you wish to retain, with a view to their potential, not just their current skills. Resignation rates and turnover are rising fast. Many staff, particularly younger staff with skills in short supply, have little or no faith in long term job security and would rather take the money while they can and use it to retrain themselves as necessary.

Judgements between those you wish to retain, (and for how long), and those who can be "allowed to develop their careers elsewhere" will change over time as priorities alter. They should, however, be based on accurate information of the potential and the aspirations of the individual as well as on their careers and experience to date. When available, information on personal circumstances can also be a major factor. Those whose family, health or disability problems or commitments are taken into constructive consideration can display well above average loyalty in times of corporate difficulty.

It is rare that the in-house files contain much more usable information than the original CV, annual appraisals and, perhaps, records of external courses attended. The recruitment agencies and executive search consultants often have more information on your key staff than you do, including the hobbies and leisure skills that may be the basis of their next career move.

The BCS-IDPM Continuous Professional Development (CPD) programme provides a low cost way of transforming the situation. Adoption of the CPD Log Books as the basis for the in-house recording of skills and experience can be used to turn skills audit from an employer driven "threat" into an employee-driven perceived benefit.

8.1.2 *Integrate skills acquisition, development and retention*

Recruitment, development and retention should be viewed as an integrated package. The type of individuals you recruit (age, sex and background) and the career paths they are offered have more effect on turnover patterns than salary or skill-set. Even where it is intended that tasks should be handled on short-term contract, the desired/expected/continued availability of contract staff also needs consideration.

Actions include:

- Manage the mobility of those you wish to recruit and retain.

The focus of so much recruitment on geographically mobile young males motivated by "job challenge" and money has predictable results. 53% of respondents to the 1994 Computer Weekly readership survey expected their next job to be with another employer. 44% expected to make their next job move in a year or less and a further 31% within 2-3 years.

Fixed term contracts, project bonuses and training contracts all have a place in improving retention, particularly if expensive employer-funded training (eg telecoms network management or SAP3) may quadruple the market rate for the individual. But none of these are panaceas. Training contracts, for example, require an equivalent degree of commitment on the part of the employer if they are to be enforceable. It was this commitment, more than any other factor, that led to the end of the apprenticeship contracts which they commonly replace.

Some large IT and FM suppliers regularly use and enforce contracts which require repayment of part or all of the cost of training in the event of staff leaving within a given period. Others state that they do not do so for mainstream trainees but, in practice, use them when training key staff with new skills that are in particularly short supply. Two of the best reviews of the advantages and disadvantages of training contracts and of the state of UK law in this area are contained in "Information Technology and Public Policy, ISSN 0266 8513, Volume 9, Number 3.

Where the intention is to recruit and retain new staff one key factor is to recruit those likely to stay - eg recruiting graduate trainees from home-based students from the local university or staff over thirty five with children and mortgages. One participant in the 1995 ITDF workshops decided "to recruit local housewives to run the help-desk because I want them to stay at least five years". "Women only" policies are not legal in the UK but policies "designed with women in mind, men also welcome" appear effective in attracting long-stay workers of both sexes - his real objective. A significant proportion of those who respond to recruitment exercises designed to attract women returners are family men willing to trade down on salary in return for life style and/or security.

It is also important to agree personal development plans which recognise that the employee is not going to be there for ever but which also demonstrate a reasonable level of commitment for the foreseeable future on both sides. Where the need is to retain those who might otherwise be at risk the offer of flexible working opportunities to all staff can help reduce wastage. This approach appears particularly useful in cutting turnover among staff based in Inner London. The problems with London's transport infrastructure are such that many welcome the opportunity to come in only for meetings or other tasks that require contact with colleagues and to work at home or in satellite offices at those tasks that do not require colleague contact.

- Challenge, interest and cherish those you wish to keep.

Opportunities to develop and practice new skills are a major attraction to IT staff. Job interest and challenge were "very important" to more Computer Weekly readers as factors when choosing a new job than salary, location or security. Salary was rated "very important" by more (56%) than location (47%) security (44%), career prospects (43%), job responsibility (40%) or working environment (34%). Employer reputation (24%), job type (19%), job status (11%), fringe benefits (9%) and employment sector (4%) came well down the list.

The 1995 IT Skills Trends report quoted a participant in one of the IT Directors' Forum Workshops who summarised the key to retaining technical staff as: "110% challenge is needed to retain interest; 98% and the best get bored; 150% and they crack up". Participants accepted that they had to pay for the training and then pay again to keep the new skills but also agreed that money alone was neither the problem nor the answer. Motivation and morale were felt to be the key motivators with money merely "a necessary hygiene factor". It was also felt to be essential to tell staff the importance of what they were doing and make them feel needed.

Many participants had contracted out most of the development and integration tasks requiring the technical skills in shortest supply and had well below average staff turnover. The situation may be different among those to whom the tasks have been contracted, some now reliant, in turn, on subcontractors for skills in particularly short supply.

- Check your outsource suppliers have the skills they claim.

Many current sub-contract hierarchies are much more vulnerable than the end customer is aware. In one tender exercise in 1995, requiring a combination of skills in particularly short supply, the CVs of six individuals appeared in bids from nearly 40 suppliers. Most bids did not state whether the individuals were in-post, under contract or would be employed if the business was won. Many, if not all, of the same CVs were probably being included in bids for other contracts to similar timescales at the same time.

It is said that the apparent sharp rise in contract staff reported early in 1996 was merely a rise in the double and treble counting of those who offered their services through multiple agencies and that the actual number available for work had fallen.

- Recognise the importance of continuity among frontline user support staff.

Retaining good user support staff can be a particular problem. This is a high-stress ("high Zantac") role and needs to be recognised/rewarded as such with focus on the need for the front-line support staff to be able to handle angry/stressed end-users and identify any second line support necessary. This requires particular attention to management support and issues of morale and not just technical training and back-up. If these are neglected absenteeism, illness and resignations will follow, regardless of salary level or "job challenge".

- Update those you wish to retain with the skills you need tomorrow as well as today.

Where the need is to retain existing staff on their current tasks at the same time as acquiring new skills for the future a number of imaginative approaches have been reported over recent years. Some schemes involve employees using their own time to follow courses paid for by the employer, often leading to academic qualifications or bonuses if the skills acquired are employed within the company within a given time-frame. Other schemes involve investment in open learning centres and distance learning materials that staff can use at their convenience. Others link a variety of learning modes (personal, commercial and academic) in frameworks administered, monitored and mentored by some of the new universities.

Other ideas include running skills transfer programmes whenever contractors are employed and programmes of local, employer-driven, inter-active workshops (more cost-effective than sending staff on remote courses provided the numbers are sufficient to enable comparable quality at comparable cost).

A key factor in all such programmes is the need to make more effective use of staff time.

- Develop programme and project management (not just monitoring) skills.

As mentioned in section 7.3.3 there are increasingly severe problems with regard to the availability of project management skills, particularly those needed for the management of complex programmes of projects which cut across organisational, cultural and linguistic or national boundaries or require the interfacing of products and services from a variety of suppliers, perhaps in different countries. For example the IT systems for the Channel Tunnel were based in the UK but the development was managed from Paris, because the British lacked the skills to run a bi-lingual project.

The problems of programme management training have to be better addressed within the UK if London, for example, is to remain a centre for multi-national and international IT operations serving end-users world-wide. The solution probably entails bringing together employers who need such skills, both users and suppliers, including FM operations and systems integrators, and one or more of the UK business schools with relevant world-class expertise, eg London Business School or Cranfield School of Management.

This problem may be at its most acute among very large users but it will spread down and out as IT systems as a whole become more complex. If not solved, it may lead to the demise of the UK as a leading player in the global world of IT. It also determines the ability of many organisations to implement the other action plans outlined in this report.

8.1.3 *Improve user/supplier relations and customer satisfaction*

This was the top priority in the action plans in the 1994 and 1995 IDPM IT Skills Trends reports. With the drop in turn-over among Heads of IT it may now be less important than staff retention in the short term but is still essential for longer term survival.

Discussions in the Computer Weekly 500 Club over the past two years and at the IT Directors' Forum have confirmed that the active management and monitoring of user expectations and satisfaction are crucial to the personal survival of most heads of IT.

On the supply side many of the software and service operations that will go down in the market shake-out over the next couple of years will do so because of widening gaps between their products and priorities and the needs of their erstwhile customer base.

There are four main steps:

- Find out what your customers/users priorities really are, how these compare with what your staff think they are and re-order your service objectives and performance measures accordingly.

Techniques like the "Service Metrics Facility" from Cranfield School of Management have been successfully used by a variety of users over the past year not only to identify problem areas and ward off the threat of out-sourcing but to cement good relationships and as the first stage in rebuilding those that have deteriorated over time. The techniques can similarly be used by facilities management and other service providers to help monitor customer satisfaction and enable the earlier identification of potential problems.

- Institute a Customer Relations Programme to "educate" your users into realistic expectations and your staff into a better understanding of your users' priorities.

Many end-users have unrealistic expectations, particularly with regard to trade-offs between flexibility, ease of use, response times, reliability, resilience, development/installation time and cost. Most have little understanding of the discipline necessary to achieve serious business benefits from the use of innovative products and services. The results can be catastrophic, particularly if back up and recovery procedures are over complex and/or neglected.

Redundancy and outsourcing programmes in the course of the recession followed by sharply rising staff turnover in recent years have disrupted relationships between many older/long-stay staff and their supplier/customer/user contacts. The consequences include misunderstandings, service problems and lost accounts.

Many suppliers, often misled by feed-back from technical support staff and/or market research conducted largely among neophiliac enthusiasts, are now seriously out of touch with the needs and priorities of end-users. In particular the need of users for continuity of methods of working and for two-way compatibility and interworking between old and new versions of the same software on machines of different vintage linked over the same network has been seriously underestimated by some suppliers.

The Computing Software and Services Association (CSSA) has shown interest in the creation of the IT equivalent of a "Consumer Association" as opposed to the current agglomeration of supplier-oriented user groups. It may be that the Year 2000 fiasco will provoke a sufficient backlash to force the pace in this area.

- Institute cross-secondment routines with key users/customers/suppliers to improve mutual understanding and broaden your skills base.

In the 1994 IT Skills report this recommendation was seen mainly as a means of developing cross-breeds and improving in-house relations with end-users. By 1995 it had become clear that the potential benefits are much wider. Few organisations, let alone departments, can now offer the diversity of experience that most IT employers, whether users or suppliers, now need.

Users who accept secondees from suppliers, to help deepen their customer/applications understanding, and use the secondees to help their own staff improve the technical support for their end-users can derive multiple benefit. Those seconded by users to suppliers or end-users can acquire much greater depth of technical or applications understanding. End-users seconded to IT obtain an understanding of the activities necessary to secure and support cost-effective and reliable systems that no other type of "education" programme could provide.

A similar approach can be seen in a number of the mature entry courses designed for employer-sponsored management "high fliers" by some of the leading business schools. These often entail placing students into organisations other than their sponsor (including overseas) to work on supervised and monitored projects as part of the programme.

Such policies need to be looked at in the context of long term career paths if those seconded are expected to return and transfer back what they have learned. Experience is that secondees either do not return, or face re-entry problems, if they do not have a challenging, pre-planned project of at least 9 - 18 months waiting for them.

A number of far-sighted and imaginative employers are considering going further and are looking at the practicality of offering career paths built around rotations between consortia of non-competing users and suppliers to enable staff to build up the portfolio of skills and experience that the members of the consortium know they will need in the future.

- Build/re-build account management skills

The new generation of mini/PC/network oriented suppliers are discovering the need for account management skills (as used to be deployed by the mainframe suppliers) as they seek to win corporation wide orders and/or higher margin support/service contracts as opposed to one-off sales of packaged hardware or software.

Meanwhile those running in-house operations know they must treat their users as customers rather than as "victims" and demonstrate better understanding than potential external suppliers. They also know this can also entail more active management of their supplier, and not just end-user, relations to secure better quality and continuity of service.

The best source of account management skills is commonly felt still to be the sales training operations of traditional mainframe suppliers (eg IBM, ICL or Unisys). There is also a rising demand for older ex-mainframe sales and support staff, not necessarily full-time and not necessarily in a direct sales-support role, as "relationship" managers. There is similar effort on the part of large users to recruit those with account management and supplier relations experience with FM and integration operations.

8.1.4 *Pool best practice and benchmark the results*

The willingness of many IT employers, both users and suppliers, to share experience was first demonstrated in the course of the Women into IT Campaign when traditional competitors shared commercial information on the cost-effectiveness and tax-efficiency of different types of flexible working, child care and family support as well as working together on schools programmes, careers materials, events and research. There were some limits to co-operation but these were found to be much less restricting than was originally predicted.

There is a need to build on this success, to share more information on the practical working and cost-effectiveness of IT recruitment and career development policies, to develop benchmarks to measure the effectiveness of human resources performance and to develop profiles and action plans for the skills that will be needed over the next few years.

Such co-operation will be invaluable as IT users and suppliers grapple with common or complementary problems, including those that will be faced, for example, in managing and supporting "virtual organisations" where personal relationships have a longer life than employment/service contracts and the corporation's most valuable assets may be its information/experience base and people networks.

We can see the process beginning. The problems of quality controlling externally contracted skills and the fear of being "personally outsourced" in the next round of change means that many IT managers, in both suppliers and users, devote increasing time to building networks of personal contacts among those with whom they work regularly. Many former senior managers are now regularly retained by their erstwhile colleagues to help with quality control, monitoring or advisory tasks where the need is for experience and impartiality. One of the major challenges over the next few years will be the quality control of products and services supplied by organisations which are floating networks of networks of partners and contractors.

Such networks should include schools, colleges and universities in ongoing relationships with their local IT employers. There is much to be done to better prepare the workforce and customers of the future. The sharing of experience can help achieve better results for less effort.

Those who are most open and enthusiastic over pooling best practice tend to gain most from them. The view confidentiality over staffing and skills strategies improves competitiveness is rarely correct. The quality and timing of response are nearly always more important than secrecy other than with regard to activities linked directly to product launches and marketing campaigns.

8.2 *Suppliers: surviving the bloodbath*

One of the driving forces behind the rise of Intranets (section 3.5) is the way in which the use of Internet standards can dramatically cut the cost of integrating and supporting large, powerful and complex networks. The quoted example of the Silicon Graphics Intranet, linking 10,000 staff but supported by only 5, may be at the extreme but many other US corporations have also made major savings by ditching proprietary networks.

In the US there is now a converging "arms race" between traditional on-line service providers (eg Compuserve), "Internet Service Providers" (eg Pipex), "Interexchange Operators" (eg Netscape), telephone companies (including the old Regional Bell Operating Companies, AT&T, MCI etc) and the Cable TV Companies. Most of those in the race are hedging their bets between two basic strategies:

- maintaining the Internet tradition of standards and interworking so as to maximise the markets they can address
- developing proprietary add-ons to help build and secure a captive customer base.

If other major players follow AT&T and Compuserve in abandoning proprietary solutions in favour of genuine standards and if the World Wide Web consortium succeeds in holding the standards ring, then the rise of the Intranets could lead to a collapse of prices in the systems integration market at the same time as interface improvements lead to a rapid increase in the volume and variety of products and services that routinely interwork over low cost (including low set-up and support cost) intranets.

The process will be akin to the massacre of custom PC suppliers and systems houses in the early 1980s when IBM and Microsoft created a set of de facto standards and the mass market turned out to be far larger than anyone other than Alan Sugar had anticipated.

On the other hand, if the interexchange and operating system companies succeed in recreating a world of proprietary add-ons and one-way compatibility, then the systems integrators will continue to flourish but markets will be fragmented, including between different versions of the same operating system or browser, and the next mass market take-off will be at best delayed and at worse aborted.

Given that the major FM suppliers now control such a large proportion of corporate architecture decisions and stand to gain so much from ease of integration, as do the suppliers of hardware and communications who need the volume sales growth to stop a market implosion, the long-term odds are probably now in favour of the rise of effective standards. If so, the current boom may be followed by the disappearance of much of the customised systems integration market as software becomes as truly "plug and play" as most hardware.

The key issue for many suppliers is whether they wish to make short term profits before exiting the market during the next wave of change or whether they want to be among the survivors who benefit from the next round of growth as well. If they wish to be among the latter they need to:

- retain the confidence of their customer base
- build customer awareness of their current and future products and services and ensure they have, or can acquire, the skills to use them
- ensure that their future products and services interwork effectively not only with the market leaders of today but with all that their customers are likely to wish to use tomorrow.

8.2.1 *Easing the user path on the Year 2000*

The most immediate task for suppliers is to check which of their products and services are already Year 2000 compliant and inform their customers - so that the latter know whether and where they need to take action. Those who cannot understand what the fuss is about because their entire product range is compliant, and perhaps always has been, should not quietly gloat. They should inform their customers, NOW, because the latter will otherwise worry unnecessarily. Then they should prepare to handle the rush of new business.

Those who have older products which are not compliant should size the conversion problem that their customers face, both volume and complexity, and ensure that they offer routes forward that are very much more attractive than those offered by their competitors.

Given the likely scale of user panic, particularly among small and medium sized users who will be relying on dealers and value-added-resellers for support, ease of transition is likely to be far more important than new features in competing for conversion business.

The diversion of effort into checking for millennium compliance is likely to lead to a hiatus in new business, save for conversions, unless suppliers act rapidly to prevent skills shortages among customers and problems with the cost and availability of skilled and experienced contractors from holding back sales of new products and services.

Suppliers who seek to compete with their users for the skills to convert their own product lines are cutting their own throats. If they do not have sufficient skills in-house they should subcontract their own conversions to India or Eastern Europe and use what skills they have in the UK to mount short-order training programmes to help their customers handle theirs.

8.2.2 *Expand awareness and skills supply for current and future product lines*

Already last year a growing number of users were changing or deferring decisions because the necessary integration, implementation or support skills were in such short supply that they had no confidence in the probability of installation to the timescales and quality required. This problem is rapidly becoming worse.

The training certification schemes of some suppliers have much to commend them but a number need repackaging to be more attractive to third party training providers let alone to individuals retraining themselves. There is a need to consider whether the prime objective is to help mainstream product sales by improving skills supply (both quality and volume) or to generate revenue from courses and materials (whether delivered by a training subsidiary or franchised). The objectives are not incompatible but some combinations are clearly priced in ways that are losing more profitable business to one part of the organisation than is gained by others.

There is a need to look harder at the issues of end-user education, training and support. The user managers who increasingly determine spending priorities are also end-users. The closest sources of influence to them are their secretaries/personal assistants (of whom they commonly see more than their partners or children let alone their IT manager). It is vital to pay far more attention to their ability to use what has been put on their desks as well as to their expectations of what it could/should achieve now and in the future.

The combination of unrealistic user expectations and lack of attention to end-usability helped cost mainframe suppliers their "account control". It may be about to do the same for those who think control over the workstation or network operating system gives them similar power. End-user resistance may prove to be a major obstacle to sales over the next couple of years, as those who have learnt how to use their current systems by trial and error refuse to change - supported by their management. Alternatively it is an opportunity, for the suppliers of packages that teach you how to use facilities as and when you need them, (including dial-up or auto-dial, round-the-clock, people-oriented, support and training services), to wipe out less customer-oriented competitors.

Whether suppliers see this as a problem or an opportunity, there is a need to take end-user (including user management) education, training and awareness far more seriously and to make products an order of magnitude easier to use. All too often graphical user interfaces merely add colour, rather than clarity, to end-user confusion.

There is also a need to review the overall approach to customer awareness/education. The shrinkage of in-house corporate IT teams during a time of increasing supplier competition means that more invitations to attend product briefings are landing on many fewer desks. Meanwhile the growth in workloads among consultants with skills in current demand means that consultants briefings can all too often be attended largely by those "between clients".

Suppliers should learn from the success of Richmond Events (the IT Directors' Forum, City IT etc), the Computer Weekly 500 Club (users only) and ELITE (users and suppliers) in attracting so many heads of IT from large organisations, including many who do not commonly attend industry events. These filter membership and attendance and enable busy people to telescope meetings and contacts into a short window: 2 - 3 days at sea with the Richmond events, the reception after a CW500 meeting and in the hotel lounge before or after an ELITE lunch.

Most of those who attend such events have clear views as to the types of event they wish to attend themselves or use to update their staff. A common thread is that, while they are usually happy to attend a couple of all-day or overnight conferences a year, most are already at their limit and the time of their staff is similarly rationed. There is a common view that most current events are too large, too long and have too much one-way information transfer which can be done by other means (tapes, videos etc). Smaller, shorter, more local events with more time for discussion and inter-action are a much better use of time than travelling to London (or elsewhere) just to listen and watch.

Those seeking improved contact with decision takers or to "educate" their advisors are therefore recommended to distinguish between discussion events (to enhance customer contact and/or identify areas of interest) and information activities (to "educate" those who have already shown interest) and make more use of tapes, videos, teleconferencing etc for the latter.

The Institute of Data Processing Management (IDPM) is piloting a "Management Update Programme" formula comprising a flagship awareness event in London, for those at the top, followed by smaller "Roadshow" events in all parts of the country, including Central and Outer London, for those who will have to do the work.

The first series is being organised and hosted by SAP (with the support of its partners) on "the terms of reference you should give your Head of IT to tackle the Year 2000 and who can help". The second, yet to be confirmed, is expected to be hosted and organised by one of SAP's competitors on "the skills needed for the next generation of software and cost-effective ways of developing and retaining them".

8.2.3 *Ease the integration of your products with those of others*

Suppliers need to take a more constructive attitude towards developing the skills needed by users and integrators to interface their products with those from other suppliers. Current proprietorial attitudes cost far more in lost sales than is commonly appreciated. This is particularly so when groups of large users with similar needs would like to integrate products from a variety of suppliers but fear that the "one-way compatible" upgrade policies of some of the suppliers will create a massive ongoing maintenance overhead.

One example is in the smartcard market. Over £250,000,000 of business in one sector alone is already being postponed until the potential suppliers agree common standards, (to enable the automatic downloading of software upgrades over approved networks to point-of-transaction terminals that will read all common cards without the need for a multiple slots in a "toast-rack" or to maintain multiple operating systems because of the difficulty of upgrading point-of-sale equipment in tens of thousands of locations). There are many other examples, from just-in-time manufacturing to inter-company e-mail, where the incompatibilities of operating systems, let alone applications packages are now the main barrier to growth in market penetration.

Given the growing world-wide purchasing power of major FM suppliers (like EDS) and the amount that incompatibility is costing them in unnecessary integration costs on existing business as well as in lost new business, (because the cost is too high compared to the benefits), the time has come for the FM suppliers to work with the major users, whether their own customers or not, to force the pace on standards. Such alliances may serve to further the march of the Intranets and bring forward the collapse of systems integration markets but will also serve to greatly expand overall markets and usage.

8.3 *Individuals: taking charge of your own careers*

Even those lucky enough to be with employers who take career development seriously, need to take more responsibility for their own training and skills acquisition. All IT professionals, whether employees or contractors, will increasingly have not only to be prepared to organise and pay for their own training but demonstrate their new skills before they can command the rate for the job. The policy of QVF (the agency set up by Software AG, of demanding that contractors pass a product examination) will almost certainly spread as users increasingly demand to be able to verify contractors claims about their expertise and experience. The growth of the supplier certification schemes of IBM, Lotus, Microsoft, Novell et al reflects this trend.

The continuous professional development programmes of the professional bodies (BCS, IEE, IDPM etc) are designed to provide a framework for such career planning but are only frameworks. The professional bodies are no more able than their members to predict which portfolio of skills will be in demand with which IT employers more than a year or so ahead. The update programmes (including "summer schools", "winter breaks" etc) already organised by some of their branches and special interest groups are relevant and are usually very good value for time and money. But provision is patchy. Unless and until employers and suppliers support such programmes, to help their own staff and customers acquire the skills they will need, they are likely to remain too small in scale to have significant effect. The geographic cover is also very uneven and depends almost entirely on the level of activity of local enthusiasts and/or support from local employers, suppliers or training providers.

Individuals wanting to see improvements in the availability of such programmes in their own area should join the relevant professional body (as an affiliate if they do not already qualify professionally) and work through their local branch and any relevant special interest group to identify sufficient local employers and individuals with common needs for such programmes to be economically viable. They should then use the local and national infrastructures of the professional body to identify competent training providers, whether from local employers, colleges and universities or from commercial training providers, to undertake the delivery.

Where employers offer to pay for staff training in their own time, whether or not there are contractual strings, employees should be prejudiced in favour of acceptance unless they already have other plans. Similarly self-employed contractors should consider signing up with those agencies which provide update training and opportunities for practical experience in new skills as part of a loyalty scheme, particularly where these schemes are linked to known forward contract opportunities with participating employers.

When you plan to pay for training yourself you should consider the following:

- What is the customer base of the training organisation?

If it does not receive most of its revenues from fees paid by the kind of employer for which you aim to work for (eg it is a college or university), which employers are on their course advisory panels or recruit from them, how recently and what are they looking for?

- What certifications/accreditations does it have?

There is widespread scepticism in IT with regard to most IT qualifications but the Approved Training Centre (ATC) routines of most software suppliers indicate competence to teach the use of specific products. "Accreditation" by the BCS, IDPM, IEE or ISEB and BS5750/ISO 9000 indicate that the organisation has been visited and its quality routines checked by an independent inspection team. So does accreditation from a reputable UK university, perhaps as part of credit accumulation and transfer programme leading to an academic qualification.

Note, however, that not all the "registration" routines of professional bodies include a check on quality assurance procedures.

- Where and how are you going to acquire practical experience of the new skills?

It may be necessary to do this on a voluntary basis with a charity or on a performance-only basis with a local employer. Either way it is important to acquire credible references. If the "client" is not sufficiently knowledgeable to describe the skills demonstrated, a local IT manager who is a member of BCS or IDPM, should be approached to provide a professional reference.

- What assistance, if any, is available from your local Training and Enterprise Council?

TECs and their associated operations are supposed to provide help for individuals planning their career development and training needs, whether funded personally or by their employer. Some have good links with local training providers and firms looking for IT staff, support and services.

Ask your TEC for information on "career development loans" and on courses which have been registered for Income Tax relief. If the course you plan to attend has not been registered for tax relief, ask your TEC for details of how those running the course can apply.

- Does the "individual" training programme of a commercial training provider meet your needs?

Several well established IT training providers now run affinity schemes ("Gold Cards", "Passports" etc) under which they provide attendance for a named individual on a series of courses for a one-off annual fee. Department for Education and Employment Training Loans can sometimes be used by individuals to pay for these.

8.4 *Training and education providers: exploiting the opportunities*

8.4.1 *The overall challenge*

Most employers halted new entry training during the recession and there are few signs of any serious recovery (section 4.2). Meanwhile there has been a major recovery in "just-in-time" cross-training to give new skills to already experienced professionals. However, there are often serious shortages of trainers with those new skills and current course delivery in a number of areas is running at a fraction of apparent demand.

Many providers with high nominal penetrations in markets where they are not constrained by resources are also aware that they are tackling only a fraction of the apparent market. One large supplier-linked training operation, already selling to almost 90% of the organisations which purchase the products of its parent, calculates that it is addressing barely 20% of those who should be trained for the users to obtain full benefit from their investments. Most of the other 80% are not being trained by their employer. The perceived consequence is substantial lost licence revenue as roll-outs and enhancements are slower and more costly than they should be.

The situation is equally bad in the contracting market. A recent survey by Hunterskil Howard indicated that under 30% of contractors received any training from their client, even including that necessary to understand the systems on which they were supposed be working, during a contract.

The structure and economics of the commercial training market, including materials and events as well as courses, have undergone major change over the past few years. Even update training requires heavy investment in materials and in training the trainers if it is to be delivered in volume. It also requires capital investment in open learning centres and networks, as well as even greater investment in materials, if it is to be delivered flexibly and locally.

The growth of low cost distance learning over multi-media, local area networks or the Internet is bogged down in a costly fragmentation of incompatible authoring languages to produce material for delivery over an equally costly fragmentation of conferencing and learning management systems. One may criticise the policies of the major network and operating systems providers (section 8.2) but compared to the jungle created by the suppliers of the competing infrastructure products for computer based training and distance learning ...

In consequence the investment needed to address the "other 80%" is far greater than it need be.

This problem needs to be addressed immediately if the Prime Minister's "IT for all" campaign is to be any more effective than the many other DTI awareness campaigns over recent years.

8.4.2 *Some market opportunities*

The most profitable market opportunity is to address the problem outlined immediately above.

- **Integration training**

Nowhere is this a bigger problem than with regard to the creation of cost-effective distance learning networks that will deliver good quality materials, direct to the user workstation (whatever version of whatever reasonably common operating system it is using, over whatever version of whatever reasonably common network).

The need is to develop the technical and managerial skills to interface products and services from different suppliers (or even different product ranges from the same supplier). Until this year, apart from technical workshops and management seminars, usually in the London area, this area was very poorly served. A number of major commercial training providers are now beginning to provide well documented and authoritative courses covering the most widely used, and most commonly integrated, products but many more are needed.

The problem outside the London area is the cost of bringing together sufficient delegates with a common set of needs to cover the cost of a trainer with the necessary skills.

The challenge is to find lower cost/risk ways of identifying whether a move to applications and needs driven training can be more profitable than the current mix of largely product/topic specific courses and materials. Part of the problem is that too many potential customers believe that local, part-time, flexible delivery should be less, not more, expensive than a course at a city centre training centre.

The reality is that, unless the customers provide the local delivery infrastructure and guarantee a full house for minimal marketing effort, delivery is uneconomic for most commercial training providers outside a handful of City centres, ring road/motorway intersections and the West London/Thames Valley area. It is not just a matter of economies of scale on the marketing front. The cost of travel and accommodation for specialist training staff and equipment installation and support commonly wipe out any nominal savings on the venue.

The largest nominal opportunity is

- **the 50-80% of users/suppliers who currently do no training**

This is referred to above and is now well identified. The 1994 IT Skills Trends report referred to the research of West London TEC which found, in 1982, that 80% of establishments provided no off-the-job IT training, only a third provided any form of IT training, only a quarter of IT departments had a training budget and over 50% of those with professional IT staff had no plans to give them any training over the year ahead.

The 1994 Computer Weekly readership survey indicated little change in this stark picture. Over half the respondents reported receiving no regular training. The controlled circulation analyses of the 110,000 registered Computer Weekly readers also indicates that training was the only purchasing decision, apart from mainframes, over which fewer readers claimed influence in 1994 than in 1991.

The situation improved in 1995 but, even so, influence over hardware purchases was three times as common as that over training decisions.

This is not a new phenomenon. Grants and levies and exhortation have been tried regularly, and in vain, since investment in training started to decline in the 1960s after contractual apprenticeships were voided by the courts.

It is unclear whether the other 80% of the theoretical market, (including end-users), and/or the unaddressed 50% of the IT professional training market are uneconomic, or whether different approaches could greatly expand the proportion receiving some form of training while generating sensible margins for those who meet their needs.

- **Specific product and applications gaps**

Most of the gaps identified in the 1995 report are now being filled by commercial training providers, for example basic TCP/IP and Internet Skills. One emerging area of demand is the integration of Intranets with mainframes and with systems like the AS400 as a new form of "client server writ large".

Another gap, identified last year and only beginning to be addressed, is to do with the techniques of producing cost-effective and attractive multimedia materials. Given that this is also one of the bottlenecks on cutting the cost and improving the availability of IT training it is a particularly important shortfall, unless we are to continue to rely on importing English language material from the USA and watch the current UK trade deficit on education and training courses and materials rise accordingly.

The availability of courses and materials on making effective use of the growing variety of communications products and services is growing but needs to grow very much more if suppliers in this area are not to continue to have business lost or delayed by skills shortages and lack of customer awareness.

- **Bridging time and location gaps**

The most important "gap-filling" opportunity is that with regard to distance learning courses and materials. But this requires co-operation to address the standards problems outlined above so that the audiences which can be addressed over any given combination of hardware, software and network are sufficiently large and attractive to cover the ongoing cost of maintenance (including regular updating) and support, as well as providing an adequate return on the original investment.

The market for physically delivered updating and learning events is therefore likely to continue, undiminished, for a number of years to come.

Some research indicates that breakfast (7.30 - 10.30) and late afternoon/early evening (3.30 - 6.30) are convenient for more staff than normal training hours. A number of in-house open learning centres are known to be most heavily used in these periods. One popular (over 400 participants from the Group IT Department alone in 1995) skills updating programme in a large user makes extensive use of Saturday morning training sessions.

The concept of organising programmes of weekly half-day events which are more a series of group therapy workshops for users facing similar problems than a coherent course has emerged in a number of locations for a variety of audiences. Some programmes have succeeded. Others have fallen apart.

Two types of group programme appear to succeed:

- where the skills and problems are relatively common and the problem is "merely" to find a location and time that is convenient to a critical mass of participants and a local trainer.
- where the skills are scarce, the motivation to succeed is high, the participants have common needs (but do not see each other as competitors) and their employers appreciate the likely cost.

Employing consultant-trainers with the skills to plan and run such programmes is not cheap. To the uninitiated it looks like half-a-day a week of asking questions rather than imparting knowledge (plus answering the odd phone call). But each such workshop session may require the whole of the rest of the week (and more) to prepare and/or follow through. Programmes between the two extremes therefore appear to have little probability of success.

One of the objectives behind the BCS-IDPM CPD programme was the formation of consortia of local employers to commission local workshop series from conventional classroom training providers who can also supply distance learning material for use between the workshops. The aim would be to reduce the cost in employer-funded core time without having to charge more than for the conventional course.

The IDPM tested a potentially successful formula for such meetings in 1994 but found that this needed a major investment in marketing to achieve the necessary audiences for live programmes to be economically viable. The conclusion was that professional bodies should organise such programmes in partnership not only with each other but also with suppliers and commercial event organisers and training providers.

The "Management Update" events being organised by SAP for IDPM over the next few months will use mainstream marketing routines to address this problem and are intended to provide a model for others to copy. Negotiations are well advanced with one of SAP's competitors to provide a second event stream. Once a third is added the band-wagon should roll.

Training providers should seriously consider whether working direct with groups of local employers, (perhaps via professional bodies, user trade associations, chambers of commerce and the new "sector partnerships") could help them to open up whole new markets.

Training providers should also look at the South Bristol model not merely with a view to direct replication but also for lessons that can be applied tangentially.

8.4.3 *Clearing the certification jungle*

"Getting our act together", the 1996 study by John O'Sullivan for ITITO, lists 30 Professional Institutes, Trade and User Associations, Sector and Education Organisations and Accrediting and Awarding Bodies covering IT in the UK. But this is only the tip of the iceberg.

There is also a growing number of commercial certification routines run by individual software and hardware suppliers and training providers as well as by associations not listed in the ITITO report. More-over ITITO is itself only one of more than half a dozen DfEE recognised "lead bodies" covering the various parts of the converging IT, communications and multimedia (hardware, software and content) industries.

An exercise in 1992-3 identified over 50 organisations running schemes to accredit IT training providers and courses, using a wide variety of standards and methods, an equally wide variety of charging structures and even more expensive duplication of staff time and effort. It also identified widespread support for wholesale rationalisation.

The unnecessary cost that results from the current duplication of effort in materials checking and inspection visits, and the audience confusion that results from similar duplication and competition in promotion, mean that much current investment in commercial accreditation is being wasted.

Representatives from IBM, Lotus, Microsoft and Novell took part in a public debate at the IT Training Show in Birmingham earlier this year on the value IT users get from their certification programmes. As a result of persistent questions from the floor they have agreed to work closer together over the next six months to explore the practicality of some form of generic certification. In parallel, ITITO has been awarded funding from the Department for Education and Employment (DfEE) to provide the secretariat for an "IT Sector Partnership" which would organise events a couple of times a year to bring together the various professional and awarding bodies and trade associations: a re-run of the old IT Skills Agency.

Meanwhile there is still widespread scepticism in the IT industry over the value of any qualifications. Until recently the NCC (now ISEB) systems analysis certificate was the only qualification to appear in job advertisements. Now one occasionally sees references to "certified XYZ engineer" as well as to the ISEB SSADM and PRINCE qualifications.

The accreditation schemes of the software houses may be seen by some as indicating quality and relevance with regard to product specific skills but there is also scepticism as to which are better viewed as geographic marketing franchises to promote sales of materials and hardware/software upgrades and which genuinely recognise all who meet a given quality standard with regard to the products and services on which they provide training. In consequence the degree of interest in the purely commercial schemes remains muted compared to the 4,000 enquiries sparked by the initial publicity for the accreditation arrangement between the University of Staffordshire and Learning Tree International.

The duplication of effort in inspection and quality assurance time and cost has to be paid for from the training providers' bottom line. Standardisation on material bought from suppliers, without allowance for material to be tailored for specific audience needs, may both detract from the benefit to customers and deny opportunities for added value and/or premium pricing.

Collaboration between reputable certification/registration/accreditation schemes over inspection and quality control procedures can enable costs to be reduced significantly and allow more of the accreditation fees to be spent on promotion and marketing. Simultaneously it allows training staff to spend more time on promotion and delivery and less on responding to questions.

There is therefore a strong financial and commercial case to bring together the aspirations of the IT Sector Partnership and the resources and budgets of the commercial training providers. The aim should not be a mere pooling of information but the creation of a new generation of alliances which cut across traditional organisational and sector boundaries and make far better use of current resources.

That rationalisation process should also involve, for example, the new networked universities (eg City, Greenwich, Plymouth, Staffordshire) with their multiple campuses for local delivery (including access to world-wide conferencing links) and multiple skills levels (from further and higher education to world-class applied research) and the providers of generic open learning (such as the Open University, Birkbeck College or Henley).

Rationalisation is not the same as standardisation and the cross-fertilisation of ideas may lead to a new diversity of provision but there is a common need for a framework that enables courses and qualifications to be assessed along at least four dimensions:

- product and technology specific competence (eg certified XYZ engineer)
- generic competence (eg NVQs, ISEB)
- professionalism (eg BCS, IDPM, IEE)
- academic standard (eg HND, MSc, MBA)

Apparently similar courses may rate very differently along the dimensions. Any given student or employer may want a mix of assessments for different purposes. Experience to date is, however, that a single assessment process can cover all dimensions - provided those running the process have the appropriate joint background. Given the number of UK academics who supplement their incomes by developing and delivering courses under commercial and professional quality control and the number of commercial training providers now working closely with academic institutions, this should not be a major problem.

The objective should, however, be a common framework, not a straightjacket. The markets for IT training are evolving over time and drop out rates on courses which have not been revised in recent years are rising as students realise how out-of-date they have become.

The different motivations of all concerned must be respected if the benefits in lower costs, lower overheads, faster updating of the trainers themselves and more cost-effective promotion are to be realised in practice. Collaboration must therefore be structured so as to reduce the time needed to define and promote new qualifications and to revise existing ones as needs change. The time it currently takes to agree new syllabi and assessment techniques is a prime reason for the current tangle. Collaborative ventures which do not directly and successfully address this problem will fail.

8.5 *Government: act or abdicate*

Much of this section is repeated from the 1995 report. Only the urgency and degree of support for the recommendations have changed.

This spring the House of Lords Select Committee on Science and Technology undertook an enquiry into Superhighways Policy issues. IDPM was delighted that the Committee turned our call for "an overall initiative that combines the best features of IT Year (1982) and of Vice President Al Gore's National Information Infrastructure Task Force (NIITF) and for co-ordinated action regarding IT skills to be a part of that initiative" into a firm recommendation for a "UK Information Society Task Force".

The Select Committee made specific recommendations as to how this should be based upon the relevant cabinet co-ordinating committee rather than any single department and embedded the IDPM call for a "National IT Skills Agenda" into the title of their report "Information Society: Agenda for Action in the UK".

The House of Lords Report was, however, largely concerned with areas of policy outside IT skills and training, however broadly defined, and it is also necessary to ensure that its recommendations are adopted and implemented by whichever party wins the next election.

It is therefore apposite to repeat the recommendations made last year, updated as relevant, together with the "Government Health Warning" that preceded them.

8.5.1 *Government Health Warning*

The UK has endemic education and training problems. Some go back over a century to when the revival of the grammar schools and universities led to a relegation and devaluation of the values of the "trade schools" and "mechanics institutes" that had enabled us to lead the world in the first industrial revolution. In the English and Welsh education system the traditions of medieval scholasticism still all too often triumph over those of practical empiricism. The gulf between academic rigour and real-world application is, all too often, bridged only when academic survival is threatened.

What price a "national curriculum" and "national vocational qualifications" in a Global Information Society? The certainty of the English and Welsh educational establishment, as represented in the consultative committees of the DfEE, that they "know best" has led the UK into an unprecedented balance of payments deficit for materials, text books, courses and qualifications. Those designed for the UK market are no longer saleable overseas. Those who wish to be employable must, all too often, now use materials or acquire qualifications specified for needs of North America or the Far East.

UK government policy can be seen as the lowest common compromise on which the warring tribes of the Civil Service and their tame, or not so tame, mouthpieces in Cabinet committees can agree. The departmental policies of the various tribes (Treasury, DTI, Home Office etc) are in turn compromises between the lobbying of the various interests they seek to placate, including those advising their possible next set of mouthpieces, currently in the ranks of Her Majesty's Opposition. The current ability of a handful of rebels in the House of Commons to upset such compromises introduces new complications but may well result in better policy.

Any criticism of government policy, including that below, applies to the compromises that have resulted over the years, not to the conscious policies that any particular minister, party or official would wish to pursue in the absence of the conflicting pressures around them. Change requires that many politicians and advisors in the main parties, officials in a variety of departments and those who lobby all and sundry, believe that action should form part of a revised set of compromises.

Vice-President Al Gore faced a similar situation in Washington, albeit with a very different set of tribal structures. Hence the nature of his initiative. Martin Bangemann faced an even more problematic situation spread over Brussels, Luxembourg, Strasbourg and the capitals of Europe. Hence the nature of his "Information Society Forum" and "High Level Group of Experts".

In the UK we can also look back, contrast the success of IT Year and the failure of most other awareness campaigns and debates, and learn from our own successes and failures as well as those of Al Gore and Martin Bangemann.

"Leaving it to the market" has not worked but neither has government intervention or spend. It may be that the most important role of government is to bring players together, stage debate and, where necessary, level the playing field by undoing some of its own past mistakes.

Many current problems with regard to IT skills and training are a direct result of past government action or fear of future government action. Others have been compounded by government inaction. Others can only be resolved if government provides a neutral umbrella for negotiation between the various organisations and interest groups involved.

8.5.2 *Problems caused/compounded by government action or fear of future action*

- Reduced job security

We now know that the benefits of compulsory competitive tendering and market testing have been exaggerated by a factor of at least two. Many central government IT departments were more efficient than their private sector equivalents and, on a truly level playing field, would have faced no contest. Many privatisation decisions derive more from Treasury accounting rules, a drive to cut the potential burden of public sector inflation proofed pensions and apparent decisions to bar Civil Service departments from achieving economies of scale by providing services to others.

In the private sector the desire to reduce pension fund contributions and other existing statutory obligations to those with staff status is compounded by a desire to reduce the numbers who will be covered by the obligations that may be imposed under the EU Social Chapter by a Labour government or by the European Court, over time, if the Conservatives remain in power.

The combined effect ensures that redundancies, particularly in the private sector are focused on older workers where employer pension contributions are highest and that public sector IT recruitment and training is cut to the bone if the department cannot be contracted out.

The job security situation is therefore almost certain to deteriorate, whichever party is in power. Employers and employees should plan accordingly.

- Reduced labour mobility

The imposition of punitive tax burdens on employer-funded relocation expenses and changes in the rules on the travelling and subsistence expenses of contractors have had a significant effect in reducing labour mobility. The crash in the housing market, compounded by reductions in mortgage relief, the reimposition of stamp duty and the continued failure to remove the many artificial restrictions on the rented housing market had an even more profound effect.

Using the 1994 Computer Weekly readership survey as a basis, over 60% of IT professionals would be willing to move home to get a new job but 85% owned or part-owned their own homes and this restricts their mobility. The recent partial recovery in house prices may have enabled some of those trapped by negative equity to escape but is unlikely to do much to improve overall geographic mobility.

Given an ageing IT workforce we can expect further reductions in geographic mobility unless radical action is taken. Given that this is unlikely, employers should consider how better to take work to where the skills are. If this turns out to be overseas this will, in the fullness of time, result in the reduction and/or termination of the pensions of the Civil Servants who failed to consider the implications. More unfortunately, it will also result in the reduction, in real terms, or termination of all other publicly funded pensions.

In the United States many of those in work are already planning on the assumption that public welfare schemes will collapse before they need to call on them. This attitude is spreading.

- Reduced labour availability

The attempt to extend PAYE to cover contractors who work through a single agency or work on projects that last several years has similarly reduced availability. Those who take their after-tax life style more seriously than their nominal pre-tax income are often led to take decisions that may be tax-efficient but are business inefficient. The wide variations in practice between tax offices in different parts of the country mean that the effects are uneven and compounded by uncertainty.

Both the extension and the uncertainty have had serious effects on attempts by employers to cushion the blow of redundancy for older workers by providing support or guaranteed work while they seek to establish themselves as independent contractors and start new careers.

The imposition of PAYE on employer funded child-care (other than for certain types of creche) and on other family care expenses and the continued failure to provide tax relief on such expenses when funded by the individual is a prime cause of the lower proportion of older women in senior posts in the IT workforce compared to other countries. The UK appears unique in making it so difficult to combine career and family life. The study by Patricia Morgan quoted in section 4.2.2 indicates clearly how the "party of the family" has, in practice, been systematically taxing the married family into extinction.

Given the proportion who have had to give up work entirely or work less than half-time, the fiscal cost of change will almost certainly be balanced by the tax revenue on the enhanced earnings of those who re-enter the work-force, including those who do so in order to run the child-care, "granny watching", after-school and out-of-term kids-club and other facilities likely to be spawned by the private sector (or public-private co-partnership initiatives), without the need for more public sector funds.

"Flexible" working is no substitute. It may make it easier to cope with emergencies but it is not possible to work professionally from home at the same time as looking after children or family.

- Unrealistic user expectations

Some government statements and awareness campaigns have been positively misleading: either in fostering unrealistic belief in the maturity of innovative products, services and technologies or, perhaps more seriously, in causing end-users to underestimate the discipline necessary for successful application and the scarcity of consultants and suppliers with practical experience. It would be a pity if the concept of awareness campaigns were to fall into disrepute. They can be very effective but there is a danger of "initiative fatigue".

It is important to recognise the reasons for the success of IT Year, which led to the belief in the value of such exercises. These succeed **only** if they are driven by consortia of users and suppliers with common objectives and a commitment to turn awareness into action. The impact of IT Year, and the willingness of many organisations to participate in future campaigns, was greatly weakened when DTI dropped its commitment to the follow through. The impact of the equally successful Women into IT Campaign was similarly weakened by the failure of the Departments of Employment and Education and Science (now combined as the DfEE) to participate or support the necessary ongoing careers and information infrastructure.

- The confusion of training with education

Just as government consistently under-estimates the importance of development and technology transfer compared to "research", so it consistently underestimates the importance of training as opposed to education. The transfer of support from successful high and medium level training programmes like the MSc Conversion Courses, TOPS and Threshold left a training gap that larger scale programmes to NVQ levels 1 and 2 and/or GNVQs did not fill.

Investment in literacy, numeracy and remotivation programmes for those 16 - 18 years who have been failed by the education system is very much in the national interest but should not be confused with vocational training.

There is an increasingly serious problem with regard to rising unemployment among those in their mid-20s, the audiences for which the TOPs and Threshold programmes were originally designed. There is a particular need to support the new multi-campus regional universities with their networks of associated further education colleges and short course operations in their efforts to bring youth, adult and commercial training into common networks offering modules that meet the direct needs of local employers but also build into qualifications of all types, professional and vocational as well as academic, to meet the aspirations of individual employees, as well as of publically or personally part-time or full time students.

This can be seen as a long overdue reversion to Victorian values, when the "red-brick" universities were founded to train the local workforce with new scientific and technical skills. That some of the new universities are world-class centres of research (often largely funded by industry through product development and consultancy contracts) should not be allowed to permit the re-imposition of more academic values by those jealous of their success.

8.5.3 *Reducing the pre-tax cost of training*

Many surveys, beginning with "A Prescription for Action" (NCC 1987) have shown that the cost of time is an even greater obstacle than the cost in money in deterring investment in training. The use of multi-media distance learning, including computer based simulations for practice and assessment, should (in theory) enable both to be addressed. In practice, even where the hardware platforms and distribution networks are already available, the necessary content, both quantity and quality as well as breadth and depth, is all too often missing. This is partly because UK markets are fragmented over too many incompatible software platforms and partly because of the idiosyncratic education and training policies of the English and Welsh (out of line with the rest of even the English-speaking world).

DfEE could greatly reduce its own costs, or rather those of the multiplicity of education and training agencies it funds (directly or indirectly) were it to take a lead in stimulating the adoption of effective de facto interoperability standards by UK based developers and purchasers of distance learning material. Such a policy should have the target of enabling the use of common hardware/software platforms and networks to access common material from village school to world-class university, from home or study centre to all types of workplace. It would thus transform the scale of the potential UK market for any given piece of material.

Such a policy needs to be based on international standards to be effective in helping cut the cost of delivery and improve the quality of content so that both are world competitive. Once these have been achieved the UK should also be able to retrieve its traditional (until recently) positive balance of payments in education and training materials as a whole. Until then there is probably a need to explicitly fund the National Council for Educational Technology to help UK suppliers and purchasers to participate in standards development as well as application.

8.5.4 *Reducing the after-tax cost of training*

Tax incentives can be a more powerful instrument of change than direct spend. Recent Chancellors have begun to recognise this and their budgets have seen the introduction of specific tax breaks for registered courses leading towards NVQs and for donations of hardware and software to schools. As yet these have been poorly publicised and therefore of limited effect but they show the way. Both the Chancellor and the Shadow Chancellor expressed interest in receiving costed proposals for the tax incentives proposed in the 1994 IT Skills Trends Report. These were provided in the 1995 report and are repeated this year.

The costing of innovative policy proposals is no more exact a science than the costing of innovative IT investments. The technique for risk avoidance is similar: prototyping. The danger is also similar: temptation to move from prototype to full scale implementation too soon. We therefore proposed a prototype embodying principles that can be extended to other areas of current and potential skills shortages but should not lead to abuse if applied in areas where there are few if any signs of shortage and/or lack of training.

The proposal is that those following professionally recognised training and/or update courses, other than to meet mandatory requirements to practice in that trade or profession, be exempted from national insurance (NI) and/or income tax for the periods spent on off-the-job training.

It is sad to have to exclude both training to meet mandatory requirements and on-the-job training but these are the two areas most susceptible to abuse. It may be that, after the success of the initial pilot, means of extension can be found but the priority is felt to be to stimulate off-the-job training in skills of known shortage where the need to meet mandatory requirements, as in accountancy, medicine and law, does not exist.

Participants would need to maintain Professional Development Log Books and the NI exemptions would apply only to assessed activities entered in the log for which auditable records are available. The exemptions from Income Tax would apply only to those following off-the-job employer funded courses in the UK during which the employee is not available for work for over 6 weeks.

The net "cost" to the Treasury, as opposed to transfers between various public sector pockets, will be negligible. Very few private sector staff follow employer-funded training courses with off-the-job modules of more than six weeks. The intended effect is to expand the number who do so, at little or no net expense to government.

The exemptions from National Insurance would apply to all forms of off-the-job training, including short course modules. They could be administered in much the same way as rebates for Statutory Sick Pay. It may, however, be easier for registered participants to claim an allowance based on industry training/update "norms" (eg 6 weeks off-the-job in the year 1 for a trainee programmer, 2 weeks a year updating for anyone fully qualified). The allowance would be lost if the norm is not met and could be increased if the norm is exceeded by more than 50%.

Given current average salary levels the nominal cost of the "lost" National Insurance revenue would be about £750 for a first year IT trainee and £400 p.a. (counting both employee and employer contributions) for each "professional". The overall cost depends on the take-up of professional development and updating programmes in areas where they are not already mandated by statute. It is therefore likely to be low unless and until training rises well above current levels.

Given that the average off-the-job training for those in the UK workforce is under 2 days and given the small number receiving more than 10 days off-the-job training outside the statutory professions, the likely number who would already qualify can be measured in thousands rather than tens of thousands. The displacement "cost", (ie tax rebates due on training that would be done anyway) is therefore likely to be well under £10,000,000.

The more significant questions are the ways in which off-the-job training delivered in short modules and/or using distance learning methods should be counted and the likely net cost as the programme stimulates more training.

The use of Professional Log Books, like those for the BCS PDS and BCS-IDPM CPD programmes, (both in line with Engineering Council recommendations), which indicate clearly which activities have been assessed for accumulation against the annual target and how the entries can be validated/audited, provide a simple solution to the first issue.

The second is more complex.

The development and delivery of commercial training materials is itself a labour intensive activity generating much higher tax yield than most. One calculation for the Secretary of State for Employment in 1987 indicated that a similar programme would result in increased, not decreased, tax yield - even before allowing for the common experience that many, perhaps most, fail to claim all the tax credits to which they are entitled.

10 days full time, non-residential, IT training to commercial standards costs around £1500 in fees and around £1500 in trainee salary and travel costs (less for first entry trainees, more for update training for IT professionals). The National Insurance tax break is therefore around 10% of the total cost of conventional training and rises only if it stimulates more local, modular, but still professionally monitored and off-the-job, training.

The expectation is therefore a benefit to spend ratio of at least 10:1.

The best way to test the case is not to spend money on theoretical studies but to mount a pilot and measure the results. The impracticality of discrimination with regard to tax breaks means that the best means of achieving this may be to announce a national scheme (but give it no more publicity than the NVQ tax breaks have received to date) and actively promote and support one or more local test programmes with employers served by particular TECs and/or tax and national insurance offices. The programmes would then be monitored with a view to additional publicity and/or review after 18 months to two years of practical experience.

8.5.5 *Other areas for government action*

The other areas for government action reported in the last two reports still hold true. These may be summarised as:

- improved information through careers and information services for mature entrants and returners as well as for school and college leavers with regard to the changing career opportunities, the quality and relevance of existing courses and qualifications and the availability of assistance with training and/or retraining. Many services are still using out-of-date and sometimes seriously misleading information. Too few have material which goes beyond the needs of the large organisations who now account for a declining proportion of employment. Such material is unlikely to be produced without serious support from government.
- a closer focus of public sector funding on those providers and courses where course content and standards are aligned to the identified needs of local employers. Publicly funded courses are still being mounted to impart skills that are not in current demand or are not in demand within the travel to work area of the trainees. Training for stock is a fallacy. Skills not used within a given time frame commonly atrophy.
- improved information through the TECs to local IT employers, particularly those in small and medium sized organisations both with regard to best practice in IT human resources and with regard to local sources of support and training.

Most small to medium IT employers are not aware of the range of IT training products, materials and services available to them. The main IT industry trade and training directories are not held in most Public Libraries or TEC information services and are not, in any case, comprehensive with regard to local provision.

Whether the information is provided on paper or web-sites the cost of updating and validation (additions, changes and **above all** the deletion of information that is not only no longer correct and but may now be positively misleading) is much greater than the nominal cost of creation.

- improved publicity and guidance for those wishing to use existing schemes, for example income tax credits for courses leading to NVQs and the corporation tax treatment of donations of hardware, software and multimedia materials to schools.

There appears to be little or no publicity on how to obtain tax relief on courses leading to NVQs, beyond the registration form for courses that can be obtained if you happen to know the right part of Inland Revenue to contact. Similarly there has been no publicity regarding the corporation tax credits available on donations to schools, beyond the press release that announced the original relief. One has the impression either that these were concessions wrung out of government by back bench MPs (and there is no intention of allowing them to be exercised in practice) or that HMG is still incapable of promoting programmes which cut across more than one department.

There is a similar need for information on the types of training contract used in the public sector (eg as in the Local Authority Conditions of Service Guidelines) and likely to be upheld in the UK courts.

- the need for government to take its own training and staff development responsibilities, as the largest direct and indirect employer of IT applications staff, more seriously.

The failure of government as an employer to support initiatives that it promotes to others sends clear messages to the private sector. In Victorian times many improvements came about because government set standards as a best practice employer and then mandated those standards on those bidding for government contracts. Given the potential for many of the information processing tasks outsourced by government to be exported out of the United Kingdom it is very important to set, and be seen to set, clear rules and standards in this area.

8.6 *Professional bodies and trades unions*

8.6.1 *The pressures*

The UK membership of most IT related Professional Bodies and Trades Unions is at best static and at worst declining. Some of those which did not, for a variety of reasons, commit to NVQs still have flourishing education and training activities overseas but many have recruitment problems in the UK of varying degrees of severity. Most are also under increasing pressure from their members to help them improve their status and employability but lack the resource to do much more than provide a framework within which members can help themselves.

Some professional bodies lack the resources to keep the content of their qualifications abreast of the changing industry requirements and may, in consequence, be in terminal decline unless they find ways of enlisting their members support for the necessary sharing and pooling of effort.

Meanwhile a number of trades unions are seeking to enhance their traditional "craft guild" role, helping their members with training, support, pensions, welfare and even job placement. This role is likely to become more important as UK employment fragments over subcontractors and specialists serving virtual organisations.

In consequence the practical distinction between trade unions and professional bodies could become blurred. This may be one of the reasons why so many of the latter are becoming increasingly concerned with "status", even at the expense of practical relevance to existing, let alone new, members.

8.6.2. *The position of IDPM*

The Institute of Data Processing Management (IDPM) is concerned with the management of IT, however IT is defined. The IDPM objectives with regard to IT skills issues are:

- to ensure that its members are well informed (so that they can plan ahead for their organisations and themselves)
- that they have cost-effective access to the products and services they need for their own career development and that of their current and prospective staff and contractors.
- that they are operating in an economic and commercial environment in which they can justify and organise any necessary investment in skill development, whether for themselves or for the teams who will develop, implement and support the systems for which they are responsible.

The members of IDPM often belong to other professional bodies as well. The British Computer Society (BCS), the Institution of Electrical Engineers (IEE), the Institute of Chartered Accountants (ICAEW), the Institute of Management (IM) and the Institute of Directors (IoD) are among the most common but the range is growing as IT Managers are drawn from an increasing variety of user backgrounds.

The staff reporting to IDPM members may also belong to an increasing variety of professional bodies and trades unions. MSF is the most common trades union in the private sector and Unison in the public sector but the growth of multi-media and convergences with communications, broadcast and publishing may change this.

In 1994 the then President of IDPM, David Fairbairn OBE (who was Director of the National Computing Centre during IT Year) made a call for co-ordinated action to the Parliamentary Information Technology Committee (PITCOM). IDPM also took a lead in working with the British Computer Society to launch a joint Continuous Professional Development to provide a framework for reskilling those already in the workforce.

In 1995 one of the Vice Presidents of IDPM, John Leighfield (who is also a Past President of the British Computer Society) hosted a meeting with the other IT professional bodies to discuss co-operation and IDPM also held discussions with the IT Professional Association (the IT section of the trades union MSF) on possible areas of common interest.

IDPM therefore welcomed the proposal to form the IT Sector Partnership with funding from the Department for Education and Employment (DfEE) to the IT Industry Training Organisation (ITITO) to provide a secretariat to organise a couple of round table events a year. But if the partnership were to be no more than a re-run of the IT Skills Agency, without the involvement of the CBI and with DTI and DfEE involvement relegated down several layers, there is a danger that it could achieve even less.

We need to achieve far more. And time is running out.

There is also a danger that treating it as one among many "sector partnerships" could even do more harm than good, particularly if these were to be split along the lines of the existing compartmentalisation of the DfEE "lead bodies" for NVQs. Under these IT is separate from digital imaging (under photography), hardware maintenance (under Electronic Office Systems), Information Services (under Libraries) and Telecommunications, let alone from content provision (split over books and journals, broadcasting and film, national and regional newspapers, periodicals, photography and printing) and the user professions.

Splits along traditional technology lines are no longer helpful and may be positively harmful. There may still be a natural division between "infrastructure" and "content" but even here we need better paths for those whose careers will cross the divide.

8.6.3 *The need for a full IT Sector Partnership*

The merger of a few trade associations, professional bodies, user groups and even lead bodies, while perhaps desirable for other reasons, would probably only divert attention from the real needs. Too many of those in the IT industry have experience of merged organisations where the sum of the whole is less than the sum of the parts.

The IT Sector Partnership should be used to agree a common "Agenda for IT Skills Action in the UK" and to promote co-operation at all levels (including political) to try to ensure that Government does indeed take a lead in those areas (local, national and European) that are its responsibility.

But the need is for urgent action. This will only happen when large users and their suppliers see the commercial case not only to act - but to act in partnership, (including where practical with direct rivals), so as to be in a position to compete more effectively in larger and more profitable markets in the future.

An effective IT Sector Partnership could provide an invaluable neutral venue for the negotiation of joint action plans to address areas of common concern to competing commercial interests.

IDPM should therefore seek to persuade participants in the embryonic "IT Sector Partnership" to involve the main IT (broadly defined) users and suppliers, including suppliers of commercial training and accreditation services, and to seek to make a reality of the long overdue plans for partnership between the various fragmented and under-funded players involved in IT training and the commercial players, who stand to gain or lose the most.

8.6.4 *Continuous Professional Development*

The pace of change, the uncertainty of direction and the need to retrain the existing workforce at least twice in the foreseeable future (and more often there-after) place an increasing premium on the value of reskilling programmes of known quality and relevance, whether these are for employees or for individuals.

IDPM should therefore continue to work not only with the BCS but with other relevant organisations on the promotion of Continuous Professional Development (CPD) as a framework for the reskilling programmes of users and suppliers as well as of individuals.

The IDPM's aims for CPD should continue unchanged. These are to help:

- individuals to keep their professional, technical and management skills up to date and maintain evidence that they are doing so in a format that can be checked by prospective employers
- both individuals and their employers to better assess the relevance and quality of the courses, materials and events on offer to help them maintain, enhance and/or update their skills
- training providers and event organisers to better identify and meet the needs of their current and prospective customers, including via more cost-effective marketing and delivery routes
- the enhanced delivery of relevant events and activities at times and locations convenient to larger audiences than are attracted by many current offerings
- the organisation of shared skills development programmes, including training co-operatives, work experience, secondments, job rotation schemes and workshop programmes that cross traditional employment boundaries

IDPM should also continue to offer CPD Log Books in which members can record evidence that they are keeping abreast of new developments and broadening and deepening their technical, professional and/or managerial competence. Such activities may include:

- Branch and Specialist Group meetings of professional bodies
- Conference/Workshops Seminars
- Training Courses
- Use of Open and Distance Learning material/Training Products
- Practical Experience (including secondments and voluntary activities)

IDPM should, however, also offer to "accredit" for CPD purposes the Log Books, both physical or electronic, used by users and suppliers for their employees, by staff agencies for contractors and by training providers for "regular students", provided these contain the necessary information to enable the verification of claimed training or experience.

IDPM should also work with the BCS to promote the commonality of routines with other professional bodies (eg the IEE consortium, the Management Charter Initiative and others) provided that there is no confusion over quality assessment. For example, if less stringent quality assessment routines are to be made mandatory for all participants, (including employers and course and event providers as well as individual members), then optional higher quality assessment and validation routines should remain available for those who require them and the differences should be clear to anyone inspecting supplier documentation or individual logbooks.

The BCS-IDPM CPD programme was also designed to provide a framework for pilot tax incentives for training and retraining (see section 8.5.3). This needs to be borne in mind in the event of any revisions.

But for anyone to benefit from CPD the programmes not only of BCS and IDPM but of IEE, IM and others must reach critical mass. This entails adoption by users as a framework for in-house reskilling programmes and by suppliers as a mainstream marketing vehicle.

In parallel with its efforts to foster co-operation with other professional bodies and trade associations IDPM should therefore work directly to interest major suppliers in the organisation and promotion of "Management Update Programmes" which meet their customer awareness and education objectives at the same time as promoting the need for partnership.

In order to attract support and sponsorship on the scale necessary to produce worthwhile results this approach must recognise the commercial realities of sponsorship, including both "exclusives" for organisations which compete head to head in the market place and "joint" exercises for those who have partnership programmes.

Finally IDPM should continue its efforts to secure publicity and political support for the actions needed. This report and the associated publicity programme is part of that process. IDPM needs to recover the cost of its IT skills research programme from commercial sales but attractive licensing arrangements should be available for suppliers who wish to distribute copies to their customers as well as for users who wish multiple copies for in-house circulation and any others who wish to use the report to reinforce their own messages with their target audiences.

9. Sources

9.1 *Primary Sources for this Report*

BPA Controlled Circulation Statements for Computer Weekly (1991 -)

For details please contact Julia McNally, Computer Weekly, Quadrant House, The Quadrant, SUTTON, SURREY SM2 5AS, Tel 0181 652 3500, Fax 0181 652 8923

Computer Economics Limited: Annual Salary Surveys (1968 -)

For further details, including information on how to obtain the full Computer Staff Salary Survey please contact Peter Stevens, Computer Economics Limited, 51 Portland Road, Kingston Upon Thames, Surrey KT1 2SH. Tel. 0181 549 8726. Fax. 0181 541 5705.

National Computing Centre: Annual Members Surveys (1984 -)

For details of NCC membership: John Perkins, Membership and Marketing Director, National Computing Centre, Oxford Road, Manchester M1 7ED. Tel 0161 228 6333. Fax 0161 236 8049

National Computing Centre: Annual Surveys of Salaries and Staff Issues in Computing (1984 -)

For details contact: Dave Masding, membership Services, National Computing Centre Limited, Oxford Road, Manchester M1 7ED. Tel 0161 228 6333. Fax 0161 236 8049

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Subscription £235 p.a. for four quarterly reports. Details from SSP, 10 Gwyn's Piece, Lambourn, Berks RG16 7YZ. Tel. 01488 72705

9.2 *Previous reports and sources used or otherwise recommended*

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- 1986 A Call to Action - Engineering Council
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- 1987 Micro-Electronic Technology in London and South-East in the Eighties (London Chamber of Commerce)
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Changes in the Employment of IT Staff (ITSA - CEL)
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- 1988 The IT Skills Crisis: The Way Ahead (NCC)
The State of the UK IT Skills and Training Market (ITSS)
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- 1989 Bridging the Gap (WIT)
- 1990 Addressing IT Skills Issues (NCC)
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- 1992 The Nightmare Scenario: 1992 IT Skills Trends Report (WIT)
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The Information Technology Sector in Avon (Avon TEC)
Market Survey of IT Training Skills Gap for Sandwell TEC (Sandwell TEC)
The Users Have Taken Over the System (West London TEC)
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- 1993 The Nightmare Unfolds: 1993 IT Skills Trends Report (WIT)
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of the Information
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21st century (Nortel)

10. Author

Philip Virgo, MA, MSc, MBCS, MIDPM, MIM, FRSA is a "handyman". He studied under Charles Handy at the London Business School in the early 1970s and now has a portfolio of "professional" roles. He is Strategic Services Advisor to IDPM, Convenor of the Computer Weekly 500 Club, Finance Executive of the Parliamentary IT Committee (PITCOM), Secretary General of EURIM (the European equivalent to PITCOM) and, when time permits, Director of a strategic planning and forecasting consultancy (Winsafe).

Among his "voluntary" roles, he is on the Council of the British Computer Society (and a former Vice-chairman Professional Board), Vice-chairman of the South and East Regional Committee of the National Computing Centre, on the Education and Training Panel of the Worshipful Company of Information Technologists (of which he is a Liveryman) and a member of the Real Time Club.

In consequence he has an exceptionally wide range of contacts across the IT industry, both users and suppliers, and across the political spectrum.

By original discipline he is a Historian (Dulwich College and Peterhouse, Cambridge). After training as a programmer with STC he moved to ICL as a financial systems analyst, decimalised ICL's own sales ledger and was sponsored by ICL on the London Business School MSc06 programme in 1971.

On return to ICL in 1973 he held a variety of posts in support and marketing including running the ICL-DTI-DoE Water Industry Development Contract, Public Sector Financial Planning consultant and Comptroller and Business Development Manager for Public Corporation Sector.

In 1977 he changed careers and joined the Wellcome Foundation as Corporate Planner responsible for R&D, Export Division (Middle and Far East) and the European Subsidiaries. While working for Wellcome he also became involved in national IT policy issues, helped draft the 1979 Conservative Party IT policy, assisted a TUC technology policy review, co-founded the Parliamentary IT Committee (PITCOM) in 1981, was a political advisor on the computerisation of PAYE and conducted policy research into IT education issues.

In 1982 he returned to the world of IT, joining the National Computing Centre to set up a Technology Assessment Service and from 1983-89 ran the "City C3 Club" for High Tech investors with monthly meetings and annual conferences to bring together fund-seekers and potential investors. In 1984 he helped create FAST (the Federation Against Software Theft) and run the campaign to extend copyright to cover computer software). In parallel he also managed the NCC Microsystems Centre and the End-User Systems division. In 1985 he was appointed IT Strategy Manager with responsibility for NCC inputs to national exercises and co-operative ventures with particular emphasis on skills shortages and product and service quality assurance. He left the staff of the NCC in 1986 to found Winsafe Ltd but was retained by NCC as an advisor until 1992 and is now active as a member.

He has also been an external advisor to the High Tech Unit of Barclays Bank (1983-8), Campaign Director of the Women into IT Campaign (1989-92), IT Skills Advisor to West London TEC (1991-2) and a Specialist Advisor to the Information Committee of the House of Commons. Other interests have included serving in the Royal Naval Reserve as a radio operator (1968 - 77) and as Membership Secretary of a 300 strong ASTMS negotiating group (1976-7).

His interest in IT skills began at London Business School when he did a sponsored study of the UK short course market for ICL and BIM and his report on the need to give better business training to IT staff, and not just IT training to management, was serialised in Computer Weekly. He ran the NCC work on the causes of, and possible solutions to, the IT Skills Crisis of the mid-1980s. In 1988 he arranged the publication of all the IT Skills Agency material that would otherwise have been lost or forgotten. Since 1991 he has produced annual reports on IT Skills Trends and worked to promote action, both corporate and political, on the recommendations.