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Skills for Information Technologists

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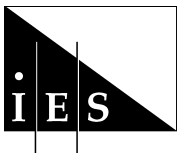

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The Institute for Employment Studies

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Contents

Executive Summary

This study explores the skills employers report needing of IT specialists, how these are changing, the main drivers of change, and some issues around recruitment, training and retention.[1] An important distinction has to be made between IT specialists and IT users. Many jobs involve some use of IT, for which employees need a familiarity with IT and, at least, a basic level of computer literacy. Other studies in the overall Skills Review have explored these skill needs. This study is, however, concerned with the IT professionals, those who develop, implement and support IT systems.

Drivers of change

Skill needs do not develop independently of general business needs and pressures. A number of pressures for change were affecting all or some of our sample, and these had implications for the skills and abilities required of IT staff. Our data suggest that in recent years there have been changes in the role of IT staff, in addition to the rapid rate of change in technology. The IT function has become more fully integrated into the business process and is facing many of the pressures experienced in businesses more generally

The main changes influencing the skills required of IT staff are:

- a closer relationship to business needs and the development of a client/customer focus — much greater attention is paid to the role of IT in a business and the extent to which an IT solution

[1] It is one of a series of studies exploring employers' skill requirements, how these are changing and the main drivers of change: the Skills Review Programme.

meets business needs. As a result IT staff need to understand the business application of the technologies they work with, and relationships with customers and clients are important.

- the knowledgeable user — technological developments are widely reported and many people are IT users. IT staff have to be able to meet the expectations of these users while also defusing unreasonable expectations.
- pressure on costs and delivery times — in recent years managers have been under pressure to be much more cost conscious, and this has affected both internal IT functions and external service providers. IT is costly, and respondents reported that they were having to become smarter in managing their costs. It is also increasingly important that delivery is quick and on time.
- rate of change in technology — the pace of change in technology continues to increase. Alongside the continued need for 'legacy' skills, new systems and packages are constantly being developed and these continue evolving. The most recent technologies frequently involve a different theoretical framework and analytical approach to older developments. IT staff need to be able to keep up with the rate and nature of change.
- the refocusing of activities — to remain competitive, possibly to keep ahead of the competition, managers were looking at the most appropriate position to place their organisation or IT function. Organisations which had previously been involved in developing software and some hardware were moving away from these activities. Many respondents reported a much greater focus on implementing systems, adapting them to meet the end users' needs and supporting users. There are a number of 'proprietary' applications which can be purchased, and the added value comes through providing the expertise to implement and tailor these to individual uses.

Skill needs

'Skill' was interpreted in a very broad sense. We were not just interested in the technical skills required to work in IT, but also the broader personal skills and attributes sought by employers which enable people to operate effectively in a working environment. Indeed, a key feature emerging from this study is the emphasis employers place on personal and interpersonal skills, or 'soft' skills, and their application in the workplace.

The skills employers reported requiring of IT staff group into the following categories:

- **Technical skills** A wide range of specific technical skills were reported extending from 'legacy' or 'heritage' skills such as in COBOL, to the most recent generations of languages. A number of themes emerged in relation to technical skills. The rate of change in technology continues to increase. New languages, systems and applications are developed and existing ones continue to evolve. Little stays still. Furthermore, developments in recent years operate on different conceptual frameworks from older applications; examples include networking, databases and multi-media. A depth of technical skill in a particular application or language is frequently needed, however in the longer term a broader range of technical abilities is important for IT specialists. They need the background conceptual knowledge and intellectual capacity to enable them to learn quickly and work in different technical areas. In many organisations there is a complexity of interwoven systems, platforms and applications, and IT specialists need to be able to work with this complexity.
- **Understanding business needs** IT does not operate in a vacuum; IT specialists need to understand the role of IT in a business and the particular needs of the business they are working in. The ability to convert business requirements into an IT project is important. Furthermore, it is not just a case of meeting the current needs of a business, but of looking to the future and implementing IT which will help to take the business forward.
- **Consultancy ability** This involves the ability to understand and analyse business needs, but also to communicate with clients or customers, manage client expectations, negotiate and influence, and generally be aware of client needs, attitudes and approaches.
- **Management skills** Depending on their precise role, IT specialists require a range of managerial skills. They might be managing teams, staff, projects, clients, suppliers, resources and budgets.
- **Problem solving and analytical skills** These are an essential component of applying IT in a business environment. Business and IT problems need analysing and solving. Indeed, it is these abilities which, it is argued, are of key importance, and enable any IT specialist to operate effectively. It is these intellectual abilities which predispose people to learn technical skills.
- **Personal characteristics and interpersonal skills** These include communication and relating to others (both specialists using technical language and non-specialists, making technical explanations in non-technical language); working with others;

attitude and personality ('fitting in', flexibility, an interest in learning and the ability to pick things up), also coping with pressure, taking responsibility and initiative, mobility and career interest.

Changing skill requirements

In many occupations skill change is evolutionary and gradual. There have no doubt been major changes in the skills required of IT specialists, and what is expected of them is, in many respects, very different to say a decade ago. However, many of these changes have been fairly gradual in nature, and are continuing to have an impact.

Thinking about the technical skills required, there are elements of both change and continuity. Despite rapid change in technology, the development of new applications, systems and languages and the evolution of existing ones, there is still considerable demand for a range of 'legacy' or 'historical' technical skills. In considering change, it is not simply that new applications, *etc.* emerge, but that new developments can bring with them a new conceptual framework. Databases, multi-media and networking are very different in nature to some of the earlier technologies.

The main theme to emerge was that IT does not operate in isolation. There is an interplay between the appropriate application of IT and its future development. It is no longer enough, in the majority of IT jobs, simply to be a technical expert. The IT function provides a business service and experts have to engage in a dialogue about business needs, communicating effectively with clients and internal customers.

Recruitment and selection

Recruitment criteria

The majority of organisations were recruiting graduates and experienced IT specialists. In addition, many respondents were either actively recruiting from other groups or were exploring other sources of recruitment.

- In graduate recruitment a computer science or related degree was not always looked for. For many posts, intellectual ability and other characteristics were reported to be of more importance. The level of degree was, however, very important. Many respondents were looking for an upper second or first class degree. Having a degree was taken as an indicator that people have an ability to learn, are able to think logically, be analytical and to solve problems.
- Experienced IT specialists were taken on to fill specific vacancies. The level and nature of their technical knowledge was of key importance. However, this was rarely enough; business knowledge and managerial ability, for example, were also looked for. Track record and previous achievements were reported to be important indicators of ability, and qualifications were of limited importance.
- Other job changers; these fell into two categories:
  - internal job changers moving into IT from other functions in a business — these had the advantage of already knowing the business. It was an interest in IT and evidence of logical and analytical ability which were looked for.
  - external job changers — these were usually recent graduates who decided their first job did not suit them, or meet their expectations. Similar criteria to those for new graduates were used. However, they also had to show that they had given some thought to their choice of career and change of job.
- Inexperienced, non-graduates — not all IT jobs require high flying graduates and, indeed, some of our respondents expressed concern about their abilities to meet the expectations of such employees. As a result they were looking at alternative sources of recruitment. The potential of Modern Apprenticeships, 'A' level recruits, and retraining people who had been made redundant were being considered. An interest in working with IT and an aptitude to develop the appropriate skills were important amongst these recruits.

The recruitment process

The recruitment interview was the main means of assessing job applicants. The formality and number of these varied between organisations. Many managers have developed sets of questions which help them to explore whether or not someone has the whole range of skills sought, or the potential to develop these. Other forms of assessment included various tests and exercises.

These had usually been developed to meet the particular needs of an individual organisation.

Recruitment was, however, often a two-way process. Managers tried to ensure that potential recruits had enough information to assess whether or not the job would meet their own needs and expectations. Applicants might be invited to an informal lunch with senior staff or to meet their future colleagues.

Shortages and recruitment difficulties

Recruitment difficulties were beginning to re-emerge at the time of our interviews, and some managers did express concern. There was a locational aspect to recruitment difficulties. They appeared to be most severe in the London area and M4 corridor, where a high proportion of IT jobs are concentrated. Indeed, employers in other parts of the country had fewer concerns.

The emergence of recruitment difficulties in IT, as for other occupations, is partly a reflection of an upturn in the economy. Not all employers maintain their intake of trainees during times of economic downturn. As the economy picks up, major investments in IT are more likely to be made and there is not always a large enough pool of ready skilled people available. However, within IT other factors also play a role. These include deregulation in some industries and the entry of new competitors; the 'millennium issue' (although now a relatively short-term issue, it was reported that other influences are likely to have a similar effect, for example, the introduction of a single European currency); and the rate of change in IT.

Although there is much focus nationally on the shortage of technical skills, managers also reported other skill gaps amongst IT staff. In particular, they commented on difficulties in finding people with the necessary behavioural or interpersonal skills.

Employers were taking a number of measures to address recruitment difficulties. These included some short-term actions, for example, head hunting and increasing pay. However, there was also evidence that employers are taking a more long-term view. For example, attention was being paid to forecasting future skill needs, training and career issues.

Training and development

The importance of training

Most of our respondents were making major investments in training, although a few felt unable to provide the level of training really needed. The rate of change in technology means that the training of IT staff is a continual challenge. Considerable investment was being made in the training of both inexperienced recruits and in keeping the skills of existing employees up to date. However, it was not only technical skills which were receiving attention. The growing emphasis on a range of 'non-technical' skills means that IT specialists were also being trained in these areas.

The delivery of training

- Initial training. Several organisations had large graduate training programmes. Detailed instruction in technical skills was only part of this. Graduates were expected to develop the range of skills discussed above. Some of this training was delivered in specialist centres, however, much was also delivered on-the-job, through mentoring, coaching, *etc.* Experienced recruits were rarely given much initial training, but were expected to become fully operational very quickly.
- On-going training. Most organisations had an extensive programme of on-going training. This included updating in existing and emerging technical skills, and training in a range of personal and interpersonal skills. In some respects, training was being more closely allied with business needs. However, in a few organisations, training was also seen as playing a broader role. For example, to maintain loyalty employees might be enabled to develop broader skills, which would make them more competitive in the labour market, at a time of job insecurity.

Training contract staff

A major motive in the use of contract staff was to obtain technical skills which were needed quickly or for a fixed period, or which were in short supply. Contract staff are employed at a premium and are expected to bring the necessary skills with them. Employers did not expect to have to invest directly in the

training of these people. However, several respondents reported that contractors had arrived without the skills they were supposed to have.

Some contractors are employed by other organisations, and representatives of these were included in our sample. These organisations usually take responsibility for making sure their own staff are appropriately skilled to meet the needs of clients. However, many contractors are self-employed and the onus very much falls on the individual to update and maintain their skills.

Internal labour markets and career structures

Labour turnover amongst IT staff, and emerging skill shortages, were contributing to employers looking more closely at a range of internal labour market and career issues. Although the attraction of higher salaries and promotion opportunities elsewhere should not be ignored, many other factors contribute to labour turnover. For example, some people may prefer a less pressured job, or be concerned about job insecurity and the nature and management of change within their existing employer.

Employers were exploring a number of different means of attracting and retaining IT staff. Meeting the expectations of highly skilled and ambitious employees was one challenge. In most organisations there are fewer opportunities for promotion in the traditional sense. Managers were looking at alternative methods of rewarding and motivating people. For example, they were trying to be clearer with staff about the opportunities actually open to them, and the skills and abilities which were necessary to reach certain positions. Not all IT experts make good staff managers and some organisations were experimenting with 'technical ladders' to reward technical excellence. One-off rewards of some kind were sometimes given, in recognition of good performance.

Training was argued to play an important role in maintaining motivation. It was reported that training helped to keep people interested in their job and develop new interests. Training might also be used to enable people to develop broader skills, which might be useful in the wider labour market, and contribute to the perception of a caring employer.

Managers were also looking at the need to recruit highly qualified graduates into some IT jobs. In particular, they were looking at opportunities to recruit and develop non-graduates, whose aspirations might be easier to meet.

Some future concerns

Finally, we identify future concerns reported by respondents:

- continuing to meet immediate skill needs and maintaining the current skills base
- how to forecast the quantity and nature of future skill needs, and develop people to meet these
- managing resources effectively — exploiting the potential offered by technology when budgets are also under pressure
- maintaining a competitive position.

1. The IT Study

1.1 Introduction

The Department for Education and Employment commissioned the Institute for Employment Studies to undertake a programme of research: the Skills Review. The aim of this programme was to explore the changing nature of skill requirements within occupations, and to complement other work commissioned by DfEE which reviews broad trends in the occupational structure of the workforce. The Skills Review involved conducting a series of eight occupational studies. These cover the main occupational groups defined in the Standard Occupational Classification (SOC), with the exception of the routine and unskilled occupations. The key focus is on the skills employers report needing and how these requirements are changing. However, each study is broader than this, exploring training and recruitment, as well as any issues which are particularly relevant to the occupation in question.

This report presents the findings of our study of information technology (IT) skills. A large number of jobs now require computer literacy and some sort of familiarity with IT, and the importance of these skills has emerged in a number of other studies in the Skills Review. However, this study focused on those occupations where the main role is working with IT, developing and implementing systems and software, at a variety of levels. A similar distinction was made in a major study of private sector employers in West London (West London TEC, 1993). This TEC study differentiated between IT users, who use IT in their normal operational duties, and IT staff, who are specialists in IT, usually working in an IT department or for a specialist service provider.

1.2 Aims and objectives

Each occupational study addresses a number of common research questions:

- What is the nature of skill requirements for the occupation?
- Have the nature and level of skill requirements changed? Are the skill requirements increasing or decreasing? Are 'new' skills emerging and some 'older' skills disappearing?
- Which sorts of skill requirements are increasing and which are decreasing? Which are emerging and which are disappearing?
- Have the skill levels of the workforce changed to accommodate these changes? Or, have there been improvements in the supply of skills which have encouraged increasing skill requirements in jobs?
- Are the skill requirements for occupations likely to carry on increasing and decreasing? Do employers view change as a continuing trend?

1.3 Research methodology

There were four threads to this study of IT skills:

- a search of existing literature
- some preliminary exploratory interviews
- a series of interviews with employers
- a discussion of the findings with a small group of employers and key actors in the sector.

1.3.1 Exploratory interviews

A very small number of exploratory interviews were conducted for this particular study. We spoke to the DfEE official responsible for this occupational area and a representative of the Information Technology Industrial Training Organisation (IT ITO).[1] At a slightly later stage in the study, we also contacted the IT Skills Forum.

[1] Now the IT NTO, Information Technology National Training Organisation.

The IT ITO is the lead body, responsible for developing and implementing appropriate NVQ frameworks. It is also the Industry Training Organisation, involved in the promotion of training more generally in the occupation. The IT Skills Forum is an independent organisation driven by its members, which provides an arena in which organisations can share their knowledge and experience, and benefit from examples of best practice.

These exploratory interviews had a number of functions:

- to inform people about our study
- to identify any research which had already been conducted or was in progress
- to increase our understanding and knowledge of the occupation, and any key skills and training issues.

1.3.2 Employer interviews

The main stage of the research involved in-depth interviews with nearly 20 employers, each lasting between one and one and a half hours. This type of study can in no way be truly representative, nevertheless we did cover a range of different types of organisation and a consistency of need does emerge from the data. Interviews were conducted in organisations providing IT services for others (for example, consultancies and software houses) and those with their own IT function serving the rest of the business. The sample therefore included employers in retailing, financial and business services, manufacturing and public services. The number of IT staff in these organisations varied, from around 20 to several thousand. In some organisations IT staff made up the majority of employees; in others they were part of a much larger workforce. Our sample also included a consultancy, providing a range of services to businesses, including the recruitment of IT staff and a register of contract staff. This respondent was able to provide a broader overview of skill and training needs within the occupation; the information provided broadly confirm the main findings of this study.

Interviews were mostly conducted at head office level. A few interviews were with a personnel or training manager, who had primary responsibility for IT staff. However, the majority of interviews were conducted with an IT manager. We felt it particularly important for this study that we should be talking

to those who had direct knowledge and understanding of the skills needed of those working in IT.

The majority of interviews were conducted in the south and south-east. This was partly because many head office functions are located in this region. It is also the home of a substantial part of the IT industry in England. However, IT functions are also located elsewhere in the country and we did speak to employers in, for example, the north-west, north-east and East Anglia.

The discussion guide

A discussion guide was developed to provide the basic structure for each occupational study. For this study the discussion guide covered:

- background to the company
- the place of the IT function in the company
- changes affecting the company in general and the IT function in particular
- the skills and abilities required of IT staff, and how these are changing
- external recruitment and the identification of the necessary skills and abilities
- internal movement, training and development.

The majority of interviews were conducted in the autumn of 1996.

1.4 Structure of the report

The rest of this report is structured as follows:

- Chapter 2 explores overall employment in IT, and the role and structure of the IT function. It also looks at the pressures and changes affecting IT specialists, providing a background for a detailed examination of skill needs.
- Chapter 3 is the core of the study. It explores the skills reported by managers to be needed of IT staff, and how these were changing.
- Chapter 4 looks at recruitment and selection, and the methods used by managers to assess the skills held by individuals. It also discusses recruitment difficulties and skill gaps.

- Chapter 5 reports two areas of data, looking at the provision of training and issues around the career structures available to IT staff.
- Finally, Chapter 6 looks to the future and draws some conclusions from the study.

2. Forces for Change

2.1 Introduction

This chapter provides a background to our examination of skill needs and how they are changing. It explores the role and structure of the IT function and pressures for change. In the final section we look at the main forces for change affecting IT staff, focusing in particular on the implications for skill needs. Developments in technology are regularly reported in the media, and it is well known that the pace of change is increasing. This brings pressure in itself, IT staff have to keep up with a growing body and complexity of technical information. However, it also adds to the other pressures. IT staff face the challenge of having to apply IT appropriately, speedily and within cost constraints; they therefore need to become generally more 'multi-skilled' and flexible.

2.2 The structure of employment

This study focused on the skills required of IT specialists, rather than the IT skills more generally required by businesses. A number of studies have identified the need for most employees to have some IT skills, and often also to understand the potential offered by IT (West London TEC, 1993; IT Skills Forum, 1995). Other studies have focused on the impact of the development of IT in particular occupations and sectors (for example, CIMTECH, 1995).

Many jobs require people to be IT literate, and this is a theme emerging from a number of other studies in this series. Computer technology has transformed a range of basic clerical and administrative jobs. Indeed, a knowledge of IT, involving, for example, a rudimentary understanding of PCs, networks,

word-processing, spreadsheets, databases, the 'windows' environment, is widely regarded as a 'generic' skill required of the workforce. This is recognised in the inclusion of IT as one Key Skill unit being introduced into NVQ and GNVQ frameworks.

For the purpose of this study we were interested in the skills needed of IT professionals. We did not strictly define the occupations falling into this category, but tried to focus on organisations employing people involved in the implementation of software and systems. Between them our respondents used a great range of job titles, and some of their responses illustrate the difficulties in describing precisely who we were interested in. For example, one respondent, reported:

> *'Job titles are a bit wishy washy, because they change roles between days.'*

Table 2:1 illustrates the size of employment in selected IT jobs. Defining IT specialists within occupational classifications is not easy. The speed of change within the industry means that new roles emerge and become important before classifications can catch up. Table 2:1 identifies three main SOC (Standard Occupational Categories). Significant numbers of people are employed in these categories, and there has been growth in employment of just over eight per cent during the first half of the 1990s. What is particularly noticeable about this table is the major growth in employment in computer systems management and a decline in programmers. There are likely to be several factors influencing this. In particular, fewer modern systems and applications require programmers, and as jobs have expanded and changed in nature there may have been some reclassification.

Table 2.1 Employment by job type, 1991-1995

Job type	SOC number	1991	1995	% change
Computer systems, *etc.* managers	126	84,440	120,608	+43.8
Software engineers	214	56,090	66,521	+18.6
Systems anlaysts & programmers	320	199,784	182,416	-8.7
Total		340,316	369,545	+8.6

Source: Labour Force Survey, 1991 and 1995

2.3 Use of contract staff

The use of contract staff in IT is not new. Different organisations in our sample seemed to be moving in varying directions in their use of such staff and to have differing motivations for doing so. The number of contract staff varied between organisations. A few rarely used consultants: *'the exception rather than rule'*.

In others, there were up to several hundred consultants employed at any one time. Sometimes these were recruited in teams, usually through a consultancy or recruitment agency. Others relied on individuals, with whom they often had a longer term relationship. One respondent reported that their ideal was to have a pool of consultants they could draw on as and when needed.

In several organisations, although contractors did still play an important role, their numbers were being reduced. This was to offer permanent staff more opportunities to do varied and interesting work, and to keep jobs secure for permanent staff. Protecting permanent workers was an important element in the use of contract staff. A number of IT projects might be one-off, although not necessarily short-lived. A distinction between the tasks given to contract and permanent staff could help the latter to feel more secure. Our recruitment consultant commented that contract staff offered benefits to companies in terms of flexibility, a fixed cost and a stable head count.

Contract staff were most frequently used to work on specific projects, fill internal skills gaps and bring in particular expertise, which might be needed in the short term, or not available internally. One respondent referred to their use of these staff as *'a flexible lung.'* Contact staff did, however, cost more than permanent staff.

Several respondents also reported some difficulties in the use of contract staff. There were sometimes tensions between internal and contract staff, and the different levels of pay in particular could be problematic. However, a theme running through several interviews concerned the level of skill held by some contract staff. A key aim in recruiting these staff was to bring in new or additional skills. It was reported that, although it appeared at an interview that a team being brought in had the relevant skills, in practice this was not always the case. Furthermore, one respondent said that most younger consultants needed some

training, whatever skills they were bought in with. The issue of contractor skills is returned to in Chapter 3.

Although many contract staff had been recruited to work on short-term projects, several organisations had long-serving contractors. One respondent reported that they had a policy of two years being the maximum length of time for a short-term contract. In practice they could not always keep to this. Sometimes contract staff did not exhibit the attributes which made them desirable as permanent staff, yet there was a continued need for their technical expertise on projects.

Apart from the benefits to companies of using contract staff, a key driver is the desire of individual IT specialists themselves. Although many people wish for stable employment, an ideal climate also exists within IT for people who want work with a different type of employment relationship. Furthermore, as a number of specific technical skills are in short supply, contractors are able to earn higher salaries than permanent employees, work on exciting projects and choose to live a lifestyle which suits them.

2.4 The role and structure of the IT function

IT played varying roles in the organisations participating in this study, and the IT function was structured in a number of different ways. Change and adaptation was a feature of all these organisations, and the IT function in particular. A few participants were providing a service to other organisations involving IT in some form or other, others had their own IT function providing a service to the main business function.

Providing a service to other businesses

The organisations providing a service to other businesses included both software houses and consultancies. The software houses focused on IT solutions offering, for example, the development of specific software to meet clients' needs, the management of resources, and consultancy on the best software or IT solutions to adopt. Other consultancies offered a broader service, for example, being *'business solution providers'*.

They offered the ability to combine IT and the management of change, recognising that the best solution to a problem or the

most appropriate way to implement change might not always involve the use of IT. IT might also be used in modelling and analysing the need for change and the form it should take: *ie* business process re-engineering.

Adapting to the changing needs of clients

The role and structure of these organisations has changed over time, as the needs of their clients have changed. For example, as technologies have become more sophisticated, specialist programming skills are no longer so widely required. Various packages and software have been developed which have taken over. Service organisations have, therefore, had to move with the potential offered by technological developments, and the demands of their clients:

> *'The technology has moved on. A lot of what we used to do is almost off the shelf. The things we used to design you can pretty much now do in a sophisticated spreadsheet package. These sorts of analysis tools have now become virtually free with Microsoft Office.'*

The internal IT function

Within many organisations, the IT department is one of a number of support functions and is required to offer support, advice and IT solutions to the rest of the business. These might be required at a variety of different levels, for example:

- As more jobs involve word-processing and the use of other computer based equipment, a greater need for basic support and advice has emerged. A number of our respondents reported the existence of a help desk or similar activity.
- Most organisations have an existing infrastructure of computer networks, mainframes and various other equipment. Maintaining, supporting and developing this was a key role for most IT functions.
- In addition, they are required to introduce new systems and equipment, whether across the whole business or to meet the needs of a particular department, providing appropriate solutions to business needs.
- In a few organisations, the IT function also included a major research and development role.

Threats of outsourcing

In recent years, as organisations have refocused, looking at more effective ways of competing and providing their core business, a number of support functions have been 'outsourced', or are at risk of being outsourced (Reilly and Tamkin, 1997). The IT function is one which has had to continually justify its in-house existence in most businesses. Our sample included a few organisations which had outsourced IT activities, and in all the others the IT function was, or had been, under pressure.

Structures of internal IT functions

To meet the pressures outlined above, the IT function was organised in a number of different ways. Similar pressures seemed to be creating different structures, although in most organisations these were constantly evolving and changing as business needs changed.

In some organisations, IT staff are decentralised, located with and managed by the business area they serve. This was the least common structure. Although it might contribute to IT staff having a greater understanding of business needs and closer links with the people they are working with, such structures were rarely reported to be the most efficient for the business overall. Although different parts of an organisation might have different needs, the lack of co-ordination of IT across a business may lead to a plethora of different platforms, software and general solutions which are not the most cost effective overall. This structure was also reported to create difficulties for the management of IT staff, especially in co-ordinating their training and career development.

The most common structures involved some form of central IT function, providing at the minimum a strategic approach and central management of IT staff. This might mean each part of the business having a dedicated set of IT staff, who are managed centrally and linked into the central function. In other organisations, IT staff were divided according to their main activity, for example, looking after existing systems and developing new applications (for day to day operations or more fundamental developments to take the business forward). A key change in one organisation was the development of a resource pool of IT staff, whose skills could be drawn on in varying

combinations to meet the needs of different projects and activities. This was also helping to co-ordinate and focus the development of IT in the business. All requests for IT support had to go through a central system, rather than be developed in an *ad hoc* fashion.

Tensions between these structures

There appeared to be a number of tensions in the organisation of the IT role. As will be discussed later, a key change affecting the IT function is the need for it to become more business orientated. In some organisations, different departments wanted dedicated IT staff who understood their particular needs and could cater for them. This, however, could create problems in the implementation of a co-ordinated IT strategy across a business. Respondents from many organisations reported greater co-ordination of the IT role, more central direction and an attempt to meet the needs effectively of both individual departments and the business as a whole.

2.5 Pressures and change

Skill needs do not develop independently of general business needs and pressures. A number of pressures for change were affecting all or some of our sample, and they were responding in a range of ways. However, all these pressures and changes have implications for the skills and abilities required of IT staff. Our data suggest that in recent years there has been a considerable change in emphasis in the role of IT staff, alongside the continuing rate of change in technology.

A closer relationship to business needs and the development of a client/customer focus

IT has had varying degrees of influence over time in business. At some points, the IT function has been a key driver; at others, for example, finance has been a major influence. The major point which emerged from our interviews was that although IT plays a key role in many businesses, this role is not independent of business needs. The implementation of new systems, software and developments have to meet specific organisational needs, or drive a business forward in some way. Furthermore, not all business needs have an IT solution and this has to be considered

in the implementation of change. As a result of this focus, IT staff have had to become more closely linked into understanding the needs of the users of their services, and this has implications for the skills needed of them.

Understanding the needs of users might seem an obvious statement; however, there has been a greater focus on this in recent years. As businesses become more complex, and as possible uses for IT expand and change, it becomes increasingly important that any IT solution does address a specific need appropriately. The scope for error becomes greater, both in terms of understanding the nature of any need and in providing the appropriate solution.

One respondent reported that a business process model was being introduced. The aim of this was to enable IT staff to better understand the demands on them and what they could supply to internal clients. While in the past there had been a tendency to say 'yes' and attempt to meet all demands for IT, increasingly requests were examined more closely. In particular, they were assessed in terms of their appropriateness to purpose and the relevance to, or fit with the rest of the business. These types of change were affecting both internal IT departments and organisations providing an IT service to others:

> *'Now we start with the customer and deliver solutions tailored to the needs of the customer . . . We want to understand more what the customer's business is doing.'*

> *'A few years ago we were isolated from what the business areas really wanted, . . . now we operate in partnership.'*

Service providers continuously look at the appropriateness of their activities. For example, in one software house a series of strategic meetings were being run and the ultimate aim was: *'to be the best client service, integrated company in the UK.*

The knowledgeable user

Closely related to the need for IT specialists to work more directly with the end users of IT applications, has been the emergence of the 'knowledgeable user'. In the past IT was very much a mystery to many people; this is no longer the case. A wide range of jobs involve some sort of contact with IT and the majority of young people leaving education now have quite a sophisticated

knowledge of IT. Furthermore, media publicity means that new developments are widely discussed, often before they have been fully developed commercially. As a result, the people IT specialists are serving often have definite ideas about what they want. A respondent in one service provider commented:

> *'We now have an educated user population. They now say "this is what we want". As we deliver a product they are already coming up with the improvements and changes they want to see in the next version.'*

The knowledgeable user can also bring pressures of another type. Their views on what is needed might be inappropriate or even wrong. Some respondents talked about the need to control clients' expectations:

> *'Sometimes you'll have to tell the client things that he or she may not like to hear.'*

Not all new developments, however attractive and exciting they sound on a television programme or in a newspaper article, are appropriate to all types of business. The implications of any new development need to be considered and explained. One respondent provided a very simple example. Not all the business was linked by e-mail. If each site sent just one communication a day to the finance department, they would be unable to cope with the volume of work generated.

These changes all have implications for the skills of IT specialists, in particular, for example, their ability to communicate, negotiate and influence. This is discussed further in Chapter 3.

Pressure on costs and delivery times

In recent years managers have been under pressure to be much more cost conscious, and this has affected both internal IT functions and external service providers. It was reported that there was a greater awareness in businesses of the costs of various service functions. Charging between internal functions means that the true cost of business services is becoming evident, and they are more open to scrutiny. IT is costly, and respondents reported that they were having to become smarter in managing their costs. Internal IT departments might be competing directly with external providers for some contracts. One manager

reported the need to be very cost sensitive, to fight off the competition and threats of outsourcing.

Alongside the pressure on costs, there has developed a focus on delivery times. Although some projects might take years, it is increasingly important that delivery is quick and on time. Indeed, some respondents talked in terms of 'immediacy'. Competition from other, or external, providers and the expectations of managers have to be addressed. One respondent reported that average delivery time on internal projects had been reduced from 40 to 12 months to meet these pressures.

Organisations working at the forefront of research and development were also reported to be affected by pressure on timescales. Markets have become more fiercely competitive and, with deregulation in some sectors, the competition has become more varied and disparate. Large market leaders want to keep ahead and continue to be the first to bring major developments to the market. Speed, in developing new applications and implementing them commercially, is therefore vital.

Rate of change in technology

A very obvious pressure has been the rate of change in IT, both hardware and software. Technology has, and continues to become more sophisticated, while at the same time things that previously needed a specialist can now be easily used by anyone. This means that IT staff have to keep up with an ever changing body of technology and possibilities:

> *'We work in an environment which can only thrive by a process of continuous renewal and change.'*

The rate of change in technology always receives great emphasis. However, a number of our organisations did have long established systems which utilised a range of older, 'legacy' skills. Changing these systems is expensive and complex, and unlikely to happen unless the systems stop meeting an organisation's needs. It is important to recognise this element of continuity when considering IT skill needs.

Changes in technology range from updates and adaptations to existing software and systems, to major new developments. Keeping up with both is equally important. One respondent commented on the rate of change in existing applications. As

soon as one version is out and becoming adopted, another follows. IT staff need to keep on top of these, the potential each offers and the differences between versions. They need to be able to identify when their existing version should be updated, and the implications this has for the end users.

To meet the needs of clients appropriately, internal and external, IT specialists need to be aware of not only what is already available in the market, but also of emerging applications. The role of IT is to help a business operate efficiently and to move forward, often through the introduction of new services and products. If IT specialists are not able to operate at the forefront of technology, recognising the appropriate roles of existing and new developments, it is unlikely that they will be able to make an effective contribution.

In addition to the rate of change in existing applications and the emergence of new developments, technology is becoming increasingly complex. New developments may involve a different form of conceptual thinking or analytical framework. Networking and the Internet, for example, operate with very different concepts to many older applications. It was also reported that the technical architecture within organisations is becoming more complex. This is partly the result of recent developments, but also the fact that these are often introduced alongside existing systems. Many organisations operate with a multiplicity of networks and platforms, and it is rarely enough for IT specialists to work on one of these in isolation. At a minimum they need to understand the interaction between these systems, and the implication of any change in one for the others.

An issue related to technological change, and receiving much publicity at this time, was the 'millennium problem'. The majority of our respondents were having to address this matter, and it was putting pressure on their resources and, in some cases, ingenuity. The necessity to sort out this issue was increasing the demand for certain technical skills, rather than changing them. In particular, it was maintaining a demand for 'legacy skills'. As long ago as November 1996, an edition of the BBC2 *Money Programme* discussed the impact of the 'millennium problem' on businesses. It reported that getting rid of the problem would cost an average sized company £5 million. In a large company, it was estimated that it would take 20 person years to make their computer systems year 2000 compliant. Despite these early warnings, there is evidence to indicate that many organisations

are only now taking year 2000 issues seriously. A recent survey (October 1997) of small businesses, for example, showed that:

- almost half of these businesses have not yet carried out a systems audit
- 16 per cent do not know how to tackle the problem
- 55 per cent believe that the issue is over-hyped.

It is likely, therefore, that the demand for skills associated with the millennium problem will increase in the short term, as organisations scramble to tackle the problem before it is too late.

The pressures brought by the rate of change in technology link closely with many of the other pressures affecting IT specialists. The need to relate IT to business needs, and relate to clients on this issue is further complicated by the pace of change in technology and its growing complexity.

The refocusing of activities

This has been referred to a number of times already, often implicitly. Whether operating as an external provider or an internal service function, the aim of all the organisations and departments interviewed for this study was to remain competitive, or improve their competitiveness. Managers of internal IT functions were looking at its structure, the service they provided and how they provided this, and their relationship to external providers. Software houses and consultancies were trying to keep ahead in the nature of the service they provided, and refocused this as demand changed. For example, one respondent reported that they moved towards activities which added the most value: *'we have moved up the applications value chain'*.

Much of this refocusing of activity reflected the cycle of technological development. Organisations which had previously been involved in developing software and some hardware were moving away from these activities. Many respondents reported a much greater focus on implementing systems, adapting them to meet the end users' needs, and supporting users. New software and systems are increasingly developed in a few specialist organisations. There are a growing number of 'proprietary' applications which can be purchased, and the

added value comes through providing the expertise to implement and tailor these to individual uses.

Another respondent described how developments during the 1970s and 1980s had been very hardware orientated. The emphasis now was on 'softer' areas. Most staff were working on generating software applications and systems and software integration. The skills needed had moved away from the prototyping of new developments and passing these to the manufacturers, towards systems integration in-house.

A manager in a software house reported that they were far less likely to win large contracts compared to the mid/late 1980s:

> *'Most companies now have the core of what they want. They are now letting off bite sized pieces of work around this core. It is small systems work. Basically the size, length and complexity of projects has come down.'*

All these changes have implications for the skills needed of IT staff. In particular, they increase the range of skills needed and introduce a need for people to be able to work flexibly:

> *'They have to be able to work on lots of smaller things over the year rather than one big thing. This requires more flexibility . . . more in consultation with the client. . . . They are getting exposed to all aspects of project management. Lower grades have to be more skilled. It is about how to work with other people, how to work with people outside. It is all about networking.'*

2.6 Summary

This chapter has made many references to the skills needed of IT specialists, and this discussion is developed further in Chapter 3. The main aim of the current chapter has been to illustrate the pressures for and drivers of change. Apart from the continual pace of change in technology and the impact this has on the technical skills needed of IT specialists, IT has become increasingly integrated into the business process and is facing many of the pressures experienced in businesses more generally. This has had a major impact on the skills needed of IT professionals in recent years, and this impact is an important theme of the next chapter

3. IT Skill Needs

3.1 Introduction

A key aim of this study was to explore the skills employers report needing of IT staff and how these are changing. For the purpose of this study, 'skill' was interpreted in a very broad sense. We were not just interested in the technical skills required to work in IT, but also the broader personal skills and attributes sought by employers which enable people to operate effectively in a working environment. Indeed, a key feature emerging from the Skills Review is an emphasis on personal and interpersonal skills, or 'soft' skills, and their application in the workplace.

Much of the literature on IT skills is concerned with skill shortages and labour market trends, but some studies do explore skill needs. A common theme emerging from this literature is the growing demand for 'hybrid' IT staff. There are a number of definitions of 'hybrid', but all suggest a need for more than technical expertise. Connor (1992) and a study for Scottish Enterprise (Yellowbrick, 1995) describe hybrid staff as possessing a wide range of technical and 'complementary' skills (for example, teamworking, project management, *etc.*). They are also able and willing to learn new skills and adapt to rapidly changing business environments and new technology. Other studies have reached similar conclusions, for example:

> *'. . . critical systems require hybrid skills — business as well as technical.'* (*Computer Weekly*, 1995)

> *'. . . hybrids are people with technical skills able to work in user areas doing a line or functional job, but adept at developing and implementing IT application ideas.'* (Earl and Skyrme, 1992)

This chapter explores the skills managers reported to be needed of IT staff, and how these are changing. Our focus here is on the

skills needed in jobs, rather than what is sought on recruitment. There is some overlap between the discussion of current and changing needs. It is very difficult to consider each in isolation, but a distinction is made in an attempt to meet the aims of this research.

3.2 Technical skills

Having technical competence and skill in using and implementing IT is obviously of key importance, although, as will be discussed later in this report, this was not always sought in the recruitment process. There were a number of elements to the need for technical skills. These include the need for detailed knowledge of and competence in particular platforms and software, for example, and more general technical competencies and abilities. In most organisations, it was reported that technical skills alone were increasingly not enough. IT staff need to relate, often in a non-technical manner, to their clients, whether internal or external, and understand the inter-relationship between information technologies and business needs.

An important area of change for IT staff is the ever increasing focus on the appropriate application of IT. This means that it is not enough to have technical knowledge; an awareness of how businesses operate and the implication of different technologies is also important. It was related as important that IT staff do not become so bound up with the technology and what it can do that inappropriate, possibly costly, options are adopted. A few years ago, for example, much attention was focused on the introduction of inappropriate computer systems in various health authorities.

There are still some jobs which require 'pure techies', those who want to shut themselves away and just work with the technology. However, these types of role seem to be increasingly rare, although one manager did report that '*there will always be a place for techies*'. In research and development jobs, detailed technical skills and an ability to use these creatively were important:

> *'Building a real in-depth competence in technologies is seen as important.'*

Without a depth of knowledge and understanding of the technologies being worked with, it is difficult to come up with new

and imaginative applications. However, many other abilities, including relating to the needs of customers, were of increasing importance.

There were elements of change and stability in the precise technical skills needed. There was evidence of a continued need for 'legacy' or 'heritage' skills (for example, COBOL programmers) and in running and maintaining mainframes. A number of organisations continue to use systems and software which were developed and implemented to meet their needs many years ago, for example: *'We still have accounting systems from the sixties'.*

These have been added to as long as they continue to meet the organisation's basic needs. Changing to a completely new system as technology progresses may not always be a sensible option. The 'millennium issue' was contributing to these needs. COBOL programmers, for example, were needed by many organisations to ensure that their computing systems did not collapse at the end of the century.

A range of other technical skills were reported to be needed. These included programming skills, skills in particular operating systems and in various approaches. Some of these were new, at the forefront of developments, others have been around for sometime. The most frequently mentioned areas in which skills were needed were:

- C
- C++
- Visual Basic
- Object Oriented programming
- Java
- UNIX
- Oracle
- networking, including local area networking
- data communications
- multimedia
- databases
- Novell systems
- Microsoft Windows 95
- the Internet.

There was an element of similarity between the needs of different organisations, although a few respondents did mention major investments in, for example, various systems which were not mentioned by others. From a study of this nature, it is difficult to assess the level of demand for different skills. However, the technical skills sought by our sample are not out of line with those reported in other studies. Furthermore, the recruitment consultant we spoke to reported that the top five skills sought were: UNIX, C, C++, Oracle and COBOL.

The rate of change in IT is well documented, and has an influence on the skills needed of IT specialists. It is not just that new technologies appear, but that existing ones are constantly being adapted and updated. Furthermore, the range of applications and systems has increased in recent years. As one respondent said:

> *'IT leaders use everything within their power to create new versions every three to six months. A year ago a top spec. PC used Word 6 and Windows 95, now it is Word 8. There is a natural enthusiasm to be using the most up-to-date, state of the art technologies.'*

However, the rate of change has increased in recent years. This is an important area of skill change, and will continue to be a challenge for employers and those working with IT:

> *'The industry is changing so fast, we are doing things this year we didn't dream of last year.'*

There were no definite views about the possible directions technology might take in the future, but the overall consensus of opinion was that those working in IT would, in general, need a broader portfolio of technical skills than in the past. One respondent from a consultancy in particular commented on this:

> *'The balance between specialisms is constantly changing . . . We may need a to have large number of people working in one area, or only a few. We need multi-skilled technicians.'*

It was commented that increasingly IT specialists need to have a depth of background conceptual knowledge which is not necessarily specific to particular applications, for example, but which enables them to quickly learn and work in different areas as the need arises. It is perhaps the conceptual framework within which networks or databases, for example, operate, and the

intellectual ability to update and re-learn specific technological skills which are of increasing importance.

Keeping up to date

The ability to learn and keep up to date was frequently reported to be needed of IT specialists:

> *'We need people with the ability to learn new technology again and again and again.'*
>
> *'Individuals who keep their skills kit bang up-to-date.'*
>
> *'The ability to learn . . . pick things up quickly.'*

There were a number of elements to this. At one level, IT staff were expected, either on their own initiative or with support from their employer, to keep up to date in their own specialism. They also needed to be interested in and prepared to train in new areas. Training is discussed in Chapter 5, and a great deal is spent on IT training each year. Another aspect of keeping up-to-date was being aware of new developments as they enter the market, whether up-dates of existing systems, programmes, applications or new innovations. It was not always felt necessary to have a detailed knowledge of all these, but there was a need to keep up with the market, and have a basic understanding of the potentials any new developments offered.

Breadth *v.* depth

Many of the points made above suggest a tension between the need for breadth and depth in IT skills, and this did emerge as an issue during the interviews. The overall theme seems to be that, although in the short term a specific skill area may be sought, in the medium to long term it is flexibility which is of importance. With fewer people and a greater range of technologies, IT specialists need to be multi-skilled. However, there is also a need for many people working with IT to have the depth of knowledge of a particular application, to be able to deal with deep seated difficulties, advise on and develop appropriate applications. Respondents were frequently looking for a depth of knowledge in one technical area, for example, *'the ability to build a database from scratch'*.

Depending on the circumstances prevailing in an organisation at any one time, there will be a varying need for specialists and multi-skilled staff. The IT specialist who can combine a range of technical skills with depth in some areas, while also keeping up with new developments, is likely to be in great demand.

An additional aspect related to technical skills is the increasing complexity and interweaving of systems, platforms and applications. IT specialists need to be able to work with increasingly complex technologies. However, they also need to understand how different systems and applications relate to each other, and the impact these have on each other, especially if any adaptations are made or something goes wrong with one. One respondent talked about the interweaving of networks and the need for IT staff working in this area not just to be familiar with one type of network. They needed skills in and knowledge of all the others operating in that organisation, and to understand how they related to each other. Another respondent reported that IT staff needed to understand multi-functional systems. They had to understand and have the skills to work with, for example, the operating system, the relevant databases and the transaction software to effectively maintain and support IT in that organisation.

Theoretical underpinning

A related theme to the need for a range of technical knowledge was the continued need for IT specialists to have a basic theoretical underpinning. For example, several respondents reported that there had been a move away from programming skills to an emphasis on the application of systems and software. This meant that many people were no longer learning basic programming and hence that they did not always have the depth of knowledge necessary to deal with detailed problems.

3.3 Understanding business needs

At various points during the discussion of technical skills, it was mentioned that excellent technical knowledge and skills are not enough. A range of additional skills are also required of many IT specialists and it is these areas which have become of increasing importance in recent years. Chapter 2 reviewed the main changes and pressures influencing the IT function. These

have played a major role in changing the range of skills needed of IT staff. For example, IT staff have been affected by organisations becoming more cost conscious and focused on business needs. The next few sections of this chapter explore the skill needs which have emerged from, or received greater emphasis as a result of, such changes and pressures. The growing complexity of technology and the potential it offers has also played an important role.

Over time there have been shifts in the extent to which technology has led, and although the potential it offers is still important, there is now much greater focus on the appropriate application of technology. Business needs play an important part and frequently lead the implementation of IT — or at least it is planned that they should. IT specialists therefore have to be much more aware of organisational needs than in the past. They need to understand how the organisation for which they are providing IT solutions operates, the interactions between different parts and, indeed, be able to identify situations in which an IT solution may not be appropriate. These types of skill or ability are particularly important for consultants and those working to implement new systems and applications within organisations. However, they are also broadly applicable to a wide range of IT staff. Most are providing some sort of service in a business or organisational context and need to understand the implications of their actions for that organisation. For example, those on a help desk may need to prioritise support, recognising the most urgent needs and the knock-on effects of any decisions they make.

A range of more specific types of business awareness were reported by our respondents. IT specialists need to be able to understand the role of IT in businesses. However essential, it is usually there to support current business needs, and to take the business forward. Implementing IT therefore has to be closely related to the needs of that particular organisation or department within it. It needs to be 'fit for purpose' and it is not always appropriate to introduce the most up-to-date applications as they become available. Some respondents talked about IT staff needing 'a degree of realism'.

The ability to convert business requirements into an IT project was a key requirement of IT specialists in a range of roles. Although IT projects should be driven by business need, respondents also reported a need for people who could bring

technology to the business, without being directly asked. To effectively take organisations into the future, it was argued that IT staff need to challenge the way things are done, identify opportunities for introducing technology and generally go beyond an acceptance that things should continue to be done in the same way as in the past. There does, however, appear to be a potential conflict here. Although there was a growing shortage of IT staff at the time of this study, a number of the organisations in which we conducted interviews had recently made employees redundant. At times of job insecurity, many people feel it is better to keep quiet and get on with their job, rather than bring attention to themselves.

The ability to make links between what was happening elsewhere in the organisation was also reported to be important. In some organisations there is a fairly centralised and co-ordinated approach to the use of technology. In others, different departments for example, go their own way. This can result in a plethora of often incompatible systems and applications. Ideally, it was reported that IT staff, especially as they became more senior, needed to take a broader overview, having the ability to make links between what they were planning or doing, and what was happening elsewhere. It may not be a matter of simply addressing one business need in isolation, but taking a longer term and broader approach.

3.4 Consultancy ability

The need for consultancy ability is closely linked to business awareness, but goes a step further. Some of the organisations involved in this study were consultancies and this type of ability was obviously of key importance to their staff. However, as the IT function within businesses has increasingly been required to provide a service to internal clients, rather than go its own way, this ability has become of importance across a greater range of IT jobs.

Consultancy ability involves understanding and analysing business needs, but also includes communicating with clients or customers, managing client expectations, negotiating and influencing, and generally being aware of clients' needs, attitudes and approach. This includes a considerable element of interpersonal skills, which are discussed later.

IT consultancy involves some very specific skills. IT staff are frequently working with and providing a service for non-IT staff, including those who may have little or no technical understanding. They therefore need to be able to talk to people in a non-technical language, to convert technical terms and concepts so they can be understood by non-specialists. They also need to be able to interpret the complexity of a business need, apply a technical solution, and relay this back to the client. An important point raised by one respondent was the need to be able to articulate, often in simple terms, why a technical innovation may be inappropriate, takes a long time to implement or is very costly. Television and the media generally have made technology more accessible to everyone and new developments are frequently reported. IT specialists have to be able to address the unreal expectations this can create from some people.

Influencing skills were also mentioned, and are closely related to the abilities discussed above. It will not always be enough to explain things in a non-technical language. IT specialists may need to be very persuasive, encouraging people to adopt the most appropriate solution:

> *'If you don't communicate and you can't influence, you won't succeed; you are onto a loser'*

— although in some cases this might work in the wrong direction; some people can be very persuasive about an inappropriate solution.

3.5 Management skills

There is a range of different types of management skills which may be required of IT staff, depending on their roles. Many of these are becoming of greater significance alongside changes in the role of the IT function. This study did not specifically address staff management, although IT specialists in more senior positions do require these skills. In most organisations, managing staff effectively is receiving greater emphasis than in the past. To be promoted, technical excellence and related consultancy skills are rarely enough; evidence of the abilities needed to manage staff is also frequently sought.

Depending on their role, IT staff may be expected to exhibit or develop a range of different management skills. These might

include the management of teams, projects, clients, suppliers, resources and finance.

Team and project management

IT staff frequently work in teams and on projects. Team working is common to many roles and functions. Team leaders need leadership skills, and to be able to listen and delegate. They also need to be able to manage people, although not necessarily in a line management role. They may, however, need to negotiate with the line managers of staff in their team, for example, over work-loads, allocation to different projects and, possibly, performance.

Project management is perhaps not new, but there does appear to be a greater emphasis placed on the skills and abilities required of those in these roles. Project managers were reported to need a wide range of abilities, in addition to technical skills, and it is these which have become more important to employers within the skills portfolio of many IT staff. The growing emphasis in many organisations on cost effectiveness, and the growth of IT as a service function, have contributed to this. Project management skills include the management of resources and client expectations; understanding and interpreting client needs; planning and organisation; decision-making; the ability to evaluate progress and actions; and delivering on time and to budget.

Some project managers will be dealing with internal clients, others with clients in another organisation. Although many of the management skills needed are common to both situations, different dynamics may be involved and project managers have to be capable of working with these.

Managing suppliers; contract management

In addition to, or instead of, managing an internally staffed project, IT specialists may be involved in managing an external supplier or subcontractor. This type of relationship is not new, especially in the provision of IT. However, respondents did report that much greater emphasis was being placed on the effective management of suppliers. The need to keep within tight budgets, and timescales, and to obtain the most appropriate technologies have been key causes of this.

It was reported above that IT specialists need to be able to discuss technologies with some clients in a non-technical language. When dealing with suppliers, they need to be extremely well versed in the language appropriate to the technology they are purchasing. Respondents talked about the need to have a dialogue with suppliers, making sure that they are not taken in and that they are getting the best value for the business. Having a depth of understanding of the application of different technologies, possibly how they have been exploited in other organisations, and being able to ask the right questions to ensure a common understanding has been reached are crucial to this role. Having appointed a supplier, there is frequently the need to manage the contract. This brings in many of the skills needed of project managers.

Financial and commercial awareness

An increasingly important area of expertise required of IT specialists was financial management and commercial awareness. The importance of this ability varied depending on the exact role of IT staff. It was most likely that those managing projects, working as consultants and in more senior positions would require these types of skill.

3.6 Problem solving and analytical ability

An important area of skill looked for in IT specialists was the ability to solve problems, be analytical and logical and, in some roles, be creative. These abilities were seen as important in enabling IT staff to operative effectively in a modern working environment. They were also related to working with IT itself, and its application to a business. IT specialists need to be able to analyse a business problem and identify a solution, especially as they gain experience and become more senior.

The ability to think analytically and logically was frequently seen as more important for inexperienced recruits than any specific technical ability. They were taken as indicators that people had the ability to learn the necessary technical skills, and the ability to keep up to date and to retrain as necessary.

The ability to bring innovative and creative solutions to business problems was also commented on as a useful skill. Solutions nearly always have to be related to an existing organisational

framework. However, the ability to see things in a different way, and make suggestions beyond the usual could be an advantage. Respondents talked about *'bringing technology to the business'* and challenging the way things were done; going beyond an acceptance that things should continue in the same way as they always have. Suggestions and new ways of doing things might not always be adopted, however, it is IT specialists who are able to think in this way who are likely to progress, and move a business forward in the longer run.

Problem solving and analytical thinking were also reported to be important abilities for IT support staff. They need to understand the technologies and how systems relate to the business. However, they also need to be able to identify the broader implications of any advice they provide to users.

3.7 Personal characteristics and interpersonal skills

A number of personal characteristics and interpersonal skills underlie, or are part of many of the areas of skill need already discussed. Although the need for these characteristics and abilities is not necessarily new, much greater emphasis is being placed on their importance for IT specialists. Technical expertise, sometimes excellence, is obviously important, however, it is rarely enough. It was reported earlier in this chapter that fewer roles require 'pure techies' than in the past. All round ability facilitating the use of IT in a business environment was frequently sought by employers.

Communication skills and the ability to relate to others, including IT specialists and non-specialists were reported to be very important. The nature of these skills has already been discussed, and some of the key elements are summarised here. There is an additional dimension to communication in this occupation, compared to others studied in this programme of research. IT has a technically specific language, which IT specialists will be familiar with. However, in many roles, IT specialists need to be able to communicate effectively in non-technical language, translating technical terms and concepts so they are understood by non-specialists who are frequently the users of IT. As IT becomes more closely aligned with business needs, this ability has grown in importance.

An ability to work with others goes beyond good communication skills. The importance of team working and working with clients means that the emphasis on personality has become more important in recent years. The image of IT specialists working alone, as 'boffins' was reported to be outdated, and the exception rather than the rule.

Attitude and personality were reported to be very important. 'Fitting in', being interested in the work, able to operate flexibly and pick things up most commonly mentioned. In many roles, respondents commented quickly, and an interest in training were on the growing need for IT specialists to understand and be prepared to operate as a service provider. Although not particularly new, the importance of this role has developed in recent years and few jobs now allow IT specialists to operate in isolation.

Many of our respondents were looking for high fliers. They talked about wanting forward thinking, proactive people who were progressive and motivated; wanting bright people:

> *'who have got what it takes to be part of [this company]'*
>
> *'. . . looking for pretty sharp people, who can make a contribution.'*

In these organisations, IT specialists were frequently operating as consultants or in research and development. They were expected to be developing and implementing the systems to take forward their own or client organisations. However, not all jobs required such high levels of personal drive and ability, and this is a theme returned to in Chapters 4 and 5. There are many IT roles which involve providing support and advice to users and supporting and maintaining existing systems, for example. In these, although sound interpersonal skills were required, staff were rarely required to be such high fliers. Indeed, it was often not possible to accommodate the aspirations of 'high fliers' in these roles.

Some respondents talked about the changing role of IT specialists in ways which reinforce the growing emphasis on personal characteristics and interpersonal skills. For example, in one business job descriptions were reported to be a thing of the past, rather there was an emphasis on job roles which were increasingly generic and flexible. Words such as achieving results,

building relations, delivering appropriate solutions, problem solving, leadership and providing and promoting a service were used to describe the skills or competencies required.

A range of other personal characteristics were mentioned as important, some by only a few respondents, others by many. These included:

- the ability to cope under pressure — this was required in a range of jobs. The IT function in most organisations is under similar pressures to other functions. Budgets and timescales have become tighter in recent years, and employees need to be able to cope with the stresses this brings
- dealing with the pace of change, in business needs and technology
- taking responsibility and working on own initiative
- some consultancies require people to be fully mobile and prepared to work away from home, possibly abroad
- career interest — *'a deep-seated interest in IT.'* The emphasis on this did vary between organisations, depending on the nature of work and jobs available, and opportunities within the internal labour market.

3.8 Skills sought in contract staff

Contract staff were primarily recruited for their technical skills:

> *'We have a higher interest in their technical ability than their personal approach.'*

The approaching millennium and emerging skill shortages as the economy has picked up over the past year or so have emphasised the need for technical skills, and the need to find them quickly. Internal staff were often preferred by others in a business, but it was rarely possible to meet all these demands:

> *'There are not enough in-house staff. Everyone wants internal people, they are seen as better.'*

There was some debate about the extent to which many of the contract staff employed exhibited sound non-technical skills. This did however, depend on their role. Where teams of external contract staff were being used, the project management and day to day communication was also usually the responsibility of a

consultant, and there can be no doubt that many did exhibit strong interpersonal and broader skills. Indeed, our recruitment consultant felt that contract staff generally had as good interpersonal skills as permanent staff.

The views of other respondents differed. For example, one manager reported that many contract staff either did not want to become permanent, or that their personal attributes prevented them from doing so. They had recently conducted an exercise, asking contract staff to put their names forward for permanent jobs. Of the few who did so, even fewer were taken on and it was their interpersonal skills which let them down:

> *'They have a "difficult" trait, but we live with this because their technical competence is very good and we don't have to worry about coaching and developing them,* etc. *within the organisation. We also target their use.'*

> *'We have contractors with us for more than two years on some projects, the good ones. They have technical competence, product knowledge, and there is an element of getting to know and demonstrating that they understand the business.'*

The overall theme for contract staff was an emphasis on technical ability and knowledge, and less attention was paid to their broader skills. Nevertheless, some sort of understanding of the business and the appropriate application of technology was usually essential. Respondents from consultancies and software houses were as likely to emphasise the need for these skills as other employers. One respondent reported that contractors could stay with the company for some time, and so*: 'fit is important'*.

It seems that those working as individuals, and in some consultancies, are not seen as having strong interpersonal skills, but that this was not necessarily a major factor in their recruitment.

3.9 Changing skill requirements

In many occupations skill change is evolutionary and gradual. Sometimes the introduction of a major change, whether in the technology worked with or in working practices, can cause a major disjuncture in skill requirements. There have no doubt been major changes in the skills required of IT specialists, and

what is expected of them is, in many respects, very different to say a decade ago. However, many of these changes have been fairly gradual in nature, and are continuing to have an impact.

New and evolving technical skills

Thinking about the technologies they are dealing with, these alone have had a major influence on skill needs. New languages, applications, *etc.* emerge and existing ones are frequently being updated. It is not simply that IT specialists have to work with different languages, applications and platforms, and so learn the detail of any particular one. Developments in IT have been complex, introducing different conceptual frameworks and a need to think within a different logical and analytical framework. For example, networking, the Internet and multimedia applications are all different in their conceptualisation to some of the older programming languages and mainframe systems. A few organisations in which interviews were conducted were working very much at the forefront of technological developments. The need for an ever more sophisticated analytical framework and understanding of the application of technology to business was evident.

Continuity and change

Alongside this change in technical skills, it also needs to be recognised that there was a substantial element of continuity. Many organisations have old systems, which although being updated, are not about to be replaced. This, along with the millennium issue, creates a continued need for many of the older 'legacy' skills. In some jobs it is enough to stay within these older technical skills. However, as organisations have added new platforms alongside their existing applications, their technical architecture has become more complex. Many IT specialists, whether working in one organisation or as a consultant, need to be cross-, or multi-skilled. If not having a depth of knowledge across many technical areas, they do need some understanding of how different applications and systems operate and relate to each other, and the implications of making changes in one for the others.

Overall technologies and their applications are becoming more complex, and it is rarely enough for IT specialists, especially in the longer term, to rely on a detailed knowledge of one, possibly

two, areas. The ability to operate flexibly is increasingly important. Indeed, one respondent argued that it was the ability to think conceptually, logically and analytically which was becoming the most important skill for IT specialists. With the appropriate intellectual framework, they should then be able to pick up and work with new developments as they emerge.

Technical skills are not enough

A major change in the skills needed of IT specialists was the great emphasis placed on the non-technical areas. These include business awareness, consultancy ability, management and interpersonal skills. There was also a heightened need for problem-solving and analytical skills, although these have long been important within the occupation. It was reported earlier that good technical skills alone were rarely enough. IT specialists do not operate in isolation from the organisation in which they are working. A growing emphasis on cost effectiveness, the appropriate application of IT to address business needs and more knowledgeable users, have all had implications for the skills of IT staff.

The importance of interpersonal skills

A key theme emerging from our interviews was the greater emphasis placed on interpersonal skills, business awareness and how people 'fitted in'. This is not unique to IT occupations, and is a general theme of this whole series of studies. However, within IT it is an important shift in the skills required. It is not necessarily the case that these types of attributes were never important, but rather that an increasing number of IT jobs do require them. Greater effort is being put into identifying and developing skills in these areas. The next chapter looks at recruitment and selection. When recruiting, especially inexperienced people, our respondents reported a strong emphasis on the interpersonal and broader skills of applicants. Without these a job offer was unlikely.

The role of management skills

Another area on which much greater emphasis was being placed was management: of people, projects, clients, suppliers and finance. It was increasingly recognised that IT specialists

need these skills, especially to progress, and that technical excellence did not mean that people were good managers. Again, an emphasis on management skills was not unique to this occupation. Within many organisations greater attention is being paid to the abilities of managers, and this was having an important impact on IT staff, in particular their ability to progress within organisations.

4. Recruitment and Selection

4.1 Introduction

The employers we interviewed were looking for a range of skills, and these were much broader than simply an expertise in IT. Indeed, when recruiting inexperienced staff the existence of IT skills was frequently reported to be relatively unimportant. Experienced staff were usually recruited to fill specific gaps and, therefore, particular IT skills were sought. There were a number of patterns of recruitment amongst our respondents, and these are explored below. This chapter begins by looking at the types of people managers reported they were seeking to recruit. The level and type of person sought did vary by employer and, in particular, according to the roles of IT staff in that organisation. The chapter then goes on to explore the recruitment process, and how managers attempted to identify whether or not applicants had the necessary skills and abilities.

Skill shortages and recruitment difficulties are frequently evident in IT. This study was conducted as shortages were beginning to appear and concern was being expressed. The final section in this chapter looks at the nature of difficulties being experienced by our respondents, and some of the issues arising around these.

4.2 Recruitment criteria

The previous chapter discussed the skills reported to be needed of IT specialists. There was considerable commonality amongst employers, despite differences in the roles of IT staff in the various organisations. Not all these skills were expected to be present on recruitment. This section explores the various sources of recruitment utilised by our organisations, and the criteria they used in recruiting from these.

Graduate recruitment

The majority of organisations were recruiting graduates. However, a computer science or related degree was not always looked for. Indeed, for many posts it was intellectual ability and other characteristics which were reported to be of more importance than the subject of the degree. Respondents commented that they were looking for 'bright people' or '*very, very, strong raw talent*'.

One respondent did, however, report that they were increasingly paying attention to degree subject; in particular maths, business or computer based degrees were sought. These graduates frequently exhibited sound logical and analytical abilities. A few respondents did report looking for evidence of the use of IT in an applicant's studies or work experience. This was often not at a high level, for example, evidence of using word processing and spreadsheets in dissertations, to construct graphs and diagrams, might be looked for.

A few respondents were recruiting to research and development posts. These, it was reported, were different to other business needs. To take forward a highly technological business in an increasingly competitive industry, graduates with systems design, through a computer science or engineering degree with a heavy software applications content were sought. To design systems, software expertise is needed. However, one respondent commented that graduates of other subjects also had a role to play in research and development. For example, philosophy graduates had been found to have a way of thinking which enabled them to write software. They were also creative and able to think about new products and concepts.

The level of degree was important. An upper second or first class degree was sought by many of our respondents, *'a lower second at a push'*. In a few cases, the number of UCCA points was also looked at. Many IT specialists are working with highly sophisticated technologies, and are expected to show considerable intellectual ability, flexibility and drive. However, there are also a range of less challenging jobs, which offer fewer opportunities for progression. Although the emphasis on top quality graduates was marked, we also came across several examples of other routes into IT jobs. A number of respondents reported that their organisation could not always meet the expectations of high

fliers, and they were looking at other types of recruit. This issue is returned to later.

A good degree was one indicator of capacity. However, as one respondent reported educational qualifications are not necessarily a good predictor of many of the qualities looked for, such as logical ability.

Organisations recruiting graduates were frequently not looking for specific technical skills. A degree plays a broader role. It acts as an indicator that people have an ability to learn and have various other, more generic capabilities, for example, the ability to think logically, be analytical and solve problems. One respondent did however, argue:

> *'. . . GCSE English language is a better predictor of logical ability.'*

Having a degree was, however, only seen as a starting point for recruitment:

> *'We are not interested in excellent technical skills without interpersonal skills.'*

> *'A degree is only a starting point.'*

Managers were looking for a wide range of personal and interpersonal skills, and the potential to develop the skills discussed in the previous chapter. Most obviously, an interest in IT was sought:

> *'We look for a strong interest in IT.'*

> *'. . . a deep-seated interest in IT.'*

Apart from evidence of a capacity to develop technical expertise, it was also the ability to understand business needs, relate IT to these, and to work effectively with colleagues and clients, which were emphasised.

In addition to their graduate intake, many respondents reported that they were either actively recruiting from other groups, or were looking at broadening their recruitment. All organisations were recruiting ready-trained and experienced employees. Other sources of IT staff were mainly job changers, whether external or from elsewhere in the organisation. A few respondents

were also looking at recruiting below graduate level, and placing less emphasis on high flyers.

Experienced recruits and job changers

A number of respondents reported that they were increasingly looking at job changers. There fell into two broad categories: people with a specialist skill or expertise needed by the organisation and more general job changers.

Experienced recruits were taken on to fill specific vacancies, meet particular needs for technical skills and boost technical experience. Although the majority of our respondents were recruiting and training inexperienced staff, there was evidence of an increasing interest in experienced staff. At times of high turnover, or rapid growth in an organisation, this type of recruitment provided a ready source of expertise, which would become productive quickly. The respondent in an expanding organisation reported that they had previously preferred to train their own staff. However, as the industry had expanded, there were now more experienced people available with the necessary skills. They had recruited successfully from this pool and decided to continue doing so.

In recruiting experienced IT specialists, it was the specific technical knowledge or skill set which was of key importance. However, this was rarely enough without evidence of broader, non-technical skills. Business knowledge and also managerial ability was also frequently sought. The main indicators used were track record and previous achievements:

> *'proven ability in the skill set looked for, good analytical technical skills.'*

> *'people who are up to speed and ahead of the game.'*

Qualifications are of limited importance at this level, although they would most likely have helped a person enter the occupation originally. It was the nature of their past experience which was looked at and, in particular where this had been gained:

> *'We look at the quality of experience and the organisations in which they had gained that.'*

Many of our respondents reported that they most commonly looked for experience in blue chip organisations. As well as the technical skills, it was commented that these people would bring business experience with them. One manager reported that they did not recruit many from software houses as these applicants rarely had the necessary planning, organisational and leadership skills. Respondents from software houses did, however, report that these skills were important to them. Many recruiters were looking for people from the six large consultancies.

Another source of recruitment was job changers from the external market. These were different from the above in that they might not have experience of IT, and rarely had a significant level of experience. This type of recruitment was closely related to the search for high flying graduates. Several respondents reported that graduates with good degrees had high expectations and would quickly look for another job if these were not met. There appeared to be considerable movement in the labour market of recent graduates. If their first job did not satisfy them in terms of interest or prospects, for example, they would look elsewhere. A number of our respondents were taking advantage of this movement. Similar indicators to those used in recruiting new graduates were used, but their previous work experience would also be looked at. Changing between different occupations or types of job, especially early in a career, did not necessarily work against these young people. They did, however, have to show that they had given some thought to where they were going, what they wanted to do and where they wanted to end up: *'it all has to stack up'.*

In those organisations in which IT was one of several service functions, there was some movement of employees into and out of IT. Internal job movers were often looked on favourably, as long as they had performed well in their previous job(s). They brought with them knowledge of the business and business needs. Specific IT skills were not looked for, although it was rare for such employees to have had no contact with IT. It was an interest in a career in IT and evidence of logical and analytical ability which were looked for.

Additional sources of recruits

The majority of our respondents were looking for highly qualified or experienced recruits. However, some managers

reported having difficulty in meeting the expectations of these staff, and in retaining them. This is discussed further in Chapter 5. Some argued that not all IT jobs require high flyers. What is required is someone with good technical skills, capable of delivering a consistent service within a business. A few organisations were, therefore, looking at recruiting people at a lower level. For example, one respondent reported that they were looking at the potential of the Modern Apprenticeship for bringing in trainees. Another respondent reported that they were considering recruiting at 'A' level. The main reasons for this were a shortage of graduates and the greater diversity of jobs. However, these people were considered too young to be employed in all except the most junior roles. It was argued that many analyst jobs require a greater element of maturity than people of this age usually have. Many of the consultancy, influencing and managerial skills are partly a function of maturity. Another respondent reported that they were looking at the possibility, with local Training and Enterprise Councils, of retraining people who had been made redundant from other jobs, as long as the showed an interest in and aptitude for IT: *'we are open minded, looking at every opportunity'*.

There was limited evidence amongst our sample of employers of a move to recruiting people below graduate level. However, this route does seem to offer potential, especially as IT becomes more widespread within businesses and if skill shortages persist. One barrier was the attitude of existing staff, especially managers. It is generally accepted that a degree is needed to operate effectively in most IT jobs.

4.3 The recruitment process

Our respondents reported varying degrees of formality in the recruitment process. In almost all cases this process was, however, challenging. Interviews were the main means of assessing applicants: *'it's all chat at the moment'.*

The number of interviews varied, and in many cases formal interviews were supplemented by informal talks with various members of staff. Line managers, more senior managers and a representative of the personnel or human resource department were usually involved.

The interviews aimed to explore a wide range of skills and abilities. Many respondents reported that they had sets of questions, or a particular approach which they relied on to explore either technical skills or the capacity to learn these skills, as well as the broader non-technical and interpersonal skills. Hypothetical questions might be asked to test how applicants might react in different situations, or they would be asked to give practical examples of their experience of and reaction to particular types of situation. This type of questioning would test a candidate's approach to, for example, team working, dealing with clients and possibly management.

An important role of the interview was to explore how well a person might fit into an organisation; would they fit with the company culture. In many cases an interview alone was not seen as enough. For example, one respondent reported that potential recruits were taken out to lunch, during which it was observed how they behaved and reacted to each other.

One difficulty some respondents were experiencing was meeting the expectations of graduates, especially very highly qualified graduates. To try and minimise turnover and dissatisfaction, the recruitment process included opportunities for potential recruits to find out more about the organisation, what it could offer and whether the job would suit them. They might meet existing employees, usually relatively new graduates themselves, and have a chance to explore what the organisation had to offer. A consultancy sent potential recruits to lunch with existing partners. This was not an assessed interview, but aimed to give applicants a further chance to explore whether the job was what they really wanted.

When recruiting experienced recruits, it was their technical skills which were of key importance. These were usually assessed through an interview with existing employees who were skilled in the relevant area:

> *'Our experts only take five minutes to assess whether they know what they are talking about.'*

Inexperienced graduates were not always expected to have any specific IT technical skills. However, the recruitment process did aim to explore their potential to learn and develop IT skills. Interviewers would therefore be looking at applicants' overall intellectual abilities, trying to explore the way they thought,

approached problems, and their ability to be creative and come up with ideas.

To supplement the interview many, although not all, respondents reported the use of a range of different tests and exercises to explore various skills and abilities. One manager reported that they did not use any tests:

> *'It's a judgement call, based on the interview and what they have done before.'*

A few were using psychometric tests, although this was not very common. As one respondent commented:

> *'Psychometric tests are not a very helpful tool, the results vary depending on the sort of day you've had, for example.'*

A number of organisations had developed their own tests, to assess a person's aptitude with IT or their logical and analytical ability. Group exercises, for example, involving role playing, fact finding, and problem solving were also frequently used, especially for new graduates.

There were some differences in the recruitment process for various types of recruit. New graduates, and frequently external job changers, went through the most testing series of activities, involving, for example, interviews, tests and group exercises. Other types of recruit usually had to go through only part of the process. Experienced recruits might have to do some tests, however, it was more common for the interview to be the main form of assessment. The general abilities of internal job changes were already known within an organisation, and the assessment usually focused on their abilities with IT and potential to develop further in this area.

4.4 Shortages and recruitment difficulties

Skill shortages and recruitment difficulties are common in IT and frequently feature in any general studies of shortages and difficulties in the economy. At the time of our interviews, recruitment difficulties were beginning to reappear, and several respondents did express concern. Since this time, difficulties have increased. Several respondents reported that during the recession of the early 1990s, they had not really experienced difficulties in obtaining the skills they wanted:

'During the recession people stayed. It is changing now, turnover is increasing. The skills we now have are what other companies want.'

This particular respondent was from an organisation at the forefront in its field and using very high level technologies. Others reported that they did not have a problem at that time, but were aware that difficulties were likely to arise in the future:

'It is not a problem at the moment but we are looking to make sure that we address any difficulties before or as they arise.'

This study was about the skills required in IT jobs, not skill shortages, and we did not explore this issue in great depth. Nevertheless, a number of points of interest do emerge from our data.

There was a locational aspect to recruitment difficulties. The majority of IT jobs are concentrated in the London area and M4 corridor and it seems that it was in this part of the country that recruitment difficulties were most severe. Managers we interviewed in other parts of the country reported fewer concerns over recruitment. For example, a respondent whose organisation was based in East Anglia reported that people tended to want to stay in the region once they had moved there and '*there are no serious high tech contenders in this area'.*

Recruiting graduates was presenting few difficulties to our respondents. The main problems came when trying to recruit ready skilled and experienced staff. There were a number of aspects to this.

Recruitment difficulties always tend to emerge as the economy picks up. During times of recession or economic uncertainty, organisations are particularly careful in their investment. Major investments in IT, and the recruitment of IT staff, may be delayed or reduced. Several respondents reported that they had maintained their intake of graduates and their training programmes during the early 1990s. However, not all did so, which means that as demand picks up there is a shortage of ready-trained IT specialists. However, the emergence of recruitment difficulties in IT is not just a function of the state of the economy. A number of other causal factors were evident from our interviews.

Deregulation in some industries, especially those which were previously in the public sector, has created competition for IT

staff in some sectors. New companies, often small, have entered these markets. This has both pushed up the demand for IT skills and put pressure on the established market leaders: *'other companies now want the skills we have'.*

The millennium date issue has created additional pressure in the demand for IT skills. This is a relatively short-term issue. However, as it is addressed, other influences are likely to take over. Most commonly, respondents mentioned the introduction of a European currency. Many systems will need a major overhaul to deal with this.

As more IT jobs have become available, specialists who are dissatisfied in some way with their existing employer, or who are attracted by seemingly better conditions elsewhere, begin to move jobs. This creates a further pressure on organisations, including those who train new entrants. One respondent commented on the amount of 'churning' in the occupation. On one hand this should make recruitment easier as the pool of potential recruits expands. However, it also causes difficulties as employers need to balance their precise technical skill needs with their availability. New skills are particularly difficult to obtain.

Technology is changing and developing rapidly. New applications and updates of existing applications are constantly emerging. This creates further pressure on the demand for skills. Not only are more people needed, but different combinations of skills are looked for. For example, a respondent in telecommunications reported a vast growth in demand for data communication skills: *'the skills just do not exist in the quantity we are after'*.

It should be remembered that the majority of these organisations were training new entrants to the industry. However, in a time of rapid change this is not always enough.

Respondents mentioned several relatively recent areas of demand in which there were not sufficient skills. These included networking and the Internet. There are simply not enough people with a sufficient depth of knowledge and skill in these areas. This is likely to right itself in the medium to long term; as new areas emerge people move into them. Indeed, in IT it seems that many specialists enjoy the challenge of moving on and updating their skills. However, a difficulty for organisations utilising, or

wishing to explore the utilisation, of new developments, is the lag between a major development appearing and people acquiring the technical skills needed:

> *'We are always one step behind because the market is moving so quickly.'*

> *'We do have recruitment difficulties; the skills we are looking for tend to be new.'*

The above discussion has focused on technical skills. Difficulties in obtaining particular technical skills were most frequently commented on. However, many respondents also reported gaps between the other skills held by IT staff and what was ideally wanted:

> *'Recruitment has been tough during the last few months. There is not the volume with the right skills and levels we are looking for in the market; one in four pass the assessment centre.'*

In particular, respondents commented on the difficulties in finding people with the right 'behavioural' or interpersonal skills. These gaps were reported amongst both recruits and existing staff.

The last section in Chapter 5 discusses career structures and raises a number of issues relevant to skill shortages and recruitment difficulties. In particular it looks at some of the methods used by employers to address recruitment and retention issues amongst IT staff. Our data suggest that employers were taking a range of measures to address recruitment difficulties. These included:

- regularly recruiting and training new entrants to IT
- head hunting: *'not all good people were looking for jobs'*
- recruiting carefully to ensure that the 'right' people are taken on and that both the expectations of the organisation and the individual are more or less in tune
- major investments in updating existing skills
- addressing career and progression issues when few opportunities exist, for example, by providing alternative sources of motivation
- pay and conditions — most respondents reported providing an overall benefits package which was attractive to employees in terms of the range and nature of benefits available. Our evidence on salaries is mixed. At the time of our survey there

was beginning to be some pressure on salaries, and subsequent evidence suggests that salaries have increased as recruitment difficulties have become more evident. However, we came across examples of organisations which were only offering what they considered the rate for the job. Managers wanted to keep salaries under control, especially when under pressure to keep costs down.

- getting better at training for the future
- attempts to forecast the level and nature of future skill needs.

Some of these measures were short-term, addressing a particular or immediate need. However, the majority were longer-term in nature, attempting to address the acquisition and retention of skills more generally. Some plans to forecast future skill needs more accurately were only in their very early stages. How to maintain and update skill needs in a radically changing and fast moving occupation has not yet been satisfactorily answered.

5. Training and Career Structures

5.1 Introduction

The technical skills needed of IT specialists are changing rapidly in many areas, and the range of skills needed in these jobs is expanding. This suggests that the training and development of IT staff is of considerable importance, and our data supports this. In this chapter we first look at the training and development reported by our respondents. Developing and maintaining an IT skills base is seen as essential, but a highly skilled workforce also means that employees are attractive on the external market. Retaining, rewarding and motivating staff was an issue of concern for many respondents and a range of different approaches were being taken. This chapter also explores the career structures available to IT staff and the ways in which employers were trying to address high levels of turnover.

5.2 The importance of training

Almost all our respondents reported that the training of IT specialists was very important. Most were making major investments in this training, although a few felt unable to provide the level of training really needed. Training budgets, although frequently very large, were often under pressure, as a consequence of more general cost pressures within organisations. In a small consultancy, it was reported that training was: *'quite often a play off'.* Generally, however, this respondent reported: '*. . . if a client wants something and we don't have the skills, we need to train*'.

The rate of change in technology means that, for most organisations, the training of IT staff is a continual challenge.

Several respondents reported that training was becoming more closely related to business needs. In the past, people might have been sent on various training events as a matter of course. Now individuals and their managers had to justify the need for attending most training activities. This focus on business need was, however, often throwing up additional training needs, in particular in non-technical skills.

Chapter 4 explored employers' recruitment practices. Many organisations were recruiting graduates with little or no experience of computers. Others were recruiting job changers and staff from elsewhere in their organisation. The focus was on the potential of these people to develop IT skills, and considerable training effort was being devoted to these new recruits.

There was also evidence of a considerable commitment to the on-going training of IT staff. There were a number of reasons for this. In particular, the rate of change in technology made training just to keep people up to date an imperative. The respondent in an organisation with a major research and development function reported:

> *'Nothing stands still . . . competition increases . . . and the ability to ship information around in ever increasing quantities means we need to keep our technical competence up and move on, ensure people are equipped to provide the types of products the world needs.'*

Another respondent commented: *'it's the cost of not training'*. If the skills of IT staff are to remain relevant, training to keep them up to date was essential.

In Chapter 3 it was reported that a much greater emphasis is now placed on the non-technical skills of IT staff. Furthermore, the managerial abilities of IT staff were coming under greater scrutiny. Promotion has long been on the basis of technical ability; however, this is now rarely enough and attention is being paid to a wide range of personal and managerial abilities. These changes were leading to training being not just about technical skills, but also about relationships with clients and managing people, for example.

One respondent commented that most line managers had been *'grown in the company'*. There had been no training in the necessary skills and it was argued *'a lot is experience'*. This was

beginning to change and attention was being given to training in these areas. Another reported that they tried to develop people's personal abilities through courses. These were often about cultural change, helping staff to realise the importance of a wide range of personal skills, and that most people had the ability to develop these.

Another related area, to which greater attention was being paid by some employers, was general business skills. To be useful, the implementation of IT has to be closely related to business needs, and IT staff have to be able to recognise, interpret and understand these needs. Training effort was being devoted to helping staff understand what the rest of the company was up to or, in the case of consultants, to understanding a range of different business problems and needs.

There has long been an emphasis on the technical training of IT staff. It seems that IT staff have, in many organisations, received more training than other staff. The need to simply keep up with developments has been the major factor in this. However, other staff have received more training in managerial and other interpersonal skills, and this has, until recently, largely been ignored for IT staff. Part of the reason for this is their particular position. Frequently they are specialists who are not part of the general career structure in organisations, and the IT function has tended to operate independently. As this function has become more focused and involved in the mainstream business, the more general skill needs of IT staff have been recognised. Some of the organisations were consultancies and software houses, where the emphasis has frequently been slightly different. They have always had to deal with clients, and the skills associated with this have received greater recognition.

5.3 The delivery of training

5.3.1 Initial training

Several organisations had large graduate training programmes. Much of this training was provided internally and by in-house trainers. The respondent from a small software house reported that they used to have a graduate programme, introduced to overcome a recruitment difficulty. Graduates had been put on a two week intensive course, covering the technologies they would

be using, and then put into a project team. This team would usually be working on a customer's site, so a range of practical skills could be obtained.

It was rare for graduate programmes to cover technical skills alone, although developing these skills was a key aim. One organisation was training on a global basis, and its training centre was in the USA. New graduates were given intensive training in the most important technologies. The course also included instruction in the particular methodology of that firm. The whole programme was frequently being updated and developed, as technology changed and as more appropriate methods of learning were identified. For example, at the time of our interviews, some of the training was being delivered as a case study. Trainees were required to imagine they were at a client's site, and they had to address a wide range of issues as they emerged. This meant that training in IT skills was combined for example, with applying IT to a business situation, dealing with clients, and working in teams. A range of skills were developed through one situation.

In another organisation, the initial training included detailed coverage of basic programming, usually COBOL or UNIX, whichever was in greatest need at the time. Further training was given in leadership skills, project management, and a range of 'softer' skills. In a large retail organisation, graduates went through a 12-month induction period. During this time they learnt about the business, were given a grounding in IT, were trained on the specific platform they would be working with, and went through a business analysis course.

Inexperienced recruits entering IT jobs through other routes were given a variety of different types of training, depending on their level and where they came from. In a few organisations people were moving into IT jobs from other functions. They often already had a good knowledge of how the business worked and might well have developed a range of personal and interpersonal skills through their general experience. The training of these people was focused on technical IT skills, and their application in the workplace.

A few of the organisations we interviewed were recruiting and training young people from college or school, *ie* below graduate level. Others were looking at the possibilities of doing this. We did not come across any examples of IT Modern Apprenticeships,

although some organisations were exploring the potential this offered. The initial training of young people depended on the jobs being filled and the extent to which the recruits already had any IT skills.

Experienced recruits were usually fitted into the training provided for existing employees. There might be some induction into the organisation. However, these people were frequently recruited for the particular technical skills they had, and were expected to become fully operational very quickly.

5.3.2 On-going training

In addition to any induction or initial training, most organisations had an extensive programme of on-going training. This training included updating in existing and newly emerging technical skills, and training in a range of personal and interpersonal skills. Although training in technical skills was generally not decreasing, greater emphasis was being placed on personal and interpersonal skills. Areas such as leadership, management skills, dealing with clients, *etc.* were reported to be receiving more attention. People highly skilled in a technical area do not always exhibit good managerial and other skills associated with working with clients and in teams. As these have become more important, attention has been turned to developing and enhancing these skills.

Some training programmes built on the skills acquired during the induction or initial training period. As inexperienced recruits gained experience, their skills could be enhanced further and any gaps in ability more easily identified. For example, as they gradually have more contact with clients, any problems with their communication skills would be dealt with as they arose. The range of tasks in which people are involved increases with experience and, rather than training to meet all needs initially, skills are enhanced as the need arises.

An important element of training provision for existing employees was a stronger emphasis on both individual and business needs. In most organisations the training and development needs of individual employees were identified through the appraisal process, or individual development plans. This was placing a greater responsibility on both managers and individuals. Managers needed to be able to see things in a broad

perspective, understanding the role of training in the organisation, and relating individual needs to those of the business. In addition, greater onus was being placed on individuals' responsibility for taking their own training and development forward. Training departments might offer opportunities and advice, but it was up to individuals to utilise these.

The definition of business need seemed to vary in its breadth. In some organisations, business need is seen in a fairly narrow context. There was some evidence that managers were very much trying to look to the future and ensure that employees would be equipped to deliver appropriately. Nevertheless, updating IT skills did seem to be very much driven by the need of the moment. Several organisations had recently achieved Investors in People (IiP) status or were working toward this. It was argued that the process of doing this was helping to clarify business needs, and focus training more directly on these.

In several organisations personal and continuous professional development (CDP) were reported to be important. In one this was to enable a highly skilled research and development workforce to keep up to date and be knowledgeable about newly emerging technologies and the opportunities these offered. In another organisation, training was being used in a broader context. Very basically a trade-off was made between job insecurity and providing employees with broader skills, helping them to compete more effectively in the external labour market if the necessity arose. It was hoped that this would maintain company loyalty after people left, improve the reputation of the company in the labour market and possibly persuade some ex-employees to return in the future.

A combination of internal and external courses were used, together with a range of less formal activities. One respondent reported that most of the technical training was delivered by internal trainers. The implementation of IT was so organisationally specific that they could not find external trainers with the necessary knowledge. However, the general trend was for an increasing emphasis on external trainers. There were several reasons for this, but the bottom line was a search for the most cost efficient means of training delivery. The rate of change in technology meant that it is not necessarily possible to keep a group of internal trainers sufficiently up to date. It made more sense to buy in expertise as required. In some cases there was no widespread need for a specific type of training, and individuals

were sent on external courses as the need rose. A second reason for an emphasis on external training was the tailoring of training to individual needs. There are now many training organisations providing a range of courses in managerial, leadership and other interpersonal skills. They will also provide courses tailored to particular needs. It is rarely cost efficient to develop courses to meet these types of need internally, when such a range is available in the external market.

In addition to formal training courses, new recruits and existing employees develop many skills simply through doing their job. New recruits were frequently placed with project teams fairly early on. Some organisations also have systems of mentoring, whereby more experienced staff help to bring on and develop those with less experience. Managers also play a crucial role, and often need developing in it, in training and developing both new and relatively experienced staff.

5.3.3 Training contract staff

The majority of our respondents, with the exception mainly of the consultancies and software houses, reported some use of contract staff. In a few organisations large numbers of contract staff were employed. There were varying motivations for this use, but a key factor was to obtain technical skills which were needed quickly or for a fixed time, or were in short supply. The training of contract staff did, however, emerge as an issue of some concern.

In theory, contract staff are employed at a premium and expected to bring the necessary skills with them. In practice, this did not always seem to be the case. For example, one respondent reported that they sometimes found that the person who fronted an interview showed evidence of the appropriate skills, but the person or people who actually came in to do a job were not always so well skilled. This, in some cases, meant that the organisation had had to make a training contribution. In the longer term, however, they had tightened their project management to ensure that the contractors delivered the skills they say they would.

Contract staff might be the employees of another organisation, in which case their training is usually the responsibility, at least in part, of that employer. As reported above, keeping IT staff up to date in their technical skills, was seen as essential by the majority of our respondents. Major consultancies and software

houses do put a major effort into training. Some of the smaller organisations might find it more difficult to fund training. Nevertheless, our evidence suggests that not training is no longer seen as an option, if these types of organisation are to survive in a competitive market. One respondent from a software house reported that training was part of their quality assurance system:

> *'. . . people on a project have to be able to do that project. Everyone has to be trained to do the job. This is checked as part of the quality system at the proposal stage. In this way we can identify major shortfalls and training needs.'*

Many contractors are, however, self-employed, although they may work through an agency. In this case, the onus very much falls on the individual to update and maintain their skills. In this study we did not interview individual contractors. However, one of our respondents did place contractors on client sites. This agency gave bonuses and rewards for continuity to the contract staff on their register, and a popular form for this was as a training credit. It was reported that contractors wanted training and recognised the importance of keeping up to date. In a rapidly changing market, in which skill shortages quickly emerge, highly skilled and up-to-date contractors can earn considerably above normal salaries.

5.4 Internal labour markets and career structures

This research was conducted at a time when IT skill shortages were again becoming an issue. This was leading to some immediate concerns amongst employers. For example, one respondent commented:

> *'Ninety per cent of CVs are out in the market at any one time, and we have to respond to this.'*

Higher salaries, opportunities for progression and possibly more interesting, or at least different, work were some of the attractions. However, these were not a major pull for all. One respondent commented that they were able to recruit experienced staff who were no longer primarily concerned with earning a lot of money. These people were mainly in their forties or older, and were prepared to make a trade-off between very high salaries and a slightly quieter, less pressured working environment. This particular organisation also benefited from operating in a exciting business sector.

It was reported by some respondents that job insecurity and disenchantment with the amount, nature and management of change in organisations was acting as a major push factor:

> *'. . . not necessarily salaries which drives people outside, they are disengaged mentally before they physically step, and the management style is that they can "piss off".'*

In one organisation, for example, there was considerable uncertainty as jobs were being lost in some functions and created in others. Although there had been no compulsory redundancies, staff were concerned about the future and their longer-term security. These uncertainties were not just affecting IT staff, but given the buoyancy of the external labour market, it was these employees who had the greatest opportunities to find alternative jobs.

In addition to short-term concerns about labour turnover and skill shortages, there was considerable evidence that employers were looking more closely at a range of retention and career development issues. In many organisations there are fewer opportunities for promotion in the traditional sense, as layers of management have been removed and efficiency cuts have been made. In one organisation, for example, three or four levels had been removed from the grading structure.

Meeting the expectations of recruits, and managing these at a realistic level, were challenges facing a number of IT employers. Reward and status are very important to many people, and this is still very much measured in terms of promotion, which usually brings with it staff management. Indeed, kudos is often obtained through managing lots of people. Graduates and other skilled recruits expect to progress quickly. Yet within many organisations needs are changing, and traditional hierarchical structures are less common.

There were a number of ways in which employers were addressing these issues. There was no ideal 'answer', but rather varying approaches were being introduced and experimented with. Organisational structure, tradition and the type of service being provided all played a role in influencing these approaches. To some extent, broader societal values were creating a barrier. As long as promotion and becoming a manager are seen as the main routes to recognition and status, employers are bound to face difficulties in motivating and rewarding staff when these

types of opportunity are limited. This issue also emerged in other studies in this series, in particular the engineering study — another technical occupation.

In a major consultancy, recruits were generally able to progress as far as their ability allowed. Opportunity was not based on vacancy, but the individual. Career paths allowed staff to progress into leadership roles and take on more responsibility, eventually becoming a partner. This organisation had very rigorous selection criteria and was aiming at 'high flying' graduates. To motivate and retain these recruits, obvious and readily accessible career paths, mostly leading up, were seen as essential. This organisation was still, however, expanding and operating on an international basis. Providing such opportunities was therefore not really a problem.

A key theme emerging from our interviews centred around attempts by employers to be much clearer with staff about the opportunities actually available to them. This often started in the recruitment process (see Chapter 4). Managers reported that applicants were invited to visit and have informal discussions with existing staff, for example, to ensure that they really knew what the job had to offer. Meeting the expectations of highly qualified graduates was a problem for a number of organisations. The job might be more mundane and promotion slower than expected.

Several of our respondents reported that, in their organisation, attempts were being made to identify the competencies needed in different jobs and levels. They were also trying to be clearer about the career opportunities available, and what skills and attributes were necessary to progress. For example, one respondent reported:

> *'[we] try to set out career plans for most people, so that people understand their capabilities and what they can achieve, . . . recognise the attributes the company is looking for . . . so that they all know what they have to achieve to reach the next grade.'*

In another organisation, an informal career and appraisal system had recently been replaced with a formal grading structure. This had been published within the company so that staff could see and understand the opportunities available to them. Conscious decisions could then be made about where to aim for, and what a person needed to do to reach this position. A different

respondent reported that a formal grading structure also required *'honest talking'*. It was too easy for managers to avoid difficult conversations with their staff. If a member of staff was not going to make it in terms of promotion, their manager needed to be honest with them about this and point out the opportunities which were available to them.

Having good technical skills does not always mean that a person will make a good manager, and it seems that the managerial abilities of IT staff are frequently not as strong as needed. Indeed, it was reported that IT specialists often do not really want to move into managerial positions, but this was the only way to progress. Another approach some organisations were taking was to be clearer about the skills required to be a manager. This not only helped managers understand their own roles, but also contributed to career development and the management of expectations held by more junior staff.

Several organisations were reported to have developed succession planning. There was generally more focus on identifying potential senior managers and providing the appropriate training and mentoring to these people: *'we take this much more seriously than five years ago'*.

These activities were not restricted to IT staff, who were considered along with other employees. Fewer opportunities for promotion and the need to identify the right people to fill senior posts were driving such moves. They also fitted with the more general drive to make career development and promotion opportunities clearer to all employees.

Alongside attempts to be clearer about the opportunities open to staff, and manage their expectations, efforts were being put into providing other types of motivation. Training was argued to be an important input. Earlier in the chapter it was reported that training and development received considerable emphasis. Several respondents commented that providing training and, for example, enabling people to: *'constantly keep interested, learning new things and interests'* was an important motivator, especially for IT staff. In some organisations, although opportunities for promotion might be limited, there were reported to be other opportunities for movement. These were rarely taken up; people preferred to stay in their own specialism. One respondent reported that there were career paths which enabled people to experience different commercial areas of the

business through working on various technical platforms. These were, however, seen as a poor relation to promotion. Another manager reported that increasingly IT staff were leaving IT and moving into the business side of the organisation.

There was also evidence of attention being given to developing technical 'ladders' within organisations. An employer with large numbers of research and development staff was reported to have 'technical advisers'. These were people with extensive technical skills but who were not necessarily good staff managers. This was one way of recognising and rewarding the importance of technical excellence. The recruitment consultant had found that a greater number of organisations were introducing technical paths. For example, in one company in which people are paid by ability, there were known to be technical people who were earning more than managers.

In a few organisations the recruitment process was being adjusted in various ways. For example, in one company there had been a tendency to recruit externally for senior positions. This had led to a situation in which:

> *'Quite good people inside didn't get a look in when it came to promotion, and almost a perception that if you were inside you can't be any good had developed.'*

Realisation of this had focused greater attention on the skills needed of managers and for promotion. Attention was also being paid to identifying career opportunities in support areas.

There was considerable discussion of the difficulties in meeting the expectations, especially of 'high flying graduates', but also other highly skilled and aspiring staff. Not all IT jobs, or organisational structures, provide high level opportunities. For example, in one financial institution, our respondent reported that during the past two years they had become very conscious of the need to focus on recruiting people whose aspirations could be met:

> *'Very good quality graduates sometimes have aspirations which are higher than we can meet. We don't have the infrastructure for very fast movement. There are good opportunities, but not for everyone to be a team leader within two years. . . . Exit interviews monitor why people leave and the main factor is that aspirations were not met. . . . We want good steady people, not high flyers.'*

They had become aware that there were mismatches between the culture of the organisation, what it could actually offer and what was being offered to recruits. As a result, recruitment had moved away from a focus on top level graduates to people who: *'. . . do a good steady job and do well within their own capabilities'*.

Other approaches to motivating and retaining staff focused on the overall package offered. Respondents reported offering a competitive package of remuneration and benefits, although some were restricted by general organisational policies. IT staff might be on separate pay scales to other staff, but it was usually felt important that these, and other benefits, did not get too far out of line. One manager reported that there was some flexibility in the package offered, for example, employees could buy and sell annual leave. In one company, one-off payments were made for a '*job well done, beyond the call of duty*.'

The recruitment consultant reported that they conducted surveys of why people accept and change jobs. These showed that salary was not amongst the top reasons people gave for changing their job. Challenge and progression were reported to be of greater importance. It was commented that their better clients were able to retain IT staff without necessarily paying the highest salaries. It was argued that the overall benefits package was more important in motivating employees, including rewarding effort and creativity, rather than just paying a lot.

Several organisations were paying attention to the broader 'employability' of staff, and this was referred to in the previous section. For example, one manager commented:

> *'We also look at personal abilities, skills not immediately needed in their job, to show we care for individuals.'*

There were several motivations amongst these employers. The principal motive was to show employees that they were 'good employers' and had their broader interests at heart. This was done through a range of the measures discussed above. In an organisation located in the south, where turnover was higher, it was reported that if people did leave, it was hoped that they would do so feeling good about the company. In another organisation, this approach to employability was reported to help retain staff.

6. Future and Conclusions

Our respondents reported a number of concerns for the future. This chapter begins by outlining these, and then draws some overall conclusions from the study.

6.1 Issues for the future

Meeting current needs

Maintaining their current skills base was of concern to many respondents. Recruiting, training, retaining and motivating IT staff are all part of this, and these issues have been discussed in detail earlier in this report. The issue of pay was mentioned by several respondents. A number were concerned about their ability to meet the pay rates dictated by the external market.

Developing skills in new applications, thus enabling their potential to be assessed and utilised was also an issue. Several managers commented on the impact of the Internet. One organisation had a sub-group looking at how to exploit the Internet effectively: *'Getting beyond its value as a toy'*.

Although the Internet has been in existence for some years, the availability of in-depth skills around its use is limited: *'for true business benefits we need sophisticated artificial intelligence'*.

New technologies and applications need effective utilisation, but there needs to be an investment in skills before this can be appropriately done. Some IT specialists will need to be risk takers, and develop capabilities in this area.

Forecasting future skills needs — their quantity and nature

This was a major concern for a number of respondents. They were looking at methods of predicting their future volume of need for existing skills and identifying new trends, in time to develop an appropriate supply of skills. All these attempts were in their early days. Employers were looking at their current business and likely future developments in the business, and attempting to translate these into a demand for IT skills. Looking more to future developments, attempts were being made to identify indicators of future change in technology which could be translated into skill needs.

Managing resources effectively

As the potential offered by technology expands, businesses need to be cleverer about how they utilise and adopt technology. Specialists need to be able to identify the appropriateness of new developments in meeting current business needs and in taking a business into the future. At the same time, there is pressure on resources, and compromises and trade-offs may need to be made. Specialists will need, in conjunction with business managers, the skills to identify potential and make these types of judgement.

Maintaining a competitive position

Many of the issues raised above contribute to this. Internal IT departments need to make the investments which enable them to remain a preferred supplier: *'demonstrate we add value'*.

Consultancies and software houses have to keep their skills and applications base at the forefront to compete. Those businesses in which IT is a central part of their product and service need to keep ahead to ensure that they can compete in their own market place.

6.2 Conclusions

This study is part of a programme of research on employers' changing skill requirements within different occupations. It raises a number of issues which are particular to this occupation,

but also a number of points which are common across the whole research programme.

Within IT, technical skills are extremely important. Without a high level of technical skill and competence, IT specialists cannot operate. These technical skills are varied in their nature, depending on the exact system or application a person is working with. There are considerable elements of stability in these skills, for example, a range of 'legacy' skills are still in demand. The 'millennium issue' has stimulated this. However, a number of organisations continue to use systems they introduced many years ago, and the demand for these skills is likely to continue. At the same time, IT is changing rapidly and often radically. Existing applications and systems are frequently undated and revised, and those working with them need to keep up with this change. Many new applications emerge, extending the potential application of IT in business and life more generally. IT specialists need to be able to keep on top of these. Some will need a depth of knowledge, others to be aware of the potentials new developments offer and their relevance in different circumstances. Many of these new developments are based on different conceptual and analytical frameworks to those of the past. IT specialists need the intellectual capacity and flexibility to maintain and update their skills if they are to fully meet the demand for IT skills.

Not all occupations have such a specific or high level body of technical information. However, IT occupations are similar to other occupations in their need for a broad base of skills. A theme throughout this programme of research has been the emphasis placed by employers on a range of non-technical, personal and interpersonal skills. This is not totally new, but there is evidence that these types of skill are reported by employers to be much more important than in the past. Some of these skills should more accurately be described as attributes and attitudes. Most organisations are looking for people who will 'fit in' and show the 'right attitudes'. Having excellent technical skills is rarely enough.

More broadly, these non-technical skills can be divided into those skills which enable people to function effectively in the work-place and those which enable them to apply their technical expertise. Considerable emphasis is placed on peoples' ability to work with others, communicate effectively, learn and develop. This is common to many occupations but in IT has certain additional dimensions. IT specialists need to be able to

communicate with other specialists and with non-specialists. They therefore need to be competent in the technical language, but also in translating this terminology so that non-specialists can understand. Working together in teams is common to almost all organisations (Dench *et al.*, forthcoming 1998). The ability to learn and develop also takes on additional aspects in relation to IT, compared to other occupations. The rate of change in IT is so great that many skills become redundant very quickly. Updating technical knowledge is essential for most IT staff.

Other skills which are receiving greater emphasis amongst IT staff relate to their ability to apply their technical expertise. In particular, the ability to relate IT to business needs, developing relevant solutions and being clear about what IT cannot do were reported to be important skills for IT specialists. To be truly effective in a business context, IT needs to operate in partnership with business needs. This is not only relevant to current activities. IT also has an increasing role in helping to take businesses forward, whatever their main activity. Closely related to this, but also to the technical nature of IT, was the need for IT specialists to be analytical, problem solvers and often creative.

All our respondents were making major investments in training IT staff. This was seen as essential to simply survive in a technical sense. However, as a broader range of skills has become important, if not essential, training effort has also been devoted to developing these. The majority were training new entrants to the occupation, and this was an important source of skills.

A major challenge for IT specialists is the rate of change in technology. Training is one means of keeping up with this change but alone it is not enough. New skill needs emerge quickly and it takes some time for the labour market to catch up. Several of our respondents were looking at how they could better forecast skill needs within their organisation. This was difficult and could only be based on current, known skill needs. However, many of the current technologies utilise skills and conceptual frameworks which were not foreseen some years ago. The challenge for the IT industry will be to develop specialists who have the analytical frameworks and intellectual capacity to quickly learn and take forward any new developments. Another challenge will be to develop the quantity of skills needed as new applications become popular.

This study also raised a number of issues which relate to an employer's ability to retain a skilled workforce. Some of these issues are common to other occupations, for example, engineers, but in many ways they are particular to IT. Providing a career structure, retaining and motivating staff was an issue for many employers. The high level of demand for IT staff in the economy generally, and the potential to earn high salaries make this occupation different to some others. Many of these issues are not particularly new. However, employers were beginning to take a longer-term view of them. Attention was being paid to, for example, the possibility of technical ladders to reward technical excellence and other ways of motivating employees. There are fewer opportunities for promotion generally, and fewer managerial posts, while promotion and progression in terms of pay and seniority remain society's measures of success. Employers are trying to introduce, and make generally acceptable, alternatives to these. In many respects a cultural shift in society generally is required to make it happen. This will take time, and perhaps be one of the major changes in the structure of work in the early 21st century.

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