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The growth and locational dynamics of the UK computer services industry, 1981-1996.

Neil Martin Coe

PhD Thesis
University of Durham
Department of Geography
1996

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13 JAN 1997

**PhD Abstract: Neil Coe, Dept. of Geography, University of Durham
August 1996**

'The growth and locational dynamics of the UK computer services industry, 1981-1996'.

The central aim of this thesis is to explore the key structural, organisational and locational trends within an innovative, fast growing and strategically important producer service sector in the UK, the computer services industry.

The thesis has five more specific objectives; firstly, to examine the ongoing internationalisation processes in this sector; secondly, to profile the spatial, structural and occupational structure of the UK industry in the context of these processes; thirdly, and most importantly, to explore the factors behind the uneven development pattern in this sector (London and the South East accounted for 59 per cent of employment in 1993); fourthly to contribute to the theoretical understanding of uneven development in contemporary economies; and finally, to consider the policy implications of the growth dynamics of the sector.

The research is based on three main tranches of fieldwork. Firstly, 17 interviews with managers and officials in the Irish software industry provide a case study of the highly internationalised nature of the package software industry. Secondly, nine interviews with representatives of the top suppliers in the UK industry illustrate how these dominant firms are restructuring both spatially and functionally to meet the needs of the developing, international market. Thirdly, the results of a structured interview survey of 173 firms spread across four counties (Hertfordshire, Berkshire, Cheshire, Tyne & Wear) are presented to illustrate the regional variations within the industry's structure, new firm formation process and linkages that both underpin, and reflect the uneven development pattern in the sector.

The analysis concludes that the dominance of the Greater South East in this industry is largely unassailable; based upon the historic growth of the industry, the region has long since achieved the critical mass to create many new firms which then reinforce the dominance, supported by the availability of labour, an acceptable living environment, and proximity to a large, high-order, regional market. The investment and restructuring strategies of key foreign-owned multinationals are also a key contributor to the South East's primacy.

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Declaration.

I confirm that no part of the material offered has previously been submitted by me for a degree in this or in any other University. If material has been generated through joint work, my independent contribution has been clearly indicated. In all other cases material from the work of others has been acknowledged and quotations and paraphrases suitably indicated.

Signed: Neil M. Gee
Date: 29/11/96

List of abbreviations.

BT	The privatised British Telecom
CCT	Compulsory Competitive Tendering
CSA	Computing Services Association (CSSA from 1995)
CSC	Computer Sciences Corporation
CSSA	Computing Services & Software Association
DEC	Digital Equipment Corporation
DTI	Department of Trade and Industry
EDS	Electronic Data Systems
EITO	European Information Technology Observatory
EU	European Union
FDI	Foreign Direct Investment
FM	Facilities Management
HP	Hewlett Packard
IBM	International Business Machines
ICL	International Computers Limited
IDA	Industrial Development Authority (of Ireland)
IT	Information Technology
MBI	Management Buy-In
MBO	Management Buy-Out
NOMIS	National Online Manpower Information Service
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturers
PC	Personal Computer
QSP	Quality Software Products
SCO	Santa Cruz Operation
SIC	Standard Industrial Classification
TTWA	Travel-To-Work-Area
VARs	Value Added Resellers

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Neil Coe, Durham, August 1996.

Chapter One: Introduction, research aims and methodology.

'Although the computer service industry is clearly a key growth sector in mature industrial economies, very little research has been undertaken on its locational development and organisational structure' (Howells 1987, p.494).

1.0 Introduction.

Information Technology (IT) is now a key factor in the growth and development of both manufacturing and service industries in mature capitalist economies. Indeed some authors suggest that such economies have now entered a new *informational* phase (e.g. Hepworth 1989, Castells 1989) in which information is key in facilitating restructuring, and in assuring competitiveness. The computer services industry, along with the telecommunications sector, fulfils a crucial role in providing parts of such an IT infrastructure to all sectors of the economy. The industry has taken on a particular significance in the 1980s and 1990s, due to the shift in profitability and activity within the whole IT industry from hardware production, to supplying software and other IT services. As an illustration, while in 1994 the world IT market grew in value by 7.6 per cent, this was made up of an 11.7 per cent increase in software and 7.1 per cent for the rest of IT services, compared to 6.5 per cent for IT hardware (EITO 1995).

Global demand for computer services is dominated by the markets of the US (42 per cent of total value) and Western Europe (30 per cent). The UK represents one of the most important and dynamic national computer service markets in the world, constituting some five per cent of the global total (EITO 1995). Along with France and Germany, the UK is one of the three major markets in Europe, representing 16 per cent of the total value. Moreover, the UK IT services industry is unmatched in Europe in terms of the level of maturity of the sector, and its openness to foreign enterprises. Within the UK economy, the computer services sector is now, by any measure, one of the leading growth sectors. Over the decade 1981 to 1991 it showed a remarkable job expansion of 169 per cent, increasing from 54800 to 147500 employees (Census of Employment via NOMIS - the National Online Manpower Information System). In contrast, the computer manufacturing sector experienced just an 11 per cent increase to 62900, less than half the 1991 computer service employment. Despite the recent recession which hit hardest at such service industries, the growth trend is continuing, and after a slight recessionary decline in 1992, employment in the sector had reached 213000 by June 1995 (Employment Gazette).

With some exceptions (e.g. Howells 1987, Henneberry & Lawless 1989, Cooke *et al.* 1992, Gentle & Howells 1994, Coe 1996, Howells 1996) surprisingly little work has been undertaken specifically on the locational development and organisational structure of this key sector (see quotation by Howells 1987, above). This doctoral research aims to start rectifying this gap. The central aim of the thesis is to explore the key structural, organisational and locational trends within this innovative and technologically advanced producer service industry in the UK, while at the same time conceptualising the sector as part of wider national and international economies.

This introductory chapter will firstly expand on the rationale behind the research and the main aims of the thesis. Secondly, the definition of 'computer services' is considered, and the operational definition used in this research will be presented. Thirdly, the methodologies used in data collection are described and evaluated, before some of the important policy issues relating to the research are introduced in the fourth section. The final section of the chapter will outline the structure and content of the rest of the thesis.

1.1 Research rationale and aims.

Many authors now recognise the need for detailed sectoral studies of individual service sectors. In a major review of producer service research in the mid-1980s, Marshall *et al.* (1987, p.40-41) concluded that;

'we believe future research should concentrate on survey work supplemented by the material available from professional and trade associations, trade unions, consultancy organisations and specialist publications on service industries.....an investigation of local areas will need to be combined with sectoral or commodity based studies' (their emphasis).

Similarly, Harrington (1995a, p.94) suggests that *'.....individual researchers must gain substantial expertise in a particular industry.....rather than further papers about the two-thirds of the economy that is "the service sector"'*. The concept of 'the service sector' highlighted by the latter author covers a hugely diverse and disparate range of economic activity. Even when industries are grouped together under headings such as 'producer' or 'consumer' services, there remains a huge variety of activity within such categories. Only by looking in detail at individual sectors in specific regions can accurate information be collected, and equally importantly, can the internal structural and regional variations within individual industries be identified.

The importance of understanding the specificities of different service types is also identified by Marshall and Wood's (1992, 1995) 'service-informed' view of economic restructuring. Such an approach sees neither production or service operations as the key drivers of economic change, but recognises the interdependencies between these sectors

of the economy. Hence, any sectoral study must consider the industry's linkages to other sectors of the economy in different localities, and in particular, the role and importance of these services to their clients. This is especially important in studying the computer services sector, which plays a key role in the 'information' economy by facilitating the storage and manipulation of huge quantities of data. As such, its strategic importance will extend beyond its simple employment levels, and information technology expertise has become crucial to the competitiveness of most sectors of the economy. Furthermore, the computer services sector is particularly interesting due to its highly innovative nature, which reflects the rapid rate of technological change in the IT industry as a whole.

The central aim of this thesis is to examine the growth and locational dynamics of the UK computer services industry within the context of this 'service-informed' view of economic restructuring, while at the same time recognising that service markets are increasingly international in their nature (Allen 1992, Daniels 1993). The main objectives of the thesis can be explained in more detail under five headings.

The first aim is to situate the spatial and structural dynamics of the UK industry in the context of what are increasingly internationalised European and global producer service markets. This will be examined in two ways. Firstly, the internationalisation of one particular subsector of computer services, software products, will be profiled using a case study of US investment in Ireland, a key base for software package production in Europe. Secondly, as large multinational firms dominate the international supply of computer services, the restructuring and internationalisation strategies of the key suppliers to the UK market will be analysed. The second aim of this research is to provide an up-to-date profile of the structural, locational and occupational characteristics of the UK computer services industry as a whole, using employment data, aggregate survey data and secondary sources. This will both give an indication of the impact of internationalisation processes on the UK industry, and provide the necessary context and background for county level studies.

The third, central, objective of the thesis is to examine the spatially uneven development of the UK computer services sector. The concentrated distribution of employment in many advanced producer service sectors is widely recognised (e.g. Howells 1988, Marshall *et al.* 1988); in the case of computer services, London and the South East alone accounted for 59 per cent of total UK employment in 1993. By analysing regional variations in both new firm formation processes, and the linkages of computer service firms to their markets, fellow IT-service providers and suppliers, this research aims to show how the development prospects for this sector are (and have been historically) far from equal across the UK, with the South East region being clearly dominant. While an

even development pattern cannot be expected in such a knowledge based sector, computer service development is nonetheless seen as desirable for more peripheral areas, not only because of the high-skill employment potential of the sector, but also due to the role of the sector in encouraging technological innovation (Allen 1992), and the potentially 'exportable' nature of its business (Howells 1987).

Fourthly, leading on from this sectorally-based analysis, the thesis aims to make a contribution to the theoretical understanding of the processes behind the uneven regional development patterns of contemporary economies. Finally, the policy implications of the growth dynamics of the computer services sector will be evaluated at the international, national and local levels. The sector has so far been largely ignored by policy initiatives at all scales (Howells 1996; see Section 1.4), and hence an important motivation for investigating the sector in detail is to inform and develop such debates.

1.2 Defining the computer services sector.

Sectoral boundaries are becoming increasingly blurred in modern economies, and hence, as with many service sectors, there are difficulties in defining a distinct computer services industry, with IT employees being present in all parts of the economy. However, this thesis focuses on the fastest growing and most structurally dynamic segment of the IT industry, the independent providers whose core business is the provision of software and computer-related services to companies in other parts of the economy. The grouping 'computer services' itself seems to bridge the divide between 'service' and 'manufacturing' activities, covering as it does such diverse activities as strategic IT consultancy and the routine manufacture of software products. The common characteristic of all computer services, however, is that they create added value to increasingly commoditised hardware systems by supplying programming and other kinds of service expertise.

For the purposes of this thesis, the starting point for such a definition of independent computer services is Activity Heading 8394 of the 1980 Standard Industrial Classification, so as to allow comparison with Census of Employment data (see analysis in Chapter Four). This Activity Heading covers the following areas; hardware consultancy, software consultancy and supply, data processing (including computer time hire), database activities and 'other computer related activities'. Under the new 1992 SIC, this field is covered by Class 72, which additionally includes the maintenance and repair of office, accounting and computing machinery. Not included are, however, further activities that are also undoubtedly IT-based services, such as IT training, IT staff recruitment and the value added reselling of IT products and services. Hence, a fairly broad definition of the sector was used when selecting businesses for research, largely corresponding to the UK Computer Services and Software Association's list of

activities undertaken by its firms. Table 1.1 lists these main subsectors, with a brief description of what they entail. In reality, many companies provide a combination of these various services. For example, the provision of any non-standard software system usually involves consultancy work in the early stages, an element of training, and then some kind of support or maintenance contract after installation, in addition to the actual design and supply of the system.

While this schema provides a basic classification of the industry sub-markets, Howells (1987) notes that further distinctions can be made in terms of other characteristics such as the type of computer service supplier, size of the target computer system and delivery mode. The most important distinctions for this research concern the type of supplier. Firstly, independent suppliers need to be separated from internal IT providers. It should be recognised that the computer service industry *per se* is much smaller than the whole of computer service activity in the economy. Estimates vary as to the exact proportion of computer services that are provided by the independent sector. While Senker and Senker (1994a) suggest that 75 per cent of computer specialists are in user organisations, in contrast Brady (1992) asserts that a similar proportion of software is provided externally. However, most studies indicate that the independent sector accounts for 40 to 50 per cent of employment (e.g. Quintas 1994, Howells 1996). For example, UK National Computing Centre data from the late 1980s suggests that 180000 (60 per cent) of the total 300000 UK software personnel of the time were working in user sectors (Quintas 1994). For the purposes of this research a pragmatic approach was adopted whereby only IT units that were established as a distinct company, and gained a substantial proportion of revenues (over one third) from clients outside the home business, were considered.

Secondly, IT service-based businesses need to be distinguished from hardware companies. Businesses that simply distribute and retail standard hardware were not considered in this research. Similarly, retailers of standard software packages were not included. However, firms that create added value by coupling hardware sales with software systems and installation, customisation and maintenance services were considered. While many computer service firms resell hardware as part of their solutions, this usually contributes little to profitability and is not considered to be their core business. Thirdly, some firms provide computer services in combination with non-IT based services. For example, IT training may be coupled with secretarial courses, or IT consultancy may be combined with various other forms of management and strategic consultancy. In such cases, only businesses gaining over half of their revenues from the IT component of their activities were included.

In summary, while all classifications are by their nature fairly arbitrary, for the purposes of this research it was possible to identify a discernible body of independent service firms gaining the majority of their revenues from computer-related activities.

Table 1.1: The main subsectors of computer service activity.

Activity	Brief description
Software Products	The provision of standardised software packages, either shrink-wrapped or with a high degree of transferability between clients.
Custom Software	The development of bespoke, highly specialised software systems with a low degree of transferability between clients.
Total Systems / Systems Integration	The design and provision of complete, integrated systems of hardware and software, sometimes known as 'turnkey' systems.
Consultancy	The supply of expert IT systems knowledge on a fee basis.
Facilities Management	The management and maintenance of parts, or all of a client firm's IT infrastructure. Also known as outsourcing or contracting-out.
Independent Maintenance	The fulfilment of hardware maintenance contracts relating to equipment produced by other vendors. Also known as third party maintenance.
Data Processing	The provision of data processing services to client's using the suppliers own facilities on a time hire or batch basis. Historically termed 'bureaux services'.
Education & Training	The undertaking of any IT-systems based training. Can range from training on standard packages, to computing languages, and high level systems analysis and design.
Recruitment & Contract Staff	The selection and provision of IT staff to clients on a contract basis.
Database Services	The design, management and maintenance of client databases, usually using the suppliers systems.
Software Maintenance	The fulfilment of software maintenance contracts. Often involves help-desk facilities and different levels of support.
Value Added Reselling	The adding of service value to combinations of hardware and software provided by other vendors.
Value Added Networks	The design, installation and maintenance of IT networks, on either a local, or wide-area (company wide) basis.
Contingency Planning	The provision and maintenance of back-up systems for IT critical businesses in the event of accidents or disasters. Often termed disaster recovery.

Source: CSA 1992, author's interviews.

1.3 Methodologies used and the choice of case study areas.

In order to investigate the issues outlined in Section 1.1, three main tranches of fieldwork were undertaken. Firstly, a large-scale structured interview survey of managers in 173 computer service firms was undertaken across four counties. Secondly, unstructured interviews were conducted with key managers from nine of the 12 largest computer suppliers to the UK market according to 1994 figures. Thirdly, 17 semi-structured interviews were arranged with managers and officials involved with the overseas software industry in Ireland. In addition to reviewing the relevant literature and Census of Employment data, it was necessary to examine the structure and

characteristics of the computer services sector before designing the main research programme. This was achieved by undertaking unstructured interviews with representatives of the Computer Services Association (CSA), Institute of Analysts and Programmers (IAP), BIFU (Banking, Insurance & Finance Union), and MSF (Manufacturing, Science, Finance Union) along with a systematic search of *The Times* and *Financial Times* over the period 1990 to 1994. The three main surveys will now be considered in turn.

1.3.1 The structured interview survey.

The central aim of the structured interview survey was to provide comparable, detailed information on the characteristics and linkages of representative samples of computer service firms in different geographical areas. Interview surveys were chosen to achieve a higher response rate (and therefore a better representation of the industry as a whole in each area) than that typically achieved with postal surveys. Before the methodology was completely finalised, a small pilot study was undertaken in the North East in March 1994. Of 15 computer service firms contacted from a Northern Development Company database, 12 were interviewed, giving an encouraging response rate of 80 per cent. The original pilot questionnaire contained both structured sections and open questions. As a result of experience gained while undertaking the pilot, the questionnaire was substantially altered, and many of the more open questions were structured. The questions covered six main areas; company activity, location issues, linkages, employment structure, telecomms and technology, and the impacts of recession and future strategy. A copy of the amended document used in the four main surveys can be found in Appendix I.

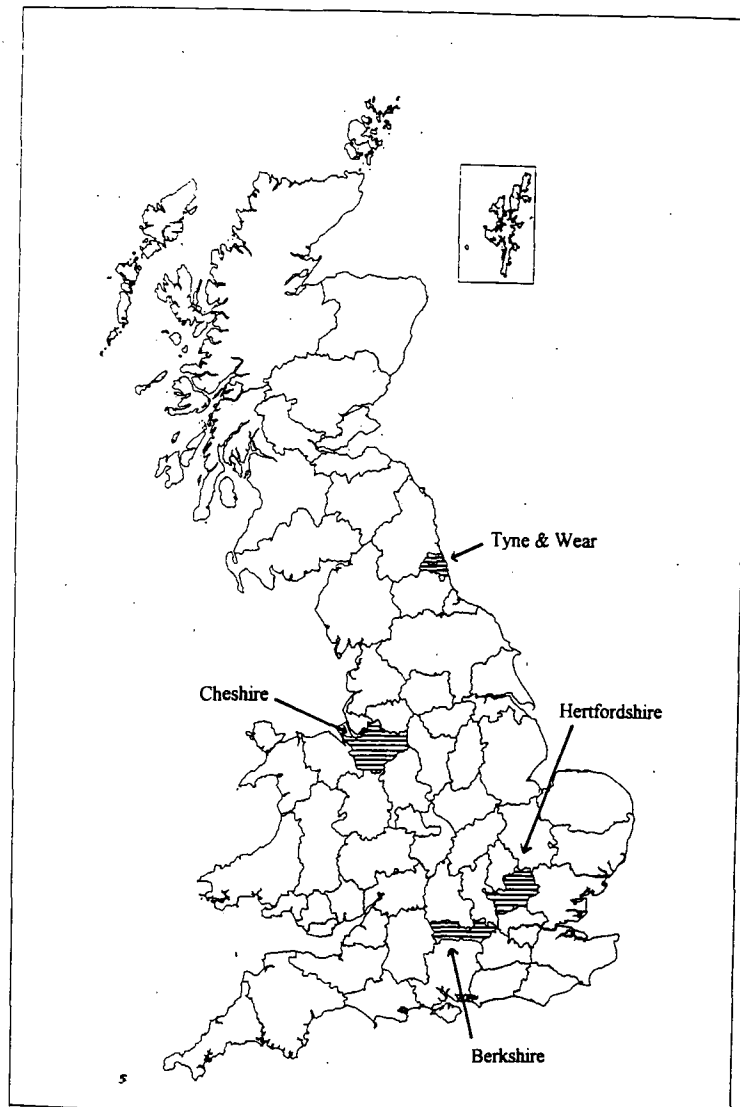
After undertaking the pilot study, the scale of sample area for the main surveys had to be chosen. For previous research (Coe 1991), the local authority district level had proved effective for a complete set of expanding firms over a given period. However, for a sample from a much larger population (i.e. all existing computer service firms) a county level approach was deemed more appropriate for several reasons. Firstly, it allows for any local government economic development schemes at the county level to be considered, in combination with any district-based initiatives. Secondly, by providing a larger population over a wider area than local district authorities, such an approach limits the distortions from any local concentrations or specialisations within the computer services sector. Furthermore, whereas many districts are of either an urban or rural nature, undertaking research at the county level provides a mix of urban and rural locations. Finally, many of the lists of computer service firms used were compiled at the county level.

It was decided to choose four counties for the survey work in order to balance the need for inter-sample comparisons with the time and financial resources available. The actual sample areas were chosen on the basis of the 1991 Census of Employment data (see Chapter Four); Tyne & Wear, Cheshire, Hertfordshire, and Berkshire. The pilot study had suggested that a core-periphery dimension would be profitable, and hence two counties were chosen in both the South East (core) and the North (periphery) to provide a good basis for a four-way comparison. Tyne & Wear accounts for the vast majority (75 per cent) of computer service employment in the North East (Tyne & Wear, Cleveland, Northumberland and County Durham) and was chosen to characterise de-industrialising urban areas of the North with a lower than average representation of computer service employment. The choice of Tyne & Wear also offered an opportunity to build on the data gained in the pilot study. Cheshire was chosen as the only county outside the South of England with an above average level of employment in this sector. Hertfordshire was chosen as it is located firmly in a band of high growth to the west of London. However, there would obviously be dangers in suggesting Hertfordshire is typical of all high-growth South-East counties, and so the traditional home of the IT industry, Berkshire, was chosen to provide a comparison. While the possibility of selecting a London borough was considered, due to the strong decentralisation trend from the city, it was decided to concentrate on high-growth counties in the South-East. Financial constraints also mitigated against fieldwork in London. Figure 1.1 illustrates the location of the four study counties in the UK.

Two main choices of sampling procedure were considered for the surveys; a random sample or some kind of matched pairs analysis. Matched pairs analysis has been used successfully by O'Farrell *et al.* (1992), who have also discussed the merits of the method in general (O'Farrell & Hitchens 1988). The central problem with a random sampling approach is that it may overlook structural factors within the study sector, and hence when comparing firms' fortunes in different areas, may not be comparing like with like. Thus, matched pairs analysis involves matching firms in different areas on the basis of their characteristics (normally age, size, ownership and precise sector) and then comparing their relative performance. This would overcome the problem for example, of comparing computer service firms in an area where they are mainly linked to defence industries, with another where the main market is finance. However, with respect to this research it is very important to establish the parameters of the sample population. For example, it is crucial that the relative importance of the different subsectors within computer services in each area and between the sample areas is obtained. To give firms in all areas of computer services equal weighting in a pairs analysis would be misleading, as some areas such as software products may be better represented. In view of this fact, and the time consuming nature of such an approach, a random sampling method was

seen as satisfactory, although recognising that the aim is to give a 'portrait' of the sample regions, and not to compare individual firms directly.

Figure 1.1: The location of the four sample counties.



Although firms were therefore selected randomly, the samples were stratified by sizeband. From an early stage in the research it became apparent that the sector was characterised by a mixture of very small and large firms, and hence it was crucial that the sample as far as possible reflected the sizeband structure of the industry in each area. While the Tyne & Wear survey reflected a 100 per cent sample of the industry, in the three other areas only a proportion of the total industry were sampled. In these cases, the firms were arranged in size groupings before a stratified sample was taken. A wide variety of sources was used to assemble the best and most up-to-date lists of establishments for each area, and these are listed in Table 1.2 (below). The majority of these lists provided the sizeband data necessary for the sampling procedure. Total sample sizes of around 70 to 80 firms were selected in each of the four areas to give

approximately 40 interviews once firms in the wrong sector, firms that had closed and refusals were discounted. The same number of firms were approached in each area for two reasons. Firstly, it was felt that interviewing any less than 40 firms in any area could lead to bias towards one subsector, sizeband or type of establishment. Conversely, interviewing more than 40 companies in areas with larger computer service sectors proved impossible due to financial and time restrictions. While the terms 'firm', 'company', 'business' and 'establishment' are used interchangeably in this thesis to avoid repetition, it is important to remember that the survey results correspond to individual establishments (i.e. branch functions as well as single-site firms and headquarters) and not necessarily whole businesses.

Table 1.2: Data sources used for the surveys.

Survey	Date undertaken	Sources for company sample
Pilot study	March 1994	Northern Development Company Business Dataline
Tyne & Wear	June / July 1994	Tyne & Wear Research and Intelligence Unit Listing of Specialist Businesses CSA Official Reference Book 1994
Hertfordshire	September 1994	Hertfordshire Business Directory, HCC Planning and Environment Dept. 1994 CSA Official Reference Book 1994
Berkshire	February 1995	Berkshire County Council Industrial and Commercial Directory 1992 Thames Valley Chamber of Commerce list of members Kompass Directory
Cheshire	April / May 1995	CSA Official Reference Book 1995 Cheshire County Council Business Directory Database Chester / Vale Royal / Congleton / Macclesfield / Warrington / Halton / Ellesmere Port & Neston District Council business directories Kompass Directory Kelly's Index
Ireland	June 1995	CSA Official Reference Book 1995 CONNECT: A database of the software industry in Ireland, Irish Trade Board and National Software Directorate, July 1993
Top 12 UK suppliers	November / Dec. 1995	Holway Report 1995 Kompass Directory CSA Official Reference Book 1995

Note: In addition to the sources listed above telephone directories and Yellow Pages were used to confirm existence of firm and addresses.

A problem with many such surveys is that they recognise only successful firms, i.e. those which are surviving. While monitoring newspaper reports can provide information on large firm closures (e.g. Townsend & Peck 1985), such analysis is almost impossible for the small firms that typify this sector. One way of looking at failure rate is to log the number of firms on the original sample list which no longer exist, as a rough indication

of the rate of closures since the list was assembled. However, this obviously takes no account of the number of new start-ups that have occurred since the date of the list.

Once the total sample had been selected from the lists, a manager in each firm was approached by letter, an example of which is given in Appendix II. Experience suggested that important components of the letter were evidence of other businesses already taking part in the survey, acknowledgement of where the company details were accessed, the promise of confidentiality, and the offer of feedback in return for an interview. Due to experience gained in the pilot survey, different designations of managers were contacted according to the size of firm. For small firms with under 25 employees, managing directors were found to have the best knowledge of the company and its overall development. However, for larger businesses (over 25 staff), marketing managers were found to be most appropriate. While managing directors in such firms were often too busy to interview, marketing directors were often used to presenting and summarising key data about the company, due to the nature of their job. Dissertation and pilot study research had illustrated that a personal contact within the target businesses was crucial, and hence, where the list or source used gave no contact name, a preliminary phone call was made to each firm to acquire the name and details of the required manager.

Table 1.3: Response rates for the four county samples.

COUNTY	Tyne & Wear	Herts.	Berks.	Cheshire	Total
Total Sample: A	84	80	70	76	310
Duplicates: B	4	2	1	0	7
Firms no longer present: C	16	14	5	15	50
Incorrect classification: D	8	2	3	2	15
Effective Sample: E = A-(B+C+D)	56	62	61	59	238
Refusals / Failures: F	10	19	20	17	65
Number of interviews: G = E-F	46	43	41	43	173
RESPONSE RATE: G/E	82.1%	69.4%	67.2%	72.8%	72.7%

The letter typically produced a spontaneous response from some 25 per cent of the sample, and, as detailed in the letter, the firms that did not respond were telephoned a week to ten days later. The sample firms were then repeatedly telephoned until a response was gained, a process which continued well into the actual fieldwork period. As a result, positive responses were achieved from over two thirds of all four effective samples, as detailed in Table 1.3 (above). Where the size structure of the interviewed firms was seen to diverge from that of the overall sample, certain sizeband groups were targeted for further letter and telephone contact. This was necessary to improve the representation of large firms (over 100 staff) in two of the four county samples. The emerging samples were also monitored in terms of their subsectoral composition,

although this was more difficult to assess as many of the sources did not indicate the activities that firms were involved in. Where the lists used did include such information, no bias towards any particular types of activity were evident.

The interviews were typically carried out over an intensive three to four week period, to restrict both accommodation and travel expenditure. In turn, all four county surveys were carried out as continuously as possible to aid comparison. Complete lists of the interviews undertaken can be found in Appendices III to VI. Interviews typically lasted between 30 minutes and one hour, and although many of the questions were standardised, issues of interest and particular relevance were also discussed freely where possible. During the fieldwork period, local government economic development officers, TEC (Training and Enterprise Council) and development agency officials were also contacted for interviews to discuss their views and perceptions as to the importance and role of the computer services sector in their respective local economies.

1.3.2 Unstructured interviews with the top UK suppliers in 1994.

Due to the large market share accounted for by the largest suppliers to the UK market, the top 12 companies were targeted for largely unstructured interviews. This part of the research was left until as late as possible in the research schedule (November / December 1995) due to the rapid rate of restructuring in these corporations. Although initially the firms' Chief Executives were contacted by letter, most of the interviews were undertaken with marketing directors or business development managers. Directory, newspaper and company publications research was undertaken before the interviews to provide a picture of the major issues and restructuring processes affecting each individual firm. However, five key areas were covered in all the interviews; organisational and spatial structure, the impacts of recession, strategic alliances and links to other IT firms, the rise in IT outsourcing, and future company development strategy. Of the 12 firms contacted, nine were interviewed, giving a response rate of 75 per cent. A full list of the interviews undertaken is given in Appendix VII.

1.3.3 Semi-structured interviews with managers in the Irish software industry.

During the early stages of this research, it became apparent that the globalisation of software supply to lower cost countries such as India (sometimes known as 'offshore programming') was a crucial trend that could impact on businesses in mature IT markets such as the UK. One country increasingly engaging in the large scale production of software is the Republic of Ireland, based mainly upon foreign direct investment from US companies looking to access the UK and European markets. To investigate the implications of these firms locating in Ireland rather than the UK, and also to gain an impression of the international structures of software firms, an interview survey was undertaken with managers and key officials in the overseas software sector in Ireland.

Using information from an Industrial Development Authority (IDA) database, a list was compiled of foreign-owned software companies in Ireland that employed over 20 employees and were not simply branch operations. To simplify the fieldwork schedule, only firms in Dublin and Cork, the two leading locations for software businesses, were contacted. The interviewed firms were asked a mixture of structured and open-ended questions about their operations in Ireland, the factors behind their choice of Ireland as a location, their employment structures, and the role of the Irish bases within their international structure. Of the 23 relevant firms contacted, 15 were interviewed, giving a response rate of around 65 per cent. This is slightly lower than in the other surveys due to the time constraints as to when firms could be visited. A full list of the interviews undertaken is given in Appendix VIII.

1.3.4 Assessing the methodology.

As the preceding three sections have illustrated, the central form of data collection for this thesis was the corporate interview, structured to various degrees depending on the target sample, and it is on this topic that the ensuing discussion will focus. The samples themselves appear to have proved effective for summarising the characteristics of the population from which they were drawn, and have provided the basis for valuable intra and inter-regional comparisons. The main deficiency of the four county samples was that they under-represented the importance of very small firms (1 to 4 employees), a problem common to all service sector research due to the lack of accurate lists, and the rapid pace at which such firms appear and disappear.

By undertaking the large-scale structured survey on a face-to-face basis, it was possible to restrict many of the problems commonly associated with standardised questionnaire surveys. For example, as has already been mentioned, a high response rate was gained, and the constitution of the sample was monitored with respect to the total population. Schoenberger (1991) suggests that a major problem with standardised surveys is that respondents can interpret the same questions differently. Here, by undertaking an interview-based approach, and thereby phrasing and explaining the questions personally, the interviewer could attempt to ensure that all interviewees understood the enquiries in the same way. Furthermore, the interviewer could annotate responses that seemed to be answered hastily or on the basis of limited information. Another advantage of this approach was that although the basic questions were standardised, there was scope for free discussion of points of particular interest and relevance. In this way, anecdotal evidence relating to the causality of the processes lying behind the firms 'characteristics' could also be recorded, and some of the advantages of both what Sayer (1992) terms 'intensive' and 'extensive' methodologies were achieved.

McDowell (1992) highlights the importance of assessing the positionality, or power relations involved in the interviewing of business managers. Unlike Schoenberger, who asserts that the interviewer often finds themselves in control, McDowell feels that *'.....the interviewer is more often in the position of a supplicant, requesting time and expertise from the powerful, with little to offer in return'* (McDowell 1992, p.213). Although the latter is the most accurate appraisal of the power balance in many of the interviews undertaken for this research, as experience and knowledge was gained through the series of surveys, interviews were conducted on an increasingly even footing, and responses were interrogated more rigorously. As the vast majority of interview subjects were male, there were no real gender relation issues, another problem with the corporate interview noted by McDowell.

Another area of concern debated by Schoenberger and McDowell is the 'validity' of information obtained in corporate interviews. By its very essence, this research has depended upon the honesty and integrity of those interviewed. While some respondents will undoubtedly have distorted or hidden the reality of their firm's situation, emphasising the academic and non-competitive nature of the survey hopefully minimised such discrepancies. To improve the validity of the evidence from interviews with large firms, given more time it may have been better to interview a number of key employees to try and corroborate and confirm crucial ideas by the process of triangulation. However, good preparation in the form of newspaper and trade magazine research was able partly to reduce this problem. As Schoenberger suggests, an interesting way to verify results was often to engage managers in discussions about their competitors, and how their own firm differs from them.

Overall, the three interview surveys have together provided a powerful combination of standardised and anecdotal, firm-specific information, that enables the process of profiling the sector and its internal and regional structural variations to begin.

1.4 Policy issues.

This section will briefly introduce the policy context within which the computer services industry is situated. It is useful to consider such policies at three different levels; international (European), national and local. In general there has so far been little policy recognition of the strategic significance of this industry at any of these levels.

At the international level, Howells (1996) suggests that *'in terms of EU industrial and regional policy initiatives, the computer services industry has been generally neglected'* and that *'as with other services, [has] traditionally been seen as a "laggard" sector of the economy and therefore of no intrinsic interest to policymakers'* (p.21). Instead, the telecommunications and IT hardware sectors have been perceived to be the leading

drivers of change, gaining higher profile in technology initiatives such as ESPRIT. The EU's new vision of the information society is detailed in the influential 1994 Bangemann Report, named after the European Commissioner for Information Technology Martin Bangemann. While it recognises the importance of the computer services industry, the report cites international deregulation of Europe's telecommunications network and increased private investment as the keys to developing an information-based society.

In the context of industrial and competition policy, computer services have received very little direct attention from the European Commission, although the introduction of market harmonisation and access programmes and a range of other liberalisation policies have had an indirect impact. Similarly, EU regional policy has only recently started to address business service issues directly, with many effects again being indirect, such as from the STAR programme which focused on improving access to advanced telecommunications services in peripheral areas. A more encouraging development is the TELEMATIC scheme (successor to STAR) which encourages small and medium-sized firms to use and supply electronic and computer services from peripheral locations. European Regional Development Fund money is available for the setting up of computer service activities in less-favoured regions. The software industry has, however, benefited most in the form of substantial funding through EU technology policies. Estimates suggest that software development projects received 40 per cent (2 billion ECU) of the total EU technology-oriented research projects funded over the period 1983 to 1994 (Pierre Conseil *et al.* 1992, in Howells 1996). This is set to continue under various programmes; the Fourth Framework Programme (1994 to 1998) under the IT programme (successor to ESPRIT), Advanced Communications Technologies and Services (ACTS), RACE, TELEMATICS and EUREKA.

The European Commission is coming under increasing pressure to focus more attention on the software and services industry. Many commentators feel that the EU could do far more to stimulate the development of indigenous businesses in a European market increasingly dominated by US corporations (see Section 3.2). For example, a group of leading European suppliers recently lobbied for a common software strategy as one of the key elements of the information society (*Computing* 29 June 1995a). Such a strategy would start by outlining the IT needs of the EU and the strengths of its existing computer companies.

While the computer services industry still occupies a background role in European IT policy, the sector has so far received even less policy attention in the UK at the national level. Since the sale of the previously nationalised ICL to STC (Standard Telephone & Cables) in 1984, the development of the IT industry's strategy and standards has been largely left to the private sector and market forces. The UK has no IT-specific strategy

or competitiveness policy, unlike other countries such as Japan and France, and there are no funding initiatives targeted specifically at the industry (*Computing* 2 June 1994). The main lobbying body of the industry is the Computing Software and Services Association (CSSA), but its influence is marginalised by the DTI's decision to negotiate with just one trade body from each industry, which can bring the CSSA into competition with the Federation of the Electronics Industry (*Computing* 13 April 1995b). According to Douglas Eyeions, a previous Director-General of the CSSA, the single most important impact of government policy on the IT industry has been the opening-up of public sector IT markets to private companies in the early 1990s, through the enforcement of market testing for Civil Service contracts, and compulsory competitive tendering (CCT) for local government contracts (personal interview 20 January 1994).

The sector is not influenced to any great extent by the indirect effects of government policies. Regional policy has little or no impact on the sector, as with many service industries, although computer service firms in Assisted Areas can apply for Regional Selective Assistance when they create employment, if they serve a non-local market. A major problem for small IT-service firms is attracting funding, and despite the creation of the small firm loan guarantee scheme, banks are still very reluctant to lend money to companies without a tangible product. Many of the schemes that do offer funding to IT firms are run by the Department of Trade and Industry (DTI). As with other technology based sectors, firms can apply for grants related to new innovations, product development, export promotion, gaining quality assurance and subsidised consultancy advice (Department of Trade and Industry 1995). In February 1996 the DTI launched an Information Society Initiative in the wake of the Bangemann Report, but the central focus of the scheme is to advise companies on the use and uptake of IT, rather than any strategy for the IT industry (*Computing* 22 February 1996). Similarly, the two year BuyIT initiative started by the DTI in 1995 is designed to improve IT procurement practices across the economy (*Computing* 29 June 1995b). Hence, while the Government is increasingly recognising the strategic importance of IT for the competitiveness and efficiency of both public and private sectors, the IT industry itself is still largely ignored.

Although business services are becoming increasingly recognised as an important constituent of the economic base of local economies (Townsend 1991, Williams 1994), many local economic development strategies in the UK are still based upon trying to attract inward investment in selected manufacturing sectors with property and capital grant incentives. While many councils in the areas that dominate existing business service employment have only recently started to formulate economic development strategies (e.g. Hertfordshire and Berkshire), more peripheral areas with a longer history of such strategies, such as Tyne & Wear, tend to focus on attracting the relocation of

lower skill business services such as telephone call centres (Richardson & Marshall 1996). While attracting such IT-intensive firms may improve the local demand for computer services, there are now indications that some peripheral areas have recognised the potential of the sector itself. For example, Wales and Scotland now have initiatives targeting both local and outside investors in the software industry. The potential for such strategies is assessed in detail in Chapter Five (Section 5.3.3).

Overall, this brief policy review suggests that Howell's (1996) recognition of a policy gulf with respect to computer services at the European level also holds at the national and local levels. Indeed, recent national-level policy developments in the UK can be seen simply as a response to the increasing interest in IT policy at the European level. A summary of the policy implications of the empirical research in this thesis is presented in the concluding chapter.

1.5 Outline of the thesis.

This section will outline the structure and content of the remainder of the thesis. Firstly, Chapter Two considers the theoretical background to this research. After presenting both manufacturing and service-oriented conceptualisations of the role of services in economic change, the chapter outlines the service-informed view of economic restructuring proposed by Marshall and Wood (1992), which provides the theoretical framework for this study. In turn, the chapter then considers how the existing literatures on producer service growth, the information economy, flexible production systems and high-technology industries can each contribute to a study of the computer services industry. The most important influences on this thesis emerge from the general producer services literature, which offers various ways of interpreting the growth, locational dynamics, market linkages and contributions to competitiveness of such sectors. While much of this research considers broad groups of amalgamated service activities, by looking at the regional and internal variations in the linkages and growth processes of a clearly defined computer services sector, it appears possible to adopt a more 'service-informed' approach.

Chapter Three focuses on the increasing internationalisation of the computer services industry. By way of introduction, the key modes of internationalisation in producer service sectors are considered, illustrating in particular the growing importance of foreign direct investment. Next, the supply and demand structures of the computer services industry are reviewed at the world and in particular, the European scale, highlighting how the increasingly internationalised nature of the industry is reinforcing the market domination of US firms. The second half of the chapter presents a case study of foreign investment in the Irish software industry to examine the international structure of one subsector of computer services, that of software products. The study

describes how, by judiciously targeting and attracting foreign investment, Ireland has grown into a key site for software manufacturing and localisation, producing around fifty per cent of all the personal computer software products used in Europe.

Within the context of these internationalisation processes, Chapter Four presents a profile of the spatial, structural and occupational characteristics of the contemporary UK computer services sector. Firstly, Census of Employment statistics are used to analyse the changing spatial distribution of computer services employment since 1981, illustrating the overall importance of London and the South East, and the growing relative importance of localities forming a 'western arc' around London. Secondly, a brief account of the historical emergence and spatial development of the UK computer services industry is presented to contextualise contemporary developments. Thirdly, four key structural characteristics of the UK sector are considered; the growing number of new entrants to the market, the industry's dichotomous sizeband structure, the increasing level of foreign penetration, and the changing subsectoral composition of the sector as a result of rapid growth in the software products and facilities management segments. The fourth and final section examines the gender and occupational composition of the workforce in the computer services industry, before proceeding to consider skills shortages and new forms of working.

The subsequent three chapters focus on key determinants of uneven development in this sector; the first two of these are based upon the results of the county interview survey. In Chapter Five, regional variations in the new firm formation process are presented. By way of context, the chapter initially presents the main characteristics of the four survey county economies, and their respective computer service sectors. Next, after profiling the quantitative variations in regional new firm formation rates, the chapter then considers qualitative variations in the new firm formation process. In particular, there appears to be important variation in the modes of start-up, the sectors of origin of founders, and the type of funding used in the four survey counties. The analysis suggests that the majority of firms emerge from their local economic structure, and that this leads to unfavourable rates of growth in many peripheral areas. The next section considers the locational influences on computer service firms, illustrating how the problems of peripheral areas are compounded by the lack of long-distance mobility of such firms, and the penultimate part of the chapter then considers the implications of these results for local economic development schemes. The chapter concludes with a review of the problems facing growing small firms.

Chapter Six develops the interpretation of the uneven development of the computer service sector, considering regional variations in the market, horizontal, and backward linkages of firms. The sales linkages of the survey firms are firstly analysed in terms of

their spatial extent and client sector, showing the importance of the South East and service sector markets. Regional variations are then interpreted in terms of the sizeband, status and subsectoral composition of the industry in each county. The analysis suggests that a transactional approach to market links may be profitable, and that the aggregate data may mask differences in strategy between individual firms. Size characteristics of the client base of computer service firms are then evaluated, before the technology behind the market links is considered, suggesting that inter-firm telecommunications links are as yet rarely used. The chapter concludes with an analysis of the linkages of computer service firms to their suppliers and fellow IT companies, indicating that while such links are highly important to certain types of firm, they are not in any way dependent on spatial proximity.

Chapter Seven assesses the role of large firm restructuring in the uneven development of the UK computer services sector. With the top ten providers in the UK accounting for some 40 per cent of the total market, it is crucial to investigate the organisational and spatial restructuring of these top suppliers. The chapter uses case studies to analyse the central processes of company development and locational change in the UK for five key types of computer service business (introduced in Chapter Four); the established hardware giants, outsourcing-led corporations, traditional computer service firms/systems integrators, software product based companies, and international IT consultancies. Key trends running through the case studies appear to be a shift towards functional rather than spatial divisions of labour, organised on an international basis, and the targeting of key market sectors. In spatial terms, the majority of employment in these firms is located in the South East. While the shift of the hardware giants into service markets is favouring locations in the South East, the growth of other firms in the outsourcing market is promoting employment growth outside the core region. The second and third sections of the chapter focus on two important aspects of large firm development and their spatial implications, namely the growth in strategic alliances between IT service companies, and the increasing importance of the outsourcing market.

Finally, the concluding chapter will reiterate the aims of the thesis and its main conclusions. In particular, the implications of this thesis for understanding uneven development in both computer services, and the economy as a whole will be considered. The policy implications of the research will then be discussed, and the thesis will conclude with a summary of how the research could be developed and augmented in the future.

Chapter Two: The state of the art - the theoretical and conceptual background.

'.. in spite of their growing quantitative importance, the role of service functions in current processes of economic, including spatial, transformation remains theoretically marginalised. The complex interdependencies that sustain both modern material transformation and service expertise are, at best, caricatured. The possibility that the role of service functions may be fundamental in capitalist change has been neglected' (Wood 1991b, p.161).

2.0 Introduction

Service industries now dominate the employment structures of advanced capitalist economies. In 1992, they accounted for 73 per cent of jobs in the USA and 64 per cent in the European Community, the figure for the UK being 71 per cent (OECD 1994). For the UK, this represents a 69 per cent increase on the 1970 figure of 42 per cent of the workforce. When the workers performing 'service' functions within primary and manufacturing industries are also included in such ratios, it becomes obvious that the vast majority of the modern workforce are involved in service provision (Crum & Gudgin 1977). The sustained level of service growth over the last 25 years has promoted a growing body of research, in both economic geography and the wider social sciences, aimed at establishing the causes and effects of these dynamics. However, as the above quotation from Wood (1991b) illustrates, it can be argued that the development of a theoretical framework is still lagging behind when compared to the overall importance of services.

Part of the rationale for choosing computer services for a sectoral case study is the industry's presence at the increasingly blurred and mobile boundary between manufacturing and services. As the definition of computer services in Chapter One showed, sometimes a material product is fabricated and sold, as is the case with 'packaged' software products, but equally an intangible service such as support, consultancy or training may be supplied. This thesis can benefit from a wide variety of literature and approaches investigating the geography of change in developed economies. As Clarke (1994) notes, studies of the sector can be informed both by work on the growth of producer services, and by the literature on small high technology firms, innovation and development. Here it will be argued that insights can also be gained from other approaches, such as investigations of the growth of an 'information economy' and the whole debate surrounding the spread of flexible practices in modern businesses.

As an introduction to these debates, the next section will outline different theories of the role of service industries in advanced economies, and the conceptual position adopted in this research project. In turn, the chapter will then consider how the literatures on producer service growth, the information economy, flexible production systems and high-technology industries can each contribute to a study of the computer services industry.

2.1 Conceptualising the role of services in economic change.

Much of the theoretical debate surrounding the rise of the service industries has focused on conceptualising the role of services in economic change. In the past, many theories in economic geography have focused upon the role of manufacturing industry as the key 'driver' of the economy, assuming service industries to be in a supportive role. Much early work on service industries (see for example Daniels 1975, 1979, 1982, 1985) merely documented the growing importance of services at various scales, without really challenging the primacy of manufacturing for economic development. Allen (1992) presents the arguments of Walker (1985, see also Sayer & Walker 1992) and Urry (1987) as exemplars of the two main (opposing) schools of thought in this field.

Walker's essentially Marxian analysis gives priority to the production of goods in the economy, and sees services as to a greater or lesser extent concerned with this manufacturing, a view shared by other commentators (for example Cohen & Zysman 1987, Storper & Walker 1989). As Allen notes, however, Walker's analysis exceeds this basic assumption, in respect of three main tenets. Firstly, many services are seen as being wrongly defined as such, in reality being aspects of, or supportive to, goods manufacture. He uses both labour type and output form to distinguish goods and services, defining a 'labour-service' as labour that does not take an intervening form of a material product, is irreproducible by other workers, and requires a unique producer-consumer transaction. Subsequently many activities commonly seen as services are ascribed to goods production. Using computer services as an example, Walker states that,

'..computer software, which consists of electronic signals on a tape or disk, can be every bit as much a material good as a chair. A customised program written for one customer would be a labour-service, but a packaged program such as Lotus 1-2-3 served up on the shelf at ComputerLand is unquestionably a good' (Sayer & Walker 1992, p.63).

Secondly, much service growth represents a deepening social division of labour in response to the increasing sophistication, complexity, scale and geographical dispersal of production processes. Hence, he asserts, the increasing number of workers in business services and white collar employees within manufacturers are dependent on goods production and do not represent a service led economy. Thirdly, Walker acknowledges

that the '*locus of competitive advantage*' in goods manufacture has shifted to functions conventionally described as services such as advertising and distribution, but that these production changes, and not consumption developments, are responsible for service growth.

For other commentators such as Urry (1987, see also Lash & Urry 1994) and Riddle (1986), certain service activities can, at certain times and places, be independent sources of economic growth and are increasingly important in international trade;

'..... there are indeed some localities, regions and countries which are dominated by service industry and employment. In most places manufacturing employment has not merely shrunk to a small potential of the total, but it is certain kinds of service industry which constitute the economic base upon which manufacturing employment appears to be based' (Lash & Urry 1994, p. 194).

For Urry, the spatial location of services is not reducible to that of manufacturing industry, and where there is a spatial coincidence, the linkages are weak or shaped by the dynamics of services rather than manufacturing. Cambridge (UK) is seen as an example of the latter. Although Allen highlights Urry's reliance on evidence on a range of consumer services such as tourism, the central proposition that services can act as an independent source of growth at the local and regional scale certainly receives much support (see, for example, Begg 1993, Townsend 1991, Williams 1994). However, such an approach does not dispute the overall importance of manufacturing exports in the trade balance of many national economies such as the UK and USA.

Allen uses the work of Wood (1991a) to illustrate what could be termed the 'middle ground' in this debate, between the two poles defended by Walker and Urry. For Wood, neither manufacturing or services are the core productive activity, and instead the functional interdependencies between all economic activities are stressed. Daniels (1989) promotes a similar argument, recounting that '*services do not displace manufacturing, and manufacturing does not compete with services; rather they reinforce each other*' (p.432). As modern economies become highly integrated, it becomes impossible to assign a primary role to any particular sector. In such an argument, the economic worth of a service is judged in terms of its contribution to the functioning of other parts of the economy, a facet of services which is often underestimated (Britton 1990). Interestingly, Allen (1988a, 1992, see also Allen & Du Gay 1994) suggests that all three approaches are derived from the same economic discourse, built around the need to explore manufacturing - services relations; this creates problems in interpreting the dynamics between service industries both within *and beyond* a national economy.

Marshall and Wood (1992, 1995) couch this interpretation of the debate in slightly different terms, calling for a '*service-informed approach*' to structural change in advanced economies. In the existing literature, they distinguish between 'conventional' and 'alternative' views of service change. The former, they argue, draw to a large degree on sector theories of economic development, such as Bell's (1973) post-industrial thesis, and tend to treat services as a uniform mass, under theorising the links to wider structural change in the economy. On the other hand, 'alternative' approaches have a tendency to underplay the importance of services in economic change, but are more precise in their definition of types of services and their economic interdependencies. A service-informed approach would recognise the huge variety of service industries, and elaborate their different relationships to, and effects on, structural change. Furthermore, it would, Marshall and Wood suggest, recognise four key features of contemporary economic restructuring. Firstly, goods and service production are highly interdependent, and depend upon complex patterns of material and service exchange. Secondly, service occupations are becoming increasingly important due to the expertise they supply to other consumption and production activities. Thirdly, while service activities can appear technologically eclectic and labour intensive, they must be considered in the context of the efficiency or satisfaction they bring to clients. Finally, the growth in service industries represents a change in the spatial divisions of skilled labour, and hence will have important locational consequences.

Such a 'service-informed' approach forms the major theoretical rationale behind this thesis, which attempts to elucidate the role of the computer service sector in changes in the wider economy, and also aims to consider the international dimension suggested by Allen (1992). This accords with Marshall and Wood (1992, p.1266); *'We, therefore, seek to clarify the role of individual services in the economy, at different times and places, as a means of developing a "service-informed" view of structural change'*.

The next three sections of the chapter (2.2-2.4) will analyse in greater detail examples of both the 'conventional' and 'alternative' views, and considers how these approaches can contribute to the interpretation of the growth of the computer services industry. In the first category, the producer services and information economy literatures will be reviewed, and under the latter, the flexibility thesis is considered.

2.2 A producer services approach.

One of the major subdivisions of services that has attracted a great deal of interest in the social sciences since the early 1980's is that of 'producer' or 'intermediate' services, with the rest of services being classed as consumer oriented. Producer services are essentially private services satisfying business or intermediate demand. There has been a great deal of debate as to which activities should be included under the producer service headings;

a commonly adopted classification is that used by Marshall *et al.* (1988). This is a fairly liberal definition, and recognises both producer services, and mixed producer / consumer services that serve both private enterprises and individual households. While the former category covers wholesale distribution, road haulage, advertising, market research, technical services, corporate head offices, R&D, trade associations, computer services, and certain financial services, the latter includes the remainder of the transport, distribution and financial sectors; for example, activities such as railway transport, banking, insurance, accountancy and legal services. However, for this debate what is important is that computer services are included in all definitions of 'pure' producer services, being largely oriented towards other businesses and government. It is also important to note that such services can be supplied by both in-house or independent providers.

Producer services have attracted such attention as they are often seen to be at the leading edge of service growth, and central to the economic base of many regions (Marquand 1983, Noyelle & Stanback 1984). As Marshall *et al.* (1988, p.14) note, producer services *'play a significant role in spatial differentiation because their demand and supply need not be geographically coincident and they are not dependent on the level of economic activity in an area'*. From this perspective, the key to understanding the uneven growth of service activity lies with the growing demand for intermediate services, (which can sometimes operate at an international scale) and the accompanying corporate restructuring (Daniels 1991). Many authors such as Coffey (1992) identify three main reasons behind the wealth of investigation into these services; firstly their rapid employment growth and its uneven distribution, second their status as a component of a region's export base, and third, their strategic role in promoting innovation and technological change in other sectors. The following three sub-sections (2.2.1-2.2.3) review research into these aspects in turn. Although classified here as 'conventional' producer services research, it will become apparent that much of this research can contribute to a 'service-informed' perspective.

2.2.1 Producer service growth and locational dynamics.

The 1980s and early 1990s have seen a dramatic increase in producer service employment in advanced economies. Table 2.1 illustrates this trend for financial, insurance and business services in the UK over the period 1981 to 1991; this category is slightly narrower than producer services, focusing on the purely knowledge and information based services. These increases are seen as significant because of the large element of skilled jobs they contain, the lack of growth in most other sectors, and also the highly uneven spatial pattern of growth. Figure 2.1 illustrates the employment distribution pattern for the same categories of business services in the UK in 1993. This map highlights the concentration of employment in London and the 'greater' South East,

and a few other urban centres such as Manchester and Edinburgh. This is a pattern reiterated by many studies (for example Gillespie & Green 1987, Howells 1988, Marshall *et al.* 1988, Daniels 1995a, 1995b). In 1993, the South East and London accounted for some 45 per cent of the UK total. However, due to a relatively slower growth rate, the overall importance of the employment in Greater London is declining relative to the rest of the South East.

Table 2.1: UK business service growth 1981 to 1991*.

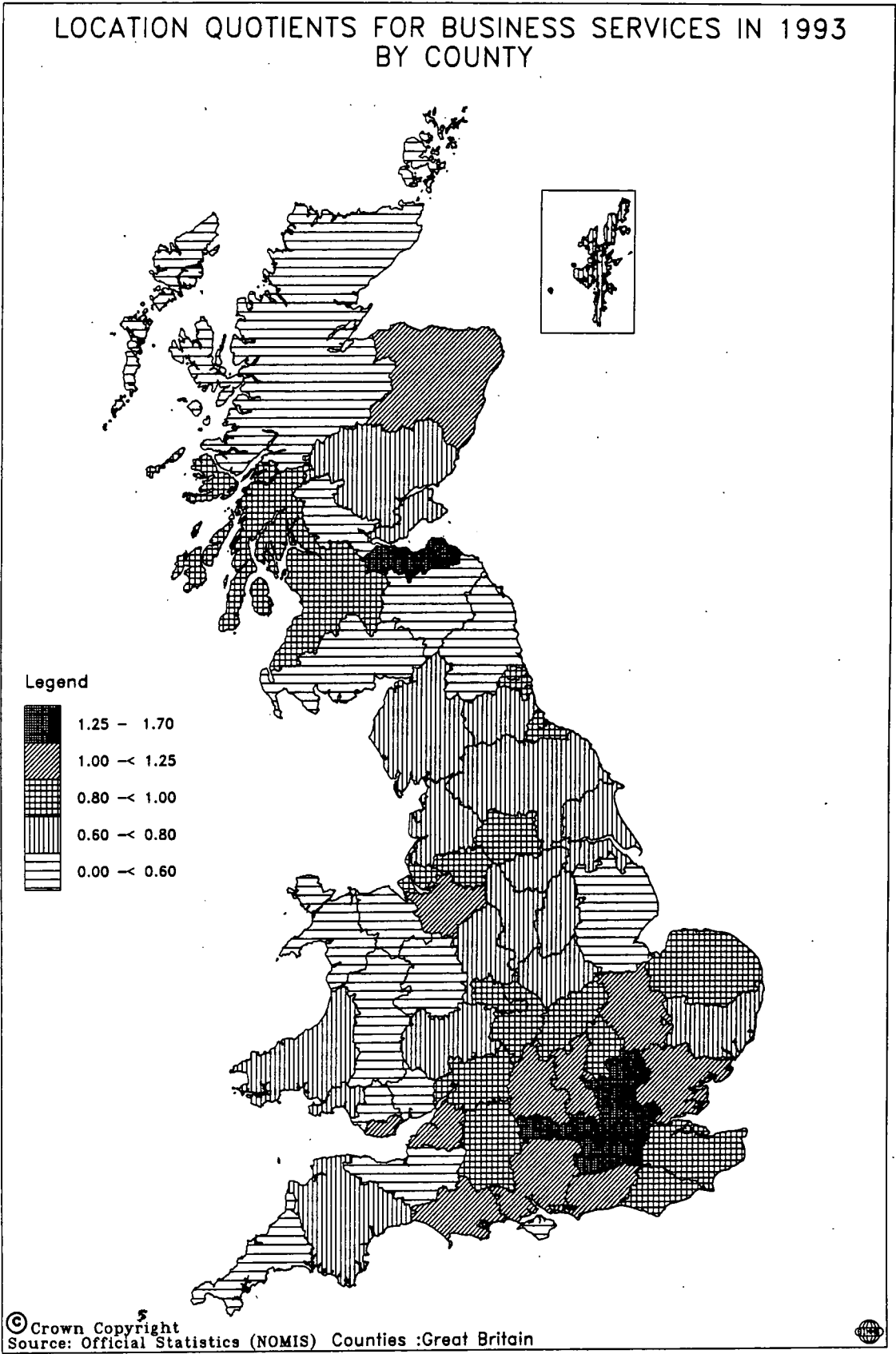
Activity	Sept. '81 employment	Sept. '91 employment	Employment change 1981-91	Percentage change
Banking and finance	486300	648900	162600	33.4
Insurance	292200	370600	78400	26.8
House / estate agents	70800	99600	28800	40.7
Legal services	127600	185500	57900	45.4
Accountancy / auditors	109100	165800	56700	52.0
Other technical / professional services	168800	229600	60800	36.0
Advertising	36100	45600	9500	26.3
Computer services	54800	147500	92700	169.2
Other business services	153400	401800	248400	262.0
Central offices not elsewhere	45400	30200	-15200	-33.4
Renting / hiring of movables	88800	122400	33600	37.8
Owning /dealing in real estate	97700	166400	68700	70.3
Total	1731000	2613900	882900	51.0

Source: Central Statistical Office, via NOMIS

* Division 8 activities under the 1980 SIC.

This pattern is by no means unique in Europe; Figures 2.2a and 2.2b illustrate that while business service growth in North-West Europe varied between regions over the period 1980 to 1990, with areas adjacent to urban centres having relatively higher growth rates, in 1990 metropolitan areas still had the greatest concentrations of employment (Van Dinteren & Meuwissen 1994). However, there are variations within this pattern, relating to the nature of the urban system in individual countries. For example, in a review of various studies of the geography of advanced producer services in Europe, Moulaert and Todtling (1995) suggest that the dominance of the capital regions is stronger in countries such as England and France than in nations with a less centralised urban hierarchy, such as Germany and Italy (for details see Daniels 1995b, Moulaert & Gallouj 1995, Schamp 1995, Cavola & Martinelli 1995). Similarly, the rate of deconcentration from capital regions also varies, between countries where the process is relatively strong, such as France and Portugal, to those where there appears to be no decentralisation, such as Denmark and Sweden (see Illeris & Sjøholt 1995, Ferrao & Domingues 1995). Also, different specialisations of producer services can be identified in the various city-regions of Europe, reflecting the specific strengths and client structures of the regional economies. Examples of this are financial services in London,

Figure 2.1: Location quotients for UK business services in 1993 by county.



engineering and software in Munich, and high-tech related services in the Rhone-Alpes. In the USA, O'hUallachain and Reid (1991) recognise the similar basic pattern of urban concentrations exhibiting relative decentralisation to contiguous areas.

Figure 2.2a: Growth of business services in North-West Europe (average annual employment percentage growth, 1980 to 1990).

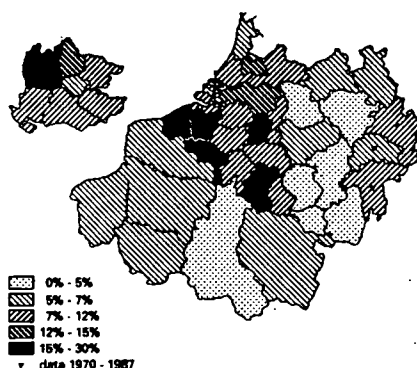
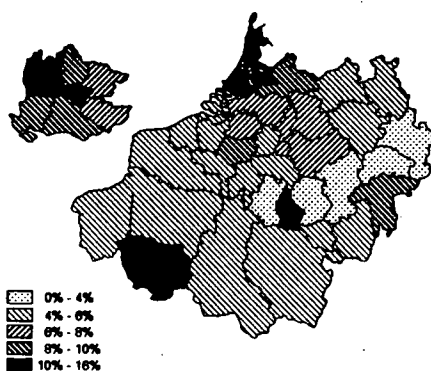


Figure 2.2b: Share of business services (of total employment, 1990).



Source: Van Dinteren & Meuwissen (1994), p.367

In order to understand the uneven geography of producer services, it is necessary to explore the processes behind their growth. This growth involves several factors related to the increasing complexity of both the external environment of firms and their internal organisation (Coffey 1992). In general the amount of information that a firm of any kind must process is continuously increasing. Coffey and Bailly (1990) suggest there are up to seven widely recognised factors which can explain the rapid growth in demand for producer services (see also Illeris 1989, Marshall & Jaeger 1990). Firstly, there have been changes in *what* goods and services are produced. With the trend towards product innovation and differentiation as consumers tastes become more sophisticated and producers become more specialised, functions such as R&D, design, advertising and marketing become more important. Secondly, changes in *how* goods and services are produced (process innovations) have occurred, whereby functions and techniques are developed with new technologies to respond to changing demand patterns, leading to

firms developing specialised capacities, or seeking assistance to do so. Thirdly, firms now operate in an increasingly complex national and international financial environment. Operations such as raising capital now require a greater depth and scope of information and expertise. Fourth, both production and consumption are becoming increasingly internationalised, and consequently firms require assistance on how to manage, and benefit from this process. Fifth, the increasingly complex regulatory environment that exists (especially in Europe) requires responses from firms, and can also increase demand from government sources as well. Six, the range of tasks relating to the internal management and administration of businesses has grown rapidly, as their organisational forms become more complex, and flows of money, people and information increase. Finally, the scope and intensity of interaction between firms has increased as firms develop more backward and forward linkages, and this requires management and co-ordination. Hence, producer service inputs play an increasingly critical role in the economy, providing the expertise, in the form of specialised labour, capable of manipulating the materials, information, capital and labour for other businesses to remain competitive (Perry 1990, Wood 1991b).

All of the functions described above, which characterise the increasing complexity of modern economic systems, can be provided internally within a firm, or contracted out to producer service firms. There can be many reasons for outsourcing such activities; to overcome in-house technical limitations and improve service quality, to overcome labour relations problems, to obtain cost savings as specialist firms can obtain economies of scale, to reduce overheads and fixed costs, to cope with the unpredictability of demand, or as part of a strategy to re-focus on core functions (Howells & Green 1986, Goe 1991). Generally they are adopted to improve profitability, flexibility and efficiency (Bailey *et al.* 1987). Illeris (1989), in a review of empirical work, suggests that certain firm characteristics can also determine the demand for external services. For example, independent firms tend to purchase more external services than subsidiary operations, medium sized firms purchase higher proportions of services externally than small or large establishments, and more sophisticated firms (that is growing, exporting or innovating businesses) use more external services. In some cases, internal functions become independent providers by the process of externalisation (Howells & Green 1986, Shutt & Whittington 1987, Howells 1989). While some authors have argued that much producer service growth is illusory (for example Gershuny & Miles 1983, Rajan 1987), there is now a general consensus that this growth represents real growth and not just the externalisation of functions from the manufacturing and other service sectors (Beyers 1989, Illeris 1989, Keeble *et al.* 1991, O'Farrell *et al.* 1993, Perry 1990, 1992, Tschetter 1987). These studies illustrate how growth is occurring simultaneously in both internal and external functions, and indeed Perry's (1990) survey in New Zealand found no overall trend to internalisation or externalisation. However, with respect to computer

services, this thesis will show there is a definite externalisation trend contributing to overall growth.

Thus, the bulk of the growth of producer services in large cities is likely to be 'real' and not just a transfer across the sectors, and this reflects the structural changes in the economy increasing the demand for such services, as described above. However, growth is also being reinforced by competitive pressures between producer service firms once they are established, and technological developments which can offer them new possibilities for service innovation. New firms can spin off from existing firms to provide new and novel services (O'Farrell & Hitchens 1990a). Hence the concentration of services close to major metropolitan regions reflects both the demands from corporate head offices and other clients, and the agglomeration advantages of networks of associated specialist suppliers of expertise. While the externalisation of functions is not the only growth factor for producer services, to a large extent it underpins their spatial centralisation. As Coffey and Bailly suggest;

'..... forces of agglomeration tend to produce what may be termed a "complex of corporate activities": the spatial clustering and mutual symbiosis of 1) the head or divisional offices of primary, secondary and tertiary sector firms; 2) high order financial establishments; and 3) the producer service firms that provide inputs to the first two types.' (Coffey & Bailly 1992, p.865)

Effectively therefore, the existing tertiary structure of the UK means that much of the demand for producer services is located in the Greater South East. The process of new firms being created by externalisation again favours areas with headquarters functions (Howells 1989, Aksoy & Marshall 1992).

However, Marshall (1992a) cautions that such corporate complexes should be seen in a wider context. The ability of producer services to be sold over increasing distances has already been noted, but furthermore, the South-East England complex has been strengthened by the growth of the City of London as an international financial centre in the late 1980s and by the high skills based regional labour market, which has meant decentralising firms can remain within the Greater South East. For Marshall, such an approach sees agglomeration tendencies as,

'.....arising from the growing significance in the economy of complex skills-based and market-oriented services to firms, and their extensive requirements for physical proximity to facilitate face-to-face contact, rather than more disintegrated forms of corporate structure per se' (Marshall 1992a, p.46, author's emphasis).

Similarly, Moulaert and Gallouj (1993, p.91) assert that 'agglomerations in their global networks' may be a more productive focus of study, and that the socio-cultural basis for such concentrations should also be expanded upon.

Further refinement is still needed. The so-called forces of agglomeration often centre around the continued need for personal interaction and face to face contact, especially where expertise is embodied in key personnel (Illeris 1989, 1991, 1994a, 1994b). However Illeris (1994b) suggests that different types of services have varying potential for decentralisation. In a slightly crude threefold classification, he proposes that back office functions, decentralised by large firms to suburbs or surrounding towns and facilitated by improving information and communication technologies, and also highly specialised services such as technology consultancies, offer greater possibilities than unsophisticated custom services. In the first there is little need for personal contact, and in the second, the high value of the service can make transport costs look modest. Mayere and Vinot (1993) support this point, suggesting that intellectual services actually have a greater need to be close to other firms that facilitate their ability to provide the service, than the end client. Illeris' third category, including such functions as complete computer solution providers, perform more frequent, lower value tasks that necessitate relative proximity (50-100km) to their clients. Similarly, Tordoir (1994) found that the spatial structure of professional service markets depends mainly on the mode of interaction between the provider and the client, and the frequency of usage of the service. However he moves on to suggest that infrequently used, highly specialised services have to locate in urban centres to reach a large enough market to survive. Overall, the potential for altering the distribution of producer services may be greater than some commentators suggest.

There are, then, new locational tendencies within service industries. Although there are still strong agglomerative tendencies, new information and communication technologies permit the extension of markets in space, and the remote supply of services. Marshall and Jaeger (1990) assert that there are two contrasting views of the links between the broader structural changes and service location that have been outlined. For some authors, such as Howells (1988, see also Green & Howells 1987, Howells & Green 1988), the existing concentrations in urban centres will be enhanced as service employment continues to grow. While services associated with the new technologies may decentralise from the largest cities, they will remain over represented in their hinterlands (Kassab & Porterfield 1991). While they would agree with this fairly pessimistic prognosis for the UK, Marshall and Jaeger feel that the evidence for such views is far from uniform across Europe. Germany and Switzerland are given as examples of states where peripheral regions were less impacted by recession than those in the UK, and have been able to benefit from indigenous business service growth due to

stronger local demand and a less established national hierarchy of regions (Jaeger & Durrenburger 1991).

2.2.2 Trade in producer services.

Hence, although there are great similarities, the map of producer services supply does not exactly mirror the distribution of demand, and this mismatch offers potential for trade. In a key study of over 2000 firms in the Puget Sound area of Washington State, Beyers and Alvine (1985) found that over half of business service firms exported 50 per cent of their output from the immediate local area. There have now been a considerable number of studies illustrating the export potential of such services, the results of some of which are summarised in Table 2.2. This is by no means an exhaustive listing, but most studies indicate that, while many services are purchased locally, producer service firms usually obtain between 30 and 50 per cent of their turnover from outside their home regions. Another tranche of work has investigated the purchase of producer services by usually manufacturing companies (for example Marshall 1982, Daniels 1991; see Illeris 1989 for summary), which also illustrate a substantial inter-regional component of purchases. Both Illeris (1989) and Harrington *et al.* (1991) outline the difficulties in comparing results from such surveys due to the different methodologies used. For example, differing approaches to the size of 'the region', services embodied in other goods, intra-corporate service exports, phrasing of questions and weighting schemes all reduce the validity of such comparisons. Harrington *et al.* (1991) also assert that without any idea of producer service *imports* to a region, it is impossible to get an overall view of such economies.

Table 2.2: Producer service exports - examples from the literature

Authors	Study Area	Local / Met. area %	Rest of region %	Rest of country %	Inter- national %
Marshall (1983)	Manchester, Leeds & Birmingham, UK	42	35	19	4
Jeanneret et al. (1984) in Illeris (1989)	2 Swiss towns	47	-	49	4
Beyers & Alvine (1985)	Seattle, USA	44	17	34	5
CENSIS (1986) in Illeris (1989)	Bari, Italy	40	24	27	9
Van-Dinteren (1987)	13 medium sized cities, Netherlands	32	25	39	4
Goe (1990)	Cleveland, Ohio	64	13	20	4
Daniels <i>et al.</i> (1991)	6 EU cities	29	25	38	8
Mayere & Vinot (1991)	Lyon & 3 towns, France	33	24	36	8
Townsend & Macdonald (1993, 1995)	Edinburgh, Scotland	42	10	41	7

Other studies include Polese (1982), Keil & Mack (1986), Coffey & Polese (1987), Hutton & Ley 1987, Stabler & Howe (1988), Harrington & Lombard (1989), Davis & Hutton (1991), Drennan (1992), Michalak & Fairbairn (1993), Esparza & Krmenec (1994), Hessels (1994), and O'Farrell *et al.* (1995).

However, by using a constant methodology for one sector in a variety of areas, this research aims to provide an insight into spatial and intra-sectoral variations in the market linkages of the computer services industry. Overall, there now seems to be conclusive evidence that producer services can be exported nationally, if not to a great extent internationally, and thereby contribute to the economic base of a locality or region, although, as O'Farrell *et al.* (1992) note, the potential for trade varies between the different types of service. Harrington *et al.* (1991) suggest that exports are more prevalent in sectors which produce expensive, non-standardised information, such as market research or custom computer software. The obvious implication for any kind of regional policy or local economic development strategy is that producer services have the same kind of attractions in terms of bringing revenue into an area that have traditionally been associated with manufacturing industry. The potential of such policies is evaluated in Chapter Five.

Similar studies have been conducted to ascertain the sectoral composition of markets for producer services. Again, some key results are summarised in Table 2.3. As Coffey (1992) outlines, contrary to conventional ideas, most studies suggest that well over half of producer services are purchased by other service establishments, whether they be other business services, consumer services or Government services. This pattern reinforces the dominance of South-East England in the UK economy, as the service structure of the economy already favours the region. While being included under the 'conventional' tradition of service research by Marshall and Wood (1992), such studies of the spatial and sectoral composition of producer service markets provide a way in which to understand service industries in terms of their linkages to wider structures in the economy, as suggested by the 'service-informed' approach. If backward linkages to sub-contractors and input suppliers, and sideways linkages in the form of joint agreements and alliances are also incorporated into analysis, it is possible to build up a detailed understanding of the role of certain firms (or groups of firms) in the economy (see analysis in Chapter 6).

Table 2.3: Markets for producer services - examples from the literature.

Author	Study Area	PC	PS	C+LG	M+C	OS	P	O
Marshall (1983)	See Table 2.2	18	8	11	37	16	4	6
Van-Dinteren (1987)	See Table 2.2	10	25	17	25	11	5	8
Perry (1990)	Auckland	0	22	13	37	19	4	5
Michalak & Fairbairn (1993)	Edmonton, Canada	12	24	26	14	7	13	4
Townsend & Macdonald (1993, 1995)	See Table 2.2	24	31	9	15	21	0	0

Key: PC - private consumers, PS - business & producer services, C+LG - central and local Government, M+C - manufacturing and construction, OS - other services, P - primary industries, O - other. Other such studies include Marshall (1982), Illeris (1989) and Goe (1990).

2.2.3 Competitiveness issues.

While the relative mobility of some kinds of producer services is now widely accepted, the unavailability of locally produced intermediate services in peripheral areas is thought to be a factor hampering the overall industrial growth of the local economy (Goddard 1979, Marshall 1983). Studies of links between head offices and corporate service suppliers still suggest that many services are purchased from the immediate metropolitan areas (up to 50 to 80km) (Marshall 1982, Polese 1982). Certainly Hansen (1990) concludes that producer services have the capacity to raise regional productivity and growth rates in per capita income. Service-rich regions, with their associated high incomes, supposedly attract other types of manufacturing, property, infrastructure and consumer investment. In less well-endowed areas, branches of large corporations often rely on tasks undertaken from their headquarters, thus discouraging the development of local business services. This may then undermine the local service availability to other firms (Macpherson 1991a, 1991b, O'Farrell & Hitchens 1990a, 1990b). Such local availability seems to be most crucial for small and medium sized businesses, who may lack the expertise and contacts to exploit long distance sources of technical service support. Even if local demand does eventually emerge, competition from successful firms in core regions may prove prohibitive. For Martinelli (1991), these inequalities are resulting in a new international division of labour, based on the uneven development of producer services. As well as recognising the role of producer services in the creation of value added and raising the competitiveness of the local economic system, Martinelli also suggests that the local labour market benefits. Opportunities are created in highly skilled and semi-skilled occupations, which contribute to an 'upgrade' of the labour market, and this creation of local knowledge and capabilities adds to the region's competitiveness.

When comparing producer services in Scotland and the South East, O'Farrell *et al.* (1992) also concluded that supplier-customer linkages within each region, and especially the presence of customers with a sophisticated demand, are critical to innovation and growth (For a similar study of Mid-Wales, see Hitchens *et al.* 1994). Hence not only can the lower quality of service supply in peripheral areas harm the competitiveness of local industry, but it can also be detrimental to the market potential of the services in other areas. These drawbacks they term *deficiencies* in service supply, in addition to the *gaps* in supply that may exist in peripheral areas, as discussed above. As O'Farrell & Hitchens assert (1990b, p.170), *'there is an implicit assumption that producer service firms in peripheral regions will deliver services to their local clients of an equivalent quality and price to those available in the South East.'* In their matched pairs sample, business service firms in Scotland were found in general to have a smaller client base, a lower skill workforce, less wide-ranging experience, and to be less export oriented. These deficiencies could be partly explained by the lower levels of competition in Scottish

business service markets, and the less sophisticated and specialised demand of the Scottish client businesses. However, for London and the South East, the clusters of interacting businesses and clients can become mutually supporting, as a process of synergy develops (O'Farrell *et al.* 1992).

2.2.4 Computer Services?

As was recognised in Chapter One, while there have been many reviews of the UK industry and its growth prospects (see for example CSA 1976, ACARD 1986, Coopers & Lybrand 1986, Grindley 1988, Brady 1992, Holway 1994, 1995a; published annually), there has been little work so far in economic geography (or other social science disciplines) on the locational and structural dynamics of the computer service sector (Howells 1987). The majority of the limited work that has been undertaken on this specific sector has, however, emerged from the producer services literature, and hence will be briefly reviewed here.

For Marshall *et al.* (1988) computer services are recognisable as a 'typical' service industry in that firms are small, and few organisations have a substantial market share; however more recent developments mean this picture is now inaccurate, with large multinationals dominating the industry (see Chapter Four). They see the sector as essentially a product of the 1960s and 1970s organisational structure: the origins of the industry may be traced back to the establishment of companies as the established computer users such as management consultants, accountants and banks started to diversify into new areas such as computer services. More recently, they suggest small firms have developed as spin-offs from many types of companies with computer expertise, and this has been enabled by the development of professional services such as software products and consultancy which have lowered entry costs. Finally, computer hardware suppliers increasingly provide their own software and support services.

The location of the computer services sector supposedly reflects the strategy of firms in serving particular markets, as well as the demand pattern for computer services (Marshall *et al.* 1988). Howells (1987) proposes that the spatial concentration of activity mirrors that in other producer services. With subsidiaries and spin-offs locating close to their parent companies, normally to remain close to the founder's residence (Green 1982), the existing tertiary structure of the UK has strongly favoured the South East. Firm movement is then constrained by the need to retain key staff, although limited local decentralisation can help to reduce costs. Large firms often establish branches in the provinces, with the North West being an attractive central location from which to serve the North of England. Henneberry and Lawless (1989) have undertaken a short review of the problems facing the development of the sector in Sheffield, citing the local economic structure, the lack of institutional support and the relatively low level

of entrepreneurial activity as the major constraints. However, Green (1982) suggested that local computer service sectors can develop where gaps in the market are left by South-East firms unwilling to keep staff in 'peripheral' areas. The markets of such firms can be limited if they do not have a branch network to serve multi-site clients. Overall, both Kelly (1987) and Cooke *et al.* (1992) propose that the sector is more concentrated in conurbations than the rest of the computer industry due to its market orientation, although activities such as consultancy and software design services have a tendency to more residentially attractive suburban locations. Indeed, Moulaert, Chikhaoui & Djellal's (1991) study of the locational behaviour of French high-tech consultancy firms over the period 1976 to 1987 has illustrated a dominant centralisation of employment in key regions, coupled with a relative decentralisation to contiguous intermediate areas.

In a wider context, Gentle and Howells (1994) have undertaken a review of the restructuring of the sector at the European level in response to several processes: the entrance of the old hardware companies onto the market, the trend to internationalisation in line with clients, horizontal integration on order to offer a 'one stop shop' service, the creation of the Single European Market, and finally, the removal of public procurement restrictions. As a result there has been a rise in firms consolidating and rationalising their activities, as well as in strategic partnerships and networking.

While the studies briefly reviewed here can offer some useful starting points for research into the emergence and spatial development of the computer services sector, there is a need for a more thorough understanding, based on comprehensive, detailed, up-to-date information. In general there has been a tendency to treat computer services as an homogenous whole, and this thesis will illustrate the variations between sub-sectors within the industry, and how these differences can influence its development patterns.

2.3 The information economy perspective.

Like much of the work on producer services discussed above, the information economy approach is seen as being part of the conventional, sectorally-based perspective identified by Marshall & Wood (1992). This analysis emphasises the key role in advanced economies of the information sector, in which the production, exchange, and transformation of information are crucial functions on which activities in all sectors of the economy depend (Porat 1977, Miles & Robins 1992). Authors such as Porat (1977) and Hepworth (1986, 1989, Hepworth *et al.* 1987) have focused on 'informational' occupations to illustrate how such labour accounts for an increasingly larger proportion of the overall workforce in all industries, including manufacturing. For Hepworth (1989, p.7), the 'information economy' concept refers to '*a new phase of economic development, wherein the production of information goods and services dominates*

wealth and job creation with computers and telecommunications providing the technological potential for product and process innovation' (author's emphasis). This epitomises the post-industrial society described by Bell (1973), and also fits neatly into the new 'techno-economic paradigm' proposed by long wave theorists such as Freeman (1987) and Hall and Preston (1988). Goddard (1992) identifies four key processes underlying the information economy. In addition to the centrality of information to all production (as noted above), he also suggests that the convergence of computer and telecommunication technologies (Kellerman 1984), the rise of tradable information and the increasing global integration of national and regional economies are all crucial characteristics.

There have been two main themes to research in this field. The first has looked at the impacts of new information and communications technologies (ICTs) on patterns of regional development. Many early studies were optimistic about the impacts on economic growth in peripheral locations, due to the removal of some of the constraints of distance and travel. More recent accounts however are far more pessimistic (Ducatel 1992, Gillespie 1991, Gillespie & Williams 1988, Goddard & Gillespie 1987, Goddard *et al.* 1985). As Goddard (1992, p.199) notes, '*far from eliminating the importance of geography, the so-called "space-transcending" ICTs, when taken together with other factors are supporting a more uneven pattern of regional development within the UK.*' There are concerns that existing concentrations of office activity are growing in relative importance as ICTs provide opportunities for new service activities (Moss 1987) and can enable increased control over branches in peripheral locations as influence becomes *more* centralised. London (or the South East) is the main hub for many national corporate networks in the UK. In such scenarios, peripheral areas, for example the North of England, are relegated to being information importers (Goddard & Gillespie 1987, Hepworth & Robins 1988) as the regional comparative advantage of London and the South East is reconstructed (Gillespie & Williams 1988). In response, there have been calls for initiatives at the local level to try and boost economies with telecommunication network schemes (Graham 1991).

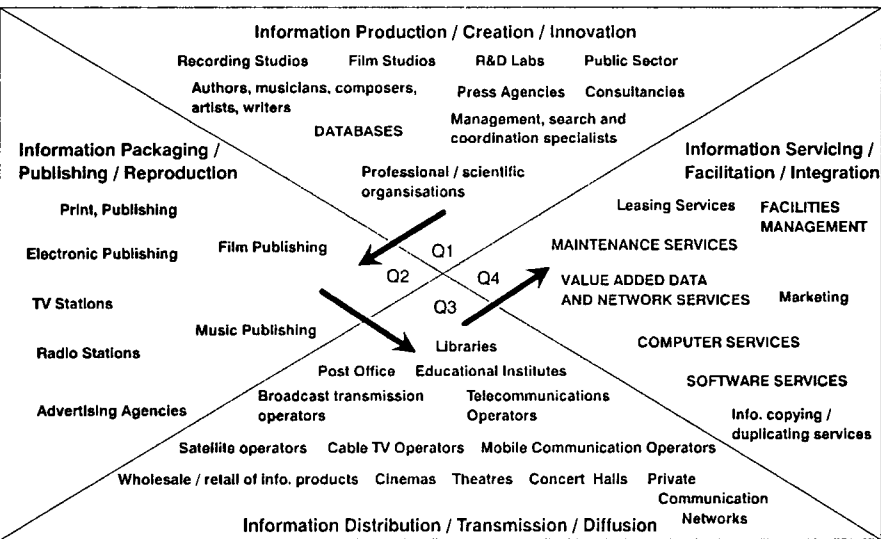
The second area of work has examined in detail the use of ICTs by corporations, and the resultant organisational and spatial outcomes. Computer networking is a key component of the ICT infrastructure, and the idea of a computer network as a spatial system has been used as a central concept in this analysis (Hepworth 1987). Studies have illustrated how networks have enabled firms to have greater spatial and functional flexibility in their business (Castells 1985, Hepworth 1989, Li 1995, Charles 1996). Both manufacturing and service firms can supposedly locate and relocate facilities more flexibly, and markets can be extended. However, Li (1995) proposes that until now too much attention has been paid to the technological systems that are employed, rather than

to studying the actual type and quality of information that is exchanged, and that a more 'functional' approach to such networks would be more fruitful. A central problem to work such as this is the 'immaterial' nature of electronic information, coupled with its ability to possess symbolic status within a system (Locksley 1992). While much of this research has focused on intra-firm changes, there is now a recognition that impacts on inter-firm linkages are becoming increasingly important (Castells 1989, Li 1995).

The information 'business' can be conceptualised as a flow of information from information producers through to information facilitators and integrators (see Figure 2.3). The computer services industry is clearly an important part of the information infrastructure; for Aksoy (1992), the sector is largely part of the servicing / facilitation / integration part of the information business. Such a perspective offers perhaps the simplest explanation of the huge growth in computer services over the last twenty years; *'the transformation to an information economy has resulted in a rapid expansion of demand for IT products and services and a fast-growing IT industry. This industry is occupying an increasingly large proportion of the overall economy and reshaping its economic geography'* (Li 1995, p.7).

However this would be a too narrowly framed and deterministic explanation of computer service growth, and misses the wider processes of change and restructuring within the economy as a whole. In particular, such a demand-driven interpretation misses the extent to which the externalisation of IT functions from other sectors contributes to growth.

Figure 2.3: Map of the Information Business.



Source: Aksoy (1992, p.59).
 Note: caps. indicate subsectors of computer service industry as defined in Chapter 1.

The information economy thesis as a whole can be criticised for over prioritising one sector of the economy, the information business, and for analysing broader economic changes in terms of its dynamic (Marshall & Wood 1992). Sayer and Walker argue in a similar vein;

'The information explosion in the contemporary economy is readily apparent, but information is not a free-floating ether; it must be pinned down. Information can be either part of industrial products or part of their production, circulation or consumption there is no convincing evidence for a large, distinct information-producing sector in the economy' (Sayer & Walker 1992, p.63)

To investigate these claims further, research is needed into the extent to which growth in the information business is now self generating, and also as to whether, as Li (1995) suggests, information based firms are helping to lead the way in terms of the organisational innovations that IT now allows. The computer service sector can provide a useful window on these processes. Overall, however, the boundaries of the information economy perspective are now increasingly hard to discern. Castells (1989), although recognising a new 'informational mode of development' dominated by information flows in his account of economic restructuring, suggests a move away from rigid sectoral approaches to one which focuses on process and the interdependencies between all sectors. Other authors are attempting to link information economy characteristics with theories of capitalist development such as flexible production (see next section) and regulationist accounts (Miles & Robins 1992, Robins & Gillespie 1992).

Despite all its drawbacks, this approach is useful in highlighting the increasingly important role of information for modern corporations, and begins to hint at the fact that sectors which form part of the overall information infrastructure, such as computer services, may have a strategic influence that extends way beyond the jobs they provide. The increasing value and mobility of information within advanced capitalist economies is a real trend which must be analysed, but it is not the sole dynamic of change, and the causal link to economic restructuring is almost certainly two way.

2.4 The flexibility approach.

The tendency of producer services (such as computer services) to agglomerate in certain areas needs to be related to the debate on the rise of flexible practices of many kinds in modern economies. Much of the latter work falls within what Marshall and Wood (1992) term 'alternative' approaches to the geographies of the service industries. Piore and Sabel (1984) described what they saw as a major shift in the structuring of advanced economies; the rise of flexible specialisation in response to a crisis of mass production. In this scenario, flexible production systems are supposedly developing to meet the

challenges of growing market saturation and increasingly sophisticated consumer demand patterns. Many other terms have been coined to describe this shift from Fordist production, such as post-Fordism (for example Amin 1994), flexible integration (Cooke 1988), flexible accumulation (Harvey 1990), and reflexive accumulation (Lash & Urry 1994). For other authors, grounded in the French regulation school, the new system rests on the fragmentation of the labour process, as large units of production break down under pressures towards vertical disintegration (Scott 1988a, 1988b, Scott & Cooke 1988, Storper & Christopherson 1987, Storper & Walker 1989). In this model, there is a tendency towards the reconcentration of production in certain areas as firms replace spatial flexibility with capital flexibility and spatial clustering. These vertically disintegrated 'new industrial districts' are based on networks of sub-contracting, supplier and customer linkages, often between small firms using flexible technologies. High growth regions such as Emilia-Romagna (Italy), Baden-Wurttemberg (Germany), the M4 Corridor (UK) and Silicon Valley and the Route 128 area (USA) have been suggested as exemplars of these trends.

The basic tenets of the argument have generated much criticism at all levels. For many, the theory is far too generalised, with some writers suggesting that 'Fordist' production was never dominant in the first place (Hudson 1989a, Meegan 1988). Sayer (1989) suggests that Fordist/post-Fordist distinction is an inaccurate dualism, noting that the whole post-Fordism concept appears *'confused in its arguments, long on speculation and hype, and based on selected examples whose limited sectoral, spatial and temporal range is rarely acknowledged'* (Sayer 1989, p.666). Sayer also argues that the central concept of flexibility can have many different meanings which need careful elaboration (also see Young *et al.* 1993), and he identifies seven different flexibilities ranging from numerical flexibility to flexible working practices. For Pollert (1988) the whole theoretical framework is guilty of mixing production and labour requirements, and also for the element of prescription such accounts often contain; that is suggesting that flexible production is a desirable development. Hirst and Zeitlin (1989, 1992) take this last point further to suggest that problems in the British economy stem in part from a failure to adopt flexible production strategies. Also concerned with the national specificities of flexible specialisation, Lovering (1990) suggests that the thesis underplays the role of national governments and how their mediations can produce different outcomes in different countries. He has further criticised the theory for inappropriately linking macro-economic changes with local micro-economic outcomes. At this micro-level, Phelps (1992) has questioned the separating out of agglomeration economies in new industrial spaces from other processes.

There are also doubts about the empirical validity of the claims; Pollert (1988), Amin (1989) and Schoenberger (1989) doubt whether the organisational changes are as

advanced as the proponents claim. To support this, Pinch *et al.*'s (1989) study of subcontracting from Hampshire manufacturing firms showed little evidence of vertical disintegration, and functions that were externalised tended to be support functions such as cleaning and catering. Many critics (such as Gertler 1992) have questioned the choice of new industrial districts for study, suggesting that only areas of a certain type have been investigated, and indeed that specific, irreproducible local factors are central to growth in these regions (Amin & Thrift 1994b). The inference is that what is happening elsewhere, that is where industrial districts are not developing, is just as important, and there is little room given for human agency and different local responses (Amin & Robins 1990). Similarly there are concerns that only selected industries have been considered, with a particular emphasis on certain high-tech and craft sectors (Gertler 1988), and as to whether the theory is therefore applicable to the whole economy.

Despite this whole tranche of critiques, as Gertler (1992) notes, there is however a consensus that certain methods are being used in the *pursuit of* greater flexibility. Table 2.4 is a useful summary of these general characteristics. Thompson's (1989) broad view of flexibility can also be enlightening; he suggests that it may be conceived as '*a number of different actual strategies and processes that a firm might employ*' (G. Thompson 1989, p.530). Hence it represents the internal and external organisational changes that a firm undertakes to achieve a certain strategy, and therefore is far more than simply using flexible technologies or specific labour policies.

Table 2.4: The Characteristics of Flexibility.

Production Organisation
New management strategies: aimed at achieving quicker decision making and faster capital circulation. Management decentralisation. Flattened management hierarchies.
New production processes: vertically disintegrated production, networking with other firms, subcontracting to allow concentration on core business. Development of formal and informal networks
Spatial structure: spatial polarisation of growth, intense local interaction, spatial clustering or agglomeration, urban concentration of consumption, dense networks of inter-firm, inter-sectoral linkages
New Technology Applications: Computer controlled production/distribution, new technology application, heavy IT investment
Change in product form: wide range of specialist services, economies of scope, customised consumption, niche markets, technology based demand, quasi/flexible integration, new opportunities for service products
Employment Structure and Social Division of Labour
Increase in white-collar work: knowledge workers, professionalisation, non wage benefits, high job security for core workers, individually negotiated contracts, rise of service jobs
Polarisation of labour: differing employment rights, part time hours, paid by the hour, informal labour practices, differing levels of job security
New gender / race division of labour: different labour use depending on race / gender leading to greater polarisation, employers use differences to their advantage
Privatisation of public sector: stagnation of investment levels, new opportunities for service sector, compulsory competitive tendering, contract and tender based work

Source: Tanner (1994), adapted from Cooke (1988), Moulaert & Svyngedouw (1989).

2.4.1 Services and flexibility

To a large extent, the theories outlined above have neglected, or at least marginalised, the role of services (Wood 1991b, Gertler 1992). For example, in his thesis describing new industrial districts, Scott (1988a) reiterates the argument of Walker presented earlier (section 2.1), explaining that any post-industrial theories acclaiming the arrival of a new information-processing form of economic organisation misunderstand the role of business services in modern society. To Wood such statements are remarkable, as *'modern agglomerations of economic activity, whether in high technology Silicon Valley, business service dominated South-East England, or the "Third Italy", are essentially agglomerations of service expertise'* (Wood 1991b, p.166). Similarly, Lash and Urry (1994) attack Storper and Walker's (1989) analysis of the connections between territory, technology and growth as having no appreciation of the importance of services in the development of 'territorial production complexes'. Furthermore, many of the features of 'flexibility' as shown in Table 2.2 have been present in service firms long before they were recognised in manufacturing businesses. A service-informed approach to economic restructuring can however identify the crucial role of human skills in support of change and indeed Wood (1991b) proposes that flexible accumulation can be best seen as dominated by the relationships between capital and expert labour.

Two authors who have tried (separately) to link the debates on flexibility and service growth are Coffey and Christopherson. Coffey (1990, Coffey & Bailly 1991, 1992) proposes that producer services can be linked to flexible production debates by considering both their inputs into the goods production process, and also the increasing vertical disintegration *within* producer service establishments themselves. Hence the key process is the unbundling or outsourcing of producer services *by any sector*. Coffey concludes that the spatial outcome of these trends is the renewed dominance of concentrations of metropolitan producer services. For Christopherson (1989) the most significant innovations in terms of labour use are occurring in the service sectors, and she suggests that so far research has placed an over emphasis on producer services. She argues that in general service firms organise production very differently from manufacturers, with trends towards rationalisation and specialisation as opposed to those of fragmentation and diversification seen in manufacturing and described in the flexible production thesis. Consequently, research is held back by the manufacturing concepts and terminology used in discussions of flexibility; *'only an enlarged vision of economic change, one that incorporates an understanding of production in services and of industrial politics, will allow us to adequately interpret the emerging spatial division of labour'* (Christopherson 1989, p.141). This thesis aims to inform the debate by evaluating the contribution of outsourcing to growth in the computer services sector, the role of disintegration within the sector itself, and also the extent to which the firms themselves are adopting flexible characteristics.

2.4.2 Networks

As a postscript to this debate, it is also worth noting the re-emergence in the analysis of networks of interfirm relations in economic geography during the late 1980's (see for example Camagni 1991a, 1991b, Dicken & Thrift 1992, Grabher 1993a, 1993b, Bramanti & Creti 1994, Dicken *et al.* 1994, Yeung 1994). This body of literature places greater emphasis on the *network form* of industrial organisation. While some of this research has investigated the evolution of networks and their spatial formation, much has focused on the industrial districts of the flexible specialisation thesis, indeed Hirst and Zeitlin (1989) suggest the flexibility theory is effectively a system of network production. The concept of the 'local milieu' has arisen, defined by Camagni (1991a, p.3) as;

'the set, or complex network of mainly informal social relationships on a limited geographical area, often determining a specific external "image" and a specific internal "representation" and a sense of belonging, which enhance the local innovative capability through synergetic and collective learning processes'.

This differs from explanations of industrial districts based on transaction costs and external economies (for example Scott 1988a), and is an intrinsically dynamic approach (Bramanti & Senn 1991), emphasising collective learning processes and local synergies of culture and attitude which enhance the efficiency and flexibility of local production systems (Storper 1993, 1995). It is important to note, however, that equally the absence of these features can have regressive effects on local economies (Perrin 1991).

For the proponents, this work offers a new model of spatial development (Camagni 1991b, Crevoisier & Maillat 1991) based on these 'milieu innovateur' and their external relations. Interestingly, however, Amin & Robins (1991) suggest that the cohesiveness of local economies is going to come under increasing pressure from processes of globalisation. These ideas of networks of both formal and informal links and their ability to create some kind of local 'culture' can however profitably be applied to networks of producer and other service firms (for example Monnoyer-Longe & Mayere 1994, Strambach 1994, Tordoir 1994). For example, in research on the gathering of market intelligence in the Canadian software products industry, Cornish (1996, 1997) has found that the social relations inherent in both formal and informal networks are more important than their spatial extent.

2.5 The high-technology debate.

As Clarke (1994) proposes, the computer services sector is also included in many debates surrounding the development of clusters of high-technology industry. Computer services is the only service sector listed in commonly used definitions of 'high-tech' industry, such as those of Segal Quince Wicksteed (1985, see Table 2.5 below) and

Butchart (1987), and as such will have some markedly different characteristics to the manufacturing sectors with which they are grouped. In general, however, such definitions try to select innovative firms, often by highlighting sectors with high levels of R&D expenditure and scientific, engineering and technical employment. With the decline of traditional manufacturing industry, some commentators have identified high-tech industry as the prime generator of the new industrial landscape (Malecki 1984, Hall & Markusen 1985, Keeble & Wever 1986a, Breheny & McQuaid 1987), and it has attracted increasing attention from academics and policy makers in a similar way to producer services. For states and localities, according to Malecki (1987), high-tech industry seems to promise rapid, clean, recession-proof high-wage industrial development, free from traditional location constraints and capable of stimulating whole new cores of industrial activity.

Table 2.5: Industries classified as high-technology by Segal Quince Wicksteed.

Title	Description of activities (1980 SIC)
Chemicals / biotechnology	Basic industrial chemicals, specialised chemical products, pharmaceutical products
Electrical equipment	Electrical equipment for industrial use
Electronics capital goods	Telecommunications equipment, electrical measuring equipment, electronic capital goods, passive electronic components
Other electronics	Other electronic equipment
Instrument engineering	Instrument engineering
Computer hardware	Electronic data processing equipment
Computer software	Computer software
Consultancy R&D	R&D, scientific and technical consultancy

Source: Segal Quince Wicksteed 1985, p.91

Keeble and Kelly (1986, see also Glasmeier 1988, Oakey & Cooper 1989, Galbraith & de Noble 1992) suggest that high-tech firms are different from the rest of the manufacturing sector in two ways. Firstly, they show a tendency to agglomerate, and then to exhibit dynamic growth through a process of intense interaction between new firms, entrepreneurs, research institutions, banks and business services. Second, the important role of key research establishments such as universities, is proposed. Once established, agglomerations are maintained by an ongoing process of innovation, spin-offs and new firm formation. Oakey (1984a) asserts that human expertise is the most important input into these firms in terms of creating added value, and so areas must be able to attract and retain such a workforce. Allied to a lower dependency on bulky raw materials and in general a higher informational content of the products (C. Thompson 1989), these differences in basic characteristics mean that the resulting distribution of high-tech employment is very different from that of manufacturing as a whole (Begg & Cameron 1988, Begg 1991). This is illustrated for the UK by Figure 2.4, which also indicates the similarities between the distribution of high-tech industry (as defined in Table 2.5 but excluding pharmaceuticals) and the map for producer services (see Figure

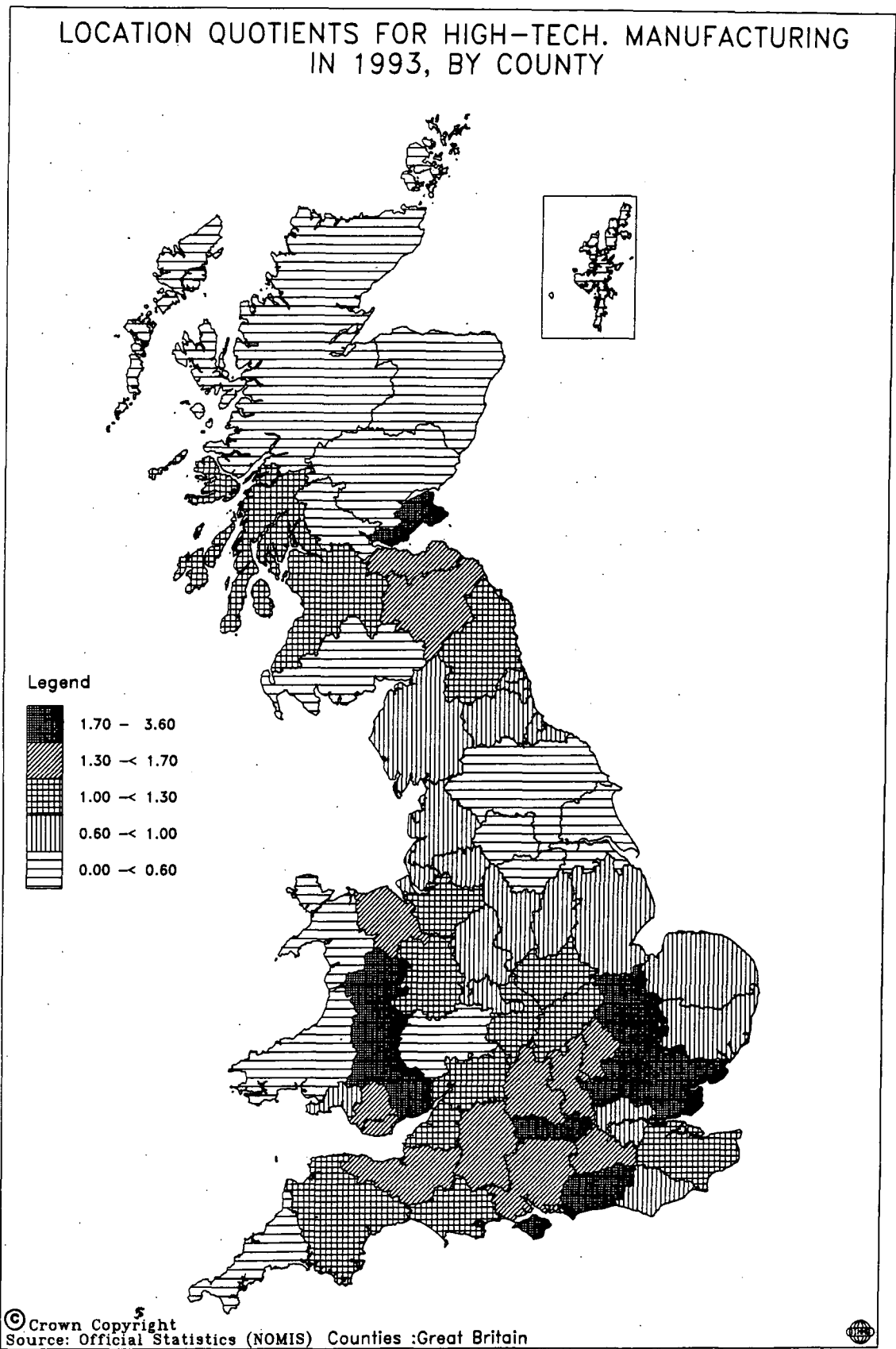
2.1), thereby seemingly supporting the argument that computer service studies can benefit from both research into high-tech and producer services. Again it is the medium to large towns of the South East outside London where the growth is concentrated: in 1993, the South East and London accounted for 39 per cent of the total employment.

2.5.1 Studying and explaining high-tech growth.

Some writers have linked the increasing importance of high-tech industry to general debates about the growing role of small firms in advanced economies since the early 1980s, and their role in exacerbating regional inequalities (see for example the work of Keeble: 1989, 1990, Keeble *et al.* 1991, Keeble, Bryson & Wood 1992, Keeble & Walker 1994). Commentators have recognised the more rural pattern of growth, and the characteristics which underlie it, such as urban-rural migration and the local occupation structures (Gould & Keeble 1984, Barkley 1988, Keeble, Tyler *et al.* 1992). Regional variations in new firm formation and entrepreneurship have been mapped nationally, resulting in both structural (or socio-cultural) and economic environment theories of this uneven growth (Mason 1985, 1989, 1991, Moyes & Westhead 1990, Westhead & Moyes 1992, Barkham 1992). With obvious links to debates surrounding producer service growth and the rise of flexibility, Keeble (1989) summarises five main theories to explain the resurgence of small firms in general. To the accounts of large fragmentation strategies (Shutt & Whittington 1987, Howells 1989), changing patterns of demand (Brusco 1982), and technological change opportunities (Kelly 1987) discussed earlier, Keeble adds recession-push mechanisms which may force entrepreneurship and corporate rationalisation (Mason 1989), and the rise of government small firms policies and incentives to encourage growth.

Many early studies looking into high-tech development were criticised for a bias towards manufacturing firms, and as Allen (1992) notes, it is high-tech service functions which are often the bearers of innovation. As an example, the same author had suggested elsewhere (Allen 1988b) that the much heralded growth of high-technology manufacturing along the M4 corridor has been less significant than the growth of services in the area. Indeed, approaching half of the UK's high-tech workforce is in fact in three service sectors: telecommunications, computer services, and research and development (Butchart 1987). Similarly, more recent studies of high-tech agglomerations (Coe 1991, Garnsey & Cannon-Brookes 1993a) show that these are now the most dynamic and fast growing sectors of high-tech industry, and Boddy (1986) suggests this manufacturing bias is often reflected in local policy. Hence an increasing number of small firm / high-tech studies recognise the importance of service sectors (and especially business services) in the overall growth dynamics (Browne 1988, Burrows & Curran 1989, Curran *et al.* 1991, Keeble *et al.* 1991), thereby feeding into the debates covered earlier (Section 2.2).

Figure 2.4: Location quotients for UK high-tech manufacturing in 1993, by county.



Within the UK there have been several detailed studies of the high-tech sector in different areas: examples include the studies of Cambridge (Segal Quince Wicksteed 1985, Keeble 1989, Saxenian 1989, Coe 1991, Garnsey & Cannon-Brookes 1993a, 1993b), comparison of computer firms in South-East England and Scotland (Keeble & Kelly 1986, Kelly 1987), and the work of Hall *et al.* (1987) on the M4 Corridor, Macgregor *et al.* (1986) on the Newbury district, Boddy and Lovering (1986) on the Bristol sub-region, Gripaios *et al.* (1989) in Plymouth, and Lawton-Smith (1990, 1991) in Oxfordshire. Many studies such as these often produce lists of location factors which underpin the attraction of particular regions for high-tech industry. For example, studies of the M4 corridor and Bristol emphasise the importance of Government Research Establishments and defence contracts, while those of Cambridge highlight the role of the University for promoting innovation and establishing the Science Park. Such studies invariably conclude that the crucial factors are locationally specific and often only occur within the 'Greater' South East of the UK, and that the growth is therefore largely irreproducible in many areas. The study of Plymouth by Gripaios *et al.* (1989) illustrates the problems of high-tech development in more peripheral areas, with an enclave developing with low levels of local linkages.

While such studies provide a valuable insight into the wide range of factors influencing high-tech firms and their location, Scott and Storper (1987, p.220) are disparaging about their usefulness for theorising high-tech development;

'In practice, these factors turn out to be little more than ad hoc lists hopefully masquerading as analysis. They miss entirely the central problem of the internal evolutionary dynamics of growth complexes.....they offer us very little indeed by way of meaningful theoretical generalisation'.

C. Thompson (1989) holds similar reservations, suggesting that the approach can overplay the 'determining' effects of the factors, and often results in an unrealistic parcelling out of individual components. Scott and Storper also reject two other explanations of growth: the seed bed hypothesis supported by Saxenian (1985) which emphasises the new firm formation process and the nurturing of initial development, and the product-profit cycle model (Markusen *et al.* 1986) which suggests a decentralisation process as products become standardised. They suggest that the former lacks an appreciation of the social division of labour and industrial organisation, and that the latter erroneously makes the organisation-location relationship the central determinant of spatial outcomes. Storper and Scott prefer a production organisation framework, which focuses, in a similar way to theories of producer service growth, on the external disintegration of functions to a production complex, which as it grows attracts and develops the labour force to sustain developments. However, in his review of a wide range of high-tech theories, Thompson (1989) concludes that none of the existing

theories allows conceptualisation of the actions of the state, the role of the existing economic structure of growth areas, or the role played by key, individual actors.

2.5.2 A downside to high-tech?

An increasing number of commentators have voiced concerns that concentrations of high technology industry may be creating social polarisation. For example, Crang and Martin's (1991) analysis of the Cambridge Phenomenon suggests that the locality is in reality weakened by a number of tensions within the phenomenon. These they term 'South-South' divides, or social and spatial divides within aggregate prosperity. Labour shortages and rising house prices are major problems; the lack of local labour supplies has pushed wage rates up to London levels, and around 50 per cent of the high-tech labour is non-local in origin. This has increased the cost of living and house prices, meaning a relative drop in standard of living for other manual and non-manual occupation groups. In Cambridge the lower category jobs such as cleaning, catering and other support services are all provided by local people, and these are often unstable, part-time and low paid. Some commentators suggest that such workforce polarisation between professionals and low waged labour within firms is a characteristic of high-tech industry (Saxenian 1985, Scott & Storper 1987, Castells 1989, Colclough & Tolbert 1990). However Klak (1989) cautions that this concept has often been extrapolated from studies of semiconductors, and his analysis of US data suggests that high-tech firms have relatively well balanced occupational structures, within a general trend to bifurcation in the whole US economy.

The gender structure of high-tech businesses has also been a focus of study; in their research, also centred on Cambridge, Massey and Henry (1992, see also Massey 1993, Henry & Massey 1993) characterise what they see as 'high-tech masculinities'. They found that over 90 per cent of scientists and engineers were male, often undertaking extremely flexible working, with up to 50 to 80 hour weeks. Massey and Henry suggest this is due to the high level of competition in these sectors, the nature of the knowledge based labour market which creates inter-personal competition, and the strong dedication of staff to their jobs. The 'science park' concept itself has become a focus for debate. While Monck *et al.* (1988) conclude that these planned high-tech developments should become a key focus for new technology based firms, Massey *et al.* (1992) are highly sceptical about their benefits. For the latter, they are a worrying symptom of the increasing separation of R&D and production in the economy, and create both social and geographical polarisation. Such parks offer increased opportunities for the 'technocratic elite' within organisations, but do little for the rest of the occupational structure.

In general, the bias of high-tech studies towards product-based industries in the past has restricted their usefulness in explaining developments in the computer services sector. There has been a slowing of academic interest in explicitly high-tech development in the 1990s, probably in recognition of the fact that such growth is now bound so closely to the expansion in intermediate services, and also due to a national recession which has stifled growth in many of these sectors (Martin 1993). Hence, the inadequacies of the high-tech approach in terms of a coherent theory and policy prescription have yet to be rectified. However, at a smaller scale, these studies offer useful insights for this thesis, particularly concerning the development of small technology based firms and how they relate to their locality.

2.6 Concluding comments.

This review of different approaches to understanding the role of services in the restructuring of capitalist economies illustrates that a variety of debates will have relevance to a sectoral study of the computer services industry. The corollary of this is that an in-depth study of the sector can inform a range of discourses. The most important influences on this thesis emerge from the general producer services literature, which offers various ways of interpreting the growth, locational dynamics, market linkages and contributions to competitiveness of such sectors. While much of such research is classed as 'conventional' by Marshall and Wood, and considers broad groups of amalgamated activities, by looking at the regional and internal variations in the linkages and growth processes of a clearly defined computer services sector, it is possible to adopt a more 'service-informed' approach. The information economy thesis, although theoretically weak, allows the strategic position of the computer services industry to be interpreted in terms of the circulation of information in the whole economy. The flexibility thesis, despite its neglect of service sectors, offers a theoretically coherent contribution to the debate surrounding the emergence of certain high-skill local economies and the importance of externalisation processes. Finally, the high-technology and small firms literatures provide useful insights to the growth of small technology-based firms in certain localities.

Although the different accounts in this chapter have been split into sections for the ease of analysis, they are all part of the same debate: explaining the increasingly rapid and diverse spatial and structural changes in advanced capitalist economies. There are many common themes and links between the various theories. For example, a 'high-tech' account of change is intimately linked to discussions of a new 'informational' Kondratiev cycle and the rise of a service economy. While this sectoral study will try to develop a 'service-informed' view of restructuring proposed, a common theme in all the theories discussed was the lack of detailed information on individual service sectors (with

services, or producer services, too often being seen as an homogenous whole) and in particular on their linkages and influence on other sectors of the economy.

Chapter Three: The changing structure of the European computer services industry.

'.....unless Europe becomes a different place the next Microsoft will be American, and so will the one after that.'

Economist, 12 November 1994, p.102

3.0 Introduction.

This chapter has two main aims. The first is to provide an overview of the computer services industry at the world and in particular, the European scale, to place in context the remainder of the thesis which focuses on the UK industry. For this, a variety of secondary sources and reports will be used, illustrating how the increasingly internationalised nature of the industry is reinforcing the market domination of US firms. The second aim is to present a case study of the overseas software products sector in Ireland to illustrate the increasingly international nature of the subsector, and to provide an insight into the European industry as a whole. The information for this study comes from 17 semi-structured interviews with key managers of overseas firms and government officials, carried out in Dublin and Cork in the summer of 1995 (see Appendix VIII for detailed list). By way of introduction, the next section describes the internationalisation trends which are increasingly influencing the development of all producer service sectors.

3.1 The internationalisation of producer services.

Both the markets and supply of producer services are now undoubtedly becoming more international in their nature, and many authors have noted how service exchanges constitute an increasingly important part of international trade (Riddle 1986, Daniels 1993). The value of service exports globally was estimated at around \$600bn in 1989. While global service trade showed only a slow growth in the 1980s, the majority of this increase was in producer services (Daniels 1993). However, balance of payments figures underestimate service trade, as intra-firm service movements are not recognised, and hence the best indicator of international service trade is data on foreign direct investment (FDI). By the late 1980s, the share of services (as a whole) in the world stock of FDI was close to 50 per cent, and they accounted for 55 to 60 per cent of world flows (UNCTC, in Daniels 1993).

As Dicken (1992) notes, there is no single explanation as to why producer service firms are expanding across national boundaries. As technological innovation accelerates and new competitors rapidly emerge, businesses are finding their market position increasingly under pressure. In order to sustain growth and profit levels it is now necessary to gain access either to new geographical markets (economies of scale) or

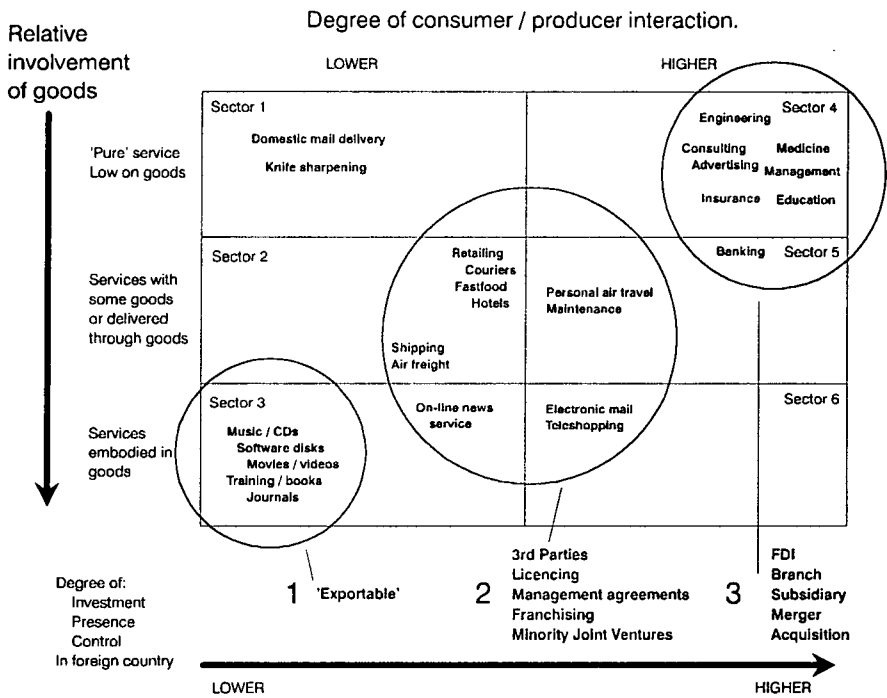
new ranges of services (economies of scope) (Enderwick 1992). While in the past limitations have been imposed on the establishment of foreign service companies in the financial and professional markets, these are now being removed both as a result of EU policy and the 1993 GATT agreement (Daniels 1995a, Pawar & Driva 1992). This deregulation of markets not only provides opportunities to access new markets, but means increased competition in home markets at the same time. For Dunning (1989), internationalisation can offer service multinational enterprises (MNEs) various forms of competitive advantage, and the search for such benefits is usually a response to the requirements of existing customers or of potential clients. The competitive advantages gained by MNEs can take many forms, such as; economies of scale which allow prices to be lowered or service quality to be raised, the spreading of risk, economies of scope as wider collections of related services can be offered, greater proximity to potential customers, increased local knowledge and improved corporate identity.

With respect to the computer services industry, Gentle & Howells (1994) describe the internationalisation process as occurring as a result of the increasing globalisation of both demand and supply in the industry. On the demand side, as key multinational customers have themselves internationalised their operations, they have found dealing with different computer service companies in various countries to be unsatisfactory. As a result, major computer service companies have responded by providing comprehensive services in key cities located across a range of major industrial economies. However, firms such as EDS and Cap Gemini Sogeti have in turn seen this as a competitive advantage with which they can attract other multinational clients. Indeed, businesses aspiring to become global players, such as Logica and Syntegra in the UK, actually target 'internationalised' sectors such as financial services, and certain manufacturing industries, to attain global coverage (see Chapter Seven, Section 7.1.3.2). Gentle and Howells also suggest that on the supply side competition in computer services is appearing from a number of new sources globally. In particular, newly industrialising countries such as Singapore and India are providing and exporting quality software at extremely low cost. Opportunities are also created for European and US firms to set up bases or joint ventures in these countries. For example, Unisys and BT are among those to have entered joint ventures in India, while Motorola, Texas Instruments and Siemens Information Systems have established subsidiaries (*Financial Times* 6 December 1995).

The interactive nature of many business service activities has a major impact on the internationalisation strategies pursued by such companies (Moulaert, Martinelli & Djellal 1991). Sapir (1993), and Riddle (1986), outline a typology of four different modes of international service transactions, which relate to the relative degrees of movement undertaken by both service providers and users. In this classification, business services come largely under the grouping in which '*the provider moves permanently to the user*',

or, in other words, where foreign direct investment (FDI) is involved. As Sapir notes, FDI is the most common form of international service competition, as it enables frequent and close interaction between service companies and their clients. FDI acts as a substitute for direct trade, and enables companies to attune their services to particular national markets, regulations and cultures, which still vary in service markets. The investing company can establish some kind of joint venture or strategic alliance, or set up its own branches or subsidiaries. Earnings can then be reimbursed to the country of ownership directly through sales of the subsidiary, or through the repatriation of profits. For a business service company, this strategy not only allows close contact with clients, but it also maintains control over the ownership and quality of service provision (Marshall & Wood 1995). This internationalisation of business services via FDI reinforces the primacy of key global cities and their hinterlands (Moulaert *et al.* 1995), a trend already identified at the national level (Section 2.2.1). Internationally-oriented business service firms considering locations for foreign investments are often attracted by the same forces that create concentrations of producer service employment within national urban hierarchies, thereby simultaneously contributing to this uneven development pattern.

Figure 3.1: Clustering of services and internationalisation modes.



Source: Vandermerwe & Chadwick 1989, p.84.

Vandermerwe and Chadwick (1989) offer a slightly more sophisticated typology of service internationalisation modes, which is particularly useful for interpreting developments in the computer services industry (see Figure 3.1 above). These authors

suggest a classification of services based upon two axes, the relative involvement of goods in a particular service, and the degree of consumer/producer interaction, producing clusters indicative of three different modes of service internationalisation. In such a schema, computer service activities are present in all three modes. Firstly, software products (sector three in Figure 3.1) represent 'services embodied in goods', with only a low level of consumer/producer interaction being necessary, and hence are classified as exportable. Secondly, at the opposite end of the scale, consultancy and systems engineering tasks (sector four) are effectively pure service activities requiring a high degree of interaction. As described previously, companies in these markets often undertake direct investment, usually in the form of a branch, subsidiary, merger or acquisition. Thirdly, hardware maintenance (sector five) represents a goods related service with a intermediate degree of interaction. As such, it is often provided internationally (and inter-regionally) by third party, licensing and subcontracting agreements.

This classification can help explain the low levels of international computer service trade. Most surveys of the computer services industry suggest that, across the whole sector, firms only export between five and 15 per cent of their turnover on average (OECD 1989, also see Chapter 6). While software products are potentially very exportable, and some personal computer software is indeed highly standardised, at present many software 'products' require some degree of adaption and tailoring to clients' needs. Hence, in major national markets, large software companies often find that the range of tasks to be provided, such as marketing, localising, installing, training and support, means that establishing a subsidiary is desirable. While many small software companies sell their products abroad under licence via other computer service firms and distributors, major software product firms in reality often use FDI to increase their international coverage, and it thereby becomes difficult to measure trade flows. For example, software developed in the US but sold in Europe is invariably included under the subsidiary's turnover. The importance of FDI in the computer services industry as a whole is reiterated by an OECD report on the internationalisation of computer services; *'.....since being close to end-users is an important element for software developers, a presence in situ via a representative office, foreign subsidiaries and joint ventures represents an important aspect of this sector'* (OECD 1989, p.10). However, visible international trade in computer services may become more prevalent in the future as more types of software and IT systems become standardised and supportable remotely.

3.2 US dominance of the global and European computer services industries.

This section will review the structure of the global, and in particular, the European computer service markets, and will also examine the dominant position of US-owned suppliers. The key features of the global IT market are presented in Table 3.1. Together,

software and computer services revenues now exceed hardware sales in many major industrial economies. For example in the UK in 1994 the hardware market accounted for £7509m of business, compared to £9329m for software and services (EITO 1995). As in the hardware industry, the global computer services industry is dominated by the USA, both in terms of market value (demand) and the provision of IT services (supply). The USA is by far the largest IT market in the world, accounting for 42 per cent of the global total in 1994. The other major market is that of Western Europe, making up a further 30 per cent of the total. Japan has the second largest national IT market in the world, representing nearly 17 per cent of global revenues. This pattern is gradually changing, however, as countries in Eastern Europe and the Rest of the World have experienced IT market growth rates consistently over 12.5 per cent for the period 1993 to 1995. Growth rates for the USA, Western Europe and Japan over the same period were 7.6, 5.5 and 7.5 per cent respectively. In terms of the supply of computer services, the global market is also dominated by US-based companies. In 1991, 11 of the top 15 computer service firms in the world were US owned, including the top seven. The list was headed by EDS, Andersen Consulting, IBM and CSC (Datamation 1992).

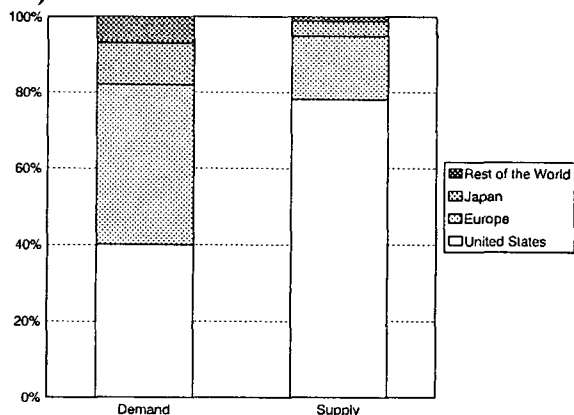
Table 3.1: Breakdown of the world IT market in 1994 by major region (m ecu's).

Region	Software	IT Services	IT Hardware	Total IT market	World %
Western Europe	25316	47732	56528	129576	30.4
Eastern Europe	436	956	2199	3591	0.8
USA	30402	67360	81114	178876	42.0
Japan	6404	26916	37544	70864	16.6
Rest of World	3691	14167	25052	42910	10.1
Total	66249	157131	202436	425817	100.0

Source: EITO 1995, p.353. Approx exchange rate: 1ecu=£0.78=\$1.17

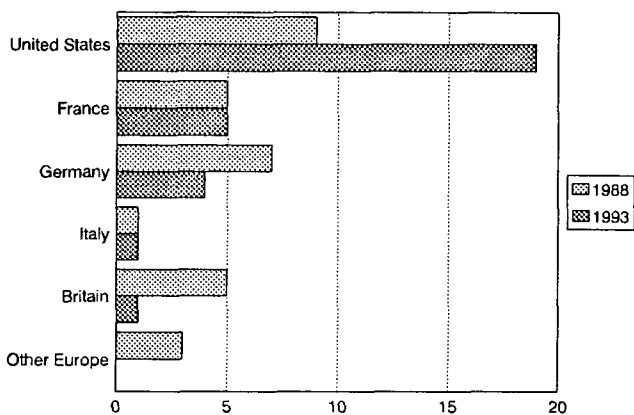
US dominance is strongest in the software products market, where European companies account for less than a third of sales in Europe, while US firms supply more than 60 per cent of the region's demand. As a result, Europe has a trade deficit in packaged software running at \$18bn a year (*Economist* 12 November 1994). The 'product' nature of computer service packages means they are particularly amenable to being sold across international borders, and hence they provide the greatest opportunity in the computer services industry for foreign market penetration. However, as has already been described, many major companies still establish subsidiaries in major markets to undertake customisation, sales, training and support tasks. The USA's dominance over this subsector is partly due to the historical origins of the software product industry on the West Coast, which created a market lead that has never been surrendered. This initial advantage is backed up by a highly innovative culture in the US IT industry, supported by the large scale of the domestic market (Saxenian 1994).

Figure 3.2: Demand and supply in the world packaged software market in 1991 (total market, \$52bn).



Source: IDC/Input in the *Economist*, 12 November 1994, p.102.

Figure 3.3: Changing ownership of the top 30 software firms in Europe*, 1988 to 1993.



Source: IDC/Input, in the *Economist*, 12 November 1994, p.102.

* European sales only.

This demand and supply mismatch in the software product industry is illustrated in Figure 3.2; Europe buys nearly as much software as the USA, but produces only a fifth as much. The trend is worsening for the European industry, with US companies accounting for 19 of the top 30 software companies in Europe in 1993, up from just nine in 1988 (see Figure 3.3). Contrastingly, very few European software companies have become successful in the USA. The large Germany company SAP is very profitably marketing applications software for business computer networks to take advantage of the US trend to business re-engineering, but this is almost the only exception to the general picture. US businesses are reluctant to use European software firms that do not have a major part of their business located in the US. Hence, UK companies such as LBMS and Micro Focus, which have tried to orient their business to the US market rather than Europe, have struggled to make profits (*Computing* 8 September 1994).

While this US dominance is most established in the software product industry, which accounts for around 30 per cent of the total market (EITO 1994), it is also becoming

apparent in the computer services industry as a whole. Subsectors such as systems integration, consulting and custom systems have traditionally been more regional in their emphasis, being fairly compartmentalised into national markets (*The Times* 2 October 1992). However, Gentle and Howells (1994) now recognise five factors that are causing this national orientation to be eroded, as IT markets become more 'globalised' (Gillespie *et al.* 1987) and the potential for FDI increases. Firstly, public procurement is becoming deregulated at the EU, national and local levels, with restrictions on the activities of foreign firms being lifted. Secondly, language barriers, although still important, are declining as many large multinationals adopt English as the corporate language. Thirdly, as hardware becomes more standardised, the dominance of national hardware companies with their own operating systems is waning and the idea of a vertically integrated national IT 'champion' has become untenable. Fourthly, national computing standards are increasingly becoming superseded by international standards with the move towards open (highly compatible) systems. Finally, size and geographical scope are now important considerations for computer service companies as multinational client firms create demand for geographical and product market diversification. As a result of these shifts, if the list of the top 20 computer service providers to the European market in 1994 is considered (Table 3.2), nine are US companies, including four of the top six. The largest European provider is Cap Gemini Sogeti, employing some 18000 people in 1991 (Eurostat 1994). Notably, there are now no UK owned businesses in the top 20; issues specific to the UK industry will be considered in the next chapter.

In addition, there are several processes contributing to the increasing share of the European market accounted for by US firms. Firstly, the easing of restrictions on public IT procurement described by Gentle and Howells has offered growth opportunities to US companies in particular. For example, both EDS and CSC have had major successes with Civil Service contracts in the UK, due to the huge economies of scale that they can apply to such large projects. As the level of outsourcing by both public and private bodies continues to grow, the market-leading US companies will benefit disproportionately. Secondly, as hardware firms increasingly move into service markets to maintain higher profit margins, national subsidiaries of dominant US IT hardware companies are improving their *service market* share in European countries. The presence of IBM and Digital (DEC) in the top 20 service suppliers (Table 3.2) is an illustration of this. Thirdly, the US-dominated software products segment is one of the fastest growing parts of the industry, thereby increasing the relative importance of key US software producers in the computer services market as a whole. Fourthly, the creation of the Single European Market has meant US firms can gain efficiencies by integrating their business at a European scale, as can their European counterparts, and create national specialisms within their European structure, while still maintaining the ability to provide a service locally.

Table 3.2: The top 20 European software and computing service suppliers in 1994.

Rank	Company	Country	1993 European Revenue m ecu	1994 European Revenue m ecu	Growth 1993-94 (%)
1	IBM	USA	n/a	2960	n/a
2	Cap Gemini Sogeti / Debis	France/Ger	2394	2328	-2.8
3	EDS	USA	1220	1520	+24.6
4	Microsoft	USA	1105	1330	+20.4
5	SNI	Germany	1043	1048	+0.5
6	Andersen Consulting	USA	863	965	+11.8
7	ICL	Japan	785	855	+8.9
8	Finsiel	Italy	874	852	-2.5
9	Digital	USA	824	824	+0.0
10	Sema Group	France	648	768	+18.5
11	Computer Associates	USA	686	708	+3.2
12	Oracle	USA	589	690	+17.1
13	Sligos	France	576	625	+8.5
14	SAP	Germany	471	564	+19.7
15	Bull	France	435	495	+13.8
16	Olivetti / OIS	Italy	n/a	479	n/a
17	Computer Sciences (CSC)	USA	n/a	423	n/a
18	Novell	USA	400	422	+5.5
19	Thomson CSF	France	435	417	-4.1
20	Alcatel	France	n/a	415	n/a

Source: Holway 1995b, p.1

Fifthly, and finally, US firms are increasing their presence by aggressive merger and acquisition strategies. For example, in the first half of 1995 there were 547 mergers and acquisitions in the European IT industry, worth some £11bn; 25 per cent of the acquisitions were made by US companies. The two giant US computer service firms, EDS and CSC, are both committed to increasing their European presence via acquisitions (*Computing* 5 October 1995). Indeed, Cooke and Wells (1991) assert that the rise in alliance-formation activities by all leading firms is the most visible outcome of the globalisation of IT markets, as firms try to compensate for their increasing specialisation, and the needs of a more international market. Such linkages can be both forward (market oriented) or backward (supplier oriented), and are increasingly international in their nature (Gillespie *et al.* 1987). Alliances can range from mergers and acquisitions to research and production agreements, and the central motivation is to improve the market position of those involved. In turn, these changes to the external structures of business organisation will have impacts on the internal structures of businesses (Cooke & Wells 1991, Cooke *et al.* 1992; see Chapter 7 for some UK based examples).

3.3 The European computer services industry in more detail.

The European computer services market is dominated by three main markets, the UK (16 per cent), France (19 per cent) and Germany (27 per cent), which together make up 62 per cent of the total value (see Table 3.3). However, it is now the less mature markets of Western Europe, such as Greece, Portugal and Ireland, and those in Eastern

Europe such as the former Soviet Union and Poland, that are expanding most rapidly. Many European economies are still emerging from the recent recession, which, for the first time had a depressing impact on the IT market, in particular on the hardware sectors. For example, over the period 1991 to 1993, the computer hardware markets of France and Germany shrank by 6.5 per cent and 2.5 per cent respectively, while that of the UK only grew by 0.2 per cent (EITO 1994). However, stronger performance in the software and service industries ensured that overall IT markets continued to grow.

Table 3.3: European computer service markets in 1994, m ecu's.

Country	Applications & systems software	IT Services	Total software and IT services	Growth 1994-95 %	Predicted Growth 1995-96 %
Austria	553	967	1520	8.4	8.6
Belgium/Lux.	672	1547	2219	4.6	4.1
Czech & Slovak Reps.	91	159	250	8.6	8.5
Denmark	426	1357	1783	5.5	5.0
Finland	249	660	909	5.0	4.6
Former Soviet Union	216	501	716	17.7	13.2
France	3878	9633	13511	5.3	6.0
Germany	8913	11037	19950	6.1	6.2
Greece	79	99	178	20.5	22.3
Hungary	55	156	211	13.3	5.3
Ireland	116	172	288	10.7	8.3
Italy	2260	5365	7625	4.0	5.3
Netherlands	1365	2153	3518	4.8	5.2
Norway	380	1069	1449	4.3	3.9
Poland	74	141	215	12.9	9.5
Portugal	130	163	293	7.6	8.4
Spain	704	1368	2072	5.4	8.2
Sweden	683	2065	2748	4.2	4.2
Switzerland	923	2103	3026	7.3	7.3
UK	3984	7977	11961	5.0	5.3
Total	25750	48692	74442	5.3	-

Source: EITO 1995, pp.359-378.

The rapid growth of Central and Eastern European markets is largely a result of the slackening of trade and investment restrictions by former communist governments since the end of the Cold War. Similarly, COCOM (Consultative Group Co-ordinating Committee), a Paris-based institution established to control the export of high-technology goods from NATO countries in the Cold War, is relaxing its restrictions on the unlicensed sale of many IT products (*Business Central Europe* October 1993). The most mature and open IT markets of the region are in the relatively stable economies of Poland and the Czech Republic (*Computing* 20 July 1995c). IT investment and sales into Eastern European markets have so far been dominated by Western European and US hardware and telecommunications companies, taking advantage of both the low level of computer ownership, and the poor existing telecommunications networks. Leading hardware systems suppliers to the region include IBM, ICL, DEC, Hewlett

Packard and Unisys. Software markets are lagging behind slightly in growth terms, due to the cost and difficulties of translating products for the different national markets and the very high levels of software piracy (80 to 90 per cent of all software used). However, certain US software firms such as Oracle are aggressively targeting the region; by late 1994 the company had seven offices and 100 full-time staff working in Central and Eastern Europe (*Business Central Europe* September 1994). There are also an increasing number of successful indigenous software companies, such as Hungary's Graphisoft, which supplies 25 per cent of Apple Macintosh architectural design packages worldwide. Computer services markets in Eastern and Central Europe will continue to grow quickly as the rapid uptake of IT systems spreads from the present lead sectors of government, finance, and the utilities, to all areas of the economy.

A more detailed breakdown of the Western European market by computer service subsector is provided in Table 3.4 (such data is not available for Eastern Europe at present). This highlights the importance of software products, as discussed previously, but also of the professional services market, which covers IT consulting, custom programming, systems integration, facilities management and IT training. Although network services are the fastest growing segment, the subsector is starting from a very small proportion of the market. There is little significant variation between the relative importance of these subsectors across the different economies of Europe, although, as countries emerge from recession, different areas of the industry may be leading the growth. For example, growth is strong in the software product businesses of France and Germany, while in the UK the professional services market is performing well, in large part due to a number of large scale Government outsourcing contracts (EITO 1995, *Computing* 10 November 1994).

Table 3.4: The Western European software and services market by product category.

Product Category	1994 market (m ecu's)	Annual growth rate 1994 (%)	% of total market
Systems Software	11928	5.9	16.3
Applications Software	9487	8.8	13.0
Software Products	21415	7.2	29.3
Professional Services	27413	6.4	37.5
Processing Services	9157	3.4	12.5
Network Services	1844	12.2	2.5
Hardware Maintenance & Support Services	13213	0.9	18.1
Services	51626	4.6	70.7
Total Software and Services Market	73041	5.3	100.0

Source: EITO 1995, p.113

The EITO (European Information Technology Observatory) review of the European software and services market in 1994 concludes that increased international competition

will have three consequences for the industry. Firstly, the European market will continue to globalise, with country markets opening up more to competition (see also Anderson Consulting 1992). At present, the UK is probably the most open market in Europe, while markets such as France and Sweden are gradually becoming more internationalised. More 'conservative' countries such as Germany are also showing signs of change, partly due to highly aggressive marketing by US IT companies. Secondly, there will be a continued concentration in the market. The market share of the top 15 vendors increased from 13 to 17 per cent over the period 1988 to 1992, but this is still low compared to other IT segments such as computer hardware. Competition from large US software and service companies may force small to medium sized European firms to focus on market niches, or to merge with (or be subsumed within) other groups. Hence, thirdly, many computer service vendors will become more specialised as the market develops and matures. A key investment opportunity for European companies with limited investment capacity, but with a high level of local knowledge, will be to mediate between client firms and large multi-national systems integrators.

3.3.1 European computer services employment.

Data on computer services employment in individual European countries is very difficult to obtain, with much EU information not being available down to the level of specific service sectors. Although such information is undoubtedly available within each country, it is often difficult to access for non-nationals and to standardise between countries. The ECSA (European Computer Services Association) no longer collates such employment data; in 1988 it estimated that employment in the sector was 200000. The best indication available now is comparative information on the changing business service employment in key European states (see Table 3.5). Computer services employment in Western Europe can be estimated by assuming that the ratio of computer service employment to the total business service employment is the same across all the countries. Thus, the data in Table 3.5 would suggest an employment level of approximately 550000 in the countries listed (6.4 per cent of the NACE 8 total).

However, European Information Technology Observatory (EITO) estimates suggest that, in 1994, some 960000 people were employed in the IT industry in Europe (EITO 1995), with 275000 of these employed in the data processing and office machinery segment, and 280000 in software and services. The balance is allocated to the IT distribution industry. This almost certainly represents an underestimate of software and computer service employment, as UK Census of Employment figures suggest a workforce of over 170000 in the UK alone in 1994 (Employment Gazette). There are two possible reasons for this; firstly, software and service staff within hardware companies such as IBM and DEC may be included by EITO under office machinery, and secondly, the distribution sector may contain businesses adding considerable value to IT

products, and which therefore would be included in many definitions of computer services. If the UK Census of Employment figure (170000) is increased in proportion with the value of the European IT services market as compared to the UK, an estimate of around 1000000 jobs is obtained. This, on the other hand, is probably an overestimate, as the UK is the most mature IT market in Europe, and also receives more US computer service investment than most other countries. Hence, if these different results are compared, a figure of some 6-700000 employees in computer services in Western Europe is the best estimate that can be made, with the UK, France and Germany being the three main employment centres.

Table 3.5: The changing business service (NACE 8) employment of EU countries, in thousands, 1984 to 1991.

Country	1984	1987	1989	1991
UK	1941.2	2232.5	2598.6	2696.9
Germany	1592.6	1765.4	1889.4	2165.1
France	1494.2	1634.5	1853.2	2018.9
Spain	376.3	437.9	543.9	607.4
Netherlands	446.3	480.0	533.0	605.0
Belgium	191.2	221.6	245.7	256.4
Denmark	174.5	203.4	215.5	214.2
Greece	77.0	91.5	105.4	nd
Ireland	69.4	71.1	74.7	80.0
Luxembourg	14.8	19.2	23.2	nd
Italy	nd	nd	nd	nd

Source: Eurostat CD-Rom, Panorama of EU Industry 1994, nd = no data.

3.4 Case Study: US investment in the Irish software industry.

'Software companies who are not already here are just queuing up to get in.'

Managing Director of US software product firm, 21 June 1995

To a large extent, as discussed in the opening chapter (Section 1.4), the computer services sector has been overlooked in policy and strategy terms in Europe (Gentle & Howells 1994). One country however that has long seen the potential and strategic value of developing a software industry is the Republic of Ireland. Indeed, there is now a growing recognition that Ireland is one of the most important centres for software development and production in Europe. This case study will describe how, by specifically targeting and attracting foreign investment, Ireland's software sector has grown from employing a few hundred people in 1980, to an industry that today employs over eight thousand staff directly (and many more indirectly), turns over an estimated £2800m annually of which £2600m is exported, and that produces around fifty per cent of all the personal computer software products used in Europe (*Financial Times* 24 June 1996). While many of the preconditions for this growth are unique to Ireland, there are also some lessons to be learnt for other areas of Europe looking to benefit from such growth, especially the UK. The study will also try to highlight certain features of the

industry that are often concealed by the aggregate statistics and promotional literature, and which may create problems for its development in the future.

3.4.1 Background.

Historically Ireland has long tried to capitalise on the benefits offered by export-oriented foreign manufacturing investment; it first became an explicit Government aim in the 1958 *Programme for Economic Expansion* (Breen *et al.* 1990). In particular, with corporation tax incentives, Ireland has proved to be an effective site for US firms looking for a base from which to produce for the European market, especially since the 1970's. There are obviously negative consequences of such a reliance on foreign owned manufacturing, and a consultancy report in 1982 concluded that '*Foreign owned industrial operations in Ireland....do not embody the key competitive activities of the industries in which they participate*' (Telesis Consultancy Group, in Breen *et al.* 1990, p.160). High skill areas such as R&D were generally absent. Another drawback was that foreign firms did not seem to be establishing links with Irish firms, and consequently did little to stimulate indigenous growth (O'Hearn 1989, Breen *et al.* 1990). For example, the DEC (Digital) manufacturing plant in Galway produced almost no spin-off companies in the twenty five years it was in operation, before its closure in 1993. For O'Hearn (1989) Ireland is a 'good' example of an economy dependent on foreign investment, which by removing trade barriers and allowing free movement of profits has restrained growth and enhanced social inequalities. However, other commentators (e.g. Grimes 1992) feel that the contribution of foreign investment in terms of services bought, employment created and technology transfer has been crucial.

In the mid-1980's, the Industrial Development Agency (IDA) commissioned research to identify growth industries to be targeted for assistance both in terms of indigenous development and foreign investment. Under the auspices of the *International Services Programme* a 1984 report by Arthur D. Little Ltd. recognised nine key sectors, the top two of which in employment potential were financial services, and computer software products (Arthur D. Little 1984). There was a recognition that once investment was won in such service industries, where knowledge is often accrued with staff, it would not subsequently be as mobile as some of the manufacturing investment described above. This research also identified the characteristics of the major software companies which should be approached, mainly in the USA. These would have a suitably large workforce, no manufacturing or R&D presence in Europe, no reliance on being close to their customers, and products transferable from the US market.

3.4.2 Ireland and the software product industry.

Hence it was a particular subsector of the computer services industry, software products (see Table 1.1), that was targeted by the IDA. Manufacturing and software localisation

(the translation and adaptation of US products for European markets) are the two key tasks now undertaken in Ireland (Press 1993). The software product sector is one of the fastest growth areas within computer services; the revenues of the top one hundred companies in the world grew by some 62 per cent over the three year period 1990 to 1992 (Softletter, quoted in Jacobson & O'Sullivan 1994). Ireland has benefited as the proportion of non-US sales for these firms has increased (from 37 to 45 per cent over the same three years). It is also a highly concentrated sector, with in 1992 the top company (Microsoft) commanding 35 per cent of the worldwide market, the top three companies 55 per cent, and the top twelve, 82 per cent.

Ireland has been able to take advantage of the supply-demand mismatch illustrated by Figure 3.2, which represents a large transfer of US software products to the major economies of Europe. Mass produced software is very different from many other computer services in that it is essentially like any other manufactured product, and need not be produced in proximity to its consumption. Jones (1994) records that the average distance from the site of production to customers in commercial packaged software markets is now 3000 miles, in systems software several thousand miles, and military software some 6000 miles. However, despite the capabilities of modern telecommunications, many companies providing other aspects of IT services, such as systems integration, training and maintenance depend on being close to where clients are located (Coe 1996). Therefore, while there are much larger concentrations of computer service employment elsewhere in Europe, for example along the M4 corridor, the Dublin area has been able to evolve into the leading region in Europe for this specific subsector, unhindered by its peripheral geographical location.

The IDA had two crucial early successes in 1985. Microsoft and Lotus Development (now part of IBM), both world leaders, agreed to set up their sole European manufacturing operations in the Dublin area. The importance of these decisions should not be underestimated; had these key players gone elsewhere, for example to a UK location, this would have severely restrained development in Ireland. The move into computer software may seem a logical progression given Ireland's already existing role in computer manufacturing, but the impeccable timing of the IDA's approaches to these US companies represents a major strategy success.

3.4.3 Theoretical concerns.

This section will outline some further theoretical concepts which are useful in understanding the 'manufacturing' nature of the Irish situation, and were thereby not introduced in Chapter Two. As Gordon (1991) notes, high technology aggregations such as that around Dublin can be produced in diverse ways, in this case as the global locational strategies of separate multinational software companies have created a cluster

of branch plants. Hence in no way does the concentration of firms around Dublin represent an innovative cluster based on the flexible production systems of small firms, as proposed by the flexible specialisation thesis (e.g. Piore & Sabel 1984). Indeed Gordon suggests that many theories of industrial concentration such as this overplay the importance of inter-firm links. The software industry in Ireland is dominated by a few large firms, and links between the overseas firms in any formal sense are highly limited. While these companies are highly locally embedded (Dicken *et al.* 1994) with a whole network of support firms tied in by subcontracting relationships, these supplier firms are becoming larger, with a trend towards vertical *integration*. Essentially what is being created in Ireland is a dependent branch plant economy (Massey 1995) as part of a global production scheme, or in other words, the international division of labour (Dicken 1992) within the software product industry. This is of particular interest as the software industry as a whole is often perceived as a high-tech, people based, service sector.

Hence, in the language of Amin and Thrift (1994b), Ireland (in particular Dublin County) appears to be 'holding down the global' to great effect in the software product industry, due to a combination of forward thinking policy decisions and certain distinctive characteristics that will be discussed in the next section. This idea suggests that Ireland has taken advantage of the globalisation of the software product industry to create economic growth at the local level, as parts of the global industry become locally embedded. Amin and Thrift (1994a) also introduce the idea of 'institutional thickness', which tries to encompass not only the economic forces at work in area, but also the social and cultural processes. This concept suggests that areas with a high presence of institutions (from firms to government agencies) which have a high level of interaction and a common agenda, can often benefit in economic development terms. Indeed this would appear a good way to describe how the overseas firms, the IDA, the Trade Board, educational establishments and indigenous supplier firms are all aligned towards maximising both exports and employment in the Irish software sector. However this is qualitatively different from regions whose institutional thickness is oriented towards local innovative networks (e.g. Cambridge, U.K.).

To a large extent these concentrations of development are unique and locationally specific, as Amin and Thrift (1994b, p.258) recognise; '*... it might be argued that most of those successful concentrations are 'one-offs': fortuitous combinations of path dependence and specific local instances have produced a unique local institutional thickness which can never be imitated.*' Indeed it is hard to see which other areas in Europe (with the possible exception of some peripheral areas of the UK) could have attracted such a level of software manufacturing investment, when Ireland's historical orientation to attracting US manufacturing investment is combined with some key policy

decisions and locational attributes (which will be discussed in the remainder of the chapter).

3.4.4 *The Irish software industry now.*

IDA figures suggest that by 1993 around 8900 people worked in the Irish software industry, and the figure is now almost certainly higher (Microsoft and Lotus together employ 1500 staff). This employment is split fairly evenly between indigenous and overseas firms, of which in 1993 there were 336 and 81 respectively. While the total is only equivalent to the 1991 computer service employment of Berkshire or Surrey, it is the export levels of the Irish companies which make it such an important centre. In 1993 the overseas companies exported some 98 per cent of their revenue, while the indigenous firms exported 40 per cent, giving total exports of just under £2000m. With typical annual employment and revenue growth rates of 20 per cent, these figures are certainly now much higher. The size distribution of overseas firms is markedly different from the indigenous sector, which is dominated by small firms (70 per cent employ ten people or less). The top four overseas companies in 1992 accounted for 45 per cent of total employment, as Table 3.6 shows. The overseas activity has grown from a level of 45 firms and 1500 staff in 1987. Figure 3.4 (next page) indicates two key points about the major investments in Ireland; firstly that the huge majority of the firms are well known American names, and secondly that most are based in and around Dublin.

Table 3.6: The Irish overseas computer software industry, by company size.

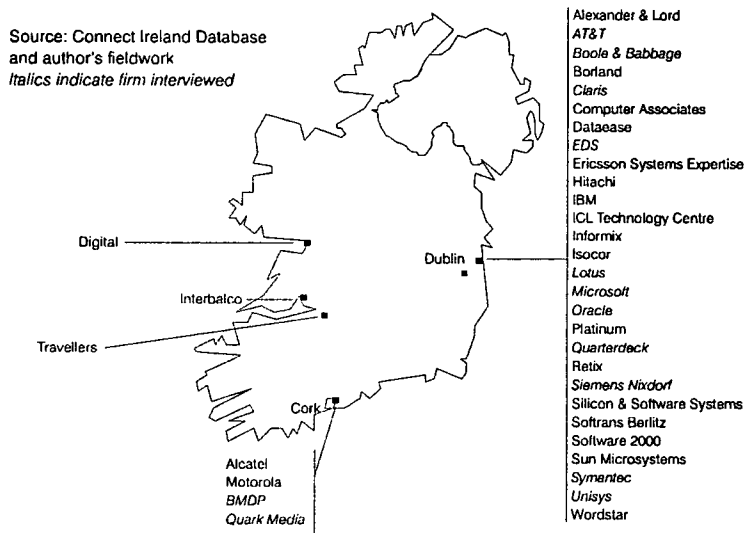
Establishment Size	Number of Establishments (% of total)	Number Employed (% of total)
200+	4 (5)	1824 (45)
50-200	16 (22)	1275 (31)
40-49	4 (5)	170 (4)
30-39	7 (9.5)	226 (5.5)
20-29	10 (13.5)	250 (6.5)
10-19	16 (22)	222 (5.5)
6-9	7 (9.5)	51 (1.5)
1-5	10 (13.5)	34 (1)
TOTAL	74 (100)	4052 (100)

Source: IDA 1992, pp.2-5.

In line with the original IDA strategy, many of these firms are PC software companies, and by 1992 15 of the world's top 40 software products companies had bases in Ireland. As has already been described, manufacturing and software localisation are the two key tasks undertaken in Ireland. Figure 3.5 (next page) is a schematic representation of the linkages of a large US software company manufacturing and localising in Ireland; many such companies have national subsidiaries in the major national markets of Europe,

providing the functions which need to be local; marketing, selling, training and support services.

Figure 3.4: Major foreign software manufacturing and development centres in Ireland, not including branch offices.

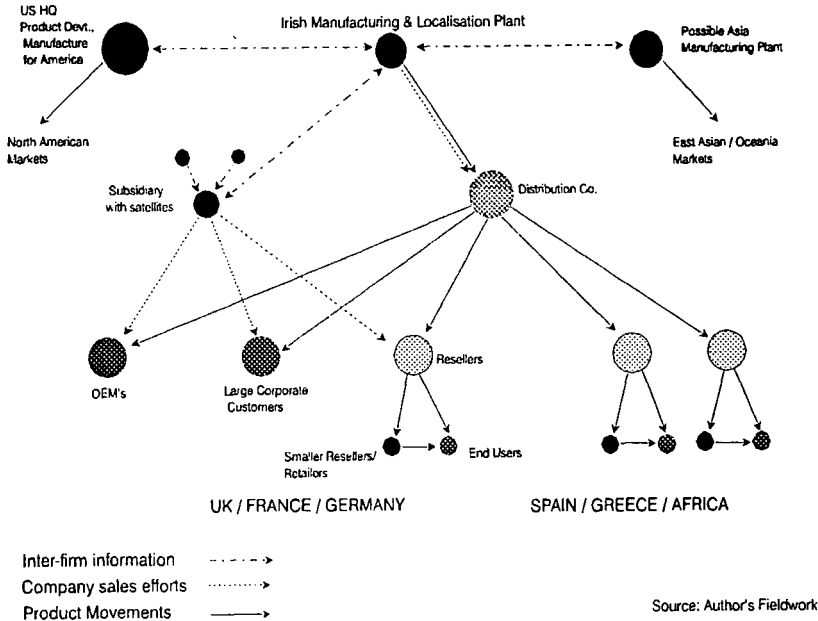


Many companies manufacture and distribute for the Middle East and North Africa from their Ireland establishment, while some service all markets outside North America. Within Europe, the UK, France and Germany are the major markets, often accounting for 60 to 70 per cent of sales. In other smaller European countries with smaller IT markets (e.g. Greece, Spain) there may not be a subsidiary, but a network of approved resellers and agents who market the products. In the future, such software firms will increasingly manufacture and localise products in Central and Eastern Europe as the market expands: Microsoft, Borland, Lotus and Symantec already manufacture under license in Russia (*Business Central Europe* October 1993). Localisation for the Asian market is more complex technically, and is undertaken by many firms (including Lotus) in Japan. Localisation and manufacturing in Latin America and Africa are minimal, with little locally added value (Press 1993).

The Irish IT market itself is limited (763m ecu's as compared to 22746m ecu's in the UK in 1995; EITO 1995), but some of the overseas representation is purely from branch offices serving this market, for example the US health systems company, SMS. The Irish market share in other sectors of the software market, in terms of total European revenue, is small. However, Ireland is seen increasingly as one of the main UNIX development centres in Europe, and companies such as Motorola and ICL have established stand alone UNIX bases. (UNIX is a widely used computer operating system, often associated with the concept of 'open systems' where various different forms of hardware work together). Other companies such as Digital and Ericsson have

appended specialist software operations to existing hardware manufacturing operations already located in Ireland, and telecommunications firms such as AT&T and Alcatel have set up software centres. As the 1994 EITO report notes, *'Ireland is developing particular strengths in software. It is now attracting software design centres, as well as the packaging and distribution facilities of overseas companies'* (EITO 1994, p.45).

Figure 3.5: Schematic representation of organisation of large US software product company.



3.4.5 The attractions of Ireland to foreign investment.

While recognising that any location decision is the result of a number of complex factors, for the purposes of this paper it is possible to group the key factors behind Ireland's success in software under four headings. Taken together, the factors can make the location choice, as two managing directors put it, *'a no-brainer'* or a no lose decision. Another indication of the critical mass that Ireland has achieved in this sector is the recent establishment there of the European Software Manufacturers Association, an informal network at management level for these companies, and also the high number of contacts they receive from other US firms considering a European base.

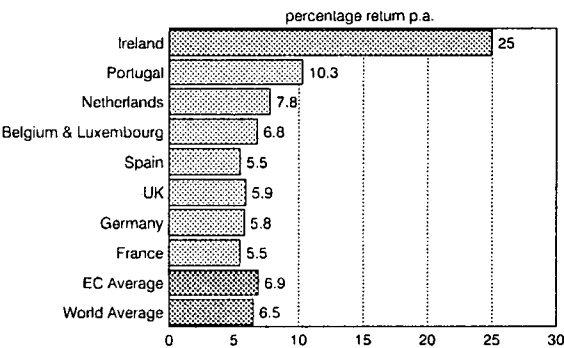
3.4.5.1 Government schemes and initiatives.

Ireland is probably the only country in Europe to have a National Software Directorate, a department within the IDA established in 1991 purely concerned with expanding the software sector and providing for its needs. The IDA in general is perceived by software companies as being highly professional and effective in its presentations. It has six offices in the USA, five in the Asia-Pacific region, and three in Europe. It is seen as having a major positive influence in other fields, such as education, funding and support services. At present a venture capital scheme is being initiated. The Directorate is also

extremely active in promoting indigenous firms and helping them become active in export markets, and the Software Linkage Programme is a good example of a scheme intended to help the industry overall by fostering links between the overseas and indigenous sectors. Since 1994 overall responsibility for indigenous development has shifted from the IDA to another Government Agency, Forbairt. According to the National Software Director, a major factor behind the success of the Directorate and more broadly the IDA is that the small size of the sector (800 firms) allows each firm to be monitored and treated individually.

The ten per cent corporation tax rate was introduced in 1981 and is assured until 2010, meaning that companies can repatriate 90 per cent of their profits, and compares to 40 per cent for Irish manufacturing companies and service industries. In the UK the tax rate varies from 25 to 33 per cent depending on the size of profits (firms with profits over £1.5m pay 33 per cent tax). The double taxation agreement between Ireland and the USA means that the tax paid in Ireland is then given as credit against the tax to be paid in the USA. This regime is a key factor behind the high rate of return achieved by all US companies investing in Ireland, which Figure 3.6 (below) shows. Although these benefits seem fairly secure, McCutcheon (1995) suggests that factors outside the influence of the Irish authorities such as inflation, the US tax regime, anti-avoidance legislation and the general disposition of US overseas investment could all affect the value of the tax relief.

Figure 3.6: Average annual percentage rate of return on US overseas manufacturing investment.



Source: US Dept. of Commerce 1993, in IDA documentation

Behind this major incentive, there is a wide range of other grants available, including feasibility grants, employment grants for new jobs created, training and management development grants, capital grants and rent subsidies. Research and development grants of up to 50 per cent are available if the marketability of the development can be proved, and IR£60m of grants have been approved in 1995 (£1 approx. = IR£1). So far, however, foreign companies have been slow to take up this particular bait. Furthermore, the Irish Trade Board is very active in promoting Irish software exports, although this is largely intended for indigenous companies.

3.4.5.2 Labour force characteristics.

Ireland, and in particular Dublin, with almost one third of the total population, can offer a large pool of English speaking skilled labour. Promotional literature suggests that, although the population is small, it is the youngest and arguably the best educated in Europe. Often quoted figures are that half the population is under 28 years of age, and 27 per cent are in full time education. Ireland has long been an education conscious country, and all three levels of education are perceived as effective. Indeed, there has been a concerted effort to foster economic growth by the provision of human capital through an interventionist education policy. In particular, higher education establishments have been encouraged to be open to ideas from industry and commerce, and around 55 per cent of students now study business, engineering and science disciplines. Company links to the Universities are well established, although this is often just in terms of sponsoring students and recruitment. In addition to this good supply of well trained IT or IT literate graduates, there is a supply of staff in the long standing foreign electronics sector who can be fairly simply retrained, particularly for software manufacturing. Staff in overseas firms are almost exclusively Irish, right up to the top management level, and workers are fairly mobile between the companies especially with the high rate of new start ups. Some managers see this as beneficial in that it reduces any possible stagnation of the workforce.

It is interesting to place these supply side developments within the context of an Irish labour market that is still losing labour through emigration, to the UK in particular. Out-migration developed in the 1980s to include many highly qualified professional graduates from the urban areas of Ireland (King & Shuttleworth 1995). Although it is difficult to gauge how this migration varies across occupations, and overall it appears to have slowed during the recessionary early 1990s, it is clear that in general the Irish economy is still not providing enough opportunities for all its graduates.

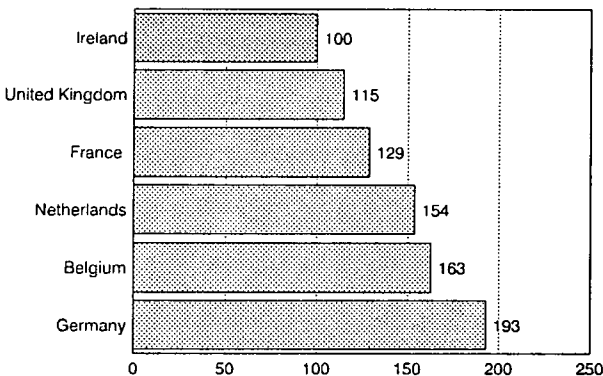
With unemployment still relatively high and the steady supply of new graduates, the overseas companies have so far had no problems in recruiting staff of any kind, and indeed nearly always echo and support the promotional claims of the Government agencies. In terms of software engineers and technical staff, recruitment is dominated by degree and diploma graduates, and many also have higher degrees or business qualifications. Language graduates are needed for localisation, and Microsoft employs over 100 mainland Europeans to ensure its products are '*linguistically and culturally correct.*' The Software Localisation Interest Group estimates that in total some 4000 staff now work on localisation tasks in Ireland (*Financial Times* 24 June 1996).

In reality, however, it is easy to exaggerate the number of high skill jobs that the industry supports. In terms of manufacturing staff, the majority enter as school leavers,

and it is important to realise that on average around 60 per cent of employees in software manufacturers are involved in fairly simple production, packaging and distribution processes, often on a shift and seasonal basis. When administration and support functions are also considered, the actual number of IT graduates employed is far lower than the aggregate employment figures might suggest. Indeed, it may be possible to suggest that there is some kind of 'dual' workforce being created, with two distinct cores; one of highly skilled development and localisation staff and one undertaking the less demanding and more repetitive manufacturing tasks.

Another potential advantage of Ireland's workforce, but one which was interestingly never explicitly mentioned in interview, is that in Western European terms it is relatively cheap, as figure 3.7 (below) indicates. However, if one assumes a US firm prefers an English speaking location, while there is a fifteen per cent difference between Irish wages and those in the UK on average, the actual wage difference between Ireland and peripheral areas of the UK bidding for overseas investment is probably minimal.

Figure 3.7: Comparative labour costs index.
Average hourly compensation (incl. fringes): index 100 = Ireland 1993



Source: Business International, in IDA documentation

3.4.5.3 Support infrastructure.

While in the mid-1980's the main attractions were the favourable tax regime and the readily available staff, a complete support network for software manufacturing has now evolved which dramatically eases the problems of establishing a foreign plant. At the same time this has created massive opportunities for Irish companies in a variety of industries, in particular printing, disk duplication, and translation. Microsoft alone sources IR£80-£100m worth of Irish goods and services annually, with 95 per cent of its raw materials coming from Ireland. Software manufacturing is essentially a simple process, neatly described in Microsoft's overview of its Irish operation;

'Manufacturing at Microsoft is a two stage process. First the product is duplicated from master disks to floppy disks. Second the finished product is assembled. This entails placing the duplicated disks,

manuals, licence agreement and packing material in the appropriate carton. These are then shrink wrapped to await shipment.' (Microsoft 1995, p.13)

In no way is this a particularly high-skill process. Local companies have benefited by becoming subcontractors for elements of this process and by providing some of the inputs. While this is a crucial argument used to counter critics who suggest that the 10 per cent tax rate is simply losing Ireland money, it must be recognised that many of the inputs are fairly basic, and do not really represent innovative high technology industry.

The best example is the computer manual printing industry, which has expanded rapidly, growing from IR£6m per annum in the early 1980's to around IR£85-90m in 1992. The printing companies have become technologically advanced and internationally competitive, and it is estimated that over 1400 jobs had been created by 1992 (IDA 1992). For example, one of the largest firms, Printech, employs around 320 people, turned over £23.0m in 1991, and accounts for 20 per cent of the Irish manual market share. Table 3.7 details growth estimates from Jacobson and O'Sullivan (1994), and also shows how important the large customers are.

Table 3.7: Demand for manuals by software publishers in Ireland (estimates, £m).

Company	1987	1990	1993
Microsoft	8.0	19.5	30.0
Lotus	3.5	12.0	16.0
Borland	0.0	8.0	7.0
Claris	0.0	3.0	4.0
Symantec	0.0	1.0	4.0
Quarterdeck	0.0	0.8	1.0
Wordstar	0.0	1.2	1.5
Total	11.5	45.5	63.5

Source: Jacobson & O'Sullivan 1994, p.108

The top nine or ten printers in this sector dominate the market place, and dedicate themselves almost exclusively to supplying software product companies. As a result a dependency on the US companies has developed, with the printing firms essentially controlled by their customers' requirements. The high level requirements of the software multinationals has meant that the latest technology is required, and printing quality is crucial, the most important measure of which is the 'ship-to-stock' status to ensure defect-free manuals (Jacobson & O'Sullivan 1994). Sector specific equipment such as shrinkwrapping and kitting machines may also be necessary, and an IDA grant programme was set up to aid firms in purchasing such machinery. Firms have had to shift from 'one-off' orders to complex production control and ordering procedures. Although such printers are using advanced technology and production processes (e.g.

JIT, Total Quality Control), the worry is that they are not really innovative, and may not be able to adapt beyond the software manual life cycle (Jacobson & O'Sullivan 1994).

Other new business sectors such as software disk duplication, kitting and translation operations have appeared, employing some 500 staff in 1992. Such companies have developed considerable expertise, not only in servicing customers in Ireland, but also aggressively marketing themselves internationally. In particular, they provide their services to companies in the US, offering them access and support for their European sales and marketing activities. Similarly courier, distribution, graphic design, disk manufacturers and packaging firms have all responded to the requirements of the software industry. Growth in all these sectors has accelerated since 1992, and mergers and acquisitions are creating large firms and a support industry that itself is becoming multinational in nature. Some such firms are Irish owned, for example BG Turnkey Systems has grown exponentially from nothing in ten years, and is headquartered from Cork, but many, such as McQueen's from Scotland, are based abroad.

The extent to which the process is subcontracted varies from company to company. Most actually replicate the disks and assemble the products using their own staff, but some such as Quarterdeck outsource the whole process. The major incentives are to remove the peaks and troughs in software production, and of course to reduce costs. Many smaller software firms in both the US and Europe use this method and concentrate on the core business of software development. However to be eligible for IDA grant aid firms must normally undertake their own disk duplication to count as manufacturing. There has been substantial vertical integration in this support industry, and some companies can now take a product to market when given a software product, i.e. from disk replication through to marketing, and in some cases first level product support. The arrival of Microsoft and Lotus at an early stage was instrumental in realigning these sectors towards software due to the large scale of the contracts involved. This made it worthwhile for companies to invest in new methods of production and the relevant new equipment. Since then, cost competition and the ever increasing number of customers have allowed the development of a mature and cost-effective infrastructure that is unique in Europe, with the IDA again instrumental in advising these companies on their development.

3.4.5.4 The communications infrastructure.

The digital telecommunications network of Ireland received over £2bn of investment in the early to mid-1980's, some of which came from EU programmes such as STAR (50m ecu's) and TELEMATIQUE (11m ecu's). Although this investment came late, its timing means that at present Ireland has a very modern and effective system, with optical fibre and satellite links direct to the USA and around the world. For companies such as the

heavily publicised Quarterdeck, which uses advanced telecommunications to provide telephone support from Dublin for Europe and the East Coast USA (to overcome the time difference problems when the California headquarters is closed), this can be a crucial location factor. In terms of other communications, Ireland has been an export driven economy for many years, and hence the freight and transport systems to Europe are well established. Ireland is well served for air transport, with five international airports.

3.4.6 The wider picture.

It is important that the success of Ireland in certain areas of the software industry is positioned in the context of other trends potentially influencing the country's economy, particularly those of offshore programming and offshore back offices.

As mentioned in Section 3.1, the rise of companies in countries which can provide more cost-effective 'offshore' programming has been increasingly recognised, and Ireland is sometimes seen as one of the countries benefiting from this trend. Those such as India and the Philippines can offer a large, cheap and well skilled labour force, thereby creating opportunities for both indigenous firms to bid for European projects (e.g. CMC, TCS) and for Western companies to establish subsidiaries (e.g. Third Wave in India, Exepos in Hungary). For Lakha (1994) this trend represents a broadening of the New International Division of Labour into new skills-based service industries. As an indication of the scale of these trends, in 1994, India generated some \$500m from software exports (*Financial Times* 6 December 1995), and each year produces around 96000 new UNIX graduates (*Computing* 27 May 1995). An often quoted example is the £200000 London Underground Timetabling system, written by Calcutta based CMC, but there are many other examples, including a £4.5m loans systems for Britannia Building Society being developed by Third Wave (*The Times* 24 May 1992). Quoted savings by using such offshore programming vary from 25 to 60 per cent (*Financial Times* 8 November 1994), but are obviously substantial, and it appears that quality and business method problems are being overcome. While historical and cultural links mean that India has done well with UK contracts and there are similar US - Philippines links, a whole range of other countries such as China, many Eastern European states and Morocco (*Computing* 27 October 1994a) are starting to bid for projects and threatening to undercut these early leaders.

Offshore programming decisions are made on both price and quality criteria, and while Ireland can offer labour costs lower than mainland Europe (Figure 3.6) its major advantage is the supply of good quality programmers. However, as has already been described, Ireland has not really developed as a major offshore programming base but rather as a manufacturing and localisation centre. While there are examples of

programming bases for multinational firms, these are often to take advantage of the particular skills (e.g. UNIX) of the Irish workforce within a European corporate framework rather than large scale cost savings. This is offshore programming in a different sense to that discussed above, and indigenous Irish firms show few signs of developing into the programming houses of India.

However the Irish base of the computer services giant EDS may be an indicator of future developments. The office has rapidly grown from 12 people in 1990 to employing over 250 in 1995. The majority of these staff are system engineers (SEs), who work on projects based all over Europe and further afield. The concept of the SE centre came out of a shortage of SE resource in mainland Europe. EDS subsidiaries in the various countries pass work to the Irish office when they cannot resource contracts, and although there is a fair degree of travel for the Dublin staff, much of the development work is then done in Ireland, aided by a sophisticated communications network within EDS. The Irish office is the first such base for EDS outside the USA, and other locations such as the UK, Spain and India were considered, with Ireland being chosen for the plentiful supply of quality staff at a reasonable price. The SE centre has been a great success, and others may soon open, possibly in Asia, Eastern Europe or Latin America. There are other examples in Ireland (such as Cambridge Technology Partners in Dublin: *Computing* 31 August 1995) and the huge success of the EDS operation may mean that further companies may also choose to set up Irish programming resource bases within easy reach of European markets.

While developments in the software industry are at present fairly distinct from the growth of back office functions, as software companies try to reduce costs in Europe, Ireland may stand to benefit if marketing, customer service and support functions are relocated. Since 1990, tens of European and American companies have set up telemarketing and back offices in Ireland, and these now employ over 3000 people (*Sunday Times* 11 September 1994). IDA rent subsidies and discount telephone rates from Telecom Eireann are two of the major attractions. The trend was started by New York Life, the huge US insurance company, who set up a small processing base in a small Kerry village in 1988. Low wages, an English speaking workforce, and advanced telecommunications made Ireland a perfect back office location for American firms in particular. Many companies such as Gateway 2000, Dell Computers, Korean Airlines and Best Western International and Sheraton Hotels have followed suit, and one US data processing firm employs more than 600 workers in Shannon, linked to Colorado via Satellite (Daniels 1995c). Telemarketing, often using freephone numbers, is the major growth area. Call centres in Ireland answer calls in several different languages, and, after a certain level is reached, calls are discounted by Telecom Eirann. While Quarterdeck (see earlier) provides telephone support for all its European customers

from Ireland, this is not as yet the general pattern among software companies, many of whom still provide support on a national basis.

3.4.7 Summary and assessment.

In conclusion, it is crucial that the overall importance and strategic value of the Irish overseas software sector are not exaggerated. This study has illustrated that beneath the aggregate statistics lie several facets to the industry's development that are not often publicised. For example, in terms of the large software manufacturers, only a minority of the workforce is involved in software development, and the proportion of graduates employed is often well below half the total staff. While the growth of the sector has undoubtedly promoted growth and modernisation in a number of support industries such as printing, these sectors have become highly dependent on their customers, and there are doubts about their long term innovative capacity. Furthermore, the important corporation tax regime may not be completely stable and is open to pressure from external forces. It is also important that the scale of investment in the industry is not over-estimated. By its nature, software package production is the only subsector of the computer services industry which provides opportunities for attracting relatively footloose manufacturing industry, and as has already been shown, the market is dominated by a few key firms, many of which now have a presence in Ireland. However Ireland does stand to benefit as the software package market continues to grow, as more software becomes standardised and personal computer use becomes even more widespread.

Bearing such points in mind, Ireland's success in attracting investment in this industry is still a very positive development for the economy, if only in terms of the very large employment and export revenue benefits. Although this success may well be partly a one-off event that is impossible to imitate, there are certainly lessons to be learnt for other European countries, especially the UK, which arguably has lost out the most in foreign investment terms. In particular the methods of the IDA, the incentives framework and the technologically oriented education system of Ireland all offer ideas of improvements. The competition for foreign investment in software and indeed in all industries will continue to increase (Dicken & Tickell 1992), and Ireland will face stiff competition from both developing nations for programming bases, but in particular from Great Britain and Northern Ireland for future manufacturing projects (*Computing* 20 July 1995a). The recent success of the North East of England in attracting two major electronics manufacturing plants with DTI assistance (Samsung at Wynyard and Siemens at North Shields) shows how such investment is still regarded as crucially important for economic development, especially in areas of high unemployment. However, in software terms, such is the critical mass of the Irish concentration of US

investment, now backed by an ever stronger indigenous sector, that in the short term Ireland seems certain to build on its present success.

In such a rapidly changing industry, there must however be some doubts about the long term viability of the software manufacturing base of Dublin and Ireland. In particular, the advent of large scale on-line product distribution, which may only be a few years away, could single-handedly remove the need for the majority of jobs presently being undertaken in Ireland. This on-line process would involve sending out copies of software and upgrades as electronic data over computer networks (such as the Internet) rather than physically manufacturing disks. Whether the localisation of products would still be carried out near the end markets is difficult to say, and this would probably vary from company to company. This would potentially affect Ireland more than the other European subsidiaries, where marketing, training and support would still be necessary. The hope must be that as the most important employment centres in Europe, the Irish plants' initial success will mean they gain functions from the individual European operations (such as Customer Support & Service and all European Product Development as in the case of Lotus) and thus secure a long term future for a core body of service employees. This is certainly the model the IDA is trying to promote;

'Many overseas software companies set up in Ireland initially to carry out a basic function, such as the relatively low skilled software manufacturing. Within a very short time the corporate management recognises the quality and skill of the Irish staff, and moves other functions, such as software localisation and eventually high-skilled product development, technical support and marketing to Ireland' (IDA 1992, p.4-2).

While it is easy to be pessimistic about the long-term future of the sector, three other factors may mitigate against the affects of such on-line developments. Firstly, the localisation of products will continue to be necessary, and would still best be undertaken near to the European markets where the appropriate language skills are most abundant. Secondly, demand from Ireland-based hardware manufacturers who package such software with their machines should also continue. Thirdly, the indigenous software industry is exhibiting great growth potential, with several world leading companies emerging, and such businesses and entrepreneurial activity may provide potential opportunities for any displaced staff. In reality, the overall outcome of these various processes is very hard to predict.

3.5 Conclusion.

The computer services market is becoming, like many other service sectors, one of global competition, and the European industry in particular is becoming increasingly

internationalised. As a result, it is especially vulnerable to aggressive US firms, and their dominance is threatening to spread from software products to computer services in general. Within these processes of change however, there are limited opportunities for regions, or perhaps for countries, to take advantage of specific developments, as the example of Ireland's software industry has illustrated.

This globalisation of the computer service sector has several implications for a study of the UK industry. Firstly, the presence of foreign firms in the UK market must be investigated, and their impact and role assessed. Secondly, the activities of UK companies abroad must similarly be analysed. Thirdly, developments in economies of particular areas or regions of the UK must be placed in the context of international, as well as national, processes. Such an approach would accord well with the arguments of Allen (1992), who suggests that discourses concerning the economic role of services *within* national economies are *'increasingly difficult to sustain in the kind of "open" economy that is the UK today'* (p.293).

Chapter Four: Profiling the UK computer services industry - the dynamics of a growth sector.

'The UK is, without doubt, the most competitive IT market in the world'

Branch Manager, US computer service company, 20 June 1994

4.0 Introduction.

The UK represents one of the most important and dynamic national IT markets in the world. The market now constitutes some five per cent of the global total (EITO 1995), and, along with France and Germany, is one of the three major markets in Europe, representing 16 per cent of the total value. Moreover, the UK IT services industry is unmatched in Europe in terms of the level of maturity of the sector, and its openness to foreign enterprises (see quote, above). The aim of this chapter is to provide a profile of the spatial, organisational and occupational characteristics of the UK computer services sector at a national level, using both the collated data from the four county samples and secondary sources for comparative purposes.

The first section of the chapter analyses the changing spatial pattern of employment over the period 1981 to 1993, using Census of Employment data obtained via NOMIS. Secondly, a brief historical account of the emergence and development of the sector is presented to contextualise contemporary developments. The third section illustrates the changing contemporary structure of the computer services sector, focusing in particular on new entrants to the market, the industry's sizeband structure, increasing foreign penetration and ownership issues, and the changing subsectoral composition of the sector. The final section examines the gender and occupational composition of the workforce in the computer services industry, before proceeding to consider skills shortages and new forms of working.

4.1 Spatial patterns of employment change, 1981 to 1993.

As outlined in the introductory chapter, the computer services sector is now, by any measure, one of the leading growth sectors of the UK economy. If the decade 1981 to 1991 is considered, there was a remarkable expansion of 169 per cent, increasing from 54800 employees in September 1981 to 147500 in September 1991. To put this growth into perspective, service industries as a whole (as defined by Divisions 6-9 in the 1980 Standard Industrial Classification) grew by 16.9 per cent, while the manufacturing sector (Divisions 2-4) suffered a decline of 24.5 per cent. Within the service sector, the Division 8 activities (banking, finance, insurance, business services and leasing) of which computer services are a part expanded by 51 per cent to around 2.2 million jobs. The

computer manufacturing sector, by comparison, only experienced a 10.7 per cent increase to 62900, less than half the 1991 computer service employment.

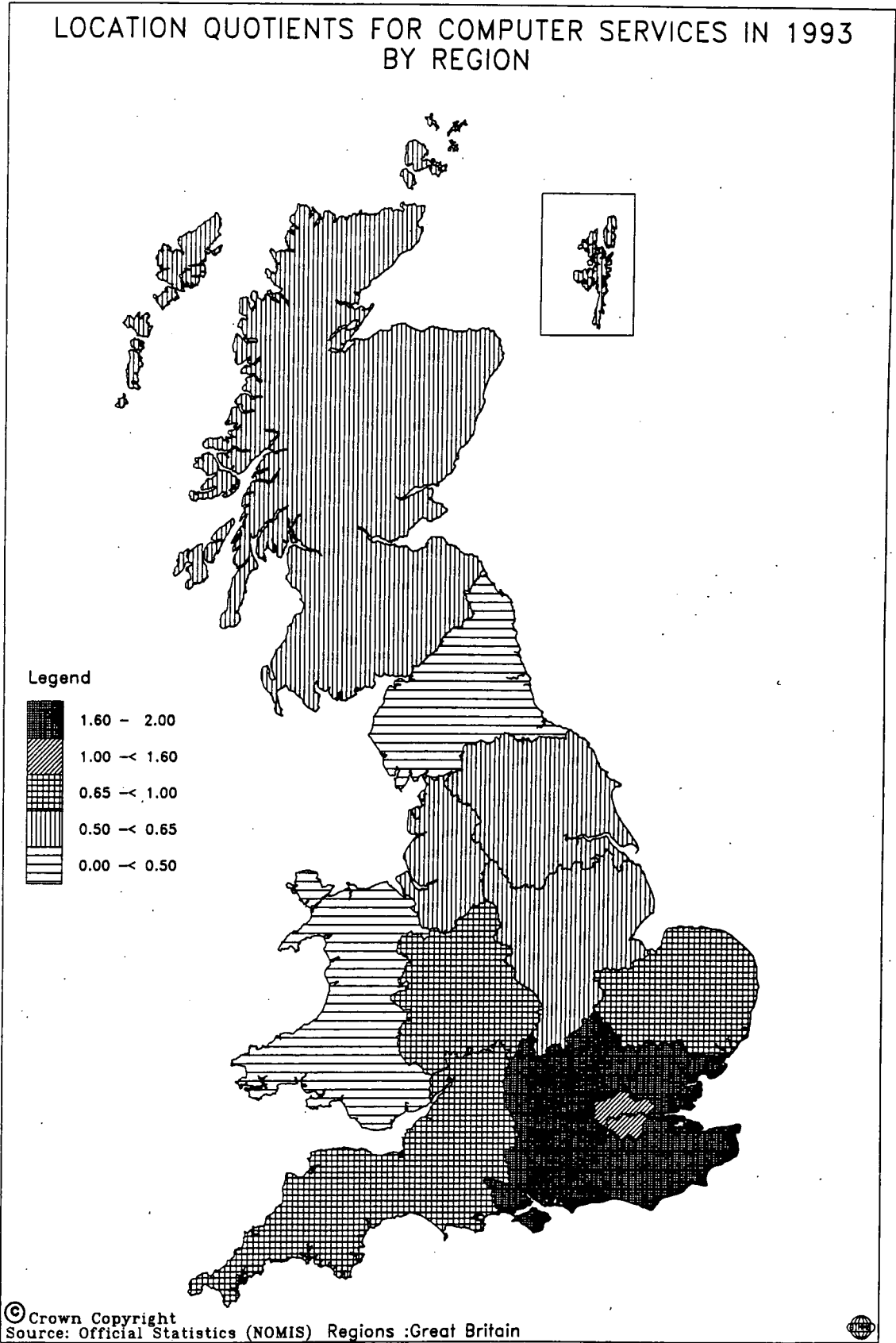
The impressive growth has continued since 1991; the 1993 Census of Employment results indicate an employment level of 183800 in the sector, constituting 0.87 per cent of the working population. However, there are problems in directly comparing the results of the 1993 Census with those taken in 1991, due to the change in the standard industrial classification (SIC). Information in 1991 was collected according to the 1980 SIC, in which computer services were covered by activity heading 8394 (AH8394). The 1993 Census was undertaken using the 1992 SIC, which was designed to take into account the burgeoning of certain service industries, and here computer services comprise the division 72 (92div72). For this category, the definition of computer services in the SIC was expanded slightly in response to its growing importance, the main addition being the inclusion of hardware maintenance activities. Such firms were included in the sample framework, but for comparative purposes, the 1993 employment in this subsector (13800) can be subtracted from the 1993 total for computer services as a whole (183800) to allow analysis for the period 1981 to 1993. This suggests an employment of 170000 for the sector in September 1993, an increase of 15 per cent on September 1991. The impact of recession on this growth is considered in section 4.3.

As identified in Section 2.2.1, the spatial concentration of producer services growth is one of the most important components of the uneven development of contemporary economies, and indeed, the benefits of the growth in computer services employment have been far from evenly spread. This uneven distribution of computer services employment can be analysed at different spatial scales, namely regions, counties, local authority districts and TTWAs (Travel-To-Work-Areas).

4.1.1 The regional picture.

The pattern at the regional level in 1993 is illustrated in Figure 4.1 and is detailed below in Table 4.1, which also includes change over the period 1981 to 1993. The most striking feature here is the huge concentration of employment in London and the South East, making up 59 per cent of the total. Indeed, as the map indicates, these are the only two 'regions' with above average computer service employment. This spatial concentration is typical of many other producer and information intensive services as several authors have proposed (see, for example, Howells & Green 1986, Marshall *et al.* 1988, Cooke *et al.* 1992). If change over the period 1981 to 1993 is considered, it is obvious that the dominance of London and the South East is long-standing, and may in fact be increasing; the proportion of total employment in these regions in 1981 was 56 per cent. The most important shift, however, has been the reversal of London and the

Figure 4.1: Location quotients for 1993 computer services employment, by region.



Rest of the South East, with the latter experiencing over twice as much growth as Greater London over the 12 year time span. The region now accounts for 37 per cent of total employment. This suggests that the computer service sector is conforming to the model of other producer service industries suggested by many authors (e.g. Daniels 1985) whereby decentralisation is occurring from metropolitan London, but largely confined to the Rest of the South East.

Table 4.1: The changing regional employment pattern, 1981 to 1993.

Region	Sep. 1981 1980 SIC	Sep. 1991 1980 SIC	Sep. 1993 1992 SIC Adjusted*	Sep. 1993 1992 SIC	Change 1981-1993 (Adjusted)	% change
South East	13200	48500	62500	67400	49300	373.5
London	17700	34200	38500	40900	20800	117.5
West Midlands	6000	13500	13700	15000	7700	128.3
North West	6200	13000	11500	13000	5300	85.5
South West	3100	10600	9200	10000	6100	196.8
Scotland	1700	5300	9000	9700	7300	429.4
East Midlands	1300	6900	7300	8000	6000	461.2
Yorks. & Humbers.	3200	6800	7200	8000	4000	125.0
East Anglia	1000	4200	5000	5400	4000	400.0
Northern	700	2100	3500	3700	2800	400.0
Wales	800	2200	2500	2700	1700	212.5
Totals	54900	147300	170000	183800	115100	209.6

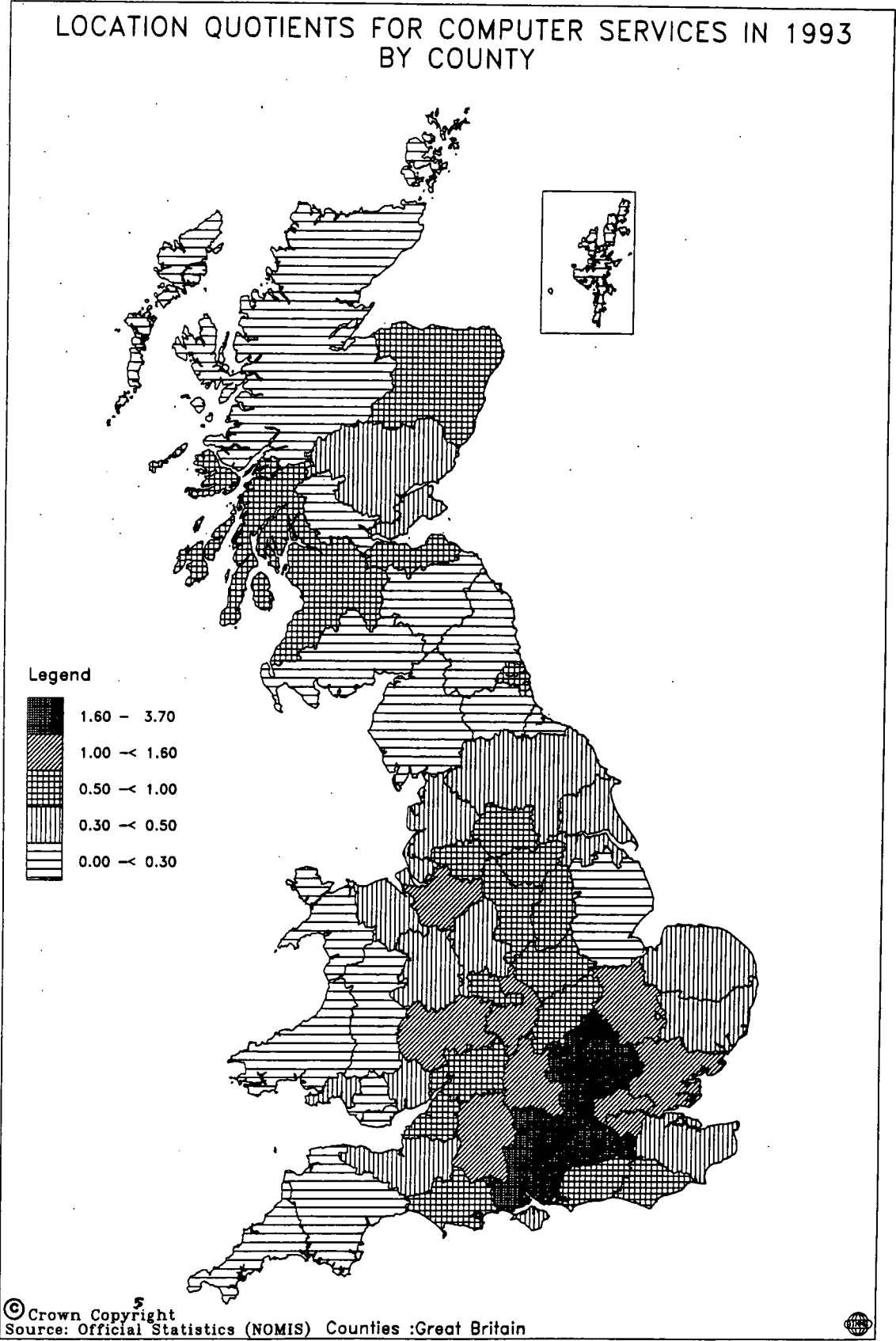
Source: CSO, via NOMIS.

* Hardware maintenance (92class 7250) employment has been subtracted to equate as closely as possible with AH8394.

4.1.2 The county picture.

More detail is obtained if the NOMIS data is analysed at the county level. Table 4.2 shows the top counties in terms of computer services employment in 1993, and Figure 4.2 illustrates the pattern using location quotients. As would be expected, Greater London dominates with 23 per cent of total employment. Of the other high growth areas in Table 4.2, five make up a ring around the from Essex in the north east to Surrey in the south, with Hampshire, Cambridgeshire, and Bedfordshire contiguous to this. Hence the concept of an 'western arc' or 'western crescent' of development around London would seem to be more appropriate in this sector than one based purely on corridors of growth (Hall *et al.* 1987), and would seem to add weight to the concept of a 'South-South' divide within the relatively prosperous South East (SEEDS 1987). This pattern is confirmed by the map of the 1993 pattern, which suggests a 'western arc' around London and an M4 corridor effect, as well as highlighting the outpost of Cheshire in the North West. Indeed, Cheshire is the only county north of Cambridgeshire and Warwickshire with above average employment levels. The 1981 to 1993 changes have altered the relative importance of the counties. While the importance of counties with provincial centres such as Greater Manchester, Avon, and West Yorkshire has declined,

Figure 4.2: Location quotients for 1993 computer services employment, by county.



those of the greater South East such as Cambridgeshire, Buckinghamshire, Hertfordshire, Berkshire and Surrey have all improved their position in absolute employment terms.

Table 4.2: The top 15 counties by 1993 computer service employment.

County	Sep 1981	Rank	Sep 1993 Adjusted*	Rank	Change	% Change
Greater London	17700	1	38500	1	20800	218
Hampshire	3900	2	12400	2	8500	318
Surrey	1900	7	11400	3	9500	600
Berkshire	2700	5	9500	4	6800	352
West Midlands	3300	4	7500	5	4200	227
Hertfordshire	1500	10	6900	6	5400	460
Buckinghamshire	3600	15	5800	7	2200	161
Essex	600	16	5700	8	5100	950
Greater Manchester	700	3	5600	9	4900	800
Strathclyde	1300	12	5100	10	3800	392
West Yorkshire	2100	6	4000	11	1900	190
Cambridgeshire	400	24	3300	12	2900	825
Cheshire	1500	9	3200	13	1700	213
Avon	1700	8	3100	14	1400	182
Bedfordshire	500	18	3000	15	2500	600

Source: CSO, via NOMIS.

* Adjusted as in previous table.

4.1.3 The local authority district pattern.

Figure 4.3 shows computer service employment location quotients for the local authority districts of Great Britain, and again supports the concept of a 'western arc' of development around London showing the concentration of employment in the South East. At this scale, certain key plants, like those of IBM in Havant and Greenock are also visible. Figure 4.4 is an enlargement of the key employment region, the South East, along with East Anglia. This map suggests that the key band of employment within the 'western arc' runs from south west Hertfordshire (centres such as Watford and St. Albans) round to north east Hampshire and west Surrey (Fleet, Aldershot, Farnborough, Woking). In particular, the sector between and along the M3 and M4 is a key concentration, with districts such as Bracknell, Wokingham, Newbury, Basingstoke and Slough showing very high levels of computer service employment. This map also gives more of an impression of the kind of centres in which the industry is developing. Although certain London boroughs perform well, the highest *relative concentrations* of employment are not generally in the large cities, but in medium to large sized towns in the residentially attractive areas of the western half of the South East, suggesting a decentralisation process from London based partly on quality of life and environmental factors.

Figure 4.3: Location quotients for 1993 computer services employment, by local authority districts.

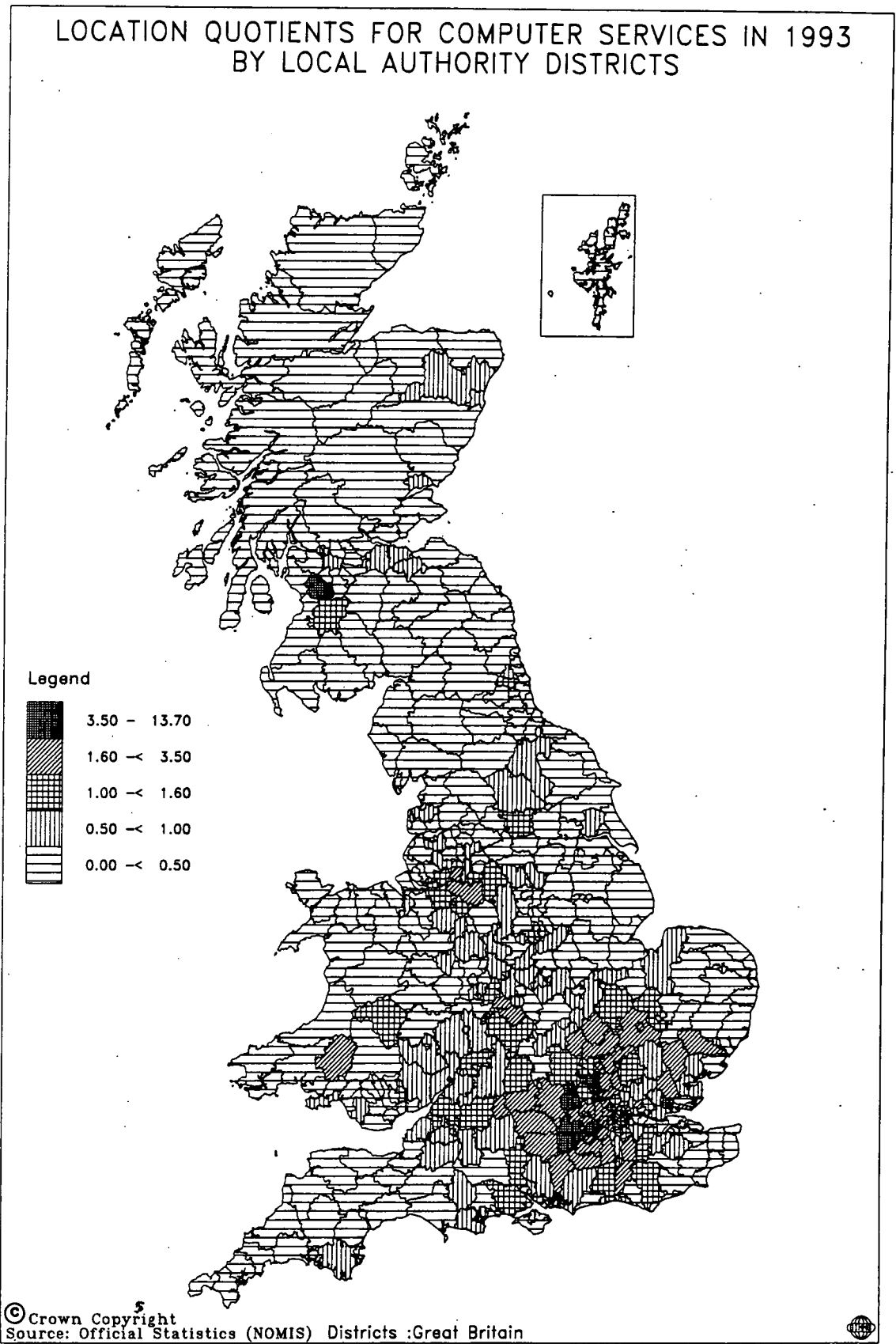
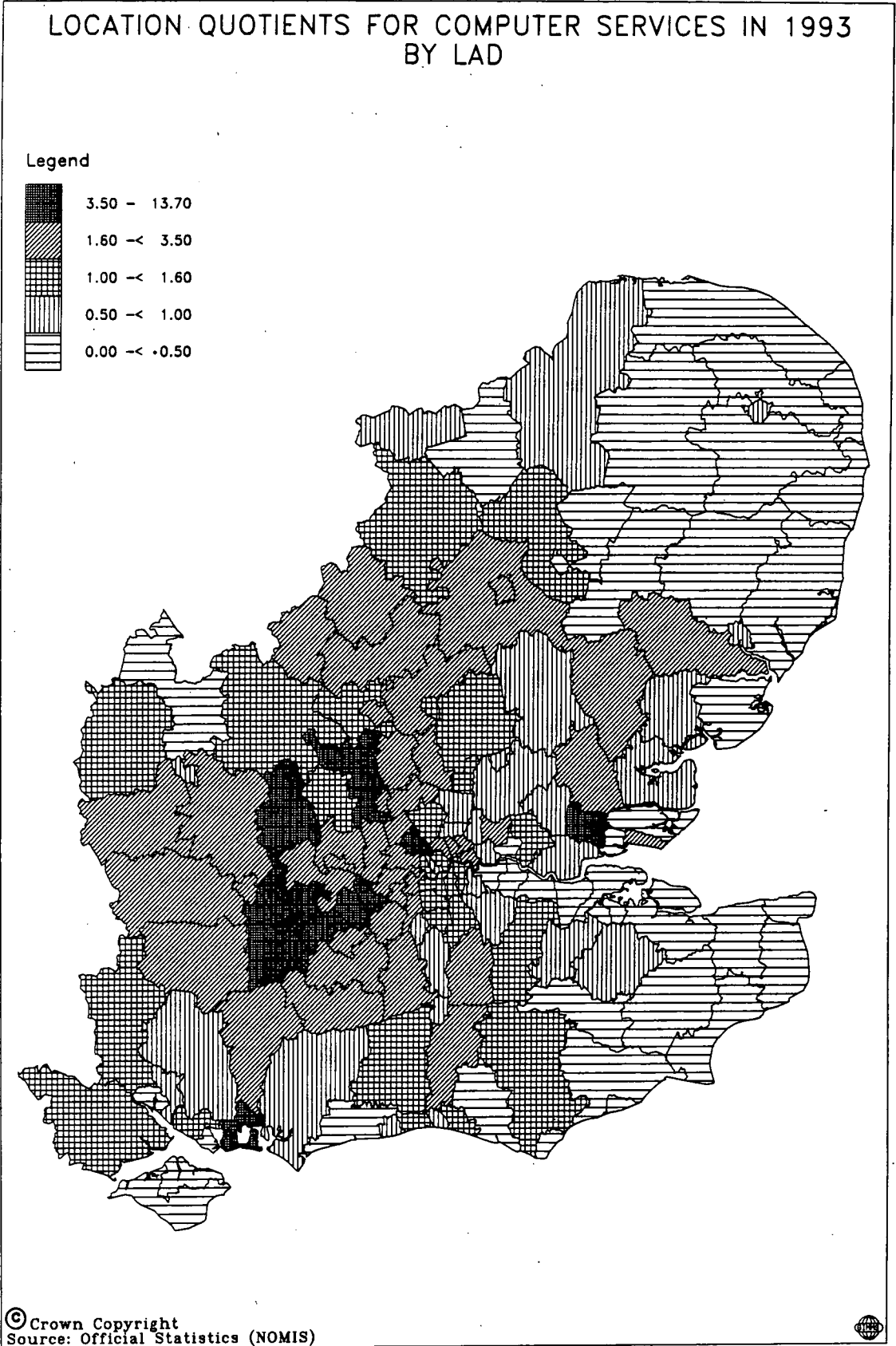


Figure 4.4: 1993 location quotients for local authority districts in South East.



4.1.4 The Travel-To-Work-Area (TTWA) Pattern.

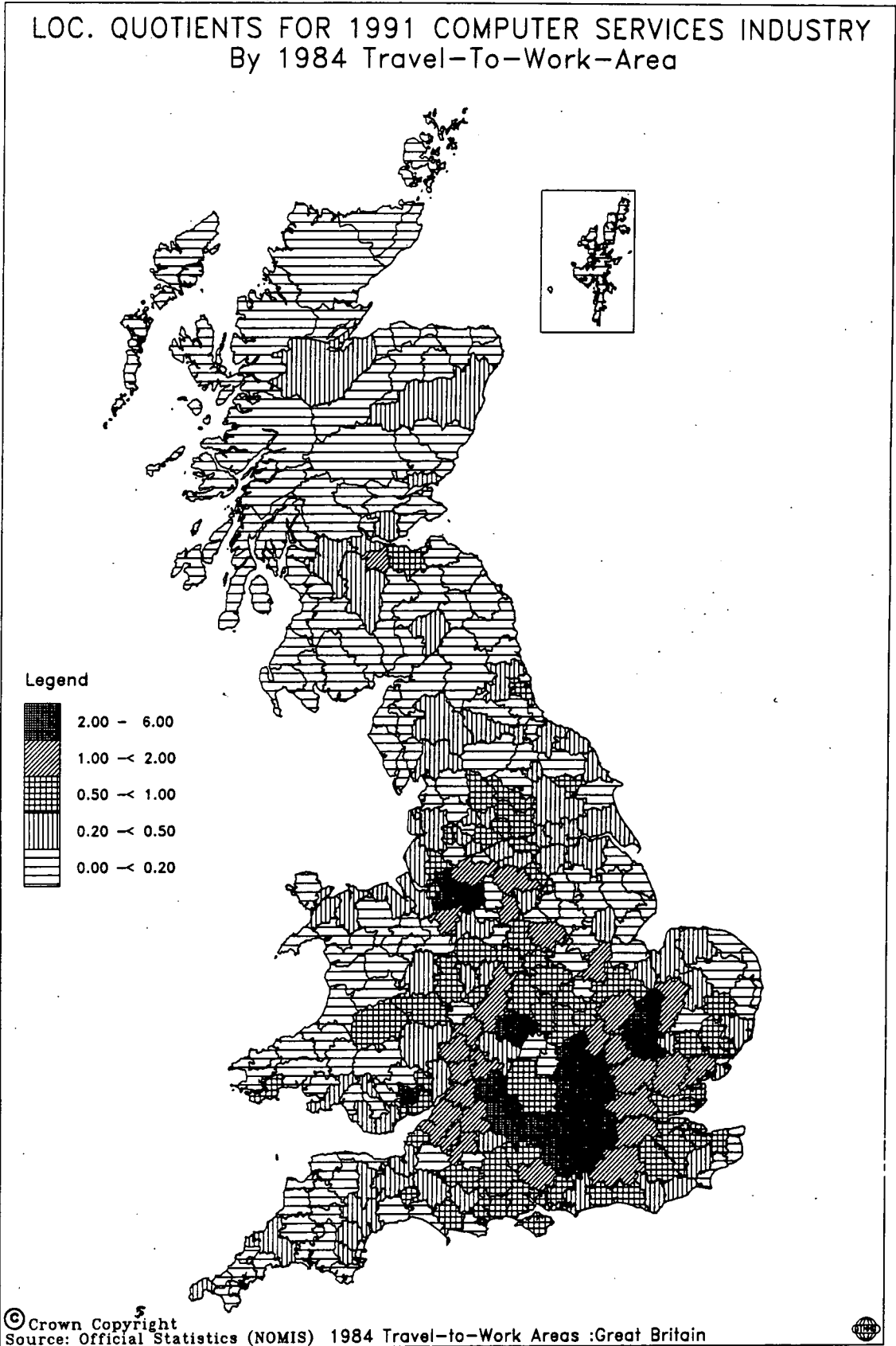
A further spatial scale that will be considered here is that of the TTWA, last defined from the 1981 Census of Population. These are areas based on a functional definition whereby 75 per cent of an area's population works in that area, and 75 per cent of those working in the area also live there, the minimum working population considered being 3500 (*Employment Gazette* September 1984). Although the 1993 Census data is not available for TTWAs, the map of the 1991 location quotients for these areas is included here (Figure 4.5) because TTWAs are the best available approximation to local labour markets, and also because it was used to assist in selecting the sample areas (see Chapter One). The map confirms that the computer services industry exhibits a highly concentrated distribution; indeed 83 peripheral TTWAs have no recorded employment in this sector at all. Furthermore, employment is located overwhelmingly in the South East and appears to support the 'Western Crescent' pattern seen at the county and district level. The M4 corridor of high-tech and service employment seems to extend some way westward, with high quotients recorded as far west as Avon and Gloucestershire. Another interesting feature is the level of employment in the three Cheshire based TTWAs of Warrington, Northwich and Macclesfield. With these exceptions, almost all the TTWAs outside the traditionally defined 'south' with above average employment ($LQ > 1$) have a large population centre (e.g. Manchester, Nottingham).

4.1.5 The intra-sectoral pattern.

One benefit of the 1992 SIC is that computer services employment can be broken down into six subsectors; hardware consultancy, software consultancy and supply, data processing, database activities, computer maintenance and 'other computer related' activities. Figures 4.6a-f illustrate the county location quotients for each of these categories, which can be compared with Figure 4.2, the pattern for the sector as a whole. It is crucial to note the relative importance of these subsectors in such a comparison however. Of the 183800 employees recorded in September 1993, 122600 (67 per cent) were involved in software, 35000 (19 per cent) in data processing, 13800 (8 per cent) in maintenance, with only 6000 in hardware consultancy (3 per cent), 4000 in other computer related (2 per cent) and 2500 in database activities (1 per cent).

Hence, the map for software consultancy and supply (Figure 4.6a) is very similar to Figure 4.2, as it represents over two thirds of the employment of the sector. Again the Western Crescent and the M3-M4 axis of development show up clearly. Figure 4.6b shows a similar pattern for hardware consultancy, and the presence of Dyfed in the top category illustrates how in areas of low employment one or two firms can create outliers in the location quotient maps. The data processing map (4.6c) again shows the

Figure 4.5: 1991 computer services employment, by TTWA.



importance of the South East, but also of certain cities outside the region, with Glasgow, Birmingham and Nottingham all performing strongly. Little can be inferred from the remaining three maps, although database employment (4.6d) is largely concentrated in the south, and computer maintenance employment is more distributed than the rest, with Birmingham, Greater Manchester, Nottingham, Bristol and South Yorkshire all with above average employment (4.6e). This almost certainly reflects the fact that maintenance operations are more dependent on the spatial distribution of computers in the economy at large than other subsectors. On this map, the Borders Region of Scotland is another which is misrepresented, having far less than 100 employees in this subsector.

4.1.6 *The changing pattern.*

Although chi-square maps can be produced to show the patterns of change for 1981 to 1991 (see Figure 4.7) and intervening periods, the changing of the SIC means that automated cartography up to 1993 is not possible. Figure 4.7 clearly shows a decentralisation process occurring over the decade, but still largely confined within a greater South East, although the growth belt appears to be extending along the M4 corridor to South Wales. It is important to note that this growth does not simply represent a process of suburbanisation from Greater London, as decentralisation has occurred to both adjacent and non-adjacent areas (Barkley 1988, Champion 1989). Figure 4.7 would again tend to suggest that quality of life and cost factors within the South East may be powerful motivators of change, rather than any new regional patterns of demand. Certain other high growth areas picked out still have only very low employment levels (<300) but high percentage growth rates which have not quite been 'ironed out' by the chi-square routine. Hence such data is only really useful for looking at the general trends, and not for hypothesising about specific TTWAs. Although decentralisation seems to occur throughout the decade 1981 to 1991, Cooke *et al.* (1992) suggest that it was strongest over the period 1981 to 1984, perhaps as a result of recession-push factors.

4.1.7 *The changing urban-rural dimension.*

Census of Employment data can also be analysed to give an indication of the urban-rural characteristics of computer service employment. Table 4.3 (below) illustrates employment change over the period 1981 to 1991 for an urban-rural typology of local authority districts. Once again, this data illustrates the relative slip in importance of London's employment, but it also clearly shows a relative decentralisation of activity within Greater London. By far the largest absolute increase in employment was registered in the mixed urban-rural areas of the South, suggesting that accessible suburban locations are important in this sector. Strong absolute growth was also found

Figure 4.6a: County location quotients for software consultancy and supply, 1993.

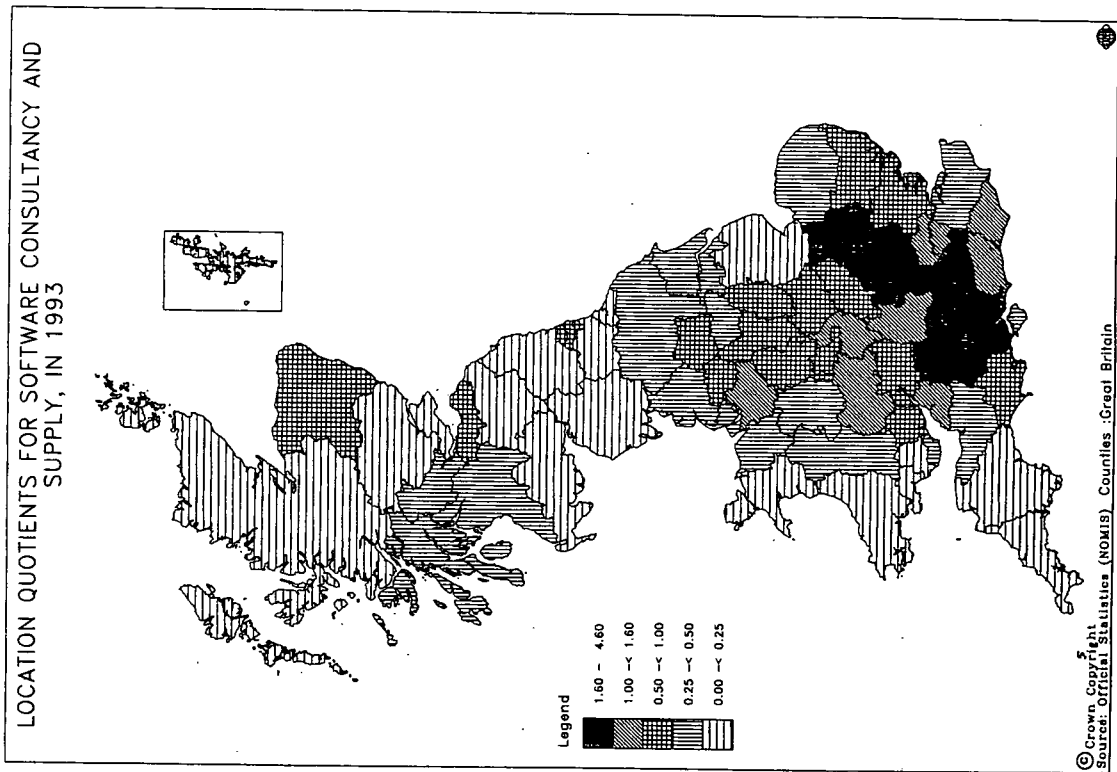


Figure 4.6b: County location quotients for hardware consultancy, 1993.

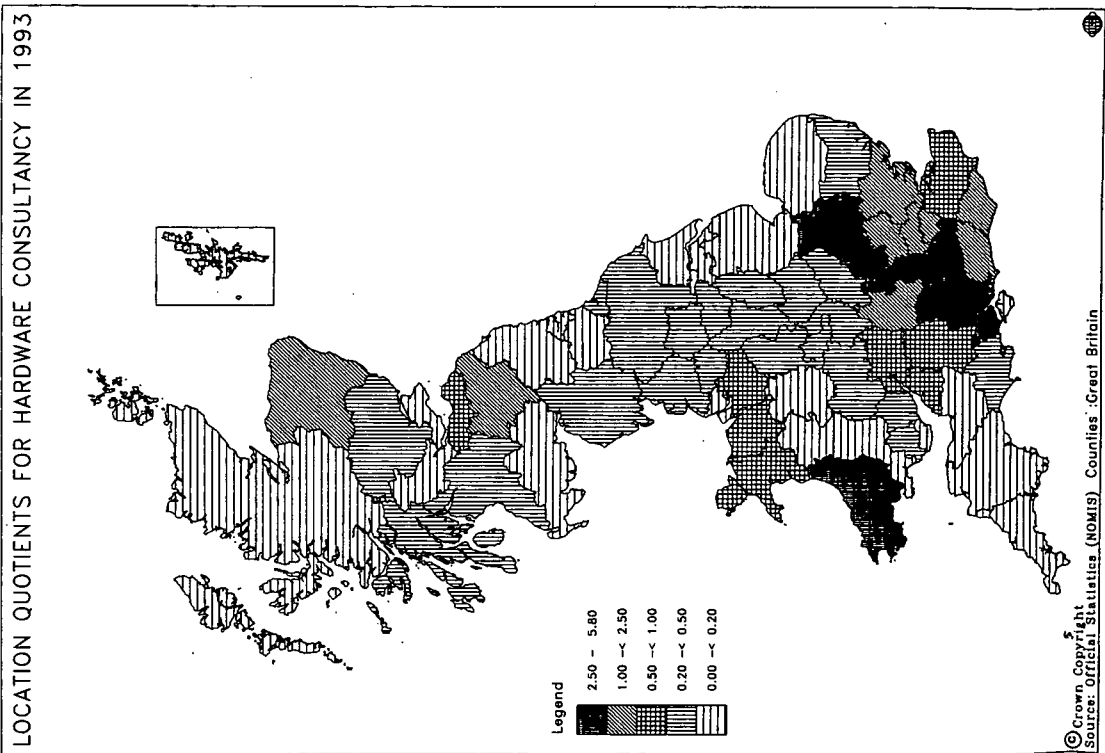


Figure 4.6c: County location quotients for data processing, 1993.

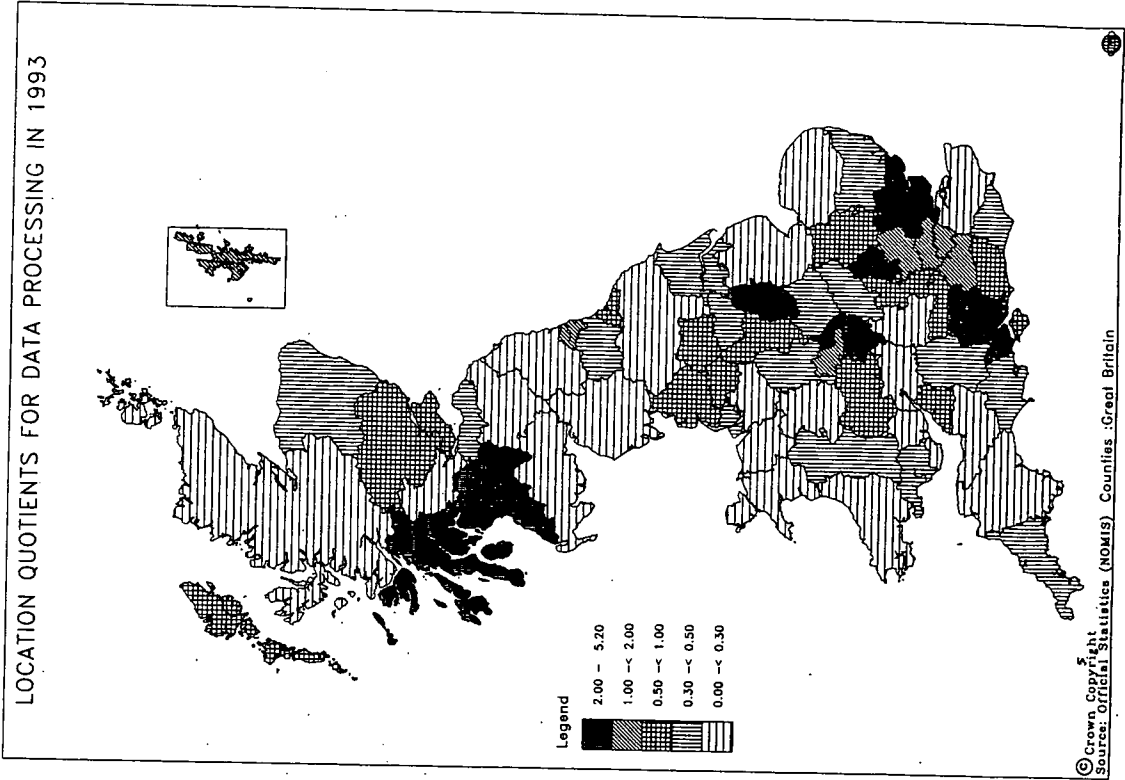


Figure 4.6d: County location quotients for database services, 1993.

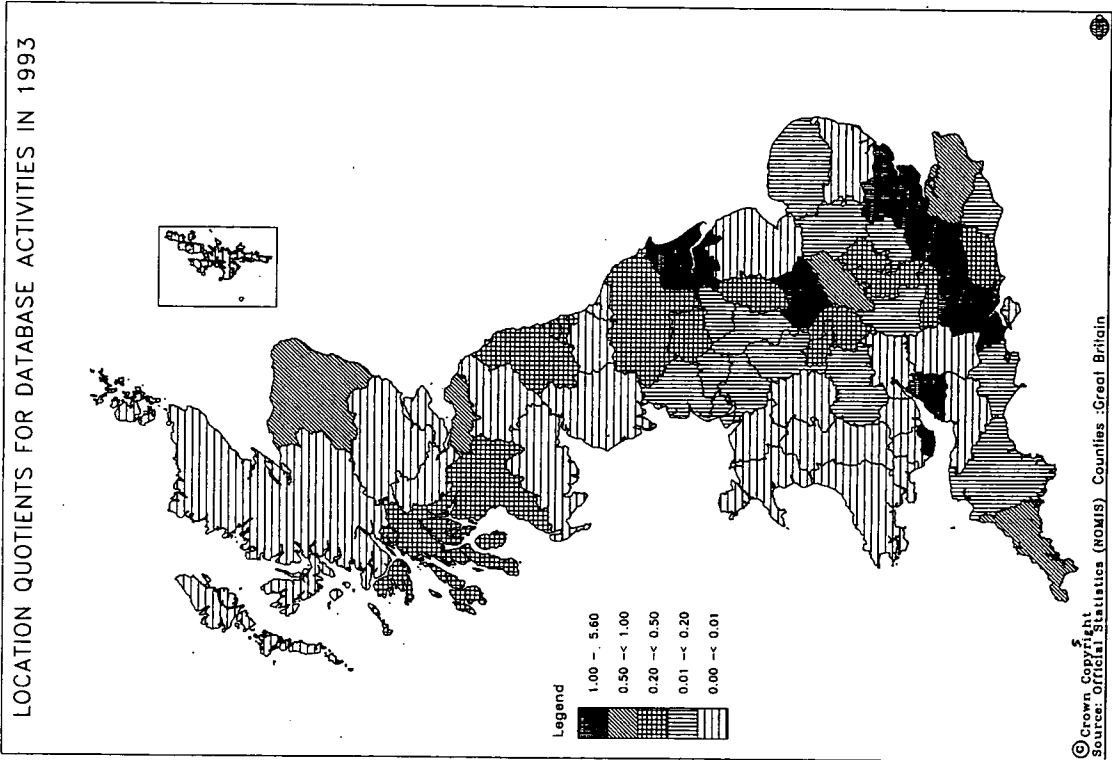


Figure 4.6e: County location quotients for computer maintenance, 1993.

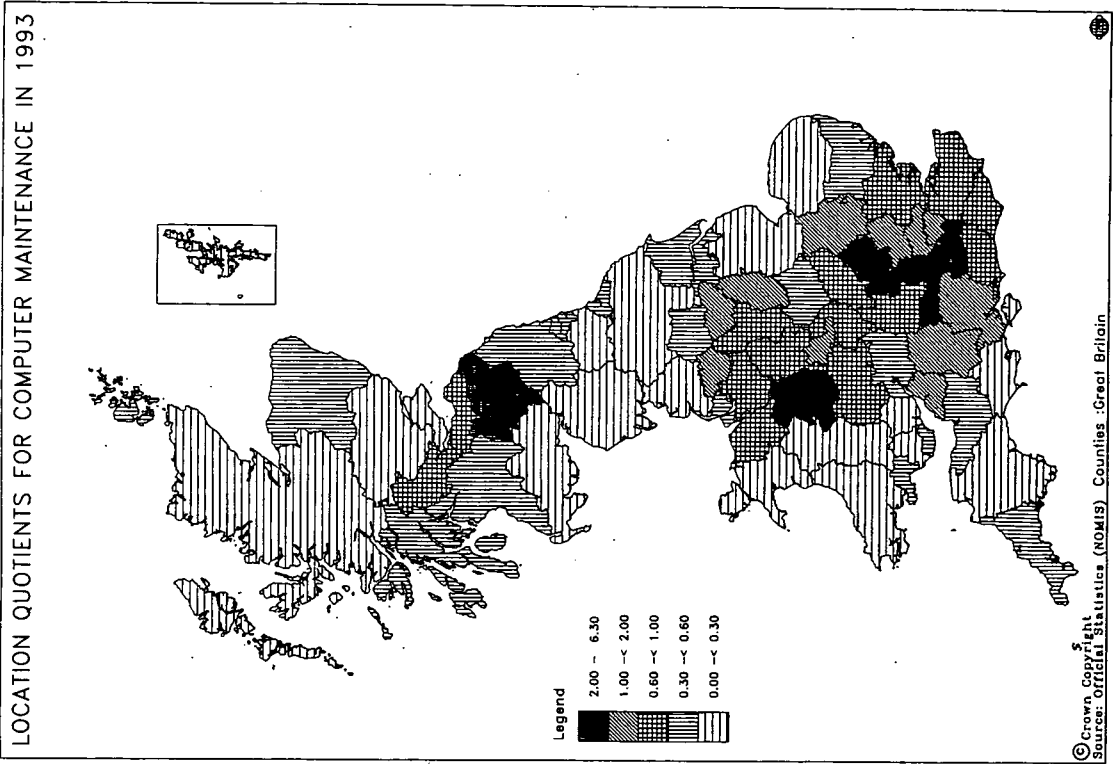


Figure 4.6f: County location quotients for other computer related activities, 1993.

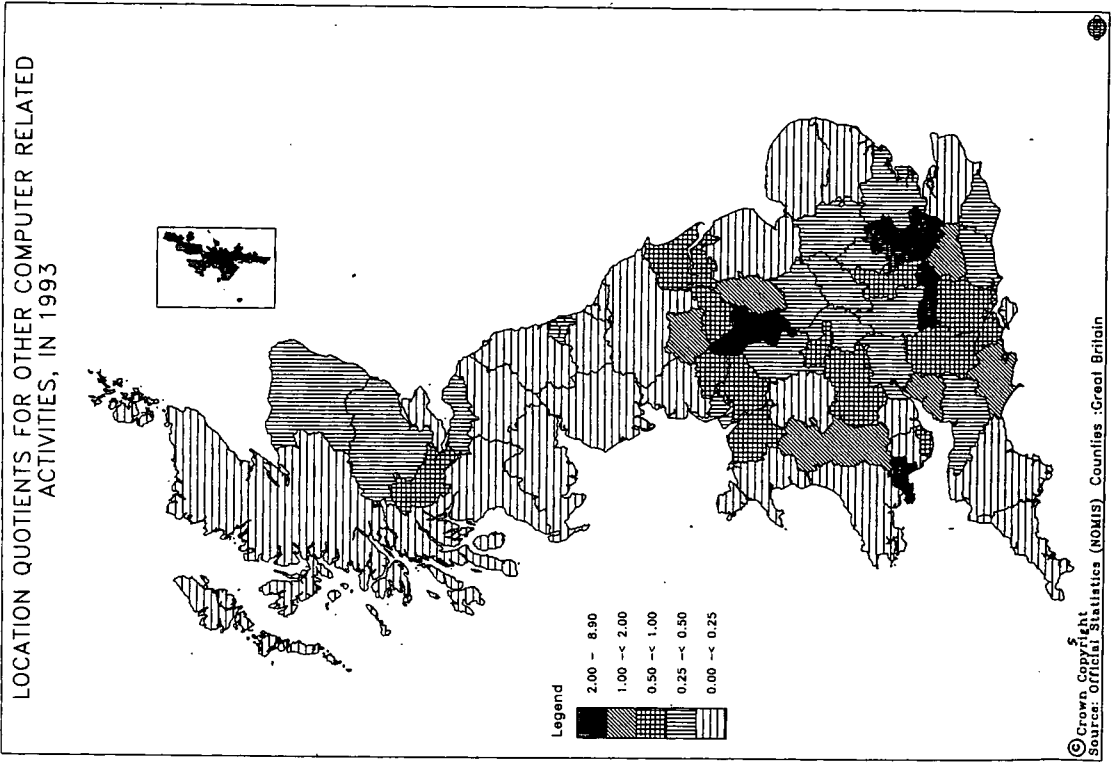
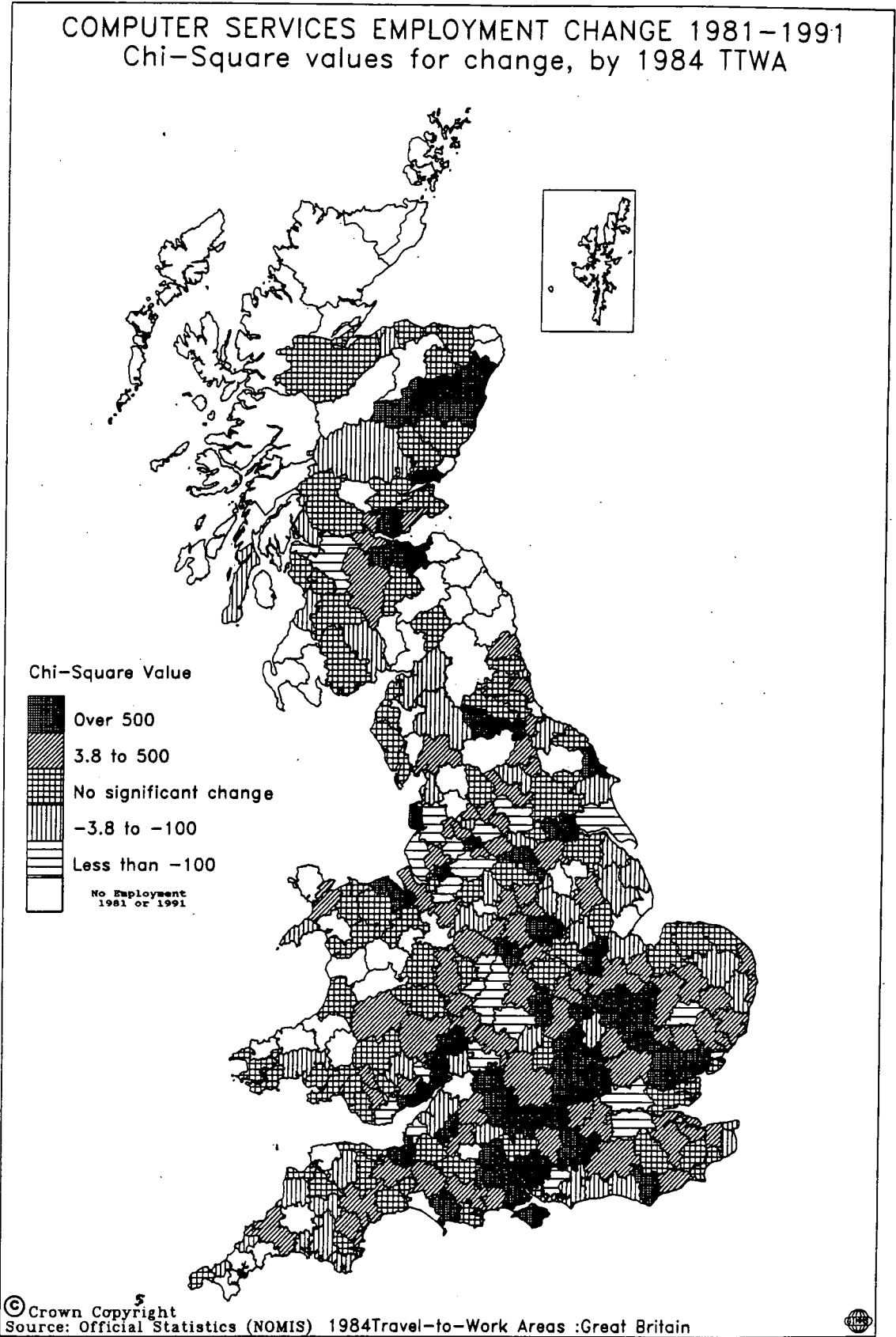


Figure 4.7: Change in computer services employment 1981 to 1991, by TTWA.



in the industrial areas, cities and New Towns of the South, confirming the growth trend already identified for all types of urban centres of southern England. In the North, however, growth was dominated by the principal cities of Birmingham, Manchester, Liverpool, Leeds, Sheffield, Newcastle and Glasgow, and their surrounding metropolitan areas. Interestingly, despite the perceived potential of computer service operations in remote areas, computer services have a very low level of representation in largely rural districts, which accounted for only 3.5 per cent on the national total in 1991. Glasmeier and Howland (1995) found a similar pattern in their study of computer services in six US states, although they found that there was potential for the decentralisation of basic data processing activities to remote rural areas.

Table 4.3: Urban-rural distribution of computer services employment, 1981 to 1991¹.

Category	Sept. '81	Sept. '91	Change	% change
Inner London	10100	18600	8500	84.5
Outer London	7600	15700	8100	106.3
Principal Cities (N ²)	5500	10700	5200	96.1
Other metropolitan areas (N)	6500	13000	6500	102.0
Cities	6000	11800	5800	97.0
Cities (N)	1500	4700	3200	220.3
Industry	1800	7400	5600	310.8
Industry (N)	900	3000	2100	250.5
New Towns	1600	7000	5400	331.7
New Towns (N)	1600	4000	2400	153.2
Resorts	500	2700	2200	409.5
Resorts (N)	100	500	400	900.0
Mixed urban-rural	7500	37400	29900	396.6
Mixed urban-rural (N)	2500	5700	3200	128.9
Outer rural	1100	3900	2800	242.7
Outer rural (N)	200	1300	1100	767.3
Totals	54800	147400	92600	169.1

Source: CSO, via NOMIS.

1 - These categories are based on the classification of local authority districts used by OPCS (1981).

2 - N = 'North' of England. Refers to the standard regions Scotland, Wales, North, North West, Yorks. & Humbs., West Midlands, leaving the 'South' as the South East, East Anglia, South West and East Midlands regions.

4.1.8 Inter-sectoral comparisons.

A useful insight can be obtained by comparing Figure 4.2 to the location quotient maps for other sectors introduced in Chapter Two. Figure 2.1, illustrating business services, shows a very clear resemblance to the computer services distribution, and this map also highlights the development of some kind of 'Western Arc', this time including London, and a pronounced M4 corridor. There is even a similar outpost in the North West in Cheshire. However there is a difference in that Division 8 as a whole is better represented in urban areas than computer services, for example in cities such as Liverpool, Brighton and Norwich, while some business service centres such as

Edinburgh, Aberdeen, Cardiff and Bristol are performing even more strongly. This suggests that computer services may show a more 'suburban' location pattern than other business services. Figure 2.4 suggests there are also similarities with the distribution of high technology manufacturing industry (as defined by Segal Quince Wicksteed, 1985, but excluding pharmaceuticals) although this map shows a more distributed employment pattern, and more of a rural component. This would appear to support the assertion of both Kelly (1987) and Cooke *et al.* (1992) that computer services tend more to urban or suburban locations than high-tech manufacturing such as computer hardware. Overall, these maps reinforce Clarke's (1994) argument that computer services can be seen to share characteristics of both the business services and high-technology manufacturing sectors, but suggest the similarities and links with other business services are stronger.

4.2 The historical evolution of the UK computer services industry.

It is important to consider the historical evolution of the computer services sector when investigating the industry's contemporary spatial and organisational structure. Friedmann's (1990) three phases of computerisation model provides a useful framework for examining the development of the computer services sector, which has closely reflected the changing technological basis of the industry. The origins of the computer services industry lie in the first, hardware oriented phase of computerisation, from the early 1960s to the early 1970s. During this period, computing service bureaux started to appear in order to take advantage of the first powerful, commercially available computers. Such bureaux operated mainframe computers, and were in direct competition with the machines rented out by the hour or minute by most of the large computer manufacturers. As well as selling raw machine time, these bureaux offered a range of basic computer services such as payroll, accounting, stock control and mailing (CSSA 1995a). Many of these bureaux, such as those of ICL and IBM, were focused around Newman Street in central London (postcode W1), which became known as 'Computer Alley'. It was here that the first computer service company in the UK, Scicon, was started in 1960 (Scicon was subsequently acquired by EDS). In 1968, twenty leading bureaux formed the Computing Service Bureaux Association, and this soon became the Computing Services & Bureaux Association to accommodate newly emerging computer consultancies. Hence, the bulk of the revenue of the computing services industry in both the 1960s and the early 1970s was earned by processing and data preparation firms.

Friedmann's second phase of computerisation, from the early 1970s to mid-1980s, was characterised by the development of software applications. Several firms producing bespoke or custom software began to appear in the early 1970s, and leading companies formed the Software Houses Association (SHA). New legislation in the USA forced the world market leader IBM to separate or 'unbundle' its hardware and software, and thus

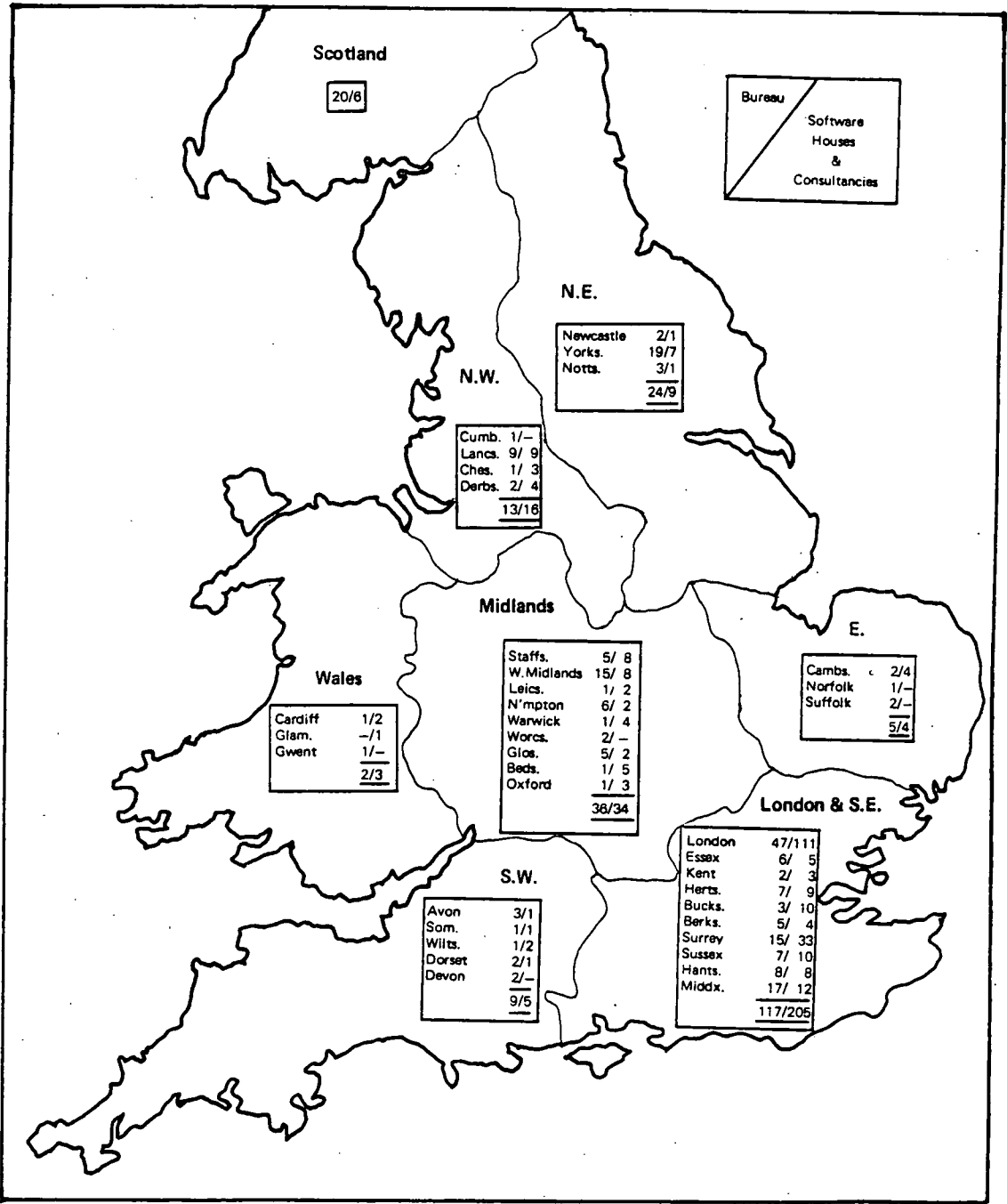
provided new opportunities for the software industry. However, the processing industry was also changing. By this time, minicomputers had started to emerge as an alternative to mainframes, and as a result remote and real-time computing started to replace the batch processing of data on mainframe computers. This new form of computer service, known as 'time-sharing', allowed the customer to have responsibility for data entry and output via small, individual terminals. Consequently, the industry started to employ less data preparation and control staff; such functions used to account for a third of all employees in the 1960s. In 1975, the SHA merged with the Bureaux Association to create the Computing Services Association (CSA).

A CSA report (1976) reviewed the development of the industry up to the mid-1970s. It consisted of just over 500 companies, of which around 225 were involved in processing, the remainder being software houses and consultancies. Figure 4.8 illustrates the geographical distribution of these businesses, and clearly shows the dominance of 'London and the South East', with two thirds of the bureaux, and just over half of the remaining companies. Many bureaux were starting to move out of central London to other parts of the South East around this time, for example the relocations of Scicon to Milton Keynes and Datasolve to Sunbury-on-Thames. In total, 21500 staff were employed in the sector, compared to 100000 in the USA, 62500 in Japan, and 16000 in Germany. At this stage, foreign penetration of the market was fairly limited, although US companies such as IBM and Honeywell were well established in the UK. While the bureaux continued to grow as more powerful hardware was developed, the software industry was growing at an even faster rate. Giant custom-built systems were typical in the 1970s, especially for the financial sector, and the demand for large teams of programmers was met by rapidly growing software houses. By 1979, processing and data preparation revenues had fallen below 50 per cent of the industry total.

The 1980s were dominated by the arrival of the personal computer and the rise of software products, and the UK industry showed remarkable growth. Indeed, over the period 1981 to 1985, the average annual growth rate of over 17 per cent was the highest 'in the world' (Coopers & Lybrand 1986). By 1986, there were an estimated 2000 companies and 45000 employees in the UK industry. Despite the fact that 15 of the top 20 providers were still UK owned, an ACARD (1986) report on software was already warning that foreign suppliers were starting to dominate a highly strategic sector. During the decade as a whole, the total revenues of CSA members rose from £500m to over £3000m, but the overall relative importance of data processing continued to fall.

Friedmann suggests that the third phase of computerisation commenced in the mid-1980s, centring on the need to provide customers with complete business solutions incorporating both software and hardware, and Grindley (1988) similarly noted the trend

Figure 4.8: The location of computing service companies in the UK, 1976.



Source: CSA, 1976, p.3/22.

to integrated systems and the increasing importance of software in such projects. Hence, many software houses developed into systems integrators, providing complete IT solutions. At the same time, a whole new range of software product companies was being established as the demand for cheap, standardised solutions rose. As illustrated in Chapter Three, the software product business is increasingly becoming a global industry, due to the need for the economies of scale of a mass market, and so the internationalisation of the UK industry increased accordingly during the decade. This was accelerated by the acquisition of many leading UK computer service corporations by overseas firms in the late 1980s, a process which has continued into the 1990s (see Section 4.3.3). In 1995, the CSA became the CSSA (Computing Services and Software Association) in recognition of the growing importance of software, and in particular, packaged software, in the sector. Table 4.4 summarises how the composition of the sector's revenues has changed during its evolution.

Table 4.4: The changing balance of key UK computer service sectors, 1969 to 1989, by percentage of total revenues.

Sector	1969	1979	1989
Processing	58	47	24
Professional Services	27	34	52
Software Products	0	4	15

Source: Holway 1994.

The second and third phases of Friedmann's evolutionary path resulted in a dramatic growth in both the number of computer service companies, and their average size (Gentle & Howells 1994). This high rate of new firm formation and significant expansion in the number of firms is a key element in the changing structure of the industry (Howells 1987). For Keeble and Kelly (1986) this growth is associated with technological change theory, which asserts that the technological dynamism of the industry favours small, flexible firms which can perceive and adapt to new technologies and market possibilities more rapidly than more rigid, larger corporations. Such a concept would also seem to connect with the product life cycle model which proposes that low entry barriers and processes of technological change favour new and small firms in early stages of the development cycle. However, in the past, many computing service firms were created as the internal computing departments of businesses in other sector reached such a size and importance that they were established as separate profit centres (Howells 1987). This externalisation process often concluded with the computing arm of the business being subject to either a take-over or a management buy-out, or set up as a separate subsidiary. The new firm formation process in computer services will be considered in detail in Chapter Five.

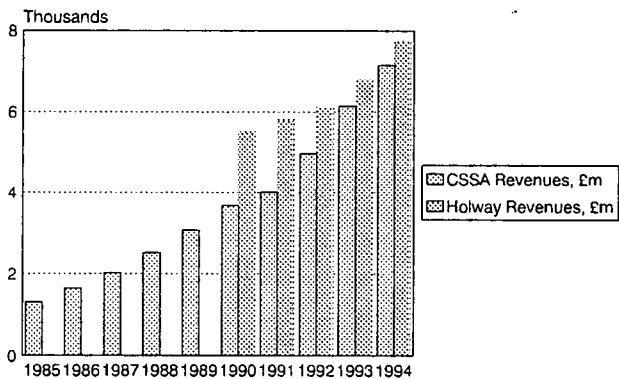
The industry is still having to adapt in the 1990s. The dominant forces of change are now the downsizing of hardware requirements, with personal computer networks replacing mainframes, the restructuring of all the major hardware manufacturers, and the massive growth of outsourcing in preference to in-house computing, due to the coincidence of economic recession and a period of rapid depreciation in hardware values (CSSA 1995a). Perhaps the best way to describe the growth of this constantly evolving industry is with the words of one marketing manager who suggested that *'the only constant in this business is change'* (personal interview 15 September 1994).

4.3 The changing structure of the UK computer services industry.

This section will assess the current scale of the UK computer services industry and its performance in recession, and the subsequent four sections will analyse the key structural characteristics of the sector.

According to EITO (1995) estimates, the UK IT market was worth some £16.8bn in 1994, of which £7.5bn was hardware revenue and £9.3bn computer services revenue. This second figure accords well with both the CSSA estimate of revenues of £7.1bn for its 380 members (CSSA 1995b), and Richard Holway's (1995b) estimate of £7.75bn for the top 1250 firms in the industry in his annual survey. As an indicator of scale, this sector is equivalent to approximately one per cent of GDP. In growth terms, there was an increase of 14 per cent on the market size of 1993, and if such a trend continues, the market will be worth some £17bn by 1998. This growth rate is second only to Germany in Europe. Growth rates in general are now increasing after slowing to five or six per cent over the worst recessionary period 1990 to 1992, and this is illustrated by Figure 4.9, showing the increasing revenues of CSSA member firms since 1985, and Holway's sample companies since 1990.

Figure 4.9: Changing total revenues of CSSA and Holway firms, 1985 to 1994.

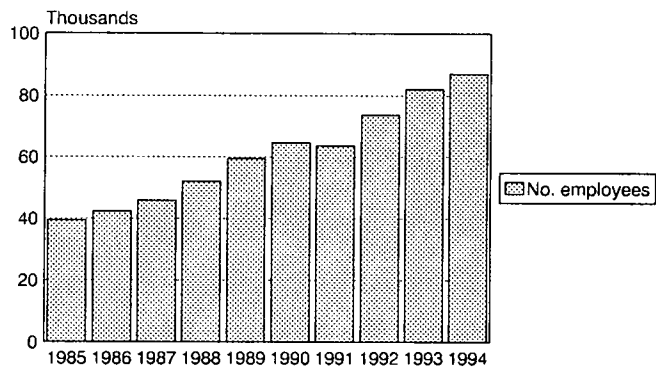


Source: CSA 1993b, 1994b, CSSA 1995b, Holway 1995b.

The economic downturn of the early 1990s was the first to really affect the computer services industry. Many companies experienced intense pressure on profit margins during this recession and some underwent 'business re-engineering'. However, the overall reduction in staff numbers was relatively small compared to that of the hardware industry, and CSSA employment has been growing consistently since mid-1993 (CSSA 1995b; see Figure 4.10 below). As an indication of job losses, the 1100 firms in the 1993 Holway sample shed some 10000 staff, or 7.5 per cent of the total between the ends of 1990 and 1992. To give one example, SD-Scicon (subsequently purchased by EDS) saved £4m on labour costs by leaving 40 vacancies unfilled and laying off 150 management staff (*The Times* 29 November 1990). Estimates from Census of Employment series (AH8394, SIC 1980) indicates that there was a slight dip in employment from 147500 in September 1991 to 144300 in June 1992, but that this improved to 166000 by September 1993.

The 173 sample firms also provide a good indication of the impacts of recession; over the period June 1990 to June 1994 employment fell in 55 firms, was stable in 46, and grew in the remaining 72. However, for many firms starting up at the beginning of, or during, the recession, the downturn was not seen as an issue. In revenue terms, over the same period, 90 experienced growth, 34 were static, and 49 contracted. Of the latter, managers in 31 companies put the fall down to recession, seven to structural changes in the company, and 11 to a combination of the two. Other research has also confirmed that computer services was one of the service sectors least hit by recession, with many firms continuing to gain revenue and customers (SBRC 1992).

Figure 4.10: Changing number of employees in CSSA companies, 1985 to 1994.



Source: CSSA 1995b.

The Census of Employment based estimates indicate that employment growth is now matching the impressive recent revenue growth; indeed over the period June 1994 to June 1995, employment in computer services (92div72, 1992 SIC) grew by 10000 jobs or ten per cent, the third largest increase of any sector of the economy. Estimates for

June 1995 suggest an employment of 213700 in the newly defined sector. These growth figures are reflected in the optimism of the managers interviewed by the author. When interviewed between May 1994 and May 1995, managers in 109 of the 173 sample firms were predicting steady growth for their firms over the coming three years. A further 44 were expecting rapid growth (over 20 per cent per annum), while the remaining 20 anticipated a period of stability, either by choice or necessity. 152 businesses were expecting to recruit staff in the next year (after interview), at an average of nearly five per firm.

4.3.1 New entrants to the market.

An important characteristic of the maturing computer services market in the UK is that some of the leading suppliers were not established as bureaux or software houses. Traditional computer service firms are now increasingly under pressure from firms originally established in a variety of other sectors, particularly computer manufacturing. As profits have slumped in the computer manufacturing sector, hardware is increasingly seen as a commodity competing only on price, with little added value. The search for profitability has meant a new emphasis on employee expertise, and hardware companies have had to seek profits from adding high value from the provision of services. Indeed, Rappaport and Halevi (1991) suggest that success in the computer industry now depends not on building computers, but manipulating them as '*computerless computer companies*'. Hence, companies such as IBM, ICL, DEC, Bull, Olivetti and Unisys are now major players in the service industry. Indeed most major vendors now obtain over 50 per cent of their revenues from services and software, often creating computing service subsidiaries to achieve this. As Table 4.5 (below) shows, the top two suppliers in the UK market are companies that were originally hardware vendors.

Table 4.5: The top 12 computing service suppliers to the UK market in 1994.

Rank	Company	Country	1993 £m	1994 £m	Growth 93-94 (%)
1	ICL UK CS revenues	Japan	415	455	10
2	IBM UK CS revenues	US	252	365	45
3	EDS UK	US	250	310	24
4	Andersen Consulting UK	US	247	275	11
5	Sema Group	France	212	223	5
6	Microsoft UK	US	150	200	33
7	Hoskyns	France	183	197	8
8	ACT Group	UK	127	189	49
9	Syntegra	UK	168	179	6
10	AT&T Istel	US	130	170	31
11	Oracle UK	US	144	166	16
12	Logica	UK	112	134	19

Source: Holway 1995b, p.5.

The CSSA see these developments as positive for the sector; while it will undoubtedly increase competition, the established reputations and powerful marketing strengths of these firms will increase the credibility of computer services in the market place at large. The internal reclassification of business as computer services by hardware corporations has to some extent buffered the recessionary and revenue job losses introduced in the previous section, although there is certainly a large component of real growth as well.

The surveyed firms also give an indication of this shift (see Table 4.6). While most firms are still undertaking the core business around which they were founded, the most frequent shift that is occurring is from a hardware oriented business to one centred on services. The other responses support the trends identified in section 4.2; the diversification of companies into providing a wider range of IT services, and the growing number of software businesses relative to consultancy and bespoke software firms. In general, due to the rapid growth of the industry, conventional computer service firms are coming under growing pressure from other sources (see Figure 4.11). In particular, management consultants and telecommunications operators are increasingly becoming important players in the market, as the presence of Andersen Consulting, AT&T Istel and Syntegra (part of BT) in the list of top suppliers indicates (Table 4.5). Other companies such as EDS are undergoing rapid growth by focusing purely on the outsourcing market. Clarke (1994) would add IT departments from non-IT companies that are engaging in the marketing of software developed for in-house purposes, to the competitors noted on the diagram.

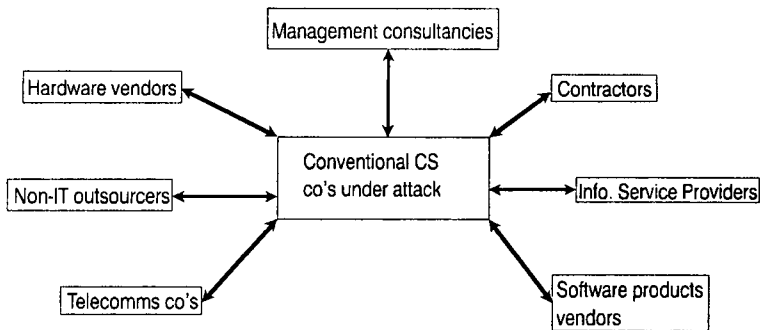
Table 4.6: The changing business emphasis of the survey firms.

Changing emphasis of business	No. Firms
Hardware to software & services	17
To a wider variety of services	15
Consultancy to software & services	13
Bespoke software to software products	7
Other	2
No change	119
Total	173

Source: Author's surveys.

The different origins of the leading computer service providers has an important impact on the organisational and spatial structure of these firms. Chapter Seven will present case studies of restructuring in the five most important types of corporations; large hardware providers, outsourcing-led corporations, traditional computer service firms, software product based businesses and international management consultancies.

Figure 4.11: New competitors for traditional computer service (cs) firms.



Source: Adapted from Holway 1994.

4.3.2 Firm size distribution.

A second important feature of the computer services sector is the firm size structure. In the UK industry, the top ten companies provide around one third of total revenues, and the top 40 provide some 70 per cent. However, the average revenue of the rest of the 42000 companies Holway identified from VAT data as being part of the sector is only £51000, vividly illustrating the proliferation of small companies in the industry, which Holway describes as '*a country of two man companies*' (Holway 1994). Table 4.7 below compares three different disaggregations of the sector by size band, but it is important to recognise the limitations of the sources of data used. The Census of Employment data refers to separate establishments 'paypoints', does not register self employed workers and also seems to omit many firms in the very small size bands. CSSA information is compiled data from the 380 or so members of the Association, and while the coverage of the industry approaches 100 per cent for large firms, it decreases for smaller size bands. Hence this data also omits many of the huge number of small businesses present in this sector, and indeed companies with less than three highly qualified staff members are ineligible for membership. The sample data represents the collated results of the 173 interviews undertaken in the four separate areas (assembled from the best available sources, as described in Chapter One) and refers to individual establishments, not companies. Overall, all these sources seem to undercount the number of very small companies that exist, largely due to problems of data collection concerning the highly volatile nature of firm 'births' and 'deaths' in the smallest size bands. Indeed, one indication of the speed of change at this end of the sector was that around 25 per cent of the firms originally sampled (from the most up to date lists available) had already disappeared by the time of the survey work.

In combination, the data in Table 4.7 provides support for the idea of a 'dual economy' in the computer services sector (Taylor & Thrift 1983, Howells 1987), which suggests an evolution in mature economies towards a situation where a small number of giant business organisations operate in conjunction with a mass of small companies. In

particular, the employment structure of the industry appears to show a relative lack of firms between approximately 50 and 500 people. This saddle distribution is best illustrated by the CSSA data, which has been graphed cumulatively in Figure 4.12 (below). If it is assumed that the data shown on the graph lacks some 80000 people working in the small firm categories, as the Holway and Census of Employment data suggests, it can be seen that the contribution of size bands to the overall employment declines relatively in the 50 to 500 region, and then increases again towards the larger firm categories. Hall & Markusen (1985) have detected a similar trend in the US computer service industry.

Table 4.7: Firm size distribution in the UK computer services sector.

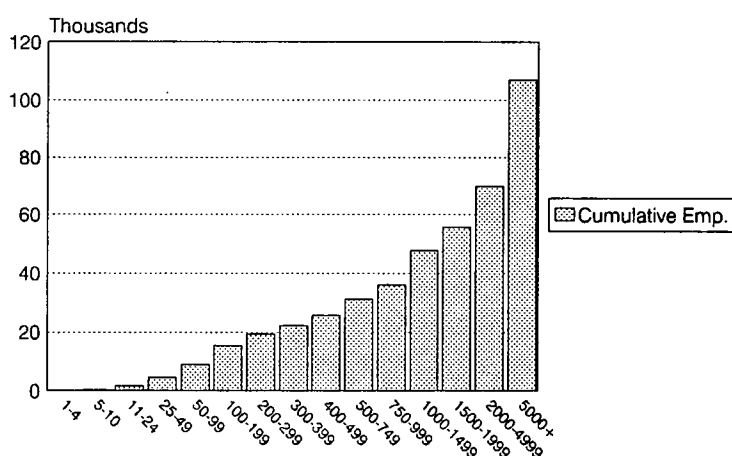
Size band	Census of Employment Units, 1993 ¹		CSSA Members & Associates, 1995 ²		Survey Data 1994/95 ³	
	No.	Employees	No. firms	Employees	No. firms	Employees
1-4	20422	32151	10	26	22	52
5-10	2325	16082	25	218	41	303
11-24	1378	22031	85	1440	46	762
25-49	609	20962	76	2676	23	830
50-99	376	25788	66	4485	19	1260
100-199	164	22190	46	6371	12	1405
200-299	42	10083	18	3957	6	1460
300-399	16	5396	9	2906	1	350
400-499	13	5824	8	3520	1	400
500-749	11	6761	10	5535	1	600
750-999	5	4067	6	4955	0	0
1000-1499	3	3861	9	11553	1	1200
1500-1999	2	3225	5	7950	0	0
2000-4999	2	5366	5	14197	0	0
5000+	0	0	4	37008	0	0
Total	25368	183787	382	106797	173	8622

Source: 1 - Central Statistical Office, via NOMIS.

2 - CSSA 1995a.

3 - Author's surveys.

Figure 4.12: Cumulative employment graph for CSSA data.



Source: CSSA 1995a.

The polarisation of the sector is recognised by ex-CSSA President Bean (CSA 1994a) who asserts that *'small companies must increasingly live off the large ones or find their own niche in which they must remain highly reactive and innovative'* (p.13). He also suggests that as the size of contract placed by both private and public sector clients increases, it is only large players that can credibly act as the prime contractor, leaving smaller companies to form consortia around them. Companies in this small-medium bracket also face special problems of profitability due to the high level of investment necessary to develop new products and services. If they are successful, firms are then vulnerable to take-over by larger, market-leading businesses. Such problems will be discussed in more detail in Chapter Five (Section 5.4).

4.3.3 Foreign penetration and ownership issues.

As identified in Chapter Three, the European computer services sector is becoming increasingly dominated by US multinationals. Within Europe, the UK market is undoubtedly the most open to penetration by foreign businesses. Table 4.8 shows how UK ownership of the top ten computing service suppliers has fallen from 66 per cent to just 14 per cent since 1985 (see also Table 4.5). While US firms already controlled one third of the revenues in 1985, this has now increased to over 50 per cent, or some £1.3bn of revenue annually. The sale of the majority holding of ICL to Fujitsu in 1990 accounts for the Japanese presence, and alone represents the loss of control of some five per cent of the market. Over the period 1993 to 1994 it appears that there has been a recovery in UK ownership, but this reflects more how the entry of one company to the list can alter the total balance, than any kind of alteration to the main trend.

Table 4.8: Changing ownership of the top ten suppliers of computing services to the UK market, 1985 to 1994 (percentage of total turnover).

Country	1985 (%)	1992 (%)	1993 (%)	1994 (%)
UK	66	23	8	14
USA	34	42	55	52
Japan	-	18	19	16
France	-	17	18	16
Total	100	100	100	100

Source: Holway 1994, Section 2, p.75.

Ownership information for the industry as a whole is not available, but 28 per cent of the CSSA membership were ultimately owned by non-British companies in 1994 (CSSA 1995b), and the proportion of revenues accounted for would have been even higher. In all, 42 per cent were owned by larger groups. The figures for the whole sector will however be lower due to the large number of undetected small firms, as the survey results indicate. For these firms (see Tables 4.9 & 4.10), 21 per cent of establishments

were part of larger groups, clearly reflecting the greater element of small and independent firms in the survey. Similarly, only 18 per cent of the surveyed firms were ultimately owned by non-British corporations. However, although the proportions of the total firms are lower, the small firms will have less impact in revenue terms, as the average turnover and employment are higher in both branches and headquarters of subsidiaries of foreign groups than the other status categories (see also Clarke 1994). When considering the site of the ultimate headquarters, the importance of US locations is clear, accounting for more firms than all the other non-British countries added together.

Table 4.9: Status of surveyed firms.

Status	No. Firms	Average Employment	Average Turnover (£m)*
Independent	80	12.6	0.96
Headquarters	38	63.7	7.54
Branch of a UK company	17	31.7	6.30
Branch of a subsid. of a UK co.	2	7.5	0.50
Branch of a subsid. of a foreign co.	11	159.0	18.10
HQ of a subsid. of a UK co.	4	60.3	6.55
HQ of a subsid. of a foreign co.	21	126.1	24.10
Totals	173	49.8	6.26

Source: Author's surveys. * Data for 152 firms that provided revenue information.

Table 4.10: Headquarters location for non-independent surveyed firms.

HQ location	No. Firms
County	4
London and the South East	9
Rest of UK	10
Europe	11
USA	17
Other foreign	4
Total	55

Source: Author's surveys.

A decade ago, three implications of the increasing foreign dominance of the software industry were identified by ACARD (1986). Firstly, the UK could no longer be sure of obtaining the software its manufacturing and service industries needed to maintain their international and domestic competitiveness. Secondly, although difficult to measure, there would undoubtedly be a negative balance of payments impact, and thirdly, the competitiveness of the UK computer services industry itself would suffer. Although the first implication looks increasingly doubtful in a rapidly internationalising global computer services market, the remaining two have proved correct. The report also suggested three possible forms which the industry could take in the 1990s: a 'net

exporting' industry based on a world class innovative sector, a 'just enough' industry servicing domestic needs, or a 'defence only' sector just concentrating on key strategic government contracts. Ten years on, it would appear that a 'just enough' industry is developing, as a major 'net importing' software sector delivering foreign products to UK customers, with the remainder of the computer services industry also being increasingly dominated by foreign players. It appears the sector may be following the development path of the UK hardware industry, which, after pioneering innovation and early growth, has almost disappeared due to lack of government funding and poor marketing;

'As today's tight margins on hardware increasingly cause computer manufacturers to look to software and services for their profits, it is debatable whether the virtual disappearance of a UK computer manufacturing industry need be a cause for concern. That concern is now focused on the software industry, where some big names have fallen into foreign ownership.....History, as they say, has a habit of repeating itself.' (Financial Times 16 March 1994a, p.XIII)

As introduced in Chapter Three (Section 3.1), there are two major mechanisms by which foreign corporations are increasing their presence in the UK market; firstly by establishing subsidiaries, and secondly by merger and acquisition. According to Cooke (1992), merger and acquisition are just two of the possible joint venture responses to technological change, uncertainty and global competition in the marketplace (see Chapter Seven for fuller discussion of joint venture strategies). Cooke's data for 1982 to 1985 suggested that IT firms engage in more proportionately merger and acquisition activity than any other sector of the economy, and if anything, this rate of activity has increased into the 1990s. For example, according to Broadview Associates (1995), 307 UK IT firms either merged or were acquired in 1994, in deals worth over two billion pounds in total. Within the IT industry, the report found that activity was more intense among information services and software companies than in any other area, with such deals making up 60 per cent of the total number and £1bn in value. Many deals were initiated by larger software firms looking for a competitive edge by acquiring smaller, more innovative specialists. Consolidation amongst medium-sized and large UK companies has long been a trend in the IT industry as a whole, and is now especially strong as businesses strive to become multinational and compete on a global basis (Financial Times 14 February 1995). Hence, of 78 deals in 1994 worth over £5m, 61 per cent involved a UK buyer. Even so, 21 per cent of deals involved a US buyer, and European firms were the purchasers in another 13 per cent, meaning that in the one year some 30 medium to large UK IT firms were lost to foreign buyers. Companies without a UK market presence often see acquisitions as a means of instantly attaining a UK base and a share of the market. The attractiveness of successful UK companies to take-over

bids from abroad, and the US in particular, is thus a major factor behind foreign penetration of the industry.

The other side of the problem is the performance of UK owned businesses in foreign markets. Overseas sales by CSSA companies in 1994 amounted to 13 per cent of total revenues, or £1.1bn. However, non-UK revenues for the Holway database companies grew by 20 per cent from 1993 to 1994, rising to £2.1bn or 21 per cent of the total. Even accounting for the larger size of the Holway sample, this inconsistency reflects the fact that, except for product companies, computing service firms are not large exporters, and show no consistency in the way in which they report earnings from their overseas subsidiaries, UK staff working for such subsidiaries and sales associated to overseas companies. For example, the CSSA figure for 1993 was 17 per cent, much closer to the Holway figure of 20 per cent for that year. Over the industry as a whole, however, the proportion of overseas sales will be far less, with the sample data suggesting a figure of around five per cent (see Chapter Six). In general, UK companies perform relatively weakly in the international computer service market, and this can be contrasted with other European countries such as France, where foreign penetration is much lower and indigenous businesses tend to have a stronger international orientation (Howells 1987). The ease of 'anglicising' a US software package, when allied with cultural similarities, has meant the UK has become an important market and base for US software companies. This is a trend from which Ireland has also benefited (see Chapter Three). By contrast, linguistic and cultural differences, together with a committed government policy, have meant that the French industry has been more protected from US domination, and this has helped to build up international competitiveness; the strong presence of French firms in the UK top ten is an indication of this fact. Furthermore, as Table 3.2 has illustrated, five of the top 20 providers in Europe are French, while none are British.

4.3.4 The changing subsectoral composition of computer services.

As recounted in section 4.2, the subsectoral composition of the computer services sector has changed substantially as the industry has evolved, occurring simultaneously with a relative decentralisation of activity from central London. An impression of the most important contemporary trends can be obtained from CSSA data for the period 1991 to 1994 (see Table 4.11) below. When considering the relative importance of different activities, it is important to note that all subsectors have grown absolutely, with the industry as a whole showing an 88 per cent revenue growth over the three year period. The most marked relative growth has been in facilities management (FM), the outsourcing of IT services to external providers rather than internal departments. Between 1991 and 1994 this increased from 8 per cent to 15 per cent of CSSA revenues, and this trend has continued with FM still the fastest growing sector in the

industry. This represents a revenue growth of £764m, increasing from £308m to £1072m. Similarly, Holway's sampled firms show an increase from £470m to £1140m over the same time span. Hence while some of this growth is purely a reclassification of activity from other sectors to the independent computer service sector, much is real growth due to the increased cost-effectiveness of specialist suppliers in running computer installations compared with that of the in-house solution. Outsourcing often means that computer service companies take on the staff of client companies, and this is fuelling employment growth in the computing services sector. In addition, however, outsourcing business is being 'created' as computer manufacturers reclassify an increasing proportion of their business as services, and also work is being reclassified by computer services companies as outsourcing to appear up to date and active in the growth sector. An example of this is business previously identified as processing; this category now only accounts for two per cent of CSSA revenues. Figure 4.13 illustrates graphically how the computer service sector may become increasingly important in the IT industry as a whole as a result of persistent outsourcing trends.

Table 4.11: CSSA firms revenue by business sector, 1991 to 1994.

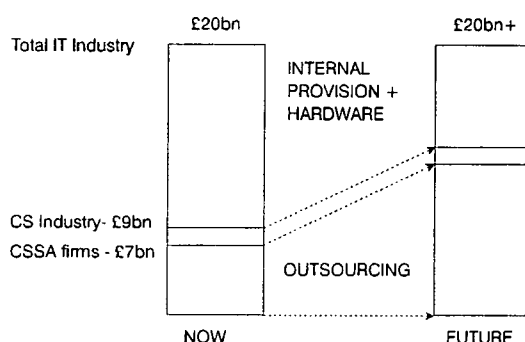
Sector	1991 % £3998m total	1994 % £7149m total	Change in share, 1991-94 (%)
Software Products	17	16	-1
IT Outsourcing (FM)	8	15	+7
Total Systems / Sys. Integration	14	14.5	+0.5
Consultancy	13	14.5	+1.5
Software Maintenance	6	7.5	+1.5
Custom Software	13	7	-6
Support / Hardware Maintenance	7	6	-1
Recruitment & Contract Staff	4	6	+2
Education & Training	3	4	+1
Value Added Resellers	4	3	-1
Processing	4	2	-2
Contingency Planning	1	1	0
Value Added Networks	2	1	-1
Database Activities	2	0.5	-1.5
Others	2	2	0
Total	100	100	-

Source: CSA 1992, CSSA 1995b.

Government policy is having an important impact on the growth of outsourcing. The CSSA aims to hold the Government to its commitment to contract out one third of public sector procurement; the Local Government Group was formed in November 1992 in response to the Government's policy of compulsory competitive tendering. Market testing for central Government IT contracts was announced in November 1992, and could result in over £750m of annual fees being transferred to the private sector (*Financial Times* 26 November 1992). However, as noted in Chapter Three, such is the

scale of some of the contracts that only a few companies can benefit, and these are likely to be foreign owned; the UK provides the most advanced example of this trend in Europe. For example, the Inland Revenue contract won by EDS is worth £150m per year for ten years, but only companies with over 20000 employees worldwide were considered.

Figure 4.13: Changing composition of the IT industry.



Source: Douglas Eyeions, personal interview 25 July 1994.

Table 4.12: The top ten FM providers in the UK in 1994.

1994 Rank	Company	Ownership	1994 FM revenues £m
1	EDS	USA	120
2	Hoskyns	France	115
3=	ICL/CFM	Japan	90
3=	IBM	USA	90
5	Sema	France	80
6	Andersen Consulting	USA	60-65
7	Capita	UK	50
8=	CSC	USA	40
8=	AT&T Istel	USA	40
8=	Data Sciences	UK	40

Source: Holway 1995b.

Table 4.12 (above) lists the top ten FM providers in the UK in 1994, and it shows that eight of these firms are foreign owned. In particular, five are US owned, alone accounting for 31 per cent of the total market, and these are the companies growing most rapidly; it is estimated that the FM business of EDS will double in 1995, and CSC announced outsourcing revenues of £140m for the year up to March 1995 (Holway 1995b). These two world leaders are developing such economies of scale and scope in FM that they are starting to dominate the market for both public and private contracts. For example, CSC has won a £900m deal with British Aerospace and a £60m contract with Ford Europe Parts, and EDS has signed the largest FM deal ever; \$3.2 billion over ten years to supply all Rank Xerox's IT needs worldwide. Hence, UK firms appear to be

increasingly losing out in the key growth sector in the IT services industry, and this is important for the issues of sovereignty discussed in the previous section (4.3.3). The growth in IT outsourcing and its spatial consequences will be examined in more detail in Chapter Seven.

In the software market, products now account for 16 per cent of CSSA revenue compared to seven per cent for custom software, and it is expected the improvement in the relative importance of products will continue. While the proportion of CSSA revenues from software packages has remained fairly stable over the period 1991 to 1994, when this is compared to the six per cent drop of custom software revenues the market trend is clear. Custom software is more expensive with a longer and less certain delivery time, and companies are responding with new products but also 'systems kernels' which combine common modules with custom built modules for individual customer's needs. Other sectors performing relatively strongly are consultancy, software maintenance and the IT staff agency market. IT consultancy shows the best profit margins of any computer service, increasing from around 20 per cent on average in 1985 to approaching 50 per cent in 1995 (Holway 1994). While margins on FM are also increasing, improving steadily from 15 to 20 per cent over the same period, margins on software products have slipped from 50 to 30 per cent, giving an indication of the sales volume increases that are occurring to maintain the segment's position. However, Holway cautions that the combination of increased competition and reduced margins for software vendors, just as they are having to spend more on R&D to meet customer requirements, will soon cause a reduction of growth in this area (*Financial Times* 24 January 1995). The main segments losing market share in the industry are custom software and data processing, for reasons that have already been discussed.

The survey data in Table 4.13 also shows clearly that a large proportion of firms have software products as the core of their business, with such businesses accounting for 45 per cent of total employment. For the purposes of the survey, software with a central core that is then adapted slightly for different clients was recorded as a software product. Many managers described their software as having an 80 or 90 per cent 'fit' in order to identify a product that needs or allows some degree of tailoring (ten to 20 per cent) for specific customers. Systems integration and broadly based computer service companies are the two other main employers in the sample. By classifying firms by their most important activity, the results are necessarily different to those of the CSSA; functions provided by many firms in support of software or total systems, such as training, consultancy, and both software and hardware maintenance are underplayed in such a schema. Another element that is downplayed is the growth of FM, due to both the fact that outsourcing employment is concentrated in huge employment centres which the survey in general has not sampled, and also that considerable numbers of such staff

are located on client sites. Overall, this data does however emphasise two of the key trends in the evolution presented in section 4.2; the increasing dominance of both software product businesses and systems integrators.

Table 4.13: Survey firms by main computer service activity.

Subsector	No. firms (% of total)	Employment (% of total)	Average employment
Software Products	52 (30)	3837 (45)	73.8
Total Systems / Sys. Integration	36 (21)	1844 (21)	51.2
Custom Software	15 (9)	364 (4)	24.3
All Computer Services (incl.FM)	14 (8)	1424 (17)	101.7
Value Added Resellers	10 (6)	96 (1)	9.6
Consultancy	9 (5)	272 (3)	30.2
Education & Training	9 (5)	99 (1)	11.0
Value Added Networks	9 (5)	260 (3)	28.9
Independent Maintenance	7 (4)	110 (1)	15.7
Data Processing	4 (2)	136 (1)	34.0
Database Activities	4 (2)	89 (1)	22.3
Recruitment & Contract Staff	2 (1)	26 (0)	13.0
Disaster Recovery	2 (1)	65 (1)	32.5
Totals	173 (100)	8622 (100)	49.8

Source: Author's surveys.

The subsectoral constitution of the industry is obviously linked to the firm size distribution described previously (Section 4.3.2). Although there is no definite relationship between firm size and main segment of activity, two general points can be made. Firstly, broadly based computer service firms with an FM capability tend to be relatively large by their nature, as do total systems companies which have to provide a whole range of expertise. Conversely however, activities such as training, reselling, hardware maintenance and staff recruitment are viable as small, locally based operations, and hence the average establishment size tends to be lower (Table 4.13). For activities such as software products or consultancy, however, firm size can range from two people to hundreds of staff, largely depending on the scale, scope and competitiveness of the business.

Many computer service firms, like the leading hardware companies, are trying to reduce the proportion of their revenues derived from computer hardware. For example, as hardware profit margins fall, many software firms are consciously avoiding selling any hardware products, often just recommending certain vendors or giving certain specifications for what is required to their clients. A few others, however, sell on hardware (colloquially known as 'box shifting') in order to provide a complete solution. Even for such software firms, hardware rarely exceeds ten per cent of turnover, and the proportion of profits accounted for is even less, with margins of just four to eight per cent for standardised hardware being quoted by managers. Hence it is the systems integrators (31 per cent of turnover on average in the sample), firms supplying all

services (23 per cent), value added resellers (65 per cent) and networking companies (11 per cent) that sell the majority of the hardware in the services industry. Several subsectors, such as training, recruitment and consultancy have no involvement with hardware whatsoever. Overall, the hardware sales of CSSA members were only 3.6 per cent of total revenues in 1994, and the figure has stayed around the five per cent mark since 1991. However, for the 167 sample firms who responded, the average proportion of turnover accounted for by hardware sales was just over 15 per cent. If the firms who deal with no hardware are discounted, the average percentage for the remaining 85 businesses rises to 30 per cent. These figures are much higher than those of the CSSA partly because hardware revenues of the old 'hardware' companies are included, whereas firms such as IBM and ICL record only their service and software revenues for the CSSA. Variations can also occur when deciding whether firms are essentially value added resellers, and thereby adding substantial service value to hardware and software products, or just computer retailers.

In summary, this, and the preceding three sections have outlined the evolving structural characteristics of the UK computer services sector. A central theme has been the increasing openness of the industry to the influences of large foreign suppliers of various sectoral origins and often of US ownership, who are starting to dominate the UK market in terms of both revenue and employment. In particular, US firms have a strong presence in the key growth markets of IT outsourcing and software products.

4.4 Workforce issues in the computer services industry.

The final part of this chapter will review the occupational characteristics of the industry. Apart from aggregate Census of Employment statistics, there is a paucity of occupational data on the computer services sector (and many other service industries). The survey sample, however, provides information on the employment characteristics of the sector, which will be considered at this stage for two reasons. Firstly, due to the lack of significant regional variation between the county results, it is reasonable to interpret the combined results as being indicative of the industry nationally. Secondly, it provides an important background and context for the subsequent chapters.

4.4.1 The occupational and gender composition of the workforce.

A breakdown of the staff covered by the survey (over 5000) is contained in Table 4.14. While it is almost impossible to produce a perfect classification of jobs for a sector like computer services, which covers such a wide range of different activities, these categories were selected after experimentation during pilot study interviews. The largest category by far is that of software engineers, or staff involved in the development, upgrading and maintenance of software, constituting nearly 30 per cent of the workforce. The next most important group, 'other technical staff', covers a whole range

of engineering functions, related to hardware and network installation and maintenance. Excluding the management, the remaining 40 per cent of staff perform less IT intensive and more supportive tasks, and it is important not to underestimate the number of more 'routine' service jobs such as administration, secretarial work and sales, in such a technologically advanced sector.

Table 4.14: Surveyed workforce by employment category.

Employment Category	Male %	Female %	Total %
Management	8.7	1.3	10.0
Management & Software Engineering ¹	1.7	0.1	1.8
Software Engineering / Consultants ²	24.4	4.2	28.6
Training	2.0	1.9	3.9
Data Entry	0.2	2.4	2.6
Other Technical Staff ³	15.7	2.9	18.6
Clerical and Secretarial	2.2	11.1	13.3
Sales and Marketing	12.8	5.0	17.8
Other	2.1	1.3	3.4
Totals	69.8	30.2	100.0

Source: Author's surveys, total of 5271 staff covered.

1 - A category for small firms who often found it difficult to identify a distinct management group.

2 - sometimes known as analysts & programmers.

3 - hardware, networking, installation and maintenance engineers, and support staff.

A crucial characteristic highlighted by Table 4.14 is that computer services is a male dominated industry, with 70 per cent of the sample workforce being men. The Census of Employment suggests a figure of 68 per cent in 1993 (see Table 4.15 below), and Curran *et al.* (1991) recorded a level of 64 per cent. Other surveys suggest the proportion of female employees is lower, in the range 23 to 28 per cent, compared with 39 per cent in France and 45 per cent in the USA (*Computing* 16 March 1995). In the sample, females dominate employment in administration and data entry tasks, have an equal share of training work, and constitute about one third of the sales and marketing workforce. In the other more highly skilled categories, however, women are in a small minority. For example, the ratio of men to women software engineers is approximately six to one, and for other technical staff, five to one. Women represent only around 15 per cent of managers, and this proportionately low representation in senior posts has been noted by other surveys (*Computing* 4 January 1996).

The industry is also dominated by full-time working, which covers over 90 per cent of employees (see Table 4.15), while of the part-time workers over 80 per cent are women. In the sample, 79 firms employed some 250 part-time staff, representing just five per cent of the total. However, these were nearly all female secretarial or data entry staff, although there was a small component of part-time female programming staff. At Table 4.15 shows, data processing is the activity where part-time staff are proportionately

most important, and this is usually indicative of women data entry staff working on shifts. When this dimension is added to the information in Table 4.14, with over one fifth of female staff being part-time, the proportional significance of female employment in the sector is reduced still further. In summary, not only are women heavily under represented, they are concentrated in the lower skill, lower paid, more routine tasks and constitute most of the part-time staff in industry.

Table 4.15: 1993 computer services workforce by type of employment and subsector.

Subsector	Male F/T	Fmle F/T	Male P/T	Fmle P/T	Total
Hardware Consultancy	3900	1300	100	700	6000
Software	82600	30400	1600	8100	122700
Data Processing	21600	9600	900	2900	35000
Database Activities	1500	800	0	200	2500
Maintenance	10000	2800	200	700	13700
Other	2400	1100	100	300	3900
Total	122000	46000	2900	12900	183800
(% of total)	66.4	25.0	1.6	7.0	100.0

Source: CSO, via NOMIS.

While other business services with more clerically based work may show a higher level of female participation (51 per cent on average in 1993), the occupational structure of computer services is very similar to that exhibited by other 'high-tech' sectors. For example, Massey *et al.*'s study (1992) of the Cambridge and Aston science parks found that only 10 per cent of qualified scientists and engineers, and 11 per cent of other professional and managerial staff were women, as opposed to 87 per cent of clerical, secretarial and administration tasks. Similarly, Crang and Martin (1991) summarise the situation in Cambridge, and start to hint at the origins of the problem;

'Within the high-technology sector itself a [similar] gender division is [also] discernible...there are but a handful of women working in private-sector research jobs in Cambridge. Women in high-technology companies tend to fill the personnel, administrative, clerical and less often marketing posts. Given the well documented biases in education and society as a whole against women in science and technology, this segmentation is hardly surprising' (p.110).

Hence the 'engineering' nature of the more skilled and semi-skilled jobs in IT services and the traditional male orientation of such occupations can be seen as a hindrance to the entry of women to the industry. Also, Massey (1993) suggests that the flexible work patterns of research based high-tech jobs, based upon long unpredictable hours and contract based working, are also prohibitive to the entry of women who may still have substantial domestic and parental commitments (see also McDowell 1991). Marshall and Wood (1995) suggest that not only may women lack the technical background to gain

jobs in IT firms (88 per cent of computer science graduates are male, for example), but access may be restricted through the selective internal labour markets of firms, which can thus perpetuate the male domination of certain occupations.

The computer services sector also exhibits an element of 'ageism' as an industry, with the workforce being dominated by people under 40. A survey of IT recruitment consultancies found that over 60 per cent of their advertising was age specific, and that 25 to 35 was the preferred age group. In general, staff are now reaching their career peak in their mid-30s to early 40s, due to the dynamic nature the IT sector. Ageism is partly attributable to the high demand for new skills, such as PC skills, compared to legacy skills (*Computing* 9 March 1995a). The nature of demand for skills in the IT industry as present then compounds the problem, with around 70 per cent of IT intensive vacancies looking being aimed at young graduates with a few years experience, as in general, such workers are perceived as being cheaper and more flexible (*Computing* 28 July 1994). The average age of sample firm entrepreneurs is considered in Chapter Five.

Traditionally, the IT industry has not supported the notion of organised labour, with only around five per cent of employees belonging to a union, such as MSF (Manufacturing, Science & Finance). The greatest union presence is in the traditionally hardware oriented companies, but this depends to a great extent on the culture of individual firms. For example, ICL has always been strongly opposed to collective representation, and while Bull Information Systems recognises unions in France, the UK subsidiary has none. The lowest representation is in software companies as these are often the newest firms. Many IT workers in other sectors belong to unions, however, and hence union representation in computer service companies is increasing in line with the growth of public and private sector facilities management. For example, ex-Inland Revenue IT staff have forced EDS to recognise their union rights, and all such staff are now represented by the newly formed Public Services, Tax and Commerce Union (PTC), which has an EDS branch head. EDS though, do not expect many of their staff working on other government contracts to join the PTC, due to the long tradition of personal representation in the sector. Another example is the outsourcing deal between British Aerospace and CSC which has resulted in the transfer of 1800 staff, of whom some 400 to 500 are MSF members. Larry Brooke of the MSF suggests that many IT firms started in a union free environment, and have remained 'greenfield' to unions ever since (see also Robinson & McIlwee 1989), but he suggests that in time workers in the industry will become organised as the industry matures and job security becomes an issue, as demand for labour declines (interview 16 February 1994). MSF is establishing a computer and IT professionals association in anticipation of this trend, and may already have some 15000 members (in all sectors) who would come under this new group.

4.4.2 Pay and qualifications.

Questions concerning wage data were not included in the sample interviews due to the reluctance (or refusal) of the pilot survey businesses to divulge such information. As a rough indicator, the average staff costs in the Holway survey were £27000 in 1994, with the average revenue per employee being £82000. Analysis of advertised vacancies suggests that salaries of £25000 to £30000 are the most readily available, with well over half the jobs advertised for IT professionals paying between £20000 and £35000. Over 50 per cent of jobs on offer tend to be in London and the Home Counties (*Computing* 23 November 1995a). In terms of regional variation, figures from the research company Computer Economics suggest that in November 1994 analysts and programmers in the South East were getting 106 per cent of the average national salary, while those in the Midlands, Scotland and the North were receiving 87 percent of the average for similar posts. The highest pay is available in London, at 25 per cent above the average (*Computing* 1 December 1994). While the majority of IT recruitment is conducted within an 80 mile radius of London, there is now evidence that individual staff are becoming less reluctant to move further afield for work, particularly to the Midlands and the North West (*Computing* 23 June 1994a).

It is more difficult to suggest whether there is a gender differential in pay rates. The average wage rates for women in the sector are undoubtedly much lower than for men, but, as in many business services, this is chiefly because women undertake the more junior and lower skilled tasks (Sassen 1991). Evidence from the USA for the period 1975 to 1990 suggests that female software workers are paid less for comparable work and that the earnings gap did not narrow over the time period, despite the increasing representation of women in the occupation (Heywood & Nezlek 1993).

A high proportion of the young software engineers and IT consultants in the industry have some kind of higher education degree, usually in computing disciplines, with subsequent experience or training in certain languages or packages. Older workers, however, may have been in the industry since before it became hardware dominated, and hence have learnt about new technologies as their careers have progressed. Qualification requirements for computer professionals in employment are now in fact increasing, and Senker & Senker (1994b) outline three converging trends behind this process. Firstly, as basic programming becomes more automated, employees are having to train in systems analysis and design skills. Secondly, as computers diffuse more widely into the economy, computer specialists are having to gain qualifications in the business processes they are trying to automate or improve. Thirdly, training is necessary to counter the increasing complexity of systems and networks. Hence, the majority of large firms have formal training schemes for staff, although small establishments concentrate more on 'on

the job' learning (sample data). Sales and marketing staff are often graduates as well, but come from a broader range of subject backgrounds. The remaining technical staff are often school leavers, possessing, or studying for, vocational qualifications such as NVQs. Such staff often gain accreditation from certain suppliers and manufacturers as their careers progress. In smaller firms, the qualifications structure is less formal, or non-existent, and staff are recruited on a more ad hoc and informal basis.

4.4.3 Recruitment and skills shortages.

The highly fluid IT job market of the late 1980s was typified by the frequent movement of employees, skills shortages and annual salary increases of seven to ten per cent. During the main recessionary period 1990 to 1993, however, the mobility of workers was greatly reduced, and salary increases dropped to two to four per cent per annum. More recently, the CSSA estimates that recruitment rates are now growing at 14 per cent annually, and suggests that this will lead to a return to the head-hunting and poaching that characterised the late 1980s. The MSL index, based on advertised vacancies for IT jobs in national newspapers offering a salary of over £20000, provides supporting evidence for these trends. The moving annual total rose in the mid-1980s to 4000, and peaked at 5000 in 1989, before slumping to 1000 in early 1992. By late 1994, the total was back up to 2000 (*Computing* 27 October 1994b). A survey of 3000 companies by the Delphi Group (*Computing* 18 January 1996a) exposed particular concerns about shortage of expertise in the areas of networking, client-server and PC development work and 50 per cent of respondents were having to use contract staff as a temporary response.

Holway (1995b) suggests that the combination of the MSL data, the CSSA trend survey and recent recruitment announcements by corporations such as EDS, Sema, Oracle and Hoskyns confirm a new IT skills shortage. The sample evidence indicates, however, that at the individual establishment level, the competitive success, stage of growth and development strategy of the business are the major controls on recruitment levels. Some respondents in successful businesses were recruiting strongly throughout the recession, and found shortages of certain leading edge skills despite the overall contraction of the sector. Overall though, only 47 of the 173 sample establishments felt that they had experienced recruitment problems in the year prior to interview, with slightly more respondents in the South East having difficulties than elsewhere. Interestingly, while a general shortage of certain technical skills was the major constraint, a lack of good sales people, combining selling skills with technical knowledge, was the next most quoted, illustrating the shifting emphasis of the industry.

The survey establishments use a variety of recruitment methods for IT staff (see Table 4.16), with local advertising, word of mouth and job agencies being the most popular

methods. There appears to be no real pattern to the choice of method between firm categories, although national advertising in either the trade or daily press tends to be used by larger, multi-site companies. Interestingly, there is a regional variation however. In the two 'northern' counties, Tyne & Wear and Cheshire, local advertising and job centres were relatively more popular, while in Hertfordshire and Berkshire, job agencies and national adverts were mentioned more often. This may reflect both the presence of more large, nationally oriented businesses in the southern counties (see Chapter Six), as well as the more established network of IT staff agencies in the South East as a whole. The level of recruitment by word of mouth and contacts suggests that there is an important informal network of relationships and connections between managers in computer service firms.

Table 4.16: Methods of recruitment of qualified staff in survey firms.

Recruitment Method	No. of Mentions
Local advertising	66
Contacts / referrals / word of mouth	56
Job agencies / executive search	55
Local universities / HE colleges	23
National advertising	23
Job centres	12
Other	10
CV's / approaches	9
Total	254

Source: Author's surveys.

4.4.4 New forms of working?

As described above, employment in this sector is largely characterised by permanent, full-time work, and any moves to more 'flexible' working in the industry are at the moment largely small scale or experimental. While the industry has for a long time included an element of self-employed contract programming and IT training staff who work on a temporary contract basis, such staff are usually only necessary for unusual levels of demand, and are very much at the periphery of the established workforce. However, teleworking is an area which firms are starting to seriously consider; market research company Spikes Cavell suggest that IT staff have been among the first to capitalise on the chance to work from home, and will take the lead in extending the concept (*Computing* 9 March 1995b). Huw's (1993) survey of teleworking asserts that ten per cent of such staff are computer professionals of some kind. For example, 1000 of DEC's 4000 UK employees operate as so-called 'flexible' workers, which includes a combination of working at home, in telecentres, and in 'flexible' offices, where non-assigned desks and IT facilities are available for whoever needs them at that time (also known as hot-desking). DEC has consolidated its operations around six offices and various telecentres, and claims to have saved £3.5m from improved usage of property,

equipment and services (*Computing* 13 April 1995a). While other IT companies, such as ICL and FI Group are experimenting with flexible working, teleworking is nowhere as near established as it could be in IT occupations. The success of such schemes seems to depend on company culture, in terms of how managers adjust their practices, and how firms assist workers with problems such as self motivation and isolation (*Independent* 6 February 1995).

4.5 Conclusion.

This chapter has presented the key spatial, structural and occupational characteristics of the UK computer services sector in the mid-1990s, and has also highlighted the key processes of change that are altering those characteristics. In summary, although the computer services industry is constantly changing as the core mix of technologies around which it is based evolve, the dominance of the South East of England in employment terms has existed since the genesis of the industry in the 1960s. In revenue terms, the sector is dominated by large, increasingly foreign owned, multinational corporations, although the considerable number of very small firms provide significant employment. While affected by the recession, the industry is now being propelled by strong growth in the software products, systems integration and facilities management subsectors, and by the strategic reorienting of major hardware players. A high proportion of the workforce are well qualified male employees, but there is an important component of support staff.

A central aim of this thesis is to investigate regional variations within the key variables of firm type, firm size, firm ownership and subsector of activity described in this chapter, and their impacts on the development of the sector in various localities. Hence, the next three chapters will consider several features of regional variation within the sector, and how these variations influence the process of spatially uneven development in the industry. The first two of these chapters use the disaggregated county survey data to consider variations in the new firm formation process (Chapter Five), and the linkages of computer service firms (Chapter Six), while Chapter Seven reviews the impacts of the spatial restructuring of large firms.

Chapter Five: Explaining uneven development I - patterns of new firm formation.

'Recent empirical study on the birth and growth of service firms in various [Italian] regions demonstrates that the development of services may be considered as an "endogenous" development process as it is mainly affected by the characteristics of the local environment to which the service firms are usually tightly connected.....in particular many new service firms rise as a gradual "spin-off" from the existing traditional service industries, rather than as a migration from other areas or a decentralisation from industrial firms.' (Capellin 1991, p.234)

5.0 Introduction.

The central contention of this chapter is that new firm formation processes, which vary both quantitatively and qualitatively across the UK, underlie the highly uneven spatial distribution of computer service employment introduced in the preceding chapter. In line with the findings of Capellin (1991, see above quotation), computer service firms appear to be largely a product of the local economic structure from which they emerge, and the formation process is particularly crucial due to the locational inertia which firms in this sector subsequently exhibit. The chapter will firstly introduce in more detail the characteristics of the four county surveys and the local economies of which they are a part. Then, various aspects of the new firm formation process will be analysed, highlighting the important regional variations that the survey illustrates. Thirdly, the key locational requirements and attributes of the survey firms and the problems they present for more peripheral areas will be discussed. The chapter will conclude with a consideration of different growth trajectories which firms exhibit, once established.

5.1 The four county surveys and their local economies.

Before proceeding to analyse regional variations within the survey results, it is necessary to outline the general characteristics of the four county economies which the interviewed businesses were drawn from. Although it is important to realise that such economies are artificial and need to be considered in their regional, national and even international contexts, basic structural differences can be identified. Table 5.1 illustrates the employment structure of the counties at the time of the last Census of Employment in September 1993. All four counties conform to the long term national trend of decreasing manufacturing employment married with increases in service functions, and in particular business services.

Table 5.1: Background data for the four survey counties, September 1993.

Measure	Herts.	Berks.	Tyne & Wear	Cheshire	UK averages
Total workforce	375400	342400	420600	376400	21.1m
% in manufact. / construction	20.0	15.6	22.3	26.6	22.1
% in financial & bus. services	20.5	22.6	14.1	16.4	16.3
% in public services	24.6	21.9	30.2	19.5	25.8
% in other services	33.2	38.0	32.2	34.0	32.9
Unemployment rate	8.5	7.3	13.1	8.4	10.4

Source: CSO, via NOMIS.

For a South Eastern county, Hertfordshire has a relatively large component of manufacturing employment, in particular in the high-tech aerospace and defence sectors. These sectors were recently hit hard by a combination of the recession starting in 1990, and the growing peace dividend from the end of the Cold War. While Hertfordshire was promoted in the 1980s as the leading UK county for high-tech employment, Rainnie *et al.* (1988) highlighted the dangerous over dependence on defence contracts and a few employers such as British Aerospace and Rolls Royce. In the recession, both these firms closed large plants, and unemployment levels leapt from 2.2 per cent in June 1990 (10800 people) to 8.9 per cent in January 1993 (43900). The situation was worsened by restructuring in the two other key sectors of employment, pharmaceuticals and financial services. As a result of the downturn, an economic development strategy for the county was initiated for the very first time by Hertfordshire County Council and the Hertfordshire TEC. This represented a major shift from the 1980s, when the major problems were skills shortages and over-development. The resultant 'Bright Green' strategy aims to combine environmental awareness with high value added economic development in the future. Hertfordshire's presence in the computer industry was established in the two decades after 1945, due to the attractiveness of its New Towns and garden cities for plants relocating from London (e.g. ICL) and for mobile foreign investors such as Honeywell and McDonnell Douglas (Kelly 1987).

During the 1980s, in contrast to Hertfordshire, the Berkshire economy was characterised mainly by strong growth in a range of office based financial and business services, and to a lesser extent in high-tech manufacturing industries such as office machinery and computers. Examples of the latter include Hewlett Packard, ICL and DEC, all major employers, and the inward investments undertaken by Dell (USA) and Siemens Nixdorf (Germany). For Hall *et al.* (1987), the genesis of Berkshire's high-tech industry can be explained by a combination of the decentralisation of industry from West London in the 1950s and 1960s, and development stimulated by Government Research Establishments such as Crowthorne and Aldermaston. The M4 motorway and Heathrow Airport underpin these processes, and have proved attractive to foreign companies drawn to the area by its 'high-tech' reputation. Like all South East counties, Berkshire

felt the effects of the recent recession, and although unemployment rose to 7.0 per cent in September 1993, employment levels in Berkshire have recovered faster than Hertfordshire and the rest of the South East, due to its more diversified industrial base. Berkshire County Council established an economic development strategy even later than Hertfordshire, in 1993, with the emphasis again being placed on sustainable development.

As would be expected, financial and business service employment levels are lower in the two northern counties, while manufacturing is relatively more important. Interestingly, the proportion of manufacturing employment in Tyne & Wear is in fact only just above that of Hertfordshire (absolute levels are higher), although this is partly held down by the high level of public service employment in Tyne & Wear. This latter feature reflects the fact Tyne & Wear is the only ex-metropolitan county sampled, centred on the cities of Newcastle and Sunderland, with all the associated health, education and administration functions. Furthermore, towns in south eastern counties such as Hertfordshire and Berkshire, and relatively rural northern counties like Cheshire, have not benefited from the decentralisation of Civil Service Departments. Newcastle however, has benefited in employment terms from the post-war relocation of part of the DSS, making it the second largest concentration of civil service employment in the UK after London (Marshall 1992b), although this is tending to reduce. Another feature of the Tyne & Wear (and north eastern) economy is the growing emphasis on large scale inward investment schemes for manufacturing development, as the previously state-owned coal and shipbuilding industries have collapsed (Sadler 1992), resulting in an unemployment rate consistently well above the national average. The plants of Nissan in Washington and Siemens in North Shields are major examples of these developments. The area has no historical record of growth in either the computer services or hardware industries.

In comparison with the other three counties, Cheshire has a relatively balanced economy. Unemployment during the recession was only slightly higher than most counties in the South East, reaching 8.4 per cent in September 1993. Cheshire exhibits above average representation in the manufacturing sector, although this is decreasing as in most areas. Approximately one third of this manufacturing employment is in the chemical industry (ICI), and a further ten per cent are involved in motor vehicle and car component manufacturing. The defence and nuclear power industries are also large employers. Local institutions are increasingly looking to attract foreign investment as in Tyne & Wear, and the decision of the MBNA bank to establish its European headquarters in Chester in 1994 was the first major success of this policy.

At this point it is appropriate to consider some of the historical factors that help explain why Greater Manchester and Cheshire have long out-performed most other areas of the North in terms of computer industry growth. The origins of this growth can be traced to the development of one of the first computers by Manchester University in 1948. This was passed to the local firm Ferranti, who by the 1970s had become a world leader in computer systems, with 5000 employees. This growth both created new start-ups, and attracted other players in the hardware industry, with DEC and IBM establishing offices in Manchester, and ICL obtaining bases in Manchester and Cheshire via merger and acquisition activity. The National Computer Centre was established in Manchester, and has created some 25 spin-off companies, and the presence of an international airport in Manchester has also been important. Cheshire in particular has benefited from these developments, due to its good quality living environment and motorway network. These factors make Cheshire an attractive place for qualified computer staff to live, and for new firms to be established or decentralised from Greater Manchester. One manager suggested there is a discernible band of IT industry development running from Macclesfield to the Mersey, sometimes called the 'Bollin Valley'.

5.1.1 The computer services industry in the study areas.

Basic information on the computer services sector in the four counties is presented in Table 5.2, clearly illustrating the different overall size of the sector in each area.

Table 5.2: Introducing the computer services sector in the four study areas.

Feature	Herts.	Berks.	Tyne & Wear	Cheshire
1981 employment in computer services	1500	2700	400	1500
1993 employment in computer services*	6900	9500	2400	3200
Employment change 1981 to 1993	5400	6800	2000	1700
1993 employment as % of county workforce	1.9	3.2	0.6	0.9
Location quotient (benchmark=0.9%)	2.2	3.7	0.7	1.0
No. of computer service units (1993)	1154	1273	183	566
No. of firms interviewed (6/1994 to 5/1995)	43	41	46	43
Total employment in interviewed firms	2348	3308	1589	1377

Source: CSO, via NOMIS.

* Adjusted as in Table 4.1, to provide comparison with 1981 data.

In terms of 1993 employment, the sector in Berkshire is three times larger than that of Cheshire, and four times larger than that of Tyne & Wear. Similarly, the computer services sector in Hertfordshire is an order of magnitude larger than that of the two northern counties. These differences are also reflected in the number of computer establishments, with over six times as many being recorded in Berkshire as Tyne & Wear. It is important to remember these basic variations in the scale of the industry in the four areas when considering the different *magnitudes* of the processes described in this chapter. While the surveys represent different proportions of the total industry in

each county, they were stratified by sizeband (see Chapter One) to try and achieve a representative cross-section of establishments.

Apart from aggregate employment data, very little information is available on geographical variations in the structure of the computer services industry across the UK. Hence, a major problem when assessing information from the four areas is the lack of regional or national data to act as a basis for comparison (the best available national data was presented in Chapter Four). However, comparing the four county surveys can give an idea of relative differences in the structure of the industry, and Table 5.3 (below) presents the subsectoral composition of the sector in the four areas. The most striking feature here is the huge scale of the software products industry in Berkshire, accounting for over three quarters of total employment. This is in part due to the large number of US software product companies such as Oracle, Computer Associates and Legent that have located their UK headquarters in towns such as Bracknell and Slough, attracted by the international reputation of the M4 corridor, and the proximity to Heathrow and central London. Oracle alone employs 1200 staff in Bracknell. There are many other examples of large firms not included in the survey, such as Microsoft, Sybase, and Novell.

Table 5.3: Surveyed firms by subsector of major activity, and area.*

Subsector	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Software Products	8 (17)	20 (77)	9 (37)	15 (22)	52
Total Systems / Sys. Integration	14 (42)	10 (16)	5 (7)	7 (16)	36
Custom Software	3 (6)	2 (1)	6 (11)	4 (2)	15
All Computer Services (incl.FM)	4 (18)	1 (0)	4 (16)	5 (54)	14
Value Added Resellers	3 (1)	1 (0)	2 (2)	4 (2)	10
Consultancy	2 (4)	2 (2)	4 (7)	1 (0)	9
Education & Training	1 (1)	2 (1)	5 (3)	1 (1)	9
Value Added Networks	4 (7)	1 (1)	2 (2)	2 (1)	9
Independent Maintenance	2 (2)	0 (0)	2 (2)	3 (2)	7
Data Processing	0 (0)	0 (0)	4 (9)	0 (0)	4
Database Activities	0 (0)	1 (1)	3 (4)	0 (0)	4
Recruitment & Contract Staff	1 (1)	0 (0)	0 (0)	1 (1)	2
Disaster Recovery	1 (1)	1 (1)	0 (0)	0 (0)	2
Totals	43 (100)	41 (100)	46 (100)	43 (100)	173

Source: Author's surveys.

* Figures in brackets represent percentage of total survey employment for that subsector in each county.

These results accord well with a 1986 survey in Berkshire and Tyne & Wear conducted by Howells and Green (1988, p.176);

'Berkshire not only had a much higher absolute number of businesses involved in computer service and related activities than Tyne & Wear but it also had a higher proportion of companies involved in more

innovative, product oriented service activities, such as software services and systems'

As this suggests, when considering subsectoral variation in the industry it is important to remember that some segments are more knowledge based than others, with innovation levels being lower in sectors like training, reselling, data processing, hardware maintenance and networking, than in consultancy or software businesses. Much of the work in the former sectors depends on the innovations of other computer companies, such as new networking or computer hardware products, and new software packages that need training support.

Another interesting variation is the higher level of total systems suppliers in Hertfordshire than the other surveys. This may reflect the strength of the computer hardware industry in the South East and its importance for providing computer service firm founders (see Section 5.2.4). Computer service entrepreneurs who have knowledge and experience of hardware systems are more likely to include hardware as part of an overall service than those from other sectors. This may also explain the low representation of this activity in Tyne & Wear compared to Cheshire and Berkshire. Many functions such as training, hardware reselling, hardware maintenance and networking seem to be spread relatively evenly, suggesting that such operations are provided fairly locally in comparison to other activities. The location of many of the labour intensive database and data processing activities in Tyne & Wear could be an accident of sampling, but may also reflect the availability of cheap, often female labour in the North East. The variation in 'all computer services' providers should not be seen as significant, as this merely reflects whether key large firms were sampled or responded to the survey. For example, although only one such firm was interviewed in Berkshire, in reality ICL and DEC are both large employers in the county.

Another important way of categorising the surveyed establishments is by their status, as in Table 5.4 below. While the structure of the industry in Hertfordshire and Berkshire is dominated by headquarters of both UK and foreign multi-plant firms, the northern counties of Cheshire and Tyne & Wear are more reliant on branch establishments. The Berkshire results clearly reiterate the importance of the headquarters of foreign firms in the county. All four areas show a good number of small independent firms, confirming the importance of new firm formation and small businesses in the sector. Clarke's (1994) survey of 122 Scottish software firms similarly found that his sample was dominated by independent firms (77 per cent of the total) and branches of UK and overseas companies. In general, branches tend to be significantly larger than the indigenous firms in both employment and revenue terms, as Table 5.4 illustrates. This overall pattern echoes the spatial division of labour approach introduced by Massey (1995) for manufacturing sectors, and indeed branches are still more vulnerable to employment

reductions than headquarters in a service industry such as computer services. This is particularly true in Tyne & Wear where around half the branches are of companies which are primarily associated with hardware and are struggling nationally as the profit margins on hardware continue to fall.

Table 5.4: Survey firms by status and area.*

Status	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Independent	19 (11)	13 (17)	24 (10)	24 (15)	80 (13)
Headquarters	12 (62)	15 (62)	6 (109)	5 (20)	38 (64)
Branch of a UK company	2 (48)	2 (12)	5 (32)	8 (33)	17 (32)
Branch of a subsid. of a UK co.	1 (3)	0 (0)	1 (12)	0 (0)	2 (8)
Branch of a subsid. of a foreign co.	2 (400)	0 (0)	6 (60)	3 (197)	11 (159)
HQ of a subsid. of a UK co.	1 (50)	0 (0)	2 (79)	1 (33)	4 (60)
HQ of a subsid. of a foreign co.	6 (75)	11 (195)	2 (31)	2 (17)	21 (126)
Totals	43 (55)	41 (81)	46 (35)	43 (32)	173 (50)

Source: Author's surveys.

* Figures in brackets represent average employment size for the status in that county.

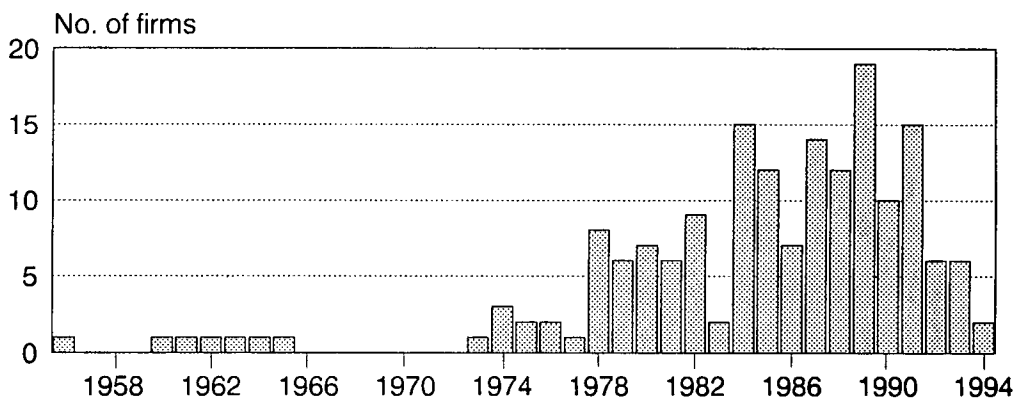
While there is a relative dependence on branches, overall Tyne & Wear (and indeed the whole North East) is not an area where many 'national' computer service companies choose to locate. For many companies based in the South, it seems that the M62 corridor is the natural place to situate a 'northern' office, with strong regional markets in Manchester and Leeds; the North East can then, if necessary, be accessed from there. Cheshire is one area which has benefited from this tendency, as the larger average size of branches in Cheshire as compared to Tyne & Wear may indicate. In particular Cheshire benefits from its good motorway connections (M6, M53, M56, M62) and access to Manchester Airport, which make locations such as Warrington particularly attractive for a northern office. While long established companies such as IBM, ICL and DEC maintain their presence in Tyne & Wear, the largest companies that solely provide computer services are not present. Some, such as EDS and Andersen Consulting prefer to have staff on client sites, such as the DSS at Longbenton. Other firms, such as Bull and Hewlett Packard, just maintain small service operations to complete their geographical cover. It is illuminating that the manager of the Newcastle branch of an international service operation felt his branch was having to perform better than the rest of the company to justify its existence.

These regional variations in the subsectoral and status composition of the industry will also have implications for the range and scope of the market relations of companies, a subject that is analysed in detail in the next Chapter.

5.2 The new firm formation process.

Processes of new firm formation are particularly important when considering the computer services sector because, as outlined in Chapter Four, the changing technological basis of the sector means that the computer services industry is fairly youthful (Curran *et al.* 1991). As an illustration, the majority of the survey firms are young, with some 79 per cent of establishments being initiated after 1980, as Figure 5.1 (below) shows. The units created before 1980 are nearly all parts of large, long established hardware businesses that have now become service oriented. Many independent firms are by definition young, as after some years growth they become susceptible to takeover, or develop into headquarters sites for small networks of offices. The lower number of surveyed firms created in the 1990s probably reflects both the impact of recession, and the slowness of the directory sources used in recognising new start-ups.

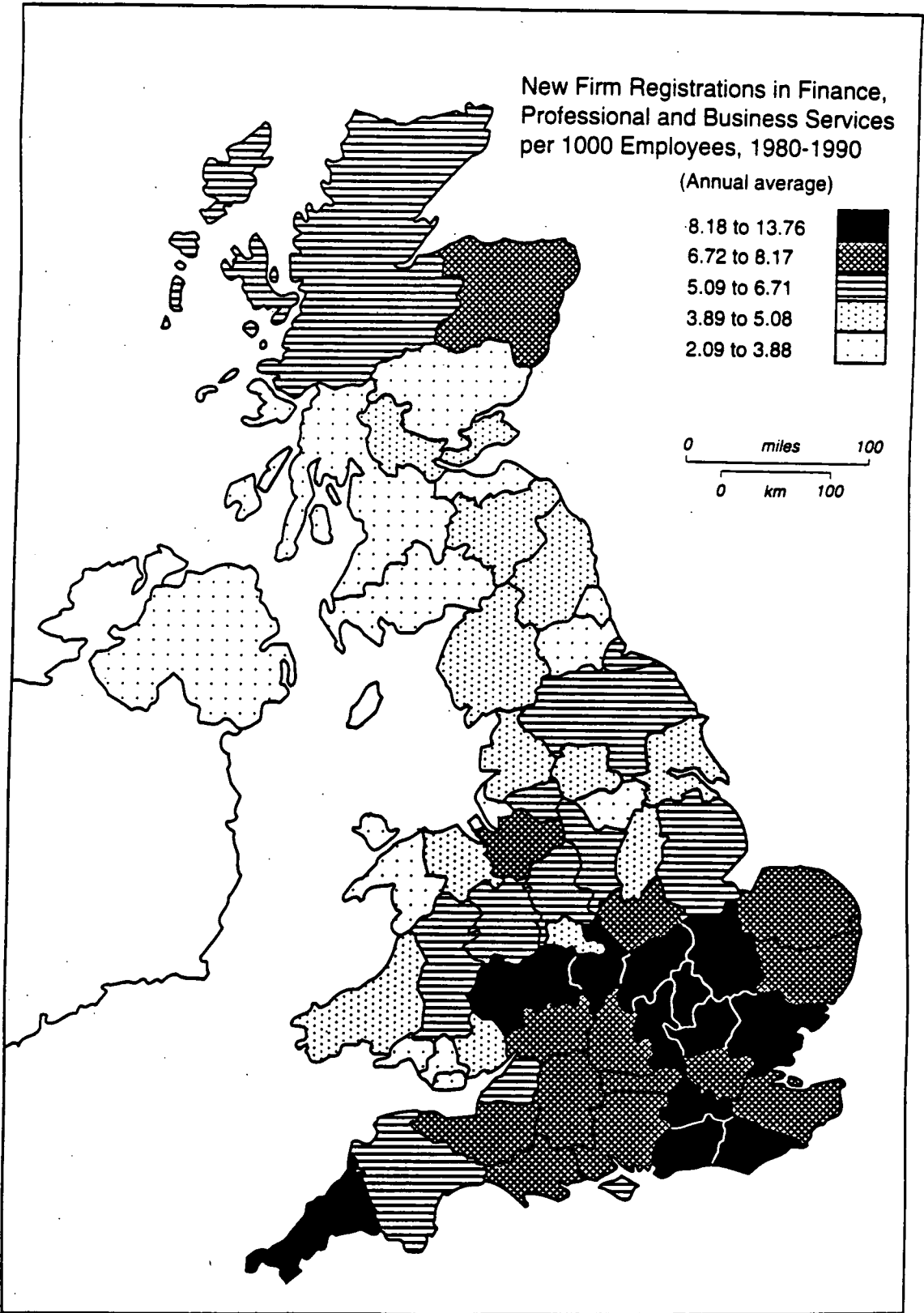
Figure 5.1: Year of establishment in county for surveyed firms.



Source: Author's surveys.

While new firm formation rates will vary geographically for all segments of the economy, areas with high company creation rates in business services are concentrated largely in the Greater South East. One way to gain an indication of firm formation rates is to divide new VAT registrations by the number of employees in a particular sector, and Figure 5.2 uses this method to illustrate the county variations for financial and business services over the decade 1980 to 1990; this distribution clearly mirrors the overall pattern of employment in the sector (see Figure 2.1). Over the period September 1987 to September 1991, the number of computer service units in the UK economy doubled from 11800 to 23600, a remarkable expansion in just four years (NOMIS). Although some of this increase can be attributed to existing businesses opening new offices and branches, the figures suggest a very high rate of new firm formation in the sector, as identified by Howells (1987). When the high death rate of small technology based businesses is considered, the rate of new firm generation in the sector becomes even more impressive. For example, the software sector exhibits a very high turnover

Figure 5.2: New firm formation rates in finance, professional and business services, 1980 to 1990.



Source: Keeble *et al.* 1993, Figure 5.6, p.46

rate of businesses, with a failure rate that may be as high as 33 per cent (Garnsey & Cannon-Brookes 1993a). As for business services as whole, the formation rates for computer services are spread unevenly across the UK, and Table 5.5 (below) gives an indication of the regional variations over the period 1987 to 1991. Employment in the whole IT industry (hardware and services) is used in calculating these ratios, due to the importance of the hardware sector in incubating new computer service firms (see Section 5.2.4).

Table 5.5: Regional new firm formation rates for computer services.*

Region	Increase in establishments Sep. 1987 to 1991 ¹	Sep. 1991 IT industry employment ²	New unit formation rate, per 1000 employees
Wales	379	4100	91.7
Yorkshire & Humberside	716	8100	88.2
London	2974	40800	72.9
South West	831	13100	63.3
East Midlands	460	8000	57.4
South East	4179	73700	56.7
East Anglia	320	5900	53.9
West Midlands	769	19400	39.6
Northern	87	2200	38.8
North West	686	18200	37.7
Scotland	452	16700	27.1
Totals	11853	210200	56.4

Source: Central Statistical Office, via NOMIS.

1 - Sizeband data only became available via NOMIS from 1987.

2 - IT industry employment defined as AH8394 (computer services) and AH3302 (computer manufacturing).

The most important point to draw from Table 5.5 is that there are substantial regional variations in the levels of entrepreneurship and new firm formation in this industry, as concluded in many general studies of small firms (e.g. Mason 1985, 1989, 1991; see Chapter Two). Interestingly, by this measure, the South East lies only just above the national average rate for new firm formation, falling a long way behind Wales, Yorkshire & Humberside and London. This may be due to the time period covered (1987 to 1991), and suggests that certain regions may be catching up the South East in terms of small firm formation, with high employment growth in the latter region being sustained by growth in existing firms and merger & acquisition activity. However, Keeble *et al.*'s results (1993) indicate that over the longer period 1980 to 1990 the South East would have performed most strongly. What is most significant for this study is that both the North West and Northern regions record rates well below average, and therefore the South East. This confirms that industrial structure explanations cannot *fully* explain patterns of new firm formation.

5.2.1 General location factors in computer services.

It can be argued that IT service firms are essentially a product of the existing industrial and occupational structure of an area. A crucial, but not unexpected point to arise out of this research is that the most important locational factor in all areas was that the firms' original founders already lived locally; for 58 per cent of firms in Hertfordshire, 59 per cent in Berkshire, 76 per cent in Tyne & Wear and 67 per cent in Cheshire (see Table 5.6 below). For example, the local knowledge of markets and premises, family ties, limited capital and the costs of moving are all prohibitive to long distance moves (Fothergill & Gudgin 1982, Keeble & Wever 1986b, Illeris 1989). Hertfordshire and Berkshire are additionally attractive for firms decentralising from London because of their proximity to large markets, and Cheshire is also benefiting as businesses move to more suburban locations from Liverpool and, in particular, Manchester. The exact location chosen, so often a fixation of research in the past, is not a priority for decision makers. Proximity to the home of the founders and key staff is a crucial factor, and more often than not the only factor, as suggested by Illeris (1994a). Only 16 per cent of establishments were set up as branches to access a particular geographical market, suggesting a low level of exogenous development in the sector, apart from the decentralisation of activity from contiguous areas. Therefore, to explain development trends, the underlying structural conditions which create (or hinder) the conditions for new firm formation must be considered. This argument is strengthened further by the 13 companies who cited links to established firms in the areas as the crucial location factor.

Table 5.6: Key county location factors for surveyed firms.

Factor	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Founders based locally	25	24	35	29	113
Geographical location & market	4	7	9	9	29
Decentralisation from urban area*	6	7	0	3	16
Link to existing company in county	8	3	0	2	13
Labour market	0	0	2	0	2
Total	43	41	46	43	173

Source: Author's surveys.

* London for Herts./Berks, Manchester/Liverpool for Cheshire.

5.2.2 Different processes of new firm formation.

The majority of survey firms in all four areas were originally either new local start ups, or spin-offs from existing firms (Table 5.7). Spin-offs were defined in the situation where a founder used a product, service or skill developed in their previous employment to establish a new firm, while new start-ups represented founders moving into a slightly different area of expertise to establish a firm. These two methods alone accounted for the establishment of nearly two thirds of the surveyed firms, with the vast majority being initiated by the movement of individuals, and not a process of larger scale externalisation

of groups of staff. In other words, many computer service businesses are being created independently of changes in established enterprises. When the many smaller firms not in the surveys are also considered, the importance of these forms of start-up increases further. This is an important contribution to the externalisation of services debate presented in Section 2.2.1. In terms of the other modes of start-up, the Hertfordshire and Berkshire surveys showed more evidence of takeovers, mergers, and management buy-outs (MBOs) than of other processes for creating firms, and this is probably facilitated by the far larger population of firms in the county compared to Tyne & Wear or Cheshire, coupled with a higher number of headquarters functions. New start-ups from outside the area represent branches set up for geographical reasons, with most of those in Hertfordshire and Berkshire representing the headquarters of UK subsidiaries of foreign corporations. The most common way to establish a branch in a new region or country was to start from scratch and recruit staff locally, although there were some examples where firms looked for a suitable takeover or expanded on the operations of existing agents or distributors.

With the predominance of new start-ups and spin-offs, new firm formation in computer services would appear to be continuing largely independently from any processes of vertical disintegration in manufacturing or service sectors. However, Howells (1987) states that *'only a small number of the major computer service companies in the UK owe their origins to a phenomenal endogenous growth rate which is the commonly accepted impression'* (p.498). He proposed that significant numbers of major computer service operators have arisen out of in-house computing departments within large multinational corporations. In the 1980s, many internal computer departments were established as separate subsidiaries, divisions or profit centres, some of which were then externalised through a sell-off or an MBO. Thus, certain computer service operations maintained links, to various degrees, with their parent companies. Analysing the top ten computer service providers in the UK in 1984, Howells found that the top six were all part of large multinational firms, such as Thorn, BP and the National Westminster Bank.

Table 5.7: Mode of establishment for surveyed firms.

Mode of establishment	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
New start up (in same area)	15	13	21	12	61
Spin-off	10	12	15	15	52
New start up (from outside the area)	4	8	7	10	29
Management buy-out	7	5	1	4	17
Take-over of existing company	3	2	2	2	9
Merger of existing companies	3	1	0	0	4
Management buy-in	1	0	0	0	1
Total	43	41	46	43	173

Source: Author's surveys.

Ten years on however, the picture was very different, with the computer services industry representing a huge sector in its own right. Of the top 12 UK providers in 1994 already introduced in Table 4.5, only three were subsidiaries of non-computer based multinational groups. Of these, AT&T Istel and Syntegra are owned by companies in the closely related telecommunications sector (AT&T and BT respectively), while EDS split from General Motors in June 1996 (*Computing* 6 June 1996a). By this time the top companies of the mid-1980s had been overtaken by re-orienting hardware firms, and by dedicated software and service firms such as Oracle and Microsoft, which have combined strong organic growth with judicious acquisitions. Furthermore, the processes of externalisation may well have slowed into the 1990s, with many large corporations having already disposed of their in-house IT functions during the high growth years of the 1980s. Some MBOs have been subsequently swallowed up in the general processes of merger and acquisitions that characterise the industry. For example, Istel, an MBO from Rover was purchased by AT&T in 1992, and Scicon (an in-house provider at BP) by EDS. Some companies have had a varied ownership history, such as Datasciences. The firm started as a merger of two software firms in the 1960s, and then was purchased by BOC and subsequently Thorn EMI in 1982, before being created as an MBO of Thorn EMI Software in 1991. The business has since been acquired by IBM (March 1996).

Thus it appears that large independent globally oriented firms have now risen to dominate the industry in the UK, as a result of endogenous growth augmented by mergers and acquisitions. Sage, MicroFocus and Misys-ACT are examples of groups that have risen to national prominence in the UK via this process. However, the computer services industry has undoubtedly been influenced by the externalisation of in-house IT functions from both manufacturing and service sectors as Howells suggests. Despite the numerical dominance of new start-ups and spin-offs in the survey, the MBOs and takeovers encountered indicate that larger than average businesses are indeed created.

However, the survey can provide no information on internalisation trends, and some authors such as Perry (1990) suggest that overall there is no trend to either internalisation or externalisation in the provision of many business services. Externalisation can also occur by the outsourcing of certain contracts in facilities management (FM) deals, as outlined in Chapters Three and Four. Indeed, the opening up of public sector markets to private suppliers in FM deals is the probably the single most important factor behind the externalisation trend that is occurring in UK computer service provision, but only a few large companies benefit. Overall, only four firms in the survey were created by the unbundling of IT units from manufacturing firms, hence supporting the argument that real increases in demand, rather than simply the vertical

disintegration of manufacturing, best explain the growth of business services (Tschetter 1987, Illeris 1989, Beyers 1989, Perry 1990, Keeble *et al.* 1991, O'Farrell *et al.* 1993, Tordoir 1994). As Perry concludes, *'a significant proportion of the fragmentation of service firms results from individuals, either small firm proprietors or large-firm managers, exploiting new markets'* (1990, p.206).

5.2.3 The origin of new firm founders.

Computer service firms are almost exclusively started by people with computing experience, and they can originate from other computer firms, or IT departments in other sectors, as the results of Clarke's (1994) Scottish software survey suggest: *'founders came from a range of backgrounds, but notably from other software and computer service companies and from positions in other organisations which involved responsibilities for managing or delivering IT services in-house'* (p.4). Table 5.8 (below) shows the sectors of origin for the establishment founders in the four county surveys. The data suggests that firm formation in the computing industry is to a large extent self generating, with founders originating from IT hardware and services companies together accounting for 69 per cent of new firm formations in Hertfordshire, 78 per cent in Berkshire, 34 per cent in Tyne & Wear and 64 per cent in Cheshire. This is to be expected in such an innovative sector, and also supports the work of Perry (1990) in New Zealand, who found there was little cross sectoral movement of founders of business service firms. The figure is higher in Berkshire and Hertfordshire, where there is a far larger 'critical mass' of firms in the computing industry, largely due to the historical spreading of the industry outwards from its origins in central London to such areas of the South East. These results confirm that disintegration within the computer industry rather than between sectors is stimulating growth, but as noted previously, this is largely due to the movement of individuals, rather than externalisation processes.

Table 5.8: Sector of origin for new firm founders in the survey.*

Sector	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Other computer services	8	15	7	13	43
Computer manufacturing	14	10	4	8	36
Manufacturing industry	3	2	11	7	23
Other services	4	2	3	2	11
Financial / business services	2	2	1	1	6
Universities	0	0	4	1	5
Local government	1	0	2	1	4
Unemployed	0	1	0	0	2
Total	32	32	32	33	129

Source: Author's surveys.

* Where applicable and data available. Firms are classified here according to the sector that the majority of founders originated from.

Although Cheshire is not far below the level of Hertfordshire in terms of the proportion of founders from other IT firms, the picture is different in Tyne & Wear, suggesting that declining industrial cities may face particular structural problems. From their study of Sheffield, Henneberry and Lawless (1989) confirm that the lack of a substantial computer manufacturing sector may inhibit expansion. The fact that computer manufacturers play a direct role in the development of computer services, and hence their location, is evident from Table 5.8, with the sector being the second most important provider of computer service firm founders (28 per cent of total). In Tyne & Wear, some 34 per cent of new firm formations originate from (non-IT) manufacturing firms, the highest proportion of the survey areas, and this reflects both the manufacturing tradition in the North East, and the lack of a substantial computer industry. Overall, some 53 per cent of surveyed firms were started by founders from service industries of some kind, mostly in the private sector. With the further 28 per cent of founders originating from the increasingly service oriented computer manufacturing sector, it can be seen that much new firm formation comes from a service base and continues independently of the manufacturing sector.

Table 5.9: Former employment of survey firm founders by size of firm.

Size	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Under 25 employees	7	7	7	8	29
25-99	7	5	8	7	27
100-499	8	7	6	9	30
500+	10	13	7	8	38
University	0	0	4	1	5
Totals	32	32	32	33	129

Source: Author's surveys.

Another way to consider the origin of founders is in terms of the size of firm they were previously working in (see Table 5.9 above). Many studies of new manufacturing firm formation have concluded that small or medium sized plants provide the best experience for entrepreneurship (e.g. Keeble & Gould 1985, Moyes & Westhead 1990). In their work on business services, however, Keeble, Bryson & Wood (1992) found that large firms were the most important incubators of new entrepreneurs, because they provided essential professional expertise, reputation and contacts with other large firms. Kelly (1987) concluded that there was regional variation in the founders' previous firm size in the computer industry, with Cambridgeshire being more dependent on small to medium sized firms than Scotland or Hertfordshire. The survey firms also exhibit a degree of spatial variation, with large firms being more prominent incubators in the southern counties of Hertfordshire and Berkshire. This primarily reflects the importance for new firm formation of large foreign owned hardware companies based in the South East. For example, in the Berkshire survey, over one third of firms were started by individuals

leaving such companies as ICL, DEC, IBM and Unisys. Although some of these firms have branches in Cheshire (DEC) and Tyne & Wear (ICL, IBM), it appears that new start-ups are more likely to occur from headquarters or larger units in the South.

Several other characteristics of founders are worth noting. The majority of firms were started by just one or two founders, with the maximum recorded being six. The survey provided no support however for Barkham's (1992) contention that there are relatively more multi-founder firms in the South East, and that this is linked to subsequent growth. As Clarke (1994) also found, there is a low level of start-ups from academic research (four per cent of the total), suggesting that the level of academic entrepreneurial activity found in the many studies of Cambridge may be unique to that locality (Segal Quince Wicksteed 1985, Keeble 1989, Saxenian 1989, Coe 1991, Garnsey & Cannon-Brookes 1993a, 1993b). The founders in the four county surveys were almost exclusively male, and this accords with the findings of Massey *et al.* (1992) that less than four per cent of high-tech firms were founded by women. The average age of the founders when starting a new firm was around 36 years of age and did not vary regionally; Kelly (1987) found similar results for the computer industry as a whole. This indicates that in general founders are gaining around ten to twelve years of experience in the industry before establishing their own business. The majority of founders have IT or related degrees, and Kelly's research found that while only 14 per cent of founders had no technical qualifications whatsoever, some 25 per cent had some kind of postgraduate qualification. These results reinforce Massey's argument (1995) relating to the importance of skilled labour pools for the attraction and start-up of high-tech firms, and this is clearly a major advantage for the South East.

It should be noted, however, that random locational effects, and especially the decisions of key individuals, can alter general patterns (Haug 1991a, 1991b). For example, the entrepreneurial decision of a printing manager in Newcastle to shift into financial software products in 1981 was certainly not the norm for that area, but the resulting publicly quoted company, Sage, is now the UK market leader with well over 300 staff and a major overseas presence. This one firm is a major component of the computer services sector in Tyne & Wear. Hence, while there appear to be underlying logics to the geographic pattern of firm foundation in the sector, random and personal elements are undoubtedly important and can be distorting.

5.2.4 Motivations and entrepreneurship.

Following on from the five main theories seeking to explain the increasing formation rates of small firms that were introduced in Chapter Two, Keeble *et al.* (1993) suggest that three main types of motivations underlie new firm formation. Firstly, there is the simple desire on behalf of founders to increase personal income, and secondly, the

motivation to achieve greater personal independence and freedom; both these concepts suggest some kind of positive 'pull' towards entrepreneurship. However, and thirdly, there can equally be less desirable 'push' factors, such as impending unemployment or lack of promotion opportunities. Furthermore, other studies have suggested that perception of a strong market opportunity can be a powerful 'pull' factor (Gould & Keeble 1985, Westhead & Moyes 1990, Levenhagen & Thomas 1993). Keeble, Bryson & Wood's (1992) wide-scale study of small business service firms found that the leading motivations (accounting for 70 per cent of responses) were positive stimuli such as independence, financial gain, job satisfaction and intellectual stimulus. The surveyed computer service firms also produced fairly positive results, and have been classified along similar lines to the factors mentioned above in Table 5.10 (below). Here the importance of a perceived market opportunity is clear, accounting for over half of the total responses, and this is largely due to the technological characteristics of the sector. As Clarke (1994) asserts, the rapid pace of change in technology and user requirements in the sector, particularly with the advent of smaller computer systems, continue to provide a wide range of niches for new start-ups. For Keeble and Kelly (1986) such evidence supports technological change theory as an explanation for new firm growth. In general, however, it can be difficult to separate 'push' and 'pull' factors; for example job dissatisfaction and the desire for freedom were closely associated to each other by respondents.

Table 5.10: Start-up motivations for survey firms (number of times mentioned).*

Motivation	Herts.	Berks.	Tyne & Wear	Cheshire	Total mentions
Market opportunity	16	19	19	18	82
Dissatisfaction / desire for freedom	12	13	10	8	43
Money / ambition / security	7	0	3	5	15
Necessity	2	3	2	6	13
Improve on existing services	2	3	2	3	10
Other	1	1	2	1	5
Total	40	39	38	41	158

Source: Author's surveys.

* Where applicable.

Haug's (1991b) study of the software industry in Washington State, USA, similarly found that dissatisfaction or 'push' factors were negligible in comparison to perceived market opportunities and potential product/process innovations. Clarke's (1994) survey of new software firms in Scotland found the same two leading motivations for start-ups as shown in Table 5.10, i.e. dissatisfaction with the founder's existing post, and the use of a product or service idea gained in previous employment, but found their relative importance more balanced. Clarke's assertion that market opportunity has become slightly less important in post 1988 start-ups was also mirrored in the survey, where motives of dissatisfaction became relatively more important after this year in the new

start-ups of all of the areas except Berkshire. This trend may reflect both an increasing saturation of the market as the industry matures, and the increasing pressure on in-house IT staff and employees in independent firms as the recession of the early 1990s deepened. Interestingly, contrary to the observations of Barkham (1992), there appears to be little regional variation in the motivating factors, suggesting that the characteristics of the sector are more influential than any spatial differences. Overall, the evidence suggests that entrepreneurship in this sector is largely motivated by positive forces, although other more negative factors are slowly becoming more important. These findings support the demand related explanation of business service growth proposed in Section 5.2.2.

5.2.5 Funding new firm formation.

The major sources of capital used by the surveyed firms for start up are shown in Table 5.11 (below). Interestingly, around one third of relevant survey firms did not require any substantial start-up capital, many depending on revenue from a first customer to develop early products. As Malecki (1985) has suggested, software operations are labour intensive and require minimal start-up capital, but this also appears to apply to other computer services, such as training, maintenance and networking. Many firms start up with the founder agreeing a contract with an existing customer while still in employment, before leaving to create a new venture. The revenue from these early contracts is then used to create a product or develop the services provided, thus avoiding the need for major start-up capital. The finished software product can then be marketed to other potential customers, or in service functions, as the reputation of the provider begins to develop. Other founders used their spare time to develop products and potential customers, while still working for their employer. Few studies of entrepreneurship or small firm formation have identified these processes, in part reflecting the manufacturing bias of many such surveys. The survey evidence suggests that the barriers to entry in this sector are indeed very low, due to the industry being both highly knowledge based and service oriented.

Where the input of financial capital is necessary, personal sources are the most frequently used source of funding, as recorded in several other studies (e.g. Oakey 1984a, Malecki 1985, Haug 1991b, Storey & Strange 1992). Similarly, Keeble, Bryson & Wood's (1992) research on new business service firms found that some 70 per cent used personal savings for part or all of the initial capital. However, attracting external investment capital of any kind has long been a problem for high-tech companies in the UK (*Financial Times* 28 February 1995), and this is illustrated by the survey, where just under 40 per cent of start-ups received funding from non-personal sources. In terms of public funds, Government schemes and local initiatives such as grants from development agencies or councils appear to be of little importance, although some impact is apparent

in Tyne & Wear. There also is a very low incidence of private venture capital being used in computer service start-ups, with only nine companies receiving this form of financing. Haug's (1991b) study in the USA also reported a low influence of venture capital, with only five per cent of the surveyed firms gaining money from this source.

Table 5.11: Sources of start-up capital for surveyed firms.*

Source	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
None necessary / first customers	10	8	16	10	44
Personal	11	10	3	10	34
Bank loan	7	4	3	3	17
Previous, or another company	0	2	5	5	12
Venture capital	3	5	1	0	9
Local initiatives	0	0	4	0	4
Private investors	2	1	1	0	4
Central government funding	0	0	2	1	3
Redundancy money	0	0	0	2	2
Total	33	30	35	31	129

Source: Author's surveys.

* Where applicable.

There are several factors behind the low influence of external capital. One problem often encountered by firms searching for start-up capital is their lack of tangible assets apart from personnel; software writing is an intellectual process which is very hard to measure or quantify. Even if programs have already been written, banks are reluctant to consider them as assets, hence precluding access to bank funds (Hall & Markusen 1985). Another restraint is the high levels of return which banks and investors require from their capital, a feature that Hutton (1996) suggests is stifling the development of the UK economy as a whole. Investors tend to look for short term returns, and this both causes, and is reflected in, the volatility of high-tech sectors such as software. A study of 1600 packaged software companies in the UK in 1994 found that short term funding was creating huge problems in the recession, with a resulting high level of insolvency (*Computing* 23 March 1995a). In 1993, 40 per cent of these firms reported negative equity, and this insecurity creates a vicious circle in which institutions are in turn unwilling to invest in such companies. A further constraint is that what venture capital is invested is biased towards management buy-outs (MBOs) rather than new start ups (*Computing* 3 November 1994), with MBOs being perceived as less risky. For example, in 1993, the British Venture Capital Association estimated that around £69m was invested in start-ups in the economy as a whole, just six per cent of the total, compared to £769m in MBOs (64 per cent).

The reluctance of venture capitalists to invest in new technology based concerns dates in part to the early 1980s, when many new venture capital funds invested heavily and then had to exit the market two or three years later with heavy losses. However, some

reports suggest that venture capitalists are now showing a revival of interest in the IT industry, partly as the result of changes in the September 1994 budget, which now offer tax relief of up to 60 per cent in the first year of investment for venture capital trusts (*Computing* 8 December 1994). In 1996, the British Venture Capital Association (BVCA) recognised 92 funds that invest in computer-related firms, but the level of capital availability is still way below that found in the US (*Computing* 25 April 1996a). The leading venture capital company in the UK, 3i, has recently launched a campaign to try and promote more early stage funding for technology businesses. The success of Unipalm, an Internet software company backed by 3i from the start is an example of what is possible, with its shares quadrupling in value after 18 months on the market (*Financial Times* 22 September 1995). In general however, it appears investors are still discouraged by the elements of risk involved, particularly in long term schemes.

There are undoubtedly substantial regional variations in the availability of bank and venture capital (Florida & Kenney 1988). Saxenian (1994), in her comparative study of the Silicon Valley and Route 128 in the USA, suggests that the more dynamic venture capital industry around Silicon Valley is the 'financial engine' of the entrepreneurial process in the region, and played a significant part in maintaining the prosperity of the area in the 1980s while the Route 128 agglomeration stagnated. The survey data presented in Table 5.11 suggests that in the UK there may be a greater availability of venture capital in the South East, with only one firm outside the two northern counties receiving such financing. Mason (1991) describes how venture capital investments are overwhelmingly concentrated in the South East, which accounted for 60 per cent of funds invested and 52 per cent of the companies financed over the period 1984 to 1987. Likewise, 64 per cent of venture capital firms in 1987 were based in the South East, managing some 83 of the total stock of investment, and there has been no evidence to suggest this basic pattern has changed in the 1990s. The dependence on personal sources of finance may also favour the South East, where average incomes are highest, and combine with high levels of home ownership and relatively strong house prices which can then be used as collateral against loans (Mason 1991).

5.3 Locational requirements and geographic inertia.

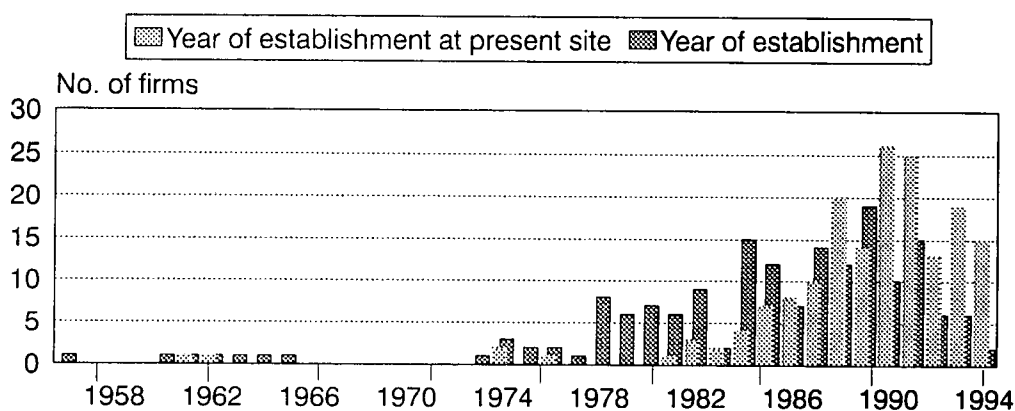
The analysis in the previous sections has described several regional variations in the processes of new firm formation in computer services, namely in terms of the overall scale of firm creation, the mode of start-up, the sector of origin of the founders and the type of capital used. It is evident that the majority of firms emerge from their local economic structure, and this leads to unfavourable rates of growth in many peripheral areas, but particularly in old industrial regions such as Tyne & Wear. These problems are compounded by the lack of long distance mobility of firms after creation, largely due to founder and staff preferences for their home area. Gordon (1991) terms this impact of

residential preference upon entrepreneurial location decisions by high-tech industries, one of 'entrepreneurial inertia', and this concept seems to apply just as well to high-tech services.

5.3.1 The mobility of computer service firms.

The potential mobility of computer service firms is not in question, with nearly 70 per cent of surveyed firms having moved at some stage since they were established. Furthermore, Figure 5.3 (below) shows that many firms have occupied their present offices for only five or six years (overlying data from Figure 5.1). The evidence from the survey suggests that firms generally move locally, often within the same county, with founders being willing to move up to 10 to 15 miles from their previous workplace. Another indication of this pattern is that some 47 firms (27 per cent of the total) were anticipating a move in the 12 months after the interview, and around 90 per cent of these moves were predicted to be local (less than 15 miles). Longer distance moves were very rare, the only exception being the decentralisation of some 16 firms (from London, Manchester and Liverpool) to contiguous counties. In a large scale survey of over 700 business service firms in Holland, Hessels (1994) also found that locational dynamism common, with over 50 per cent of firms having relocated at some stage. Furthermore, he similarly concluded that *'most relocated business services [in the Randstad] have remained within their own urban or suburban realm. This confirms the limited geographic mobility of enterprise in general'* (p. 373).

Figure 5.3: Year of establishment at present site.



Source: Author's survey.

Patterns in the type of moves made by surveyed firms are shown in Table 5.12 (see also Section 4.1.7). These results confirm Hessels (1994) assertion that while many firms move from urban to suburban locations, far less move in the opposite direction; 48 per cent of firms that have moved have relocated from a central urban location to a more suburban location in the same or another town, while none moved the other way. Concomitantly, only ten per cent of mobile businesses had relocated to another urban

centre, with another 13 per cent moving within the same central urban area. This general suburbanisation trend is stronger than the pattern of movement down the urban hierarchy to smaller centres proposed by the 'counterurbanisation' thesis (Champion 1989). For example, it is not uncommon for firms to move to suburban estates of larger urban areas, and indeed this is often where the largest and most prestigious business parks are found. Another important feature is the number of very local moves, with 23 of firms remaining within the same urban or suburban locale, and a further ten per cent staying on the same building complex or estate.

Table 5.12: Patterns in the movement of surveyed firms.

Type of move	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Urban - same town suburban	5	5	8	5	23
Decentralised from contiguous city	6	6	n.a.	4	16
Within same urban area	3	3	6	3	15
Within same suburban area	3	5	2	2	12
Within same building / estate	4	3	4	1	12
Urban - suburbs of smaller town	1	2	5	3	11
Urban - suburbs of larger town	4	1	2	0	7
Urban - smaller urban area	2	2	1	1	6
Urban - larger urban area	1	4	0	1	6
Suburban - different suburban area	0	3	0	1	4
Other	2	2	0	3	7
Total	31	36	28	24	119

Source: Author's surveys.

The major reasons quoted by the surveyed firms for leaving their last address are presented in Table 5.13, confirming that the relocation of computer service firms is most often motivated by a lack of space to expand, as found with many other business services (Townsend & Macdonald 1993, Hessels 1994). Many of the firms classified here as 'decentralising' were also motivated by the need for more space, in combination with a desire for cheaper rents. Modern office parks on the outskirts of urban areas can offer the necessary space, along with plentiful car parking, good road access, high quality buildings and an improved 'high-tech' image. Such results confirm both the mobility of computer service firms, and the high growth levels that they exhibit. Many firms moved fairly regularly as their size fluctuated, and relocating locally was not seen as a major upheaval, as most computer service firms merely require basic offices that can support an IT infrastructure, and hence there is little equipment or machinery to move.

Table 5.13: Surveyed firms' reasons for leaving their previous address.

Reason	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Expansion	24	28	27	19	98
No move since start-up	12	5	18	19	54
Decentralisation	6	6	0	4	16
Lease ending	0	2	1	1	4
Contraction	1	0	0	0	1
Total	43	41	46	43	173

Source: Author's surveys.

5.3.2 Local location factors for computer service firms.

As outlined in Chapter Four, businesses in the computer service industry tend to urban, and particularly suburban locations. Of the 173 firms interviewed, some 123 (71 per cent) were located in suburban locations, of which 98 were on industrial estates or business parks. A further 40 (23 per cent) were to be found in town or city centres, leaving only ten (six per cent) in rural or village locations. For this analysis, suburban locations were defined as being either on the edge or outskirts of an urban area, or at a significant distance from the central business district. Town centre businesses tend to be small locally based software or training firms, with the exception of Bracknell, where large employers such as Oracle and Cognos are centrally located. Figures 5.4a-d show the locations of the surveyed firms for the four counties, confirming this pattern, and particularly illustrating the very low incidence of companies in rural locations. According to the responses of the few rurally located businesses, this is probably more a function of the lack of modern business units and good road access, than the need for frequent inter-personal contact in a more urban location. The maps also show some clustering of firms on key business parks, such as the Team Valley Estate in Gateshead (Tyne & Wear), and others near Warrington (Cheshire) and Hemel Hempstead (Hertfordshire). The main regional variations are the higher incidence of businesses in the villages of Cheshire and Berkshire, and in the town centres of Berkshire and Hertfordshire.

While the major factors behind the survey firms locating in their present counties have already been introduced in Section 5.2.1, the smaller scale location factors are shown in Table 5.14. Many factors such as those of access for staff and clients or proximity to an airport are properties of the actual location, while others such as size or cost refer to the physical properties of the building and its surrounding environment. Good road access for both employees and customers was the single most important factor overall. Other 'locational' factors vary in their importance between areas. For example in Berkshire, proximity to Heathrow and the image benefits of an M4 corridor location were important factors not registered to the same extent elsewhere. Many of the other factors were site related, and are important in the precise location decision, that, as has already

Figure 5.4a: Location map of surveyed firms in Hertfordshire.

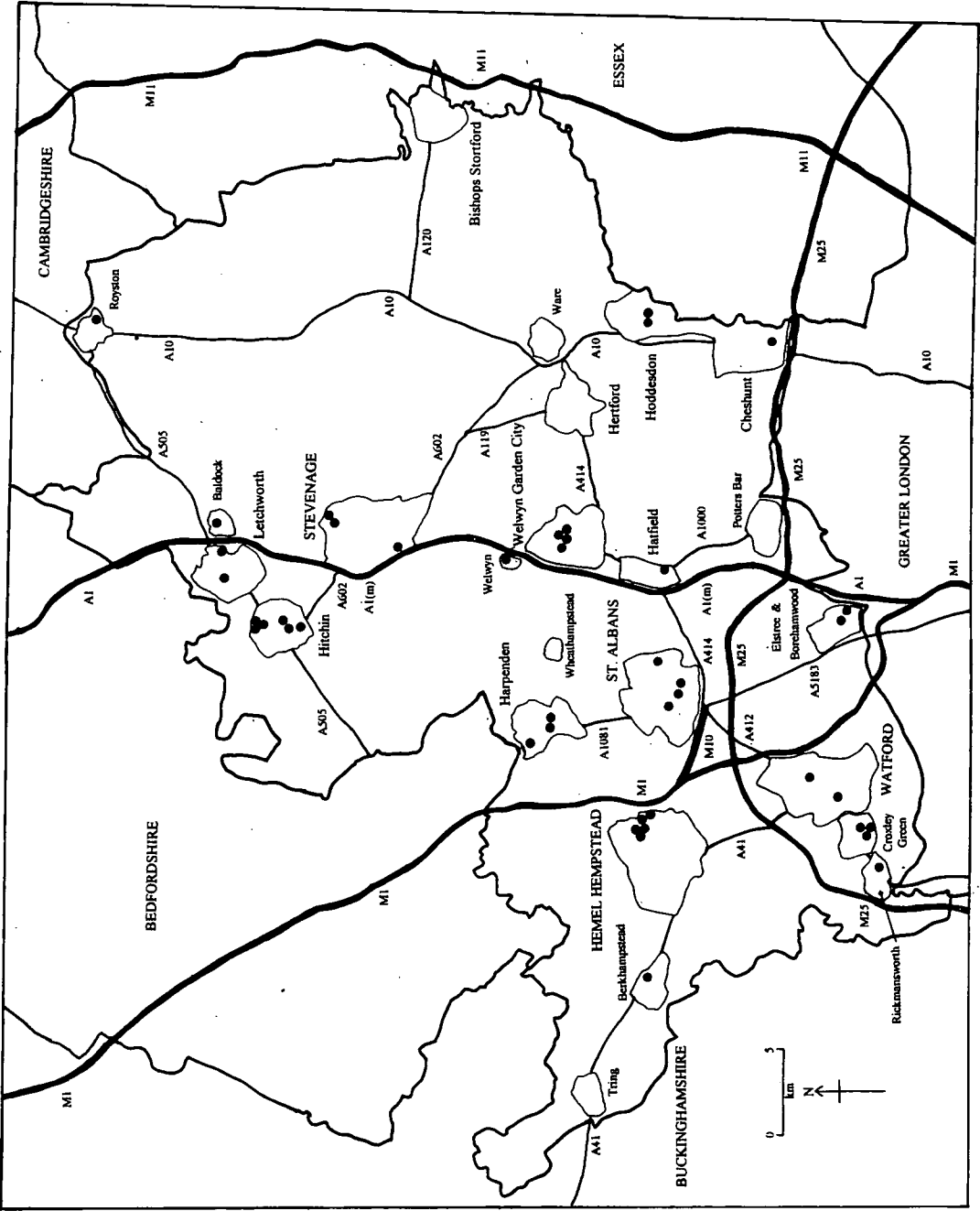


Figure 5.4b: Location map of surveyed firms in Berkshire.

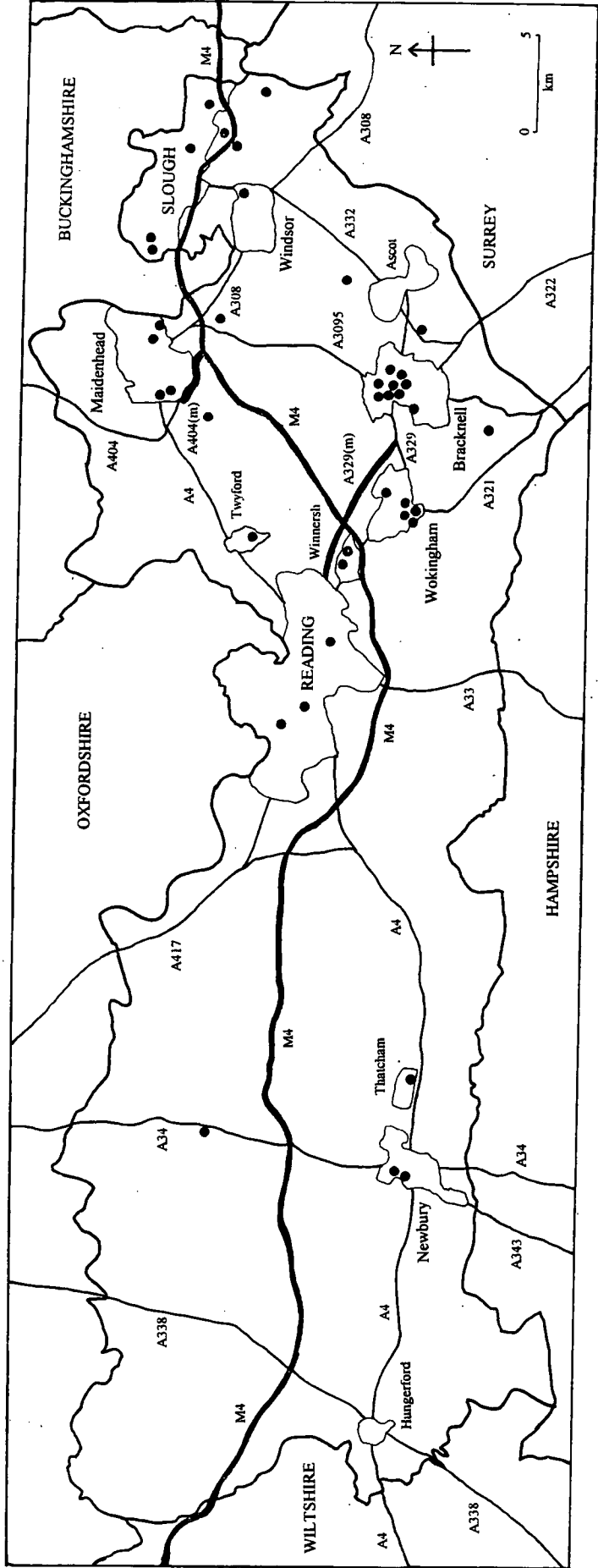
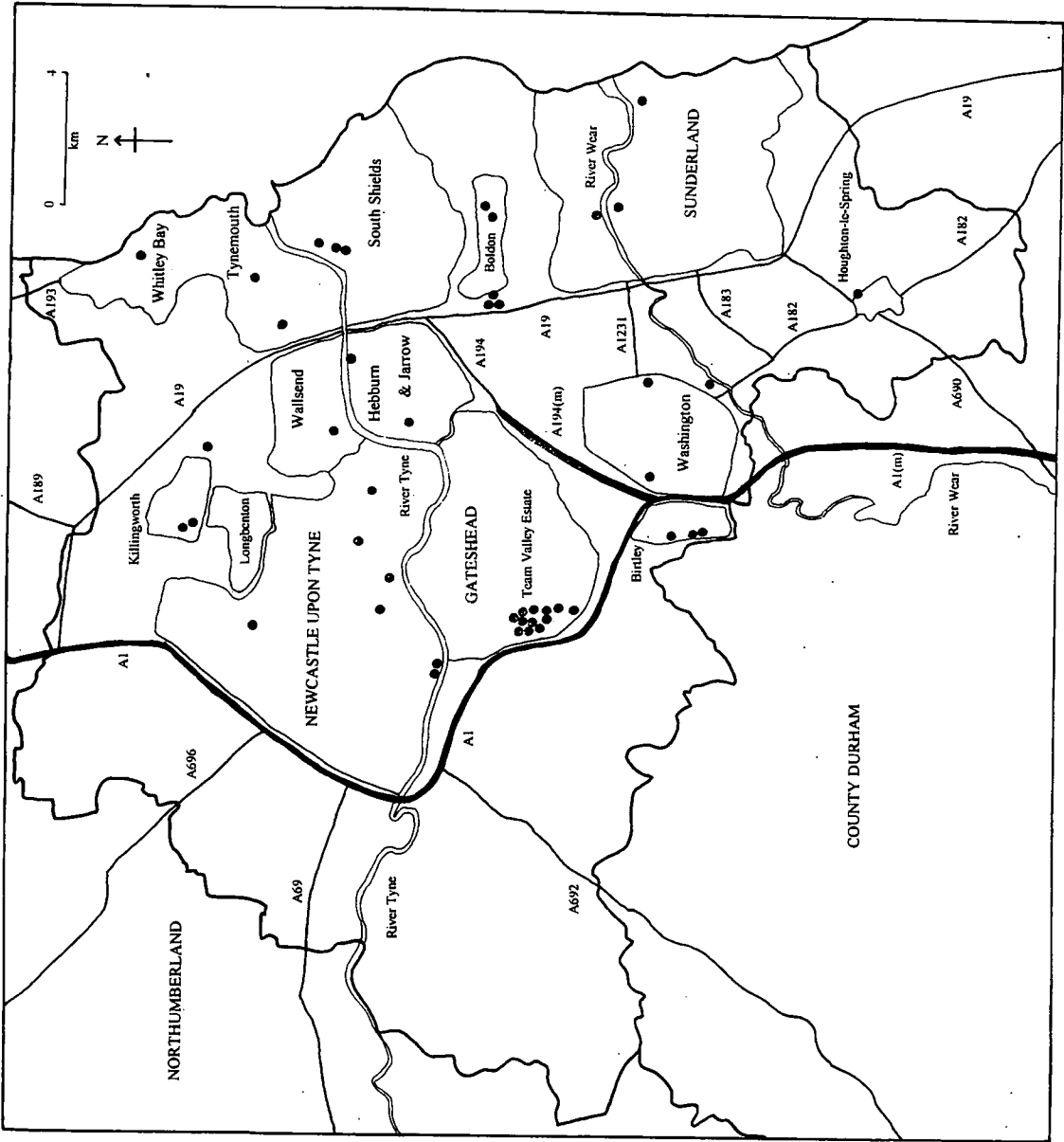


Figure 5.4c: Location map of surveyed firms in Tyne & Wear.



been described, often takes place within the local area surrounding the founders' residence or previous firm. The basic conditions of an available, suitably sized unit at an affordable price, must be met. Firms often look for an aesthetically pleasing location that creates the right image, and provides ample parking for staff. Firms at all stages of development are keen to have expansion space available, while young firms often take advantage of the cost savings and flexibility afforded by fully serviced units. Some larger firms prefer to have premises purpose built, particularly in terms of the interior layout and design. Many of the required locational attributes are similar to those recorded in the literature on high-tech firms (e.g. Coe 1991), although the actual requirements of firms are often just for standard office space as with many other business services. However, firms involved with hardware or network product reselling may also require warehouse space.

Table 5.14: Location factors for the surveyed firms.

Factor	Herts.	Berks.	Tyne & Wear	Cheshire	Total mentions
Communications / road access	18	15	11	24	68
Cost	12	14	12	12	50
Access to clients	9	4	12	7	32
Availability	7	7	4	11	29
Link to firm already there	11	5	9	3	28
Appropriate size	6	12	4	4	26
Close to staff homes	7	2	9	5	23
Close to international airport	3	12	1	5	21
Image / prestige / condition	6	6	1	4	17
Expansion room	1	6	5	3	15
In an 'IT industry area'	2	11	0	0	13
Purpose built	2	1	6	1	10
Good car parking facilities	3	4	2	2	11
Aesthetically pleasing / nice environment	5	0	2	3	10
Communal services provided	3	0	4	1	8
Staff availability	0	3	2	3	8
Short lease	2	2	0	3	7
Incentives (rent, rates etc.)	0	0	3	3	6
Available to buy	0	2	2	1	5
Good telecommunications	1	4	0	0	5
Town centre location	4	0	0	0	4
Other	0	1	2	0	3
Total	102	113	91	97	403

Source: Author's surveys.

As would be expected, the locational disadvantages experienced by firms (see Table 5.15) are to a great extent the converse of many of the important locational advantages. For example, the two major problems reported are high costs and poor road access, already identified as the most important locational requirements. There are several interesting regional variations in the responses however. Prohibitive rent costs were experienced more in the two South East counties, reflecting the national pattern of

variation; as a rough guide, in December 1994, prime industrial rentals were measured at £81/m²/year around Heathrow, £78 in Hemel Hempstead, £41 in Warrington, and £30 in Newcastle (*Financial Times* 9 June 1995). Traffic congestion problems were worse in the three counties other than Tyne & Wear. The two northern counties suffered more from crime, and also from a remoteness from key South East based customers. Interestingly, perceived image problems emanating from a non-M4 corridor address were reported more frequently in the other south eastern county, Hertfordshire, than elsewhere. This suggests that Berkshire, more than any other county in the 'Western Arc', has established a leading reputation in the IT industry. Against Henneberry and Lawless' (1989) proposition that the inadequate supply of new purpose built property may have hindered the growth of computer services in certain localities in the 1980s, there was no perceived deficiency in any of the four study areas, including Tyne & Wear, where a wide variety of industrial estates and business parks has been developed.

Table 5.15: Surveyed firms perceived disadvantages with present location.

Disadvantage	Herts.	Berks.	Tyne & Wear	Cheshire	Total mentions
None	20	20	21	23	84
Road access / congestion	4	7	2	6	19
Cost	6	7	3	0	16
Remote to customers	2	0	6	3	11
Image / poor aesthetic quality	1	2	5	1	9
'Poor' area / remote to M4 corridor	5	0	2	1	8
Crime levels	0	1	3	4	8
Lack of services / out of town	1	1	1	2	5
Lack of space	2	0	2	0	4
Long staff travel distances	0	2	0	2	4
Poor public transport links	1	0	3	0	4
Unsuitable design	2	0	0	0	2
Poor car parking	0	0	1	1	2
Other	1	4	2	1	8
Total	51	45	44	46	186

Source: Author's surveys.

The relative youth of the industry, and the tendency of firms to locate in fairly new suburban estates, means that companies often avoid many of the problems that affect longer established, town centre oriented business services. For example, in central Edinburgh, Townsend and Macdonald (1993) reported that the lack of parking, poor building conditions, and presence of offices not suited to the installation of computers were the major disadvantages. In the computer service survey, these issues were far less important.

5.3.3 Implications for local economic development schemes.

The low ranking of local or central government incentives on the list of locational advantages in Table 5.14, combined with the lack of long distance mobility of computer

service firms, implies that the sector may be fairly immune to regional and local economic development initiatives, and the efforts of institutions to attract outside companies to their area. As Malecki (1989) recounts;

'Can public policies enhance high technology if it is such a people-driven process? To some extent, the answer is no. The industrial mix, the presence or absence of venture capitalists, and the local history of entrepreneurship are difficult to change, and then change only tends to come about in the long run' (Malecki 1989, p.74).

For Malecki, public sector intervention can only really be effective by either developing the informal networks of links between business, education establishments and government agencies, or by improving the quality of life factors which attract qualified workforces. Nevertheless, some authors, such as Henneberry & Lawless (1989, p.130), propose that, *'the computer services sector is a mobile one.....thus cities and regions may try to attract in and/or retain computing firms through standard promotional techniques'*. However, evidence from interviews with public officials involved in economic development in the four surveyed counties, indicates that Malecki's more pessimistic view is the most accurate.

The analysis presented so far in this chapter suggests that the most effective way to stimulate the computer services sector in a local environment would be to incubate and support new small firms. Encouraging entrepreneurship may be more difficult in many areas of the north; there appears to be substantial regional variation in the level of entrepreneurial activity in computer services (see Section 5.2), and there is definitely far more of a background to such activity in the South East, a fact recognised by Tyneside TEC. Nonetheless, the improved availability of start-up capital, management and consultancy advice, and subsidised premises could all be beneficial to new firms. For example, Feeser and Willard (1990) have found that fastest growing computer firms have a stable market focus, and are operating in an area close to that of the founder's incubator organisation, and so early advice on strategy would potentially be valuable. Schemes are established in all four counties to provide this and other assistance, although the emphasis is still largely on the provision of premises. Interestingly, one economic development officer suggested that as many computer service firms had very low demands for space, it was not an industry that could be actively encouraged. In Hertfordshire, heavy government funding has established a 'role model' Business Link, where business development functions such as assisting start-ups in high-tech sectors are given a high priority in addition to the normal range of training schemes. As Table 5.11 has shown though, local or central government funding is hardly ever used for start-ups in the computer services industry, implying that the impact of such schemes is minimal. Table 5.16 presents the level of use of government grants in the survey firms. In Tyne & Wear, seven local firms have used the Assisted Area status of much of the region to

claim Regional Development Grants, and, in all four areas, there has also been a limited uptake of DTI schemes for established firms, aimed at promoting quality, innovation, and export levels. With 73 per cent of firms using no grant at any stage of their development however, in general this appears to be a sector developing independently of the activities of government agencies.

Table 5.16: Major source of government grant funding for surveyed firms.

Funding Type	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
None used	38	31	27	32	127
DTI initiatives ¹	2	7	6	6	21
Regional Devt. Grants ²	0	0	7	0	13
Local Councils / Devt. Bodies ³	1	1	3	1	5
Small firm loan guarantee scheme	1	0	1	2	4
European (EU) schemes	1	2	0	1	4
ITEC funding	0	0	2	1	3
Total	43	41	46	43	173

Source: Author's surveys.

1 -Innovation, product development, export promotion, quality assurance and subsidised consultancy schemes.

2 - Regional Development Grants for new employment created in Assisted Areas.

3 - Rent, rates, relocation or capital grants from Councils or Development Agencies.

Given the apparent lack of mobility of computer service firms within the UK economy, the prospects for attracting relocations to the North East look bleak, especially considering the advantages of a South East or M62 Corridor location. Surprisingly, workforce quality does not seem to be an issue here, with over 700 IT related graduates being produced by the universities of the North East annually, and many of these having to leave the area because of a lack of IT opportunities (Tyne & Wear Development Corporation, personal interview 2 September 1994). In Cheshire however, there would appear to be potential for attracting investment from companies based in the South East, but looking to improve their market penetration in the north. Despite the relatively good performance of the county in this sector, the IT industry is not a sector targeted by the Economic Development Department of the County Council. All four areas can try and attract foreign direct investment in the computer services industry. In the national, if not global, competition for inward investment, foreign computer service firms are again unlikely to choose Tyne & Wear, or the North East in general, as their location. Indeed, agencies such as the Northern Development Company, and Tyne & Wear Development Corporation do not even target the sector specifically. However, in Hertfordshire, the economic development strategy created since the heavy defence closures of 1990 to 1992, identifies computing as one of six sectors for future development. In Berkshire, where economic development initiatives are still at an embryonic stage, no particular target sectors have been identified, and the emphasis so far has been on investing in training and the support infrastructure for local businesses described above.

A more productive approach may be to promote the local market by encouraging the uptake of IT by traditional businesses in Tyne & Wear and similar areas. Such schemes could be undertaken by local government, development agencies, TECs and Chambers of Commerce (Henneberry & Lawless 1989). Furthermore, heavily IT dependent, but potentially more mobile, sectors such as financial service back offices and telesales, can be targeted. These often depend on the availability of cheap female labour and good telecommunications. For example, the attraction of the British Airways Ticketing Centre and the AA Financial Services and Insurance Department to the Newcastle Business Park has provided work for the Newcastle IBM branch and Quality Software Products of Gateshead. Similarly, further investments such as the MBNA in Chester will boost the demand for IT services in the North West. Even if this policy does not result in increased business for indigenous computer service firms, it should improve the outlook for the branches of national or international businesses. Although Henneberry and Lawless (1989) proposed two other possible policy options for old industrial areas, in terms of improving the local stock of high quality office space, and raising local IT skill levels, neither of these appeared to be important issues in Tyne & Wear or Cheshire.

In addition to the example of Ireland (see Chapter Three), other peripheral areas are starting to specifically target the attraction of investment in the software industry. For example, the software house RMS was attracted to opening an office in Cardiff with grants of £100000 from the Welsh Development Authority (WDA) and the Cardiff Bay Development Corporation. Another WDA initiative, IT Wales, has grants available, and together with three South Wales TECs provides resources for IT training (*Computing* 1 September 1994). Scotland Enterprise is another institution that has recognised the significance of the computer software sector, but here the emphasis is on indigenous small firm growth. In early 1992, the Softnet scheme was established to provide all the services and infrastructure required by fledgling software businesses, often at subsidised rates. By 1995, there were five sites, accounting for 11 per cent of Scotland's software businesses, and money has been attracted from Development Corporations, Development Agencies and the European Regional Development Fund (*Computing* 16 February 1995). Although the export performance of indigenous Scottish companies is improving, the deadweight effects involved in these developments are hard to measure. Indeed, critics suggest that these centres are little more than high-tech office developments, with the central problem of cash flow remaining unsolved (Clarke 1994).

In conclusion, the locational inertia exhibited by the computer services industry is such that it remains largely unaffected by regional policy or local economic promotion schemes. In particular, this has implications for peripheral areas which have not benefited from the large employment growth in the sector. For old industrial areas such

as Tyne & Wear, the only way forward may be to boost the local market by encouraging the uptake of IT, and attracting more footloose, IT intensive industries.

5.4 Firm growth and evolution.

This final section will briefly consider the problems faced by computer service firms after start-up, and how this affects their growth trajectory. The key growth constraints recorded by the survey firms are shown in Table 5.17. Some 59 businesses could not identify any constraints, which is an indication of the strong growth dynamic of this sector. However, 45 firms (26 per cent of the total) spread between the four areas perceived financing and cash flow problems. In addition, seven companies mentioned the difficulties in obtaining external funding. Hence the problems of attracting external investment identified in Section 5.2.5 appear to continue as firms develop. Indeed, such difficulties were generally concentrated among small independent firms in the early stages of development; many small firms have problems in raising between £50000 to £100000 for example, due to the lack of internal equity necessary to support such loans (Department of Trade and Industry 1991). A shortage of skilled motivated staff was noted by 20 firms, a surprisingly low level of response given the supposed IT skills shortage in the UK economy (see Section 4.4.3).

Cash flow and finance problems can constrain firms in two main ways (Hall & Markusen 1985). Firstly, the research and development of new products and services may be restricted. For example, Clarke (1994) found that 67 per cent of Scottish software companies recorded a lack of resources to develop new products or services, and this problem was concentrated far more in independent firms than branch establishments. This constraint should be interpreted in terms of the low capital but high human resource intensiveness of software development; in particular the availability of staff time for quality staff is a key problem. These points confirm the relevance of aspects of the high-technology literature introduced in Chapter Two. In particular, Oakey (1984a, 1984b, Oakey & Cooper 1989) has identified the difficulty which companies have in freeing resources for further product development over the short life cycle of existing products, which can then lead to recurrent funding problems at the end of each life cycle. Hence, although time and knowledge may be the only resources necessary to establish a small software company at first, once a customer base that needs to be supported is established, it becomes increasingly difficult to free up time for highly knowledgeable staff. This argument would appear to apply just as much to more service oriented functions in computer services, as, almost by definition, they have a large technical component, the basis of which is rapidly changing.

Table 5.17: Key growth constraints experienced by surveyed firms (number of mentions).

Constraint	Herts.	Berks.	Tyne & Wear	Cheshire	Total mentions
None	9	15	16	20	59
Cash / finance	12	12	11	9	45
Staff shortages / motivation	6	6	3	5	20
Lack of marketing / sales	4	1	8	3	16
Price competition	4	0	2	1	7
Lack of external funding	3	1	3	0	7
Poor management	2	1	0	1	4
Firm size	1	1	2	0	4
Lack of IT spending by clients	0	1	2	0	3
Other	9	3	5	5	22
Total	50	41	52	44	187

Source: Author's surveys.

In software product markets, these problems are compounded by the falling profit margins, and the diminishing returns from software upgrades. In a study of the personal computer software sector, Prusa and Schmitz (1994) concluded that a firm's initial product was usually its most successful, and that sales decline through the subsequent range of packages. Hence it would appear that firms have a problem maintaining what they term the 'original innovative thrust', as more and more clients decide to stick with the version they have, and some shift to competitors' packages. In general, new versions of software are usually released at 12 to 24 month intervals, and Carmel (1995) suggests that this creates a 'market rhythm' in this subsector. Firms are reluctant to break the pattern, having reached the best balance between providing new features and how often customers are prepared to upgrade. He also proposes that reducing the cycle time of software products to gain competitive advantage is not seen as a strategic tool in the industry, but again funding restraints mean this is impossible in most small firms.

The second major constraint that a lack of financing imposes is the inability to research and penetrate new markets. In Scotland, Clarke (1994) recorded that over 40 per cent of respondents specified resource constraints inhibiting their ability to research new markets, and a similar proportion identified constraints on their capacity to achieve entry to new markets. Once a product or service has been established locally, many firms need to increase the market area they sell to in order to grow (Feesser & Willard 1990, see also Chapter Six). This creates particular problems for areas such as Tyne & Wear, where the local market is small and may be fairly unsophisticated (e.g. O'Farrell *et al.* 1992). More firms in Tyne & Wear cited a lack of quality marketing as a constraint to growth than in any other county (Table 5.17), seemingly supporting this argument. For counties in the South East such as Hertfordshire or Berkshire, there is a huge regional market that can be accessed without the need for a branch office or long distance marketing campaigns. As Hall & Markusen (1985) have highlighted, however,

marketing requires expertise as well as resources, and it is important that firms recognise that the skills necessary for successful marketing are fundamentally different to those required for product development.

The general lack of capital provision in the early stages of development can have several consequences. As already noted, the death rate among small software and service businesses is very high, and many start-ups simply collapse. Some small firms enter into mergers with larger firms that have the necessary development funds available internally. The need to establish products on the market outside the local area is another pressure toward merging with a larger business that has an established distribution system. Consequently, it is now rare for small firms to grow to a reasonable size by endogenous growth, as was possible in the early 1980s. Competition in the market has reached a level where successful firms soon become targets for takeovers, even if they do not actively seek such deals themselves. Firefox, a Solihull based Internet provider employing around 100 people, is a good example of this process. After successfully floating on the US stock exchange in 1995, the company was bought by the US supplier FTP Software in January 1996, in a deal worth £66m (*Computing* 25 January 1996). As a further indication of the effects of these developments, in the survey, no indigenous start-ups created since 1985 have grown to over 100 employees.

However, despite these constraints, the rates of entrepreneurship and new firm formation in the computer service sector continue to increase. Hall & Markusen (1985) have suggested that computer staff as a group are a highly motivated, entrepreneurially minded group, and that many are drawn to IT occupations because of the opportunities for intellectual and commercial freedom that they can provide. Even when fast growing firms are sold to larger concerns, the key individuals concerned generally make huge profits, and many subsequently leave to create new firms.

5.5 Conclusion.

In order to consider uneven development in a relatively young and highly innovative sector such as computer services, it is crucial to understand the process of new firm formation. The evidence presented in this chapter has shown that the computer services industry is largely a product of the existing industrial structure, and has reached a stage where growth is almost self generating. The majority of firms are founded by individuals from existing independent computer enterprises, rather than from any larger scale externalisation of IT functions from other sectors. New firm founders elect, almost exclusively, to establish their new businesses locally. Hence, in terms of the volume of new firm formation, the highest absolute numbers of new firms are in areas where the computer industry has a historical presence, such as the South East and the Manchester / Cheshire area. As a result, older industrial areas with no history of development in the

IT industry, such as Tyne & Wear, Merseyside and Sheffield, have experienced relatively low growth.

There also appear to be further regional differences within the largely structurally determined process described above. Spatial variations in the level of entrepreneurship mean that areas such as the South East actually perform better than the North and the North West in new firm formation terms than the size of their computer industry would suggest. Other regions such as Wales and Yorkshire & Humberside also perform very strongly. The scale of the industry in the South East results in proportionately more firms being created by processes such as takeovers, mergers and management buy-outs, rather than just by the movement of individuals. The availability of start-up money is a problem experienced in all areas, but private and venture capital appears to be more available in the South East. Hence, although industrial structure appears to be the most important explaining factor, economic factors such as capital availability are also important (Mason 1985).

Further to these underlying differences, the sector seems to exhibit a high degree of locational inertia, with a very low number of firms showing any significant degree of spatial mobility, apart from local trends to more suburban locations. This poses problems for development bodies in peripheral areas trying to promote development in high growth sectors such as computer services. The best approach for these areas would seem to be to try and increase the scale of the local market for both indigenous and branch providers, and to increase the level of financial support for the start-ups that do occur.

Once established, however, firms do not exist in isolation, and their development and success also depends on a variety of different linkages. In particular the market relations, and the relationships firms develop with suppliers and other computer companies are important, and the spatial nature of these linkages will be considered in the next chapter.

Chapter Six: Explaining uneven development II - backward and forward linkages.

'Where both forward and backward linkages are concerned, the concentration of producer services in a small number of large cities enables the transaction costs associated with the production and delivery of such services to be minimised. In particular, it is the cost of maintaining face-to-face contact between the producers, on the one hand, and their inputs and markets, on the other hand, that is potentially the most expensive element of intermediate-demand service production: this expense can be significantly reduced by spatial agglomeration' (Coffey 1992, p.142).

6.0 Introduction.

The previous chapter has suggested that uneven development in the computer services industry is partly both created and maintained by quantitative and qualitative differences in the new firm formation process, and the locational inertia inherent within it. This chapter will illustrate that there is also significant regional variation in the linkages of computer service firms, which further contributes to the processes of uneven development. This accords well with the conclusions of Coffey (1992, see above), who posits that the concentrated (inter-regional) development pattern of many producer services can be explained by the external economies of scale resulting from a skilled pool of human resources, and the opportunities for forward and backward linkages. While the labour market factors supporting the growth of computer service firms in the South East have been discussed in the preceding chapters, this discussion will suggest that it is forward or market links which are particularly crucial to the development of this sector.

Hence, the aim of much of this chapter is to characterise and explore the market linkages of the survey firms, in a number of ways. The first section will analyse the vertical market sector breakdown of the sales from the survey firms. Next, the spatial pattern of these markets, and the sizeband, status and subsectoral variations behind this pattern, will be considered. The third section will examine further characteristics of the client base, and how it is acquired. Fourthly, the limited nature of the remote links employed by the survey firms will be introduced, and the chapter will conclude with a consideration of the importance of 'backwards' and 'horizontal' linkages.

6.1 Computer service firms' sales by vertical market sector.

In order to understand the role of computer service firms in the economy, it is firstly crucial to characterise the types of purchasers that consume such services. While there have been many studies investigating the market sectors of producer services in general (see section 2.2.3), very few provide information for specific industries such as computer services. Examples of four studies that do provide such data are given in Table 6.1 (below), confirming that, like many other producer services, computer service firms gain a substantial proportion of their revenues from other service sectors (ranging from 52 per cent to 81 per cent here). Furthermore, as Goe (1990) suggests, the markets for computer services (and many other producer services) often exhibit a substantial component of consumer services demand. Interestingly, computer services would appear to have a relatively low level of links with private individuals compared to other business services (Marshall 1983). It is also important to note the variations between the results of the four studies, which may result partly from issues of definition, but seem to suggest that the market sector linkages vary across both time and space. In particular, the proportion of business from the manufacturing, producer service and government sectors show the most significant variation.

Table 6.1: Markets for computer services - examples from the literature.

Author	Study Area	PC	PS	C+LG	M+C	OS	P	O
Marshall (1983)	Manchester, Leeds & Birmingham, UK	1	17	6	46	21	1	8
Van Dinteren (1987)	13 medium sized cities, Netherlands	1	54	16	17	11	1	0
Perry (1990)*	Auckland, New Zealand	0	32	15	28	18	3	4
Esparza & Krmenc (1994)	Chicago, Illinois	3	57	7	17	16	0	0

Key: PC - private consumers, PS - business & producer services, C+LG - central and local Government, M+C - manufacturing and construction, OS - other services, P - primary industries, O - other.

* Data for a subsector of computer services, data processing.

Detailed data on market sectors was provided by the majority of the survey firms, and the collated results are shown in Table 6.2. The sectoral categories used here were derived from a more open classification used in pilot interviews, and represent the end markets for computer services, to the extent that software products sold via reseller chains are classified according to their final client. The 'computer services' market sector represents services supplied directly to other computer service firms, and software that these firms actually adopt or used in the provision of their own IT service. In the second column of this table, the figures have been weighted by employment (used here as the best available measure of business volume) to show the overall importance of market sectors when the different sizes of firms are accounted for, and hence provide a more accurate overall measure of the significance of different markets. This is particularly important in the light of the uneven firm size distribution highlighted in Chapter Four.

Table 6.2: Survey establishments' sales categorised by market sectors.

Sector	Unweighted average %	Weighted average %
Other computer services	7.4	4.2
Financial & business services	20.8	22.2
Central government ¹	12.0	19.7
Local government ²	8.9	9.4
Manufacturing & construction	26.9	19.7
Other services	17.1	16.9
Utilities ³	1.8	1.4
Private households	5.1	6.4
Total	100.0	100.0

Source: Author's surveys.

Data for 157 firms.

1 - includes the National Health Service and the Armed Forces.

2 - includes education, emergency services and local quangos (e.g. TECs).

3 - gas, electricity, water, nuclear power (majority now privatised).

Several points arise from these results. Firstly, the importance of service industry markets is again confirmed, accounting for some 72.4 per cent of total business, with 29.1 per cent of the total coming from public services alone. Secondly, the four major markets for computer services are other producer services, manufacturing & construction, central government and 'other services', which covers activities such as transport, wholesaling, distribution, retailing, leisure and tourism (see also Van Dinteren 1987). These markets all constitute more than 15 per cent of the total (weighted) market, with the financial and business services sector alone accounting for 22 per cent of the total. Thirdly, the importance of the industry in providing intermediate or producer services is highlighted, with a mere 6.4 per cent of final revenues being attributable to individuals or households. This essentially represents purchases of standard personal computer software including games, and a limited amount of hardware maintenance. Fourthly, it is possible to gain an indication of how the importance of the market sectors varies with the size of the computer service firms. Comparing the two columns suggests that, in relation to smaller firms, large firms gain more revenue from central government clients than manufacturing and construction markets. Thus, weighting increases the central government proportion from 12.0 to 19.7 per cent, and there is a concomitant fall in the manufacturing and construction contribution from 26.9 to 19.7 per cent.

A problem with such analyses is that there is no accurate comparable national data available, although in this instance, the CSSA does provide a slightly different breakdown for member firms (Table 6.3 below). This data again confirms that financial services, manufacturing industries, government institutions and other services (if 'services', 'retail/wholesale' and 'transport' are summed) provide the major markets for

computer services. As outlined in Chapter Three, although the CSSA represents just 330 computer service firms, it covers nearly all of the largest providers, and hence this information is biased towards the larger companies in the industry. However, a comparison of this data with that in Table 6.2 suggests that the survey results are perhaps slightly over emphasising the importance of government markets, and under representing the contribution of finance markets. Comparing the CSSA data over the period 1991 to 1994 illustrates that the vertical market sector pattern is fairly static over the three years, with the major change being the collapse of the aerospace and defence market after the end of the Cold War. The continued growth of the computer services industry in Hertfordshire, an economy that depends highly on these industries, is an indication that computer service markets extend well beyond a firm's home county (see section 6.2).

Table 6.3: CSSA firms revenue by vertical sector, 1991 to 1994.

Market Sector	% of total 1991	% of total 1994
Finance	25	24
Manufacturing	14	16
Government	15	15
Utilities	9	8
Services	6	7
Retail / wholesale	6	7
Healthcare	3	6
Defence & aerospace	13	5
Transport	4	3
Others	5	9
Total	100	100

Source: CSA 1992, CSSA 1995b.

6.1.1 Regional variation in market sector linkages.

The survey information introduced in Table 6.2 can be disaggregated into data for the four counties. One way to present these results is to consider the largest market sector for the surveyed firms (see Table 6.4 below). For 42 firms (27 per cent of the total who responded), manufacturing and construction clients account for the most revenue, but of such firms, 20 are in Tyne & Wear, far more than in the other three counties. In the previous chapter, the importance of the manufacturing sector of Tyne & Wear for new computer service firm formation was identified, and hence the orientation of many computer service providers in Tyne & Wear to manufacturing markets is unsurprising. The survey firms' sales are graphically represented in Figures 6.1a (unweighted by employment) and 6.1b (weighted). Around thirty per cent of the (weighted) business in Tyne & Wear is generated by manufacturing and construction firms, and this is in marked contrast to the lower proportions in the other three counties. In particular, only ten per cent of the revenues of Hertfordshire based firms come from these markets, and, when considering this data, it should be remembered that Hertfordshire has a relatively

high level of manufacturing employment (largely aerospace and defence) for a South East county (see section 5.1).

Table 6.4: Largest client sector for surveyed establishments*.

Sector	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Manufacturing & construction	9	5	20	8	42
Financial and business services	10	12	4	8	34
Other services	8	4	5	8	25
Central government	6	7	5	4	22
Other computer services	2	6	3	2	13
Local government	5	3	0	3	11
The utilities	0	0	2	3	5
Private households	1	0	0	1	2
No response	4	0	9	6	19
Total	39	41	37	37	154

Source: Author's surveys.

* Where data available.

The other notable regional variations are the higher importance of both business service clients, and central and local government customers, in the south eastern counties of Hertfordshire and Berkshire. When the larger overall scale of the computer services sector in these counties is considered, the results would seem to strongly support the idea that computer services will be relatively more buoyant in local economies where the service activities which often employ computer services are themselves thriving (Henneberry and Lawless 1989). Hence to suggest, as Beyers (1989) does, that regional trends in producer service employment appear to be intimately linked with the economic buoyancy of manufacturing, would appear to be fallacious.

The importance of central government markets is to be expected in counties bordering Central London. Even in cases where parts of government departments have been decentralised, the procurement of IT is likely to be undertaken from the London headquarters, and often favours the large multinational firms which tend to locate the majority of their workforce in the South East (see case studies in Chapter Seven). In reality the weighted Hertfordshire figure for revenues from central government clients may be lower than the stated 31.0 per cent, as two of the largest employers surveyed were very oriented to this market, and this is reflected in the unweighted figure of 12.1 per cent. These general results are, however, in accordance with Howells & Green's (1988) study of the industry in Tyne & Wear and Berkshire, which also concluded that in the latter county *'establishments were also found to have benefited from a much higher proportion of national and local government purchases'* (p.176). Although the level of financial and business service customers appears similar between all the areas, it is of course higher in absolute terms in Hertfordshire and Berkshire, where there is

considerable demand from the City of London, and other producer services concentrated in the outer South East. The level of business service custom may have been held down artificially in Hertfordshire by the survey selection of two large providers to the public sector (noted above), as the unweighted figures again show.

Figure 6.1a: Survey establishments' sales by market sector.

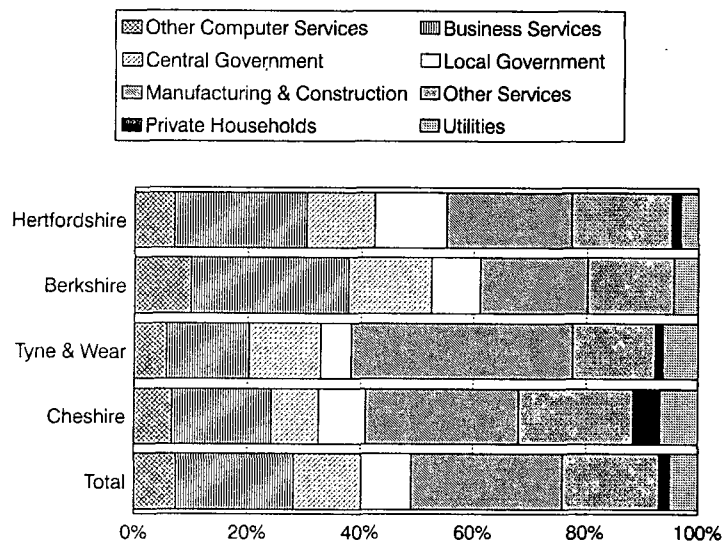
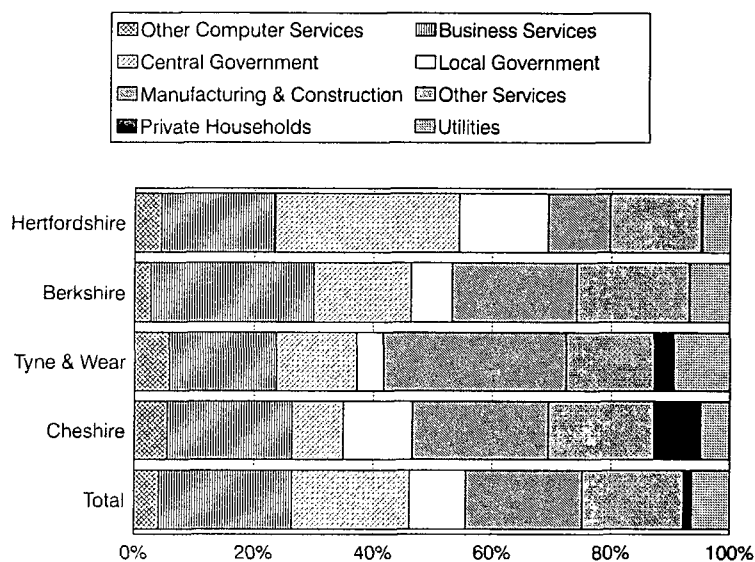


Figure 6.1b: Survey establishments' sales by market sector, weighted by employment.

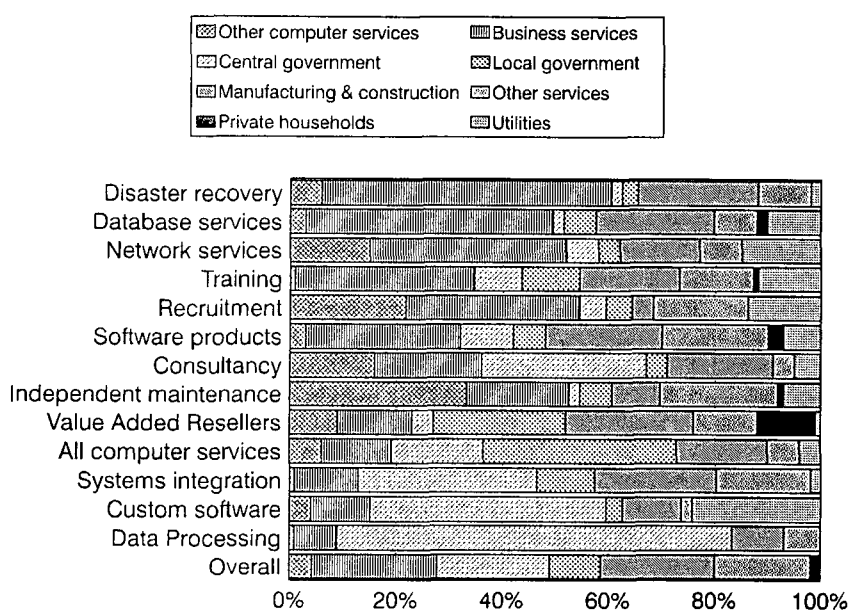


Source: Author's surveys.
 Data available for 42 firms in Herts., 38 in Berks., 39 in Tyne & Wear, and 38 in Cheshire.

Underlying these general patterns in market sectors are the regional variations in the status and main specialisms (or subsectors) introduced in Section 5.2.1 (see, especially, Tables 5.3 & 5.4). Examining the market sectors disaggregated by firm status across all four areas suggests that variations in status have little impact on the overall balance of

clients (for a dissenting view, see Marshall 1983). The only exception to this is that central government markets tend to be disproportionately served by certain types of firms, largely due to the scale of contracts offered. In particular, the survey found that branches of subsidiaries of foreign owned companies gain over half their (weighted) revenue from central government clients, and a further 30 per cent from local government. This reflects how large foreign multinationals are increasingly gaining significant proportions of UK government markets, as described in Chapter Four (Section 4.3.4).

Figure 6.2: Market sectors for different computer service activities in survey establishments, weighted by employment.



Source: Author's surveys.

More interesting variations are uncovered if the market sectors are disaggregated by the different subsectoral activities of computer services: these results are represented in Figure 6.2 (above). Such analysis suggests that the various market sectors have varying requirements in terms of the computer services that they employ. For example, companies in the financial and business service sectors appear to consume relatively high levels of software products, and disaster recovery, database, network and recruitment services. Central government clients, however, use more consultancy, custom software, data processing, systems integration and general computer services than other markets. These differences may in turn reflect the kind of IT systems used in different sectors, for example the large custom built systems that government departments require. The high level of disaster recovery services used by business services indicates how crucial a live IT system is to the operations of many financial companies. The main computer services used by other IT service companies were independent maintenance, network services, and recruitment, and this largely reflects the main functions that computer service firms

tend to subcontract (see Section 6.5). Other market sectors such as manufacturing and 'other services' appear to consume a more balanced variety of services.

6.1.2 The special problems of old industrial, urban areas.

In Figure 6.1b, the weighted results for Cheshire seem very similar to those of Berkshire, except for the slightly lower importance of government markets that has already been identified, and are probably fairly similar to those for Hertfordshire, once the central government market for the county has been adjusted downwards. These observations suggest that it is the urban, industrialised nature of the Tyne & Wear economy that is the crucial determinant of variation. The dependence of the North East on large scale primary and manufacturing industry in the past, and the problems caused by its decline since the early 1980's, are widely recognised (e.g. Hudson 1989b), and Martin (1989) asserts that this decline has severely constrained the overall development of both business and consumer services. The fact that the computer services industry of the area is more tied into manufacturing than in the South East and Cheshire has several further implications, which may also apply to other urban areas lacking a growing service base, such as Merseyside, Sheffield and Glasgow.

Firstly, in absolute terms, firms are active in a declining market place, both locally and nationally (although it could be argued that use of new technology, including IT, is part of the reason for this). Secondly, many manufacturing sectors have been slower at turning to external IT providers than parts of the service economy, such as financial services, and hence computer service companies are not oriented towards the fastest growing markets in relative terms (Douglas Eyeions, ex-CSSA Director General; personal interview, 25 July 1994). While central and local government contracts are also large growth areas, especially in the light of Compulsory Competitive Tendering (CCT), representation in these markets is again weak. Thirdly, there could be wider competitiveness implications. As noted in Chapter Two, Allen (1992) has suggested that high-tech services (such as computer services) are often crucial bearers of innovation, rather than high-tech manufacturers. Furthermore, 'peripheral' regions which are less well endowed with higher corporate functions are often viewed sceptically with regards to the formation of strong producer service complexes (Massey & Allen 1988) of which computer services are an integral part. When comparing producer services in Scotland and the South East, O'Farrell *et al.* (1992) found that supplier-customer linkages within each region, and especially the presence of customers with a sophisticated service demand, were critical to innovation and growth. The further implication is that the strong links to manufacturing industry, combined with the lack of headquarters in Tyne & Wear, could lower the quality of computer service supply and thus harm both the competitiveness of local industry, and the market potential of the services in other areas. Furthermore, MacPherson (1991b) found that, in a declining industrial area of the USA,

non-innovatory manufacturing firms tended to look very locally for producer service suppliers, and this could exacerbate the problems.

In summary, the results presented in this section (6.1) illustrate that the market sectors of computer service firms to a certain extent reflect the structure of the local or regional economy in which they are positioned. This in turn suggests that a substantial proportion of sales are conducted over relatively short distances. Thus, while sectoral analyses of markets are beneficial, for a fuller picture of the role of links between computer service firms and their clients, information is required on the distances over which these client relationships are conducted. It is to this subject that the next section turns.

6.2 Computer service firms' sales by geographical area.

As already discussed in Chapter Two, many studies have illustrated that producer services engage in substantial inter-regional trade, although such work often refers to much larger countries (e.g. Canada, USA) than the UK. As with market sector data, however, there are only a few studies that provide detailed information on the level of computer service exports from different areas; the results that are available are shown in Table 6.5 (below).

Table 6.5: Computer services exports - examples from the literature.

Sector	Study Area	Local / Met. area %	Rest of region %	Rest of country %	Inter- national %
Beyers & Alvine (1985)	Seattle, USA	47	5	41	7
Coffey & Polese (1987)	Montreal, Canada	63	11	25	1
Van Dinteren (1987)	13 medium sized cities, Netherlands	14	19	66	3
Davis & Hutton (1991)	Vancouver, Canada	16	28	17	39
Haug (1991b):	Washington State, USA				
- software programming		37		55	8
- software manufacturing		22		69	9
- other computer services		68		27	5

Comparison with the data for producer services as a whole in Table 2.2 supports Marshall's (1983) assertion that computer services sales appear to be relatively mobile compared to other business services. Much of the research in Table 6.5 refers to large Canadian or American cities, but Van Dinteren's (1987) results from smaller cities in Holland suggests that the level of exports will automatically appear to increase as the size of the urban area where the firm is situated decreases. An important point to note is the low level of international computer service exports, except in the case of Vancouver, Canada, where strong links to the north western states of the USA are developing (Ohmae 1995). Haug's (1991b) data for Washington State indicates that the level of

exports may vary between the different subsectors of computer services, with software, and in particular software products, proving more amenable to trade over long distances.

Table 6.6: Survey establishments' sales by area.

Area	Unweighted average %	Weighted average %
County	22.0	10.1
Rest of region	37.3	45.3
Rest of UK	33.8	38.9
Rest of Europe	3.8	3.6
Rest of world	3.1	2.1
Total	100.0	100.0

Source: Author's surveys.

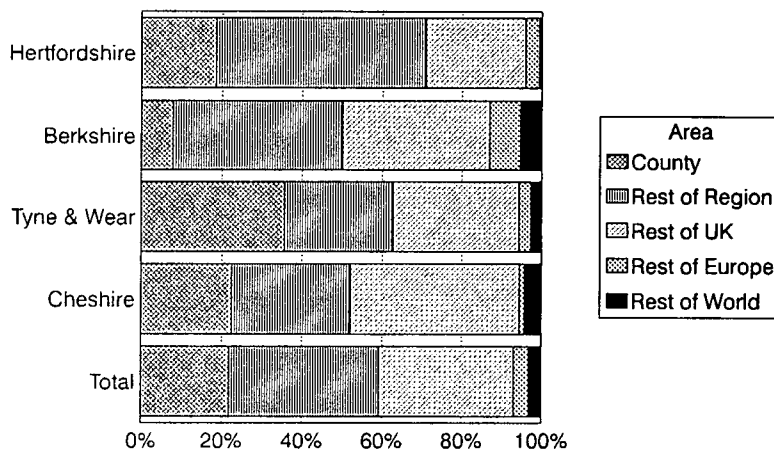
Data available for 162 firms.

The survey firms' sales are categorised by area in Table 6.6 (above), with 162 of the total 173 establishments offering a response to this question. In this classification, multi-plant customers were classified according to the location of the procuring office. As with the market sector data, these results have been weighted by the employment in each firm to account for differing firm sizes. Several points are worth noting from this table. Firstly, the data confirms the general sales 'mobility' of computer services, with 45 per cent of (weighted) business being conducted with clients based outside the home region of computer service firms. Secondly, however, the proportion of business exported outside the UK is low (5.7 per cent when weighted), confirming that, in general, computer service companies are not large exporters, although as Gentle and Howells (1994) note, the potential for such trade will improve as internationalisation and foreign penetration of the UK market continue to increase (as described in Chapters Three and Four). Thirdly, firms only receive around ten per cent of revenues from clients in the same county, but 55 per cent of revenue is derived from the home region. Hence, theories that emphasise the importance of agglomeration economies derived from the proximity to clients may need to be considered at the regional, rather than local level (on UK scales and definitions). Finally, as with the market sector data, the two columns can be compared to ascertain how firm size affects the pattern. Such a comparison suggests that larger firms gain relatively more revenue from the rest of the region and the rest of the UK, while, as would be expected, smaller firms are more oriented to the immediately local (county) market. Interestingly, weighting has no impact on the levels of international exports. This is partly due to the number of large foreign owned subsidiaries which serve purely the UK market.

6.2.1 Regional variation in the geography of markets.

As with the market sectors, the geography of sales information can be disaggregated by the four survey counties. Figures 6.3a (unweighted) & 6.3b (weighted by employment) illustrate the geographical breakdown of markets for the four areas in graphical form, while the data is presented in more detail in Table 6.6. Interestingly, the level of international trade is similarly low in all four counties, which contradicts the conclusions of O'Farrell and Wood (1994, see also O'Farrell *et al.* 1996), who found that business service firms in the South-East had more international linkages than those in peripheral areas. Weighting does not alter these results significantly, suggesting that the level of exports does not vary with firm size. The main regional variation appears to be the importance of the local (county) markets in the two northern counties, compared to the strong regional market of the South East, tapped into by firms in Hertfordshire and Berkshire.

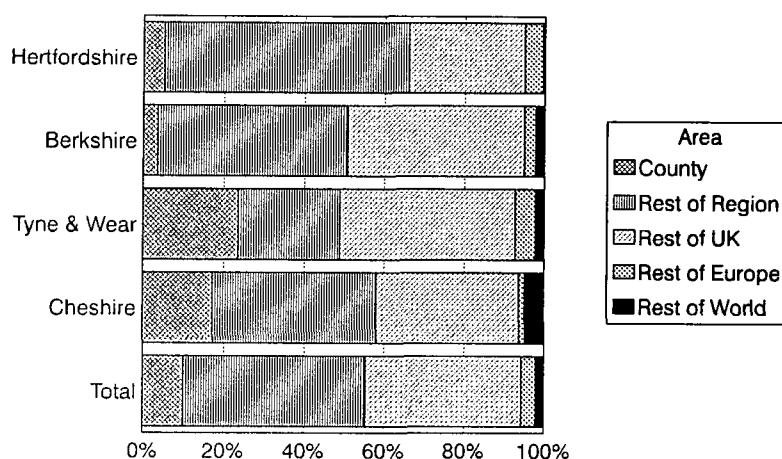
Figure 6.3a: Survey establishments' markets by area.



Weighting the data by employment reduces the proportion of revenue derived from the home county for Berkshire and Hertfordshire computer service firms, while the level of business in the rest of the region increases slightly. This suggests that while larger firms may therefore be operating over longer distances, the high level of business undertaken with clients in the South East (including London) is largely unaltered, being 65.9 per cent in Hertfordshire and 50.8 in Berkshire (when weighted). These results support Marshall's (1982) assertion that when a region has a major producer service complex, such as the South East, a large proportion of the demand will remain in that region. It is worth noting that only 5.2 per cent of (weighted) business in Hertfordshire and 3.6 per cent in Berkshire came from the County itself, and indeed the immediately local market was seen as unimportant, whereas proximity to London and the South East market in general was seen as crucial. Hence this links back to the discussions of market sectors, with the pattern for Hertfordshire and Berkshire firms being more likely to reflect

characteristics of the South East economy as a whole rather than any local specialisations in the counties themselves.

Figure 6.3b: Survey establishments sales by area, weighted by employment.



Source: Author's surveys.

Data available from 40 firms in Herts., 36 in Berks., 46 in Tyne & Wear, & 40 in Cheshire.

The more detailed information shown in Table 6.7 offers some further insights into the nature of the South East's economy. Firstly, Greater London itself represents a very important market, constituting 30 per cent of the total sales of firms in Hertfordshire, the same as the Rest of the South East put together. For firms in Berkshire, the metropolis accounts for 19 per cent of sales, with 28 per cent coming from the outer South East. While these figures largely reflect the scale of the producer service and headquarters complex that exists in London, it also indicates how firms retain London clients when decentralising to the Home Counties. The breakdown of the Rest of the South East markets strongly supports Allen's (1992) concept of a regionalised service economy, within which distance from clients is largely irrelevant. This is shown by the results for Hertfordshire; despite the fact that the county is directly north of London, the split in revenues between counties 'north of the Thames' and 'south of the Thames' (see Table 6.7 for definitions) is almost exactly even. Although inconclusive, the Berkshire data suggests that there may be a slight 'western' bias to activity within the region, with three times as much revenue (20.7 to 7.3 per cent) being derived from the seven western counties as the three eastern counties (again see Table 6.7 for categories).

Weighting by employment affects the sales pattern to a greater degree than the two southern counties in the case of Tyne & Wear. Here, the effect is that sales to the rest of the UK increase from 31.6 to 43.8 per cent of the total, while county sales fall from 35.7 to 23.7 per cent. This suggests that firms in the North East have a greater need to establish exports (to thereby reach a similar population and market size) to facilitate growth than firms in the South East. Indeed the whole of the 'North', as defined here,

provides only 49 per cent of the overall markets when weighted. Additionally, 22.4 per cent of the (weighted) business of Tyne & Wear firms is in the South East and London. Daniels (1984) suggested that inter-regional transfers of business services in the UK which are not oriented to the South East are largely confined to contiguous regions, and are best developed among insurance and finance activities. However, for computer services, Tyne & Wear firms reported difficulty in penetrating markets in the North West and West Yorkshire, compared to say, the Midlands, where there was less competition. These features reflect the fact that the North East is essentially a small, regional market, and is relatively isolated by Northumberland, the Pennines and North Yorkshire. Martinelli (1991) argues that a vicious circle can develop, whereby the limited overall level of regional demand in peripheral regions hinders the development of local suppliers, which in turn further depresses demand levels. Overall, the prospects for the sector in peripheral areas such as Tyne & Wear would seem to depend heavily on the 'exportability' of computer services.

Table 6.7: Survey establishments' sales by area, both weighted and unweighted.

HERTS: % of business in;	Herts.	Greater London	SE ¹ counties North of Thames	SE ² counties South of Thames	Rest of the UK	Rest of the EU	Rest of the World	Total (%)
Unweighted	18.6	25.5	14.9	12.0	25.0	3.5	0.6	100.0
Weighted	5.1	30.0	15.3	15.4	29.1	4.5	0.5	100.0
BERKS:	Berks.	Greater London	SE counties East of London ³	Other SE counties ⁴	Rest of the UK	Rest of the EU	Rest of the World	Total (%)
Unweighted	7.8	21.7	4.9	15.7	36.9	7.8	5.3	100.0
Weighted	3.6	18.9	7.3	20.7	44.2	2.8	2.2	100.0
TYNE & WEAR:	Tyne & Wear	Rest of North East	Rest of the North ⁵	South East & London	Rest of the UK	Rest of the EU	Rest of the World	Total (%)
Unweighted	37.9	16.7	8.1	16.8	14.7	3.0	2.8	100.0
Weighted	23.9	17.3	7.7	22.4	21.3	5.1	2.2	100.0
CHESHIRE:	Cheshire	Gr. Manch. & Merseys.	Rest of North West	South East & London	Rest of the UK	Rest of the EU	Rest of the World	Total (%)
Unweighted	22.5	23.3	6.3	13.6	28.6	1.5	4.2	100.0
Weighted	17.4	29.7	11.0	11.3	24.3	1.5	4.8	100.0

Source: Author's surveys.

1 - Defined here as Bedfordshire, Buckinghamshire, Essex & Oxfordshire.

2 - Berkshire, East Sussex, Hampshire, Isle of Wight, Kent, Surrey & West Sussex.

3 - Essex, East Sussex & Kent.

4 - Bedfordshire, Bucks., Hampshire, Herts., Isle of Wight, Oxfordshire, Surrey, West Sussex.

5 - Cumbria, North West, Yorkshire & Humberside.

The situation in Cheshire appears to be slightly different. As in Tyne & Wear, sales within the county are important, and represent 17.4 per cent of the weighted total. In contrast, however, there is also a strong regional market, based around the cities of

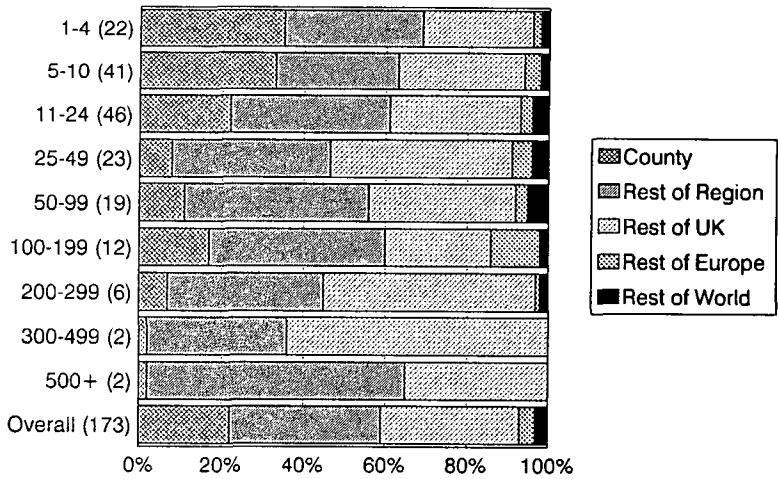
Liverpool, and in particular, Manchester. These two agglomerations alone account for 29.7 per cent of the business of Cheshire firms (see Table 6.6, above), adding further support to Marshall's (1982) proposal that in regions with developed producer service complexes, a substantial proportion of demand will remain in that region. Again in contrast to Tyne & Wear, only 11.3 per cent of revenues are derived from sales to London and the South East, with more of the out-of-region sales coming from contiguous or nearby areas, and in particular the West Midlands and Yorkshire. These results are indicative of the structure of the computer services industry in the area, with a large number of branch establishments serving a large regional demand, and therefore not needing, or desiring, to extend their operations further.

6.2.2 Further determinants of the geography of sales.

The sales patterns exhibited by computer services businesses do not, however, merely reflect the scale and economic structure of the various local and regional markets in the UK economy. The structural characteristics of the industry itself also have an impact; three attributes were found to be particularly important and will be considered here, namely, firm size, status and main subsector of activity.

The geography of the markets of all the survey firms (that responded) have been graphed by establishment sizeband categories in Figure 6.4 (below, unweighted by employment). This diagram shows that there is a general trend towards a higher level of both regional and national exports as establishment size increases, with the level of sales within the home county decreasing. Up to 200 employees, the level of international exports also increases, but over this threshold they decline dramatically. This reflects the fact that many of the larger employers in the survey were UK subsidiaries of multinationals, and hence largely oriented to the UK national market. The clear relationship found in the survey data contradicts the results of Beyers and Alvine (1985). In their large scale survey of over 1000 firms in Washington State, USA, the authors concluded that there was no relationship between firm size and the level of 'export' market orientation. There are anyhow two main problems with using establishment size differentials to explain regional variations in market linkages. Firstly, although the scale of the industry varies between the four survey counties, the actual balance of small and large offices in the surveys does not. Secondly, establishment size is not really an effective variable in its own right, being largely a function of the competitive success, development strategy, status and the type of activity that characterise the business. The influence of the last two factors will now be considered.

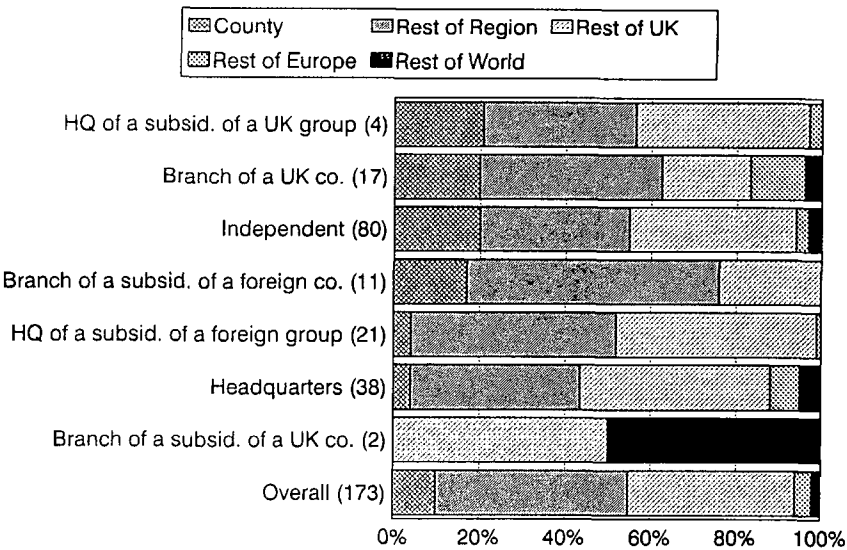
Figure 6.4: Survey establishments' sales by size category and area.



Source: Author's surveys.
Figures in brackets indicate number of survey firms in each category.

The survey firms' pattern of sales have been classified by the different status categories in Figure 6.5 (below), and ranked according to the level of home county sales. By again weighting the data by employment, the results compensate for the sizeband effect described above. This graph indicates that there does appear to be some relationship between status and the level of intra-national export activity. In particular, branch and independent operations appear to be more oriented to local clients than headquarters, and this will have an impact on the regional variations in sales patterns shown in Figure 6.3, due to the higher dependency on branch establishments in Tyne & Wear and Cheshire (see Table 5.4). While establishments classified as 'Headquarters', or 'Headquarters of foreign owned subsidiaries' only derived four per cent of their revenues from home county clients, the level was 20 per cent for independent firms and branches of UK companies. There is less difference in the level of sales to the rest of the home region, largely due to the fact that many of the surveyed headquarters are located in the strong regional market of the South East, and hence much of their business remains within this region. However, headquarters operations again exhibit stronger sales to the rest of the UK beyond the home region. Interestingly, the major influence of UK as compared to foreign ownership is in the greater scale of international exports, with foreign owned concerns tending to focus purely on the UK market. While the data for the categories 'HQ of a subsidiary of a UK group' and 'Branch of a subsidiary of a UK group' do not fit this pattern, they should perhaps be treated with caution due to the low number of firms in both categories (four and two respectively). Overall, these results echo the conclusions of Marshall (1983), but they again differ from those of Beyers and Alvine (1985), who found that there was no difference between the market patterns of branch firms and those headquartered in the Puget Sound region.

Figure 6.5: Survey establishments' sales by status and area, weighted by employment.



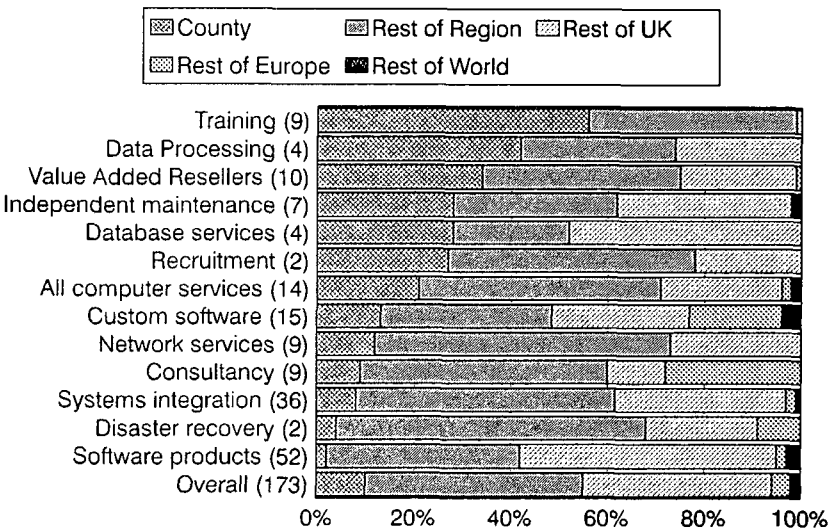
Source: Author's surveys.
 Figures in brackets indicate number of survey firms in each category.

These variations in the level of local business undertaken by branches and headquarters of computer service firms reflect the fact that a hierarchical division of labour often exists within multi-site businesses (Moulaert, Martinelli & Djellal 1991). Much of the R&D, strategic planning, administration and marketing is concentrated at headquarters, and hence staff in the headquarters locations are in effect underpinning the revenues earned by other branch sites. Branch offices are often operational agencies or just 'sales' branches, using many internal services provided from the headquarters to support their local clients. Thus, branches are also likely to be less integrated into their local economy in terms of suppliers; as most intermediate service inputs are imported from headquarters, the local contribution to the final service value added is low (Marshall 1983). For Moulaert, Martinelli & Djellal (1991), the functional divisions of labour within producer service firms will be strong in economies such as the UK, which has a fairly centralised structure around London and the South East. Using the example of IT consultancies, they suggest that in a more 'decentralised' economy such as Italy, firms respond by providing a wider range of functions at the regional level.

The subsectoral composition of the industry in different areas also has an impact on the sales pattern (see Figure 6.6 below), with the various types of service exhibiting different market geographies. IT training, for example, is provided very locally, with some 56 per cent of business being generated by the home county, and a total of 99 per cent from the home region. Other activities such as data processing, value added reselling, hardware maintenance, database services and disaster recovery also depend to a large degree on local clients, with over a quarter of revenue being derived from the

home county. Towards the bottom of the diagram, other functions can be provided over greater distances, and in particular software products. Survey firms specialising in this field gained on average some 53 per cent of their revenues from outside the home region. The special properties of this subsector that make it amenable to relatively long distance trade have already been discussed with respect to the Irish example (see Chapter Three). However, the low level of international trade which is recorded emphasises the national nature of the *provision* of software products as opposed to their internationalised manufacture (see Figure 3.4). Figure 6.6 suggests that the two activities most suited to international exchange are custom software and consultancy (23 and 28 per cent of business respectively), and this is due to the high value and specialised nature of the services (Illeris 1994a).

Figure 6.6: Survey establishments' sales by subsector and area, weighted by employment.



Source: Author's surveys.
 Figures in brackets indicate number of survey firms in each category.

As the subsectoral composition of the industry varies across the four counties (see Table 5.3), these variations will have an impact on the overall sales pattern shown in Figure 6.3. For example, the large number of software product companies in Berkshire can partly explain how the overall sales pattern for firms in the county is different to Hertfordshire. As software packages can be sold more effectively at distance than most other computer services, this contributes to the proportion of sales outside the home region being higher in Berkshire, at 44.2 per cent of total revenues, than in Hertfordshire, at 29.1 per cent. Such results should, however, be considered in combination with the regional differences in the status of computer service firms. For example, the high level of exports from Berkshire beyond the South East is also due to the fact that many of the software product firms there are UK headquarters.

6.2.3 A transactional approach?

A profitable way to view the variations between the spatial market structures of different computer service activities may be to consider the different kinds of transactions involved. Both Illeris (1994a, 1994b) and Tordoir (1994) propose that the spatial structure of professional service transactions depends mainly on the mode of interaction between client and provider, and the frequency of usage of the service. While close interaction may favour physical proximity, if services that require close interaction are also highly specialised and infrequently used, the subsequent market area required often leads to the concentration of the services in large urban centres or their close hinterlands. However, such firms can also compensate by increasing the geographical spread of their market; for example, the successful Newcastle IT consultancy Mari, with over 300 employees, targets specialised European Union contracts.

Tordoir identifies three types of provider-client interaction in professional services generally; 'sparring', 'jobbing' and 'sales'. Sparring relations involve an interpersonal and reciprocal process of interaction, as in the case of IT consultancy services and the development of custom software (Moulaert, Martinelli & Djellal 1991). Jobbing relations typify computer services such as the provision of total systems, data processing and database activities. Here, the requirements of the provider are more standardised, and interaction is often required only during the initialisation of the work and during its final presentation or installation. Sales relations are only really found in mass produced software package businesses, and in the value added reselling of standard combinations of hardware and software. However, the core of computer service companies that market products which can be 'tweaked' for different clients fall somewhere between the jobbing and sales classifications of transaction patterns.

Illeris (1994a) has considered such concepts and their spatial consequences with respect to computer services, contrasting the market relations of three types of computer service producers; data processing bureaux, suppliers of complete computer solutions, and software and systems developers. In the first category, the need for meetings and interaction with clients is low, with much contact taking place via telecommunications, and hence distance from clients is largely irrelevant. Secondly, Illeris identifies a whole range of total systems companies that provide fairly unsophisticated systems to a range of clients, typifying the jobbing relations that Tordoir identifies. For such firms, proximity to clients is important in order to develop and support the systems, and Illeris suggests that clients tend to be within 50 to 100km of the company. To extend their market, such firms have to establish branches. Thirdly, software and systems developers require a complex sparring relationship with their clients, which can provide agglomeration economies in urban centres. However, the large value of the contracts involved means problems of distance are often overcome:

'From studies of computer services and technological services, it is known that very sophisticated firms are able to serve distant clients, even if the contacts have to be face to face, because travelling costs are low compared with the price of the contract' (Illeris 1994a, p.7).

These latter two categories suggest that in future research, the total systems / systems integration category used in this survey should perhaps be split into two; firstly, those firms providing relatively standard combinations of hardware, software, training and support, and secondly, those supplying complicated, high-level, multi-platform systems.

Adopting these concepts can provide useful insights into the survey results illustrated in Figure 6.6. For example, the international activity of custom software and consultancy firms can be conceptualised in terms of the high value of the projects in relation to the transport and labour costs of frequent interaction. The high proportion of software products revenues derived from outside the home region reflects the sales based nature of many of the firm-client links involved. Also, the provision of some 71 per cent of business by general computer service firms, and 61 per cent by systems integrators within the home region partly reflects the 'jobbing' nature of such activities. However, some activities seem to fall outside the categories that Illeris and Tordoir have devised. Providers of hardware maintenance and network services are on call to supply quick, on-site support, which therefore limits the geographical spread of the market. Although this is similar to a 'jobbing' relationship, the possibility of being called out at any time means that the spatial constraints are particularly strict, and hence such firms are found in all areas. Furthermore, IT training companies that provide services on their own premises have to be accessible for client staff to attend for days at a time, with a similar effect on size of the market area. Overall, although such an approach is very useful, it may need further refinement, and patterns of firm-client interaction must still be linked to the status and strategy of firms.

Tordoir (1994) also illustrates how the mode of transaction can influence the extent to which professional service firms can establish the hierarchical division of labour between offices that Moulaert, Martinelli & Djellal (1991) identify. He suggests that the highly transactional nature of many computer services is crucial in understanding why 'fully-fledged' national and international spatial divisions of labour are uncommon within businesses in this sector, in contrast to others such as banking and accountancy. However, as has already been described, the small geographical size of the UK means that some functional divisions of labour can operate effectively within the national economy. In general, only in the software products segment does the nature of the business allow three groups of tasks, R&D, manufacturing and localisation, and sales, support and training, to be separated spatially on an international basis (see Chapter Two).

6.2.4 The role of the firm in 'constructing' market geographies.

The preceding discussion on the market relations of computer service firms has provided useful insights to the regional variations that exist, but it would be fallacious to assume that such variations can be explained solely by differences in either regional economic structures, or in the structure of the computer services sector itself. Firms can greatly influence the geography of their own markets by the marketing and growth strategies that they pursue, and, ultimately, their competitiveness then determines the extent to which they succeed.

As an example, the managing director of the UK subsidiary of a US software products company based in Hertfordshire suggested that the geography of sales of his company had been partly shaped by the choice of location for branch offices, with clients tending to be within 25 miles of these offices. The selection of Birmingham, Manchester, Newcastle and Edinburgh for branch offices therefore had an impact on the distribution of the 45 per cent of sales that the company conducted outside the South East. The actual decision where to site an office often reflects the management's perception of where market opportunities are strongest, with much market information coming from the existing client base. The decision can also be influenced by where staff or associates are willing to establish a new office. Hence, personal and perceptual factors are important, and the locational strategy of businesses does not always mirror the overall geography of the target market. Such processes can thereby reinforce the uneven development of the industry, with areas that have an established IT reputation and are situated in a healthy regional market, such as Berkshire and Cheshire/Greater Manchester, benefiting disproportionately from investment decisions. Conversely, areas perceived as remote and detached from developments in the IT industry, such as Tyne & Wear, can face difficulties that extend beyond the limited scale and structure of the local market.

From research on the telecommunications and computing industries, Cooke and Wells (1991) propose that firms often grow by increasing the market area in which they operate: '*.....the geographical space of the market is far more important to business practice in general than.....purely locational factors*' (p.353). They propose that firms are entering an increasing number of alliances and joint ventures to increase their global coverage and hence the geographical space of the market (see Section 3.3). Cornish (1994), however, has suggested that this is too simplistic an understanding of what is essentially a two-way interactive process between firms and their markets. She asserts that increasing the market area is only one of many strategies that firms can pursue. For example, companies can grow by increasing their market share within its existing geographical markets. Furthermore, new product innovations can effectively redefine the constitution of markets, and the new sources of demand may well be found in the

local or existing markets. One particular example is the gradual transition of firms from writing custom software to producing software products (identified in Section 4.3.1; see also Cooke & Wells 1991), which can alter the pattern of demand, with products being amenable to longer distance trade.

These different scenarios for firm growth may explain the rather inconclusive results concerning the past and expected future changes to the pattern of sales of the survey firms (see Tables 6.8 & 6.9 below). Earlier analysis (Section 6.2.1) has suggested that in order to grow, firms in the North East have had to look for customers beyond the region, and in particular, in the South East, and this has certainly been the case for the three major computer service companies in the region, QSP, Sage and Mari. In terms of past change though (see Table 6.8), while the results do suggest that ten of the survey firms from Tyne & Wear have expanded outside the county, this level is not significantly higher than in Hertfordshire. The lower degree of change in the firms of Berkshire and Cheshire may suggest that many firms in the former county were established to serve a fairly national market, and those in Cheshire have remained oriented towards regional market. This may be especially true for computer service firms operating in the strong regional market of the South East and London.

Table 6.8: Change in sales pattern since establishment.

Type of relative change	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
No change	28	34	30	35	127
Growth in UK outside home region	8	2	10	5	25
Growth in home county & region	5	0	4	1	10
Growth abroad	2	4	2	1	9
Other	0	1	0	1	2
Total	43	41	46	43	173

Source: Author's surveys.

Again, the expected future growth changes summarised in Table 6.9 show little significant regional variation. The Berkshire results again indicate that the sales patterns of firms from that county are not expected to alter greatly. As the data presented in Section 6.2.1 shows that in general these firms export a relatively high level of their services beyond the South East region, these results support the notion that the many software product firms based there have been oriented to a fairly national market (often as UK subsidiaries) since start-up. Interestingly, some 18 per cent of companies expect their fastest growth will occur abroad, an indication of the trends towards internationalisation described in Chapter Three. Of the 31 companies, 24 were involved in either software products or IT consultancy, confirming that these activities offered the best potential for international exchange, and the vast majority were either independent

firms, or headquarters of UK computer service businesses. Overall, these results would seem to confirm Cornish's (1994) assertion that there is no simple relationship between firm strategy, firm growth and the spatial extent of markets.

Table 6.9: Expected change to the geography of sales.

Most important area of <i>relative</i> growth	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
No change	21	25	21	25	92
Abroad	7	9	7	8	31
Parts of UK outside home region	7	0	7	6	20
Home region as local market	6	2	5	4	17
UK outside home region	2	5	5	0	12
Home region, as branch	0	0	1	0	1
Total	43	41	46	43	173

Source: Author's surveys.

6.3 Size characteristics of computer service firms' client base.

Further information was collected in order to characterise the market links of the survey firms. For example, the sales and marketing methods used are summarised in Table 6.10. The most prevalent method used is the 'mailshotting' (sending of publicity material) of potential customers, usually drawn from an industry register or database, and, in a high proportion of cases, this literature is followed up with a telemarketing call. This approach is especially common in software product companies. In small firms this work is normally undertaken by the same staff involved in providing the software or service, but in larger businesses dedicated telemarketing staff tend to be employed.

Table 6.10: Sales and marketing methods used by survey firms.

Method	Herts.	Berks.	Tyne & Wear	Cheshire	Total mentions
Mailshots	27	24	15	28	94
Telemarketing	25	18	9	20	72
Word of mouth	22	9	21	14	66
Trade Journals / Magazines	15	12	6	12	45
Shows / Exhibitions	10	13	4	6	33
Open days / Seminars	12	6	1	7	26
Personal targeted marketing	8	5	8	4	25
Dedicated sales teams	3	3	8	4	18
Joint marketing	3	2	5	4	14
Local advertising	4	0	0	7	11
Public relations agencies	1	5	3	0	9
National advertising	4	3	2	0	9
Other	0	1	4	1	6
Totals	134	101	86	107	428

Source: Author's surveys.

Interestingly, over one third of companies reported that 'word of mouth' or recommendations and referrals were an important source of new business. National newspaper and television advertising is only employed by the very biggest companies such as IBM and Microsoft, while advertising in the local press and telephone directories tends just to be used by locally oriented companies providing services like training, hardware maintenance and value added reselling. Advertising in IT magazines and client market journals is far more popular, and can be more effective in reaching the target audience. The most apparent regional variation is the low use of seminars, shows and exhibitions by firms in Tyne & Wear. The majority of such events take place within the South East, and hence these results suggest that firms in the North East may be missing out on this form of interaction with clients and competitors.

Table 6.11 (below) illustrates the scale of the regular client base of the survey firms. This was defined as the number of customers that had used the service in the previous year, and would be expected to use it again the next year. In the slightly different case of software companies, the number of clients using the software and with ongoing service contracts was added to the new clients obtained during the 12 months prior to the interview. Many software companies gain a substantial proportion of their revenues from the annual licenses and support contracts for existing clients, ranging from around 30 to 70 per cent of the total depending on the company's stage of development. Overall, there is a clear relationship between the size of the client base and the size of the computer service firm, with, as would be expected, larger firms having a greater client base. However, the size of client base also seems to vary between the different subsectors of computer services. In particular, software product and value added reselling businesses tend to have a larger number of customers due to the standardised 'product' nature of the activities.

Table 6.11: Scale of the regular client base for the surveyed firms, by size category.

Firm sizeband	1-9 clients	10-49	50-99	100-249	250-499	500-999	1000+	Total firms
1-10	11	16	15	8	6	2	2	60
11-49	3	17	13	13	11	3	9	69
50-99	3	2	0	4	3	5	2	19
100-499	1	4	0	3	6	2	4	20
500+	0	0	0	0	0	1	1	2
Total	18	39	28	28	26	13	18	170

Source: Author's surveys.

As a result, many large software product companies never actually see their end clients. Sage, for example, sell their accounting software through 2000 dealers with over 4000 separate UK outlets. These dealers range from high street retailers to dedicated resellers

with a designated geographical market area. Sage staff only have contact with end consumers when providing telephone support. Similarly, SCO (The Santa Cruz Operation) sell their UNIX operating system via a network of value added resellers, hardware vendors and systems integrators, and the managing director estimates that over 80000 establishments use the software in the UK. As a consequence of this reseller chain, the majority of the marketing that SCO undertakes is directed to the rest of the IT industry. Providers of more specialised software that needs any degree of tailoring to customer requirements tend to sell direct to their client markets, although smaller firms may employ agents or resellers in overseas markets. Firms also benefit in that they can often gain revenue from a range of support services such as training, consultancy and system modifications, and Clarke (1994) suggests that this is particularly important as profit margins on the software products themselves continue to fall.

Table 6.12: Survey firms sales by client size categories.

Size category of computer service firms	Average percentage of total number of clients in these size categories				Total
	small 1-19 empl.	medium 20-99	medium-large 100-999	large 1000+	
1-10	24.4	19.2	30.1	26.3	100.0
11-49	7.7	23.0	32.9	36.4	100.0
50-99	8.7	8.7	29.1	53.5	100.0
100-499	6.7	11.7	38.2	43.4	100.0
500+	2.5	2.5	25.0	70.0	100.0
Average	13.6	18.6	32.0	35.8	100.0

Source: Author's surveys.

The survey firms' sales can also be disaggregated by the size of the client firms (Table 6.12 above); it should be noted that these figures represent proportions of the *total number of clients*, and not of total revenues. Again, the dominant relationship is that large computer service firms gain a higher proportion of sales from large clients than small computer service companies. In particular, for the very large establishments in the survey (over 500 employees), around 70 per cent of their clients were large, as defined here (over 1000 staff). Clarke (1994) found in Scotland that only a small number of software firms aim their services or products wholly or partially at small businesses. However, he also concluded that, when serving larger or 'blue-chip' companies, small companies were still confined to small value contracts, with only 12 of the 75 surveyed independent firms recording an average contract size of over £50000, as compared to 12 out of 15 branches of larger companies. As a consequence, small firms often have to increase their market area in order to grow early in their life cycle. While small firms may not lack technical sophistication, larger UK and multinational organisations can bring economies of scale to bear, and tend to win the role of prime contractor for many schemes. Hence, if the data in Table 6.11 was weighted to indicate the proportion of

overall revenues, while the results for the larger computer services would be skewed even more towards large customers, those for smaller computer service firms might be less affected, with the average contract size remaining small for all sizes of clients.

With only a small proportion of survey firms having ten or less clients (11 per cent), the general level of dependency of companies upon one or two key customers is quite low (see Table 6.13 below). Only nine of the 169 businesses that responded had relied on their largest client for over 50 per cent of their revenues in the year prior to the interview, and only 20 derived more than 30 per cent. Of the former nine firms, eight have less than 25 employees. Custom software, consultancy and systems integration are the main activities that are susceptible to a high degree of dependency, due to the contract nature of the work. This means that smaller firms can be working on just one or two projects at a time, and failure to find new work at the end of large schemes can dramatically affect the overall revenue levels.

Table 6.13: Proportion of total revenue from largest client, for surveyed firms.

Firm sizeband	<10%	11-30%	31-50%	51-80%	80%+	Total firms
1-10	33	15	5	4	3	60
11-49	52	13	3	1	0	69
50-99	15	1	1	0	1	18
100-499	16	2	2	0	0	20
500+	2	0	0	0	0	2
Total	118	31	11	5	4	169

Source: Author's surveys.

In conclusion, this short section has illustrated that the characteristics of the customer base in terms of its overall scale, level of bias to large schemes, and client firm size balance are largely determined by the size of the computer service firm, and its main subsector of activity. The next section will consider to what extent the provider-client link depends on information technology once established.

6.4 The technology of market links.

A central feature of the computer services industry is that, despite the huge advances in the sophistication of communications technologies over the last two decades, the sector still exhibits a sustained pattern of uneven spatial development. While in theory many computer service firms could be located anywhere in the UK and provide their service remotely, in reality, as has already been described in Section 4.1, decentralisation from the core South East region is proving to be highly limited. Table 6.14 (below) illustrates how the surveyed firms perceived the importance of remote links (other than normal telephone lines) to their overall service. Surprisingly, over one third of managers felt

that such links were of no importance to their firm at all, and only 28 per cent recorded that they were fairly or very important. There appears to be little regional variation in this pattern, except in the case of Berkshire, where over one quarter of firms felt such links were very important. This essentially reflects the high level of software product companies in this county, with firms oriented to providing software based services being the main users of remote links. Businesses in some subsectors such as training and recruitment have no need for such services, while more hardware related activities, such as independent maintenance, value added reselling and network services generally have to provide an on-site service.

Table 6.14: The technology of market links.

Importance of remote links	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
Not important	18	11	18	15	62
Slightly important	11	10	9	11	41
Fairly important	8	9	10	10	37
Very important	6	11	8	6	11
Total	43	41	45	42	171

Source: Author's surveys.

The most common use of telecommunications links to clients by software oriented firms is in providing what is often termed 'remote diagnostics'. This involves staff in the computer firm establishing a live link (or 'logging in') to the client's computer system to upgrade software, or more commonly, to detect and solve any problems or faults. Such links are usually established via modems, although more sophisticated forms of data transfer such as ISDN (integrated services digital networks) are slowly becoming more common. While much software can in theory be dispatched and installed remotely, most companies providing business systems install the software in person and provide initial training, and then subsequently provide a greater proportion of support remotely. Interestingly, however, a large proportion of support and 'trouble-shooting' is still carried out over the telephone, with staff 'talking' clients through their problems. For standardised software products sold through a reseller chain, telephone support is often the only back-up for clients; for example, Sage employs over 100 telephone support staff in Newcastle. While such support centres could be situated in a wide range of locations, they tend to be located along with the headquarters, marketing and training functions. In terms of the foreign companies that dominate the products subsector, this usually means a South East location.

Table 6.15 (below) summarises the level of use of telecommunications (other than standard telephone lines) in the survey firms, with some 60 per cent using no further services. For many small firms, the costs of establishing more advanced links such as

ISDN still appear to be prohibitive. The level of uptake among firms is largely a function of the size and nature of the firm, with large, international businesses using a wider range communications systems. Interestingly, much of the technology is used for internal communication between different offices, as the system can more easily be standardised and made secure (Li 1995). To establish links with customers using systems such as videoconferencing and ISDN requires considerable investment by the clients themselves, and further resistance may emanate from client firms who are often reluctant to allow remote access to their networks for confidentiality and security reasons. In general, despite improvements in telecommunications services meaning that links are increasingly good quality and relatively cheap, computer service firms appear to be far slower at establishing remote links, especially *to clients*, than the technologically oriented nature of the business might suggest. Such evidence confirms that new information technologies must be considered as only an enabling factor rather than a crucial determinant of location (Illeris 1989), and in practice only offer limited potential for accessing remote markets.

Table 6.15: The use of telecommunications services by surveyed firms*.

Use	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
None used	26	25	24	28	103
Services used	17	16	22	15	70
Total	43	41	46	43	173

Source: Author's surveys.

* Other than standard telephone and fax connections. Services used include leased lines, videoconferencing, and ISDN (secure, wide waveband data transmission).

6.5 'Backwards' and 'horizontal' linkages in computer services.

As the opening paragraph of the chapter illustrates, the uneven development of producer services may be partly attributable to backward, as well as forward, or market linkages. As Coffey (1992, p.141) states, *'like manufacturing, the production of intermediate-services requires a particular mix of inputs. The spatial proximity between producer services and the sources or creators of knowledge, information and technical ability is crucial'*. As Michalak and Fairbairn (1993) note, the organisational developments within producer services sectors themselves have been largely neglected by producer services research, with most work concentrating on the organisational dynamics in other sectors that are promoting the growth of these intermediate services. Using evidence from the four county survey, this final section of the chapter will suggest that for this particular sector, spatial proximity for backwards linkages to suppliers and 'horizontal' links to other IT companies is not perhaps as important as the market links already discussed.

A key indication of the importance of backwards linkages in producer service development is the high proportion of services from surveyed establishments that are

supplied to other business service firms (as described earlier in this chapter; see Section 6.1). In one of the few studies to consider the supplier linkages of producer service firms, Michalak and Fairbairn (1993) found that around half of computer service firms were involved in subcontracting in their survey of businesses in Edmonton, Alberta. This was a lower proportion than in the architecture, engineering and R&D, and marketing and advertising sectors, but higher than in the legal, accounting, and management services sectors. For the authors, this suggests that the types of producer services that significantly contribute to the competitiveness of other businesses are themselves the most prone to subcontracting, and the resulting mesh of interconnections can be characterised as a '*complex of corporate services*' (p.774). Interestingly, Michalak and Fairbairn found that firms in the computer services sector were the most dependent on non-Edmonton based firms, with just over a quarter of business being subcontracted to companies outside the metropolitan area. In terms of the overall inputs of goods and final services to producer service firms, computer services were the least dependent on local inputs, with some 36.4 per cent of inputs coming from outside the city. These results indicate that computer service firms exhibit a relatively low dependence on local subcontractors and suppliers compared to other business service sectors.

Table 6.16: Subcontracting relationships of the surveyed firms (multiple response).

Type	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
None	10	13	20	16	59
Hardware support / maintenance	15	9	9	7	40
Networks and cabling	10	5	9	10	34
Contract training staff	4	8	4	4	20
Contract development staff	6	4	3	2	15
Hardware provision	5	2	3	2	12
Advertising / telemarketing	2	3	2	3	10
Software development companies	1	4	0	2	7
Consultancy	1	3	3	0	7
Other	2	1	2	2	7
Data entry / data processing	0	0	3	1	4
Public relations	2	0	0	1	3
Software maintenance	0	0	2	1	3
Total	58	52	60	51	221

Source: Author's surveys.

To investigate backwards linkages, the survey firms were asked about any tasks they subcontracted apart from standard legal and accountancy activities (see Table 6.16, above), and just under two thirds of firms were found to subcontract some kind of operation. The most common functions to be subcontracted were the support and maintenance of computer hardware (23 per cent of firms), and the provision of networks and cabling (20 per cent of firms), both being other types of computer services. In the case of the former activity, computer manufacturers are increasingly providing cover for

their hardware, and hence the proportion of business being subcontracted to dedicated computer maintenance firms is declining. However, hardware companies and value added resellers may themselves subcontract work to maintenance businesses to achieve complete geographic coverage of the country. Individual contract staff are also widely used in the industry, especially to undertake training and programming. By taking on individuals with short term contracts, firms can compensate for fluctuations in demand for these two skills. Evidence from the survey suggests that firms with less than 50 employees are most likely to employ contract staff, as they do not have enough employees to adjust for shifts in demand internally. Among the other functions that are subcontracted, external marketing and public relations companies tend to be employed only by the very largest computer service companies.

Interestingly, Table 6.16 indicates that there is hardly any regional variation in the level of subcontracting by computer service firms, which in turn suggests that the availability of such businesses will have a limited locational influence for computer service companies. Indeed, the survey evidence strongly supports Michalak and Fairbairn's (1993) assertion that computer services are not strong *local* purchasers of services. Not a single company responded that the local availability of suppliers or potential subcontractors was important in the locational decision, or furthermore, was crucial to the firm's subsequent growth and development. The most commonly externalised services, hardware maintenance and network services, were subcontracted to a mixture of local and non-local firms, of varying sizes. The survey results were inconclusive as to whether branches tended to procure services via their headquarters, with evidence of both national agreements established by headquarters, and local arrangements initiated by branches. While independent firms tended to subcontract to local suppliers, a pattern in establishments of different status was that, in serving distant clients, companies often employed maintenance or networking companies close to the clients. While the overall balance of local to non-local procurement may be similar to that found by Michalak and Fairbairn, these results suggest that in reality the geographic pattern of the linkages is highly flexible and may vary within establishments depending on the location and type of client.

Analysis of the horizontal linkages of computer service establishments to other IT businesses produces a similar picture (see Table 6.17), with regional variation within the survey results again being limited. Overall, 107 of the survey establishments (62 per cent) engage in some kind of formal link or joint venture with other IT companies, and in general, larger firms undertake more joint ventures. The most common kind of scheme undertaken was some kind of joint marketing or selling, with firms offering the services or products of other IT companies in conjunction with their own core activity. These are very often mutual arrangements, and also frequently occur between hardware

and software businesses or total systems businesses. For example, a software house may always recommend a certain type of hardware when required, and in return the hardware company may pass on enquiries for a particular niche of software. Whether the firms involved actually supply one another's product or service themselves, or refer the client across, depends on the individual circumstances.

Table 6.17: The types of main joint venture activity undertaken by the survey firms.

Type	Herts.	Berks.	Tyne & Wear	Cheshire	Total firms
None	22	11	16	17	66
Joint selling / marketing	7	14	11	16	48
Normally prime contractor	8	2	5	7	22
Normally sub-contractor	3	11	3	1	18
With hardware companies	2	1	5	1	9
Consortium bids / joint research	1	2	3	0	6
Other	0	0	3	1	4
Total	43	41	43	46	173

Source: Author's surveys.

The other major type of link is the prime contractor / subcontractor relationship introduced earlier. For many large complex IT schemes, groups of companies bid together under the management of a prime contractor. The prime contractor is normally a large national, if not multinational, IT firm, bringing both economies of scale and credibility to the bid. The prime contractor can be a hardware firm, a software or systems integration company, or an IT based consultancy such as Andersen Consulting. The companies shown here as 'normally a sub-contractor' represent both the hardware maintenance and networks services companies described above in the discussion of subcontracting trends, and software and total systems providers that are not large enough to take on the prime contractor role. A further nine companies are involved in fairly equal relationships with hardware vendors, a type of venture that Sole and Valls (1991) term 'co-contracting'. The results also indicate that joint research and product development is fairly uncommon between computer service providers, especially when compared to the number of agreements in the hardware industry (Cooke 1988), reflecting the 'service' nature of many of the activities.

Again, it is the geography inherent in these links that is particularly interesting. As with subcontracting links, the survey firms did not cite the need for proximity to other IT businesses as an important locational factor or influence on development. While many links involved businesses in the South East due to the national structure of the IT industry, longer distance links were also common. In particular, joint selling agreements do not require long term close interaction. In the case of large, prime contracted schemes, much of the joint work is often done at the client's site. Regional variation in

the pattern of linkages is limited, although the Berkshire firms may exhibit a slightly higher level of involvement in joint ventures. While many firms recognise the image and prestige benefits of a Berkshire location (see Table 5.14), the actual level of concrete links to other local companies is low, as in the other three counties. When coupled with the relatively high degree of spatial mobility exhibited by computer service sales (Section 6.2), these results cast doubt on theories of growth that recognise locally-based flexible production districts (e.g. Scott 1988a, 1988b). Future research should perhaps concentrate on identifying the informal links and networks of informal contacts that exist, and how these links actually influence the overall development of businesses (Cornish 1994). However, while many interviewees spoke of having friends in local businesses, there was little evidence of crucial exchanges of ideas or information.

6.6 Conclusion.

This chapter has characterised the market linkages of computer service companies, and the regional variations within these patterns, in particular in terms of the sectoral and spatial constitution of the markets. Two crucial determinants of these regional variations are the status, and subsector of activity, of the individual computer service firms that make up the overall picture. Regional variations in these two variables are themselves intimately linked to the historical development of the industry and the structure and hierarchy of the UK economy; for example, the headquarters functions of foreign computer service firms tend to be situated in the core South East region. The chapter has also indicated that localised links to partner and supplier firms do not appear to be an important influence on the development pattern of the sector.

In combination with the analysis presented in Chapter Five, these conclusions have important implications for understanding the uneven development patterns in advanced producer service sectors. The agglomeration economies attributable to producer service firms in certain locations (Martinelli 1991, Coffey 1992) are in reality difficult to separate from other locational and structural influences (Phelps 1992). While the scale and nature of the local and regional markets in which firms find themselves can affect their success and spatial development strategy, the underlying economic structural conditions that promote or hinder the incubation and growth of computer service firms appear to exert the most powerful influence on the uneven spatial development of the industry. This creates problems for peripheral urban areas such as Tyne & Wear, where growth in the IT services industry is restrained by the small size of both the indigenous IT industry and the local market.

Overall, this analysis casts doubt on theories of regional economic development based purely upon the agglomeration economies created by close proximity to markets and suppliers, such as the flexibility thesis (see Section 2.4). For example, while the M4

corridor is touted as an exemplar of a new industrial space built upon flexible inter-firm relations and low transaction costs, the survey evidence suggests that the main factors determining the development of the computer services industry in the area are its historical links to the hardware industry, and the overall attractiveness of the location to US software product companies. This growth has been underpinned by the highly qualified labour market, the environmental qualities and transport links of the area, and the strong regional market of the South East. Local linkages to other IT companies and producer services firms are fairly limited, and are more confined to the South East region in general than to any specific local economy. This would accord with Allen's (1992) notion of a regionalised mode of service growth in the core region, rather than the development of any more localised growth districts. The theoretical issues raised here will be discussed further in the concluding chapter.

The increasing internationalisation of the computer services sector (see Chapter Two) also casts doubt on the emergence of any self-contained growth economies; the next chapter will consider in detail how large computer service firms are re-organising spatially and structurally in response to the requirements of international clients, and how these firms contribute to uneven development.

Chapter Seven: Explaining uneven development III - the spatial restructuring of large firms in the UK.

'Although the UK computer services industry does have a high rate of new firm formation, there also exists an important set of elite multinational computer service companies operating in the UK market which appear to be holding onto and strengthening their market position' (Howells 1987, p.498).

7.0 Introduction.

In value terms the provision of computer services in the UK economy is dominated by a few large businesses, as identified in Section 4.3.2. Howells, above, describes the situation in 1984, whereby the top ten computer service suppliers in the UK controlled some 22.1 per cent of the total market. In the subsequent decade, the position of the leading companies strengthened even further, with the top ten firms accounting for 33.0 per cent of the UK market in 1994 (Holway 1995b), and thus it is crucial to consider the spatial and structural dynamics of these influential businesses when interpreting uneven development in this sector. Furthermore, as introduced in Section 3.1, the largest computer service firms are increasingly internationalising and operating on a global basis, and hence organisational change in the UK operations of these firms will in part reflect the internationalisation strategies of the overall businesses. In general, there appears to be a shift in emphasis from geographically-based national divisions of labour, to functional groupings of activity organised at an international (usually continental) level.

The nature of the restructuring processes undertaken in response to the increasingly competitive and international nature of computer service markets, and their spatial impacts, will, however, depend partly on the origins and historical evolution of the businesses concerned. Hence, this chapter will firstly use case studies to analyse the central processes of company development and locational change for five key types of computer service business (introduced in Section 4.3.1); the established hardware giants, outsourcing-led corporations, traditional computer service firms/systems integrators, software product based companies, and international IT consultancies. In the second and third parts of the chapter, two key (already introduced) elements of the large firm dynamics in the industry will be considered in more detail, namely strategic alliances (see Section 4.3.3) and the rise of facilities management (see Section 4.3.4). The information presented in this chapter is derived largely from unstructured interviews with managers from nine of the top 12 UK computer service suppliers in 1994 (see Table 4.5), supported by various company publications and press items.

7.1 Case studies of large computer service firm restructuring.

While the companies in Table 4.5 are ranked according to their UK revenues, the top suppliers also dominate the industry in employment terms. Table 7.1 (below) shows the employment levels in the nine surveyed firms, with the total of 51000 representing just over one quarter of the total employment in the sector at the time of interview (NOMIS). Of the remaining 'top 12' firms not interviewed, Microsoft (UK) employ around 600 staff and AT&T Istel provides a further 1300 jobs (CSSA 1995a). However, it is not possible to give an accurate employment figure for the ACT Group, due to restructuring following the merger with the Misys Group in 1995.

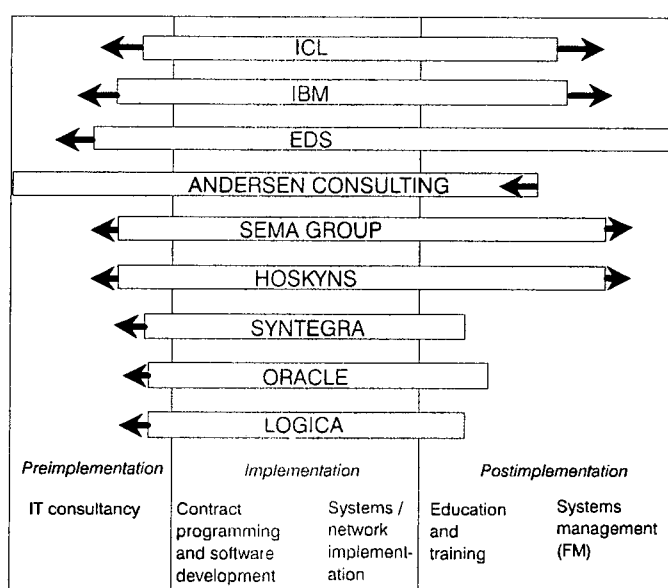
Table 7.1: Large firm employment levels in the UK.

Company	Employees*	UK revenues in 1994 (£m)
IBM	15000	365
ICL	12000	455
EDS	8500	310
Andersen Consulting	3800	275
Hoskyns	3700	197
Sema Group	3200	223
Logica	2100	134
Oracle	2000	166
Syntegra	1500	179
Totals	51000	2304

Source: Author's surveys & Holway 1995b.

* At time of interview; November 1995 to January 1996.

Figure 7.1: Service diversification among leading computer service providers.



Source: Author's interviews and IDC, in Gentle & Howells 1994, p.314.

Figure 7.1 (above) illustrates the diversification strategies of these key businesses. The computer services market can be represented as a continuum, from pre-implementation consultancy, through systems design and implementation, to systems management and maintenance. The diagram highlights two important trends within this range. Firstly, most firms are increasingly trying to target strategic and IT consultancy operations. While computer systems themselves become less profitable and more standardised, consultancy activities remain highly profitable, with a strong 'value-added' component. Secondly, there appears to be a split between firms that are targeting the rapidly expanding IT outsourcing market, such as EDS, Hoskyns and Sema, and those choosing to concentrate on the design and provision of systems, such as Logica, Oracle and Syntegra. These differences in basic strategy have a major impact on the structural and spatial development of these companies, as the following case studies will illustrate.

7.1.1 Restructuring of the hardware giants.

Throughout the 1980s, hardware manufacturers have faced increasing competitive pressures, associated with the continued long-term decline in the basic price of computers, the rising cost of research and development, and the creation of more open competitive markets due to the gradual demise of non-interoperable standards and the adoption of UNIX and open systems (Gentle & Howells 1994; see also Section 4.3.1). As the profitability of hardware has continued to fall, companies primarily involved in hardware manufacture have sought to expand their related computer service activities, where firms have been able to maintain high margins. This has generally been achieved through a mixture of organic growth and acquisitions, but substantial internal restructuring has also been necessary for the companies to become competitive as international service-oriented businesses. In this section, these processes and their spatial implications will be considered for the two leading computer service providers in the UK in 1994, ICL and IBM, both of which originally grew to prominence by selling proprietary hardware systems and related services and software.

7.1.1.1 The restructuring of ICL.

In 1994, ICL was the largest supplier of computing services and software to the UK market, and the seventh largest in Europe (Holway 1995b). A nationalised concern until 1984, ICL has been majority owned by the Japanese electronics giant Fujitsu since 1990. Although largely financially independent of its parent, ICL's role within the group is now to focus on the European software and services market (Fujitsu has acquired another company in the North American market, Amdahl). ICL has now reached the stage in its development where the company gains more revenue from software and services than hardware (52 per cent to 48), which contrasts with the position in 1985 when hardware accounted for 85 per cent of revenues, of which 70 per cent came from mainframe technology (Corporate Strategy Manager, personal interview 28 November 1995). As

the following discussion will show, this shift in emphasis has increased the relative importance of ICL's locations in the South East.

Up until 1990, ICL was structured as a highly centralised company, focused on three main geographical areas; the UK, Europe and North America. Since then, however, the company has been reorganised into a series of semi-autonomous businesses, each with profit and loss responsibilities. While there were originally 26 such businesses, these have been progressively rationalised so that by November 1995 there were ten main units, organised into three groups, industry systems, services and technology businesses. Table 7.2 (below) outlines this structure and the main responsibilities of each business within ICL. Of the industry and service businesses, only the Retail Systems Group really has a global remit, based on the takeover of the US firm Datachecker, with the other units focusing on European markets or Europe-based multinationals. ICL is, however, trying to develop non-European outlets for its hardware products, essentially using Fujitsu's sales channels.

While ICL has acquired businesses such as CFM and Technology (see Table 7.2) as part of its strategic restructuring, other parts of the company have been disposed of in various ways. A 1994 merger and acquisitions report noted four such divestments in that year alone (Broadview Associates 1995). Firstly, the communications subsidiary was sold to Sanderson Electronics. Secondly, two particular product lines, TeamDistribution and Open Systems Management, were sold to the US software company Computer Associates. Thirdly, GE Information Services bought out ICL's stake in their 1987 joint venture INS, an EDI (electronic data interchange) network services provider. Finally, ICL sold its Guardian Computer Services disaster recovery unit to a management-led buyout for around £24m.

Hence, the structure of ICL is continually evolving, and since late 1995 several further changes have been proposed to reorientate the business still further towards service functions (*Computing* 14 March 1996). The volume products division (see Table 7.2) is to be sold to the parent company Fujitsu, with ICL retaining a 20 per cent share, creating a European PC company reporting directly to Tokyo. Similarly, the majority of the D2D manufacturing arm is to be sold when a suitable buyer is found. Two new divisions will be also created; a global business in partnership with Fujitsu to sell ICL's TeamWare software which has been relatively successful in Europe and Japan, and an interactive services business to exploit developments in Internet and multimedia technologies. These divestments will leave ICL free to concentrate on its target activities of systems integration, multi-vendor support services and outsourcing.

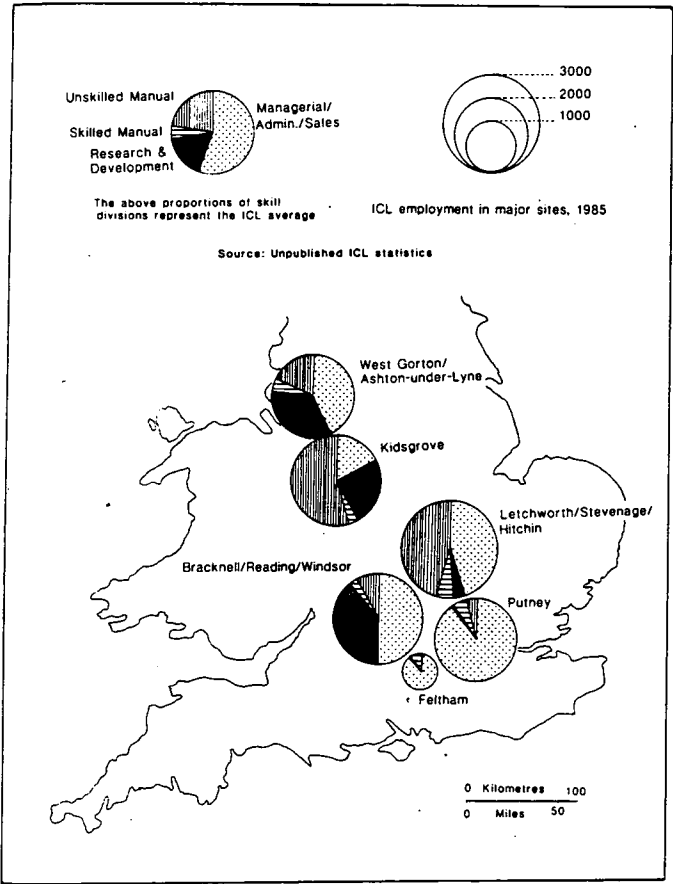
Table 7.2: The organisational structure of ICL, as of November 1995.

Group	Business	Role
1. INDUSTRY	1. Retail Systems	World-wide provision of retail systems. Headquartered from Dallas, Texas, USA, after acquisition of US retail automation company Datachecker.
	2. Financial Systems	Provision of financial systems to UK / European based customers.
	3. ICL Enterprises	Provision of complex, large scale projects for a wide variety of multinational clients, such as major airlines and the National Lottery. Controls 'Peritas', ICL's independent training company.
	4. Industry Systems Europe	Systems integration in a variety of market niches across Europe e.g. local government, health care, manufacturing and travel.
2. TECHNOLOGY	1. High Performance Systems	Manufacture of high performance hardware such as mainframes. Based in Manchester.
	2. Volume Products	Large scale manufacture of ICL UNIX machines, personal computers (PC's) and servers. 290000 PC's made in 1994, in Finland, after acquisition of Nokia Data in 1992. German PC manufacturer Aquarius purchased in June 1995.
	3. D2D	Contract manufacturing of electronics such as printed circuit boards for both ICL and external clients (37 per cent of revenues in 1994). Based in Hertfordshire.
	4. Technology Plc	Multi-vendor personal computer distribution company, purchased in 1992. Started with sole responsibility for ICL's PC distribution, but was unable to meet demand.
3. SERVICES	1. ICL Sorbus	Multi-vendor service arm; primarily European but with a world-wide remit and global clients such as American Airlines and Shell. 50 per cent of turnover from UK at present. Initially a joint venture, ICL bought out Bell Atlantic's share in 1995.
	2. CFM Outsourcing	IT outsourcing arm with a European focus. Strong presence in local government markets. Acquired in 1991, and has increased from £6m turnover p.a. to £120m in 1995.

Source: Author's interview 28 November 1995, *Financial Times* 20 June 1994 & 23 February 1995.

While some analysts such as Richard Holway suggest that ICL is re-aligning itself towards computer service activities too slowly, this in part reflects a deliberate decision on the part of management to avoid the large-scale redundancies seen in other hardware companies in the 1990s, such as IBM, DEC, Unisys, Siemens Nixdorf, Bull and Olivetti, and to try and stabilise the workforce. However, ICL had already experienced considerable job losses in the 1980s (Kelly 1987). The UK organisation bore the brunt of these cuts, with total employment falling from some 25000 in 1980 to 12000 by 1990. Although the mix of skills and occupations is still constantly changing, UK employment has been steady at this level since 1990. ICL employment overseas actually increased over the decade 1985 to 1995, from 6000 to 11000, partly due to the acquisitions of Nokia Data and Datachecker. According to the Corporate Strategy Manager of ICL (personal interview 28 November 1995), there is now a recognition that the organisational structure of the company (i.e. its staff) holds the key to growth and innovation.

Figure 7.2: ICL employment by location and skill division, 1985.

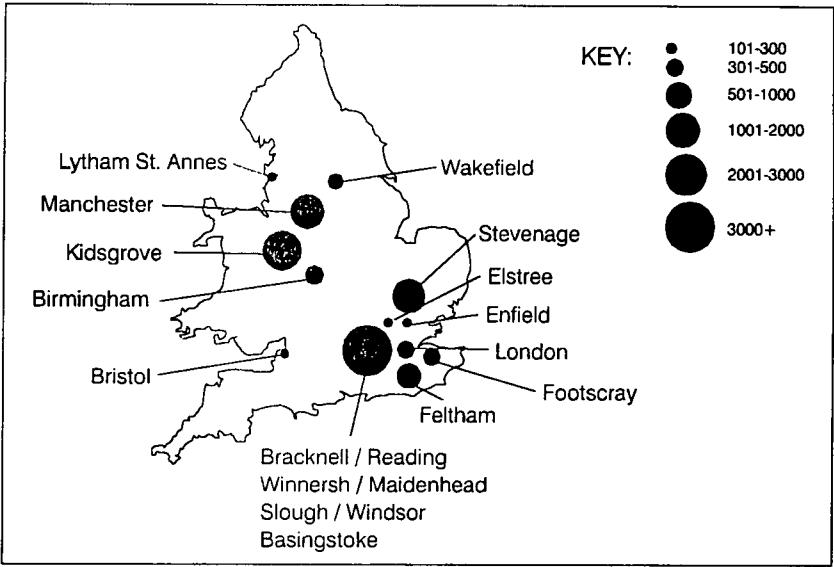


Source: Kelly 1987, Figure 3.4, p.51.

The restructuring of ICL has had a distinct impact on the geography of employment in the company. Figure 7.2 (above) shows the major locations and skill divisions of the ICL workforce as they were in 1985. Essentially, manufacturing was split between sites

in Kidsgrove (near Stoke-on-Trent), Manchester, Letchworth and Stevenage, software and support services were based in Reading and Bracknell, and the HQ was (and still is) in Putney, London. This pattern of offices was a result of a historical sequence of mergers and acquisitions that largely predated ICL's formation as a merger of two large groups in 1968 (see Kelly 1987 for a detailed description). For example, the concentration of employment in Manchester has its roots in Ferranti's computing operation of the early 1960's. The concentration of computer software service employment in Berkshire is the result of a locational decision taken during early rationalisation (1968 to 1971) based largely on the availability of skilled labour. By 1985, the manufacturing operations in Manchester, Kidsgrove and Letchworth had already shed 1000 jobs each since 1981 (Kelly 1987).

Figure 7.3: Major ICL UK employment centres (>100 staff), June 1996.



Source: Unpublished ICL statistics.

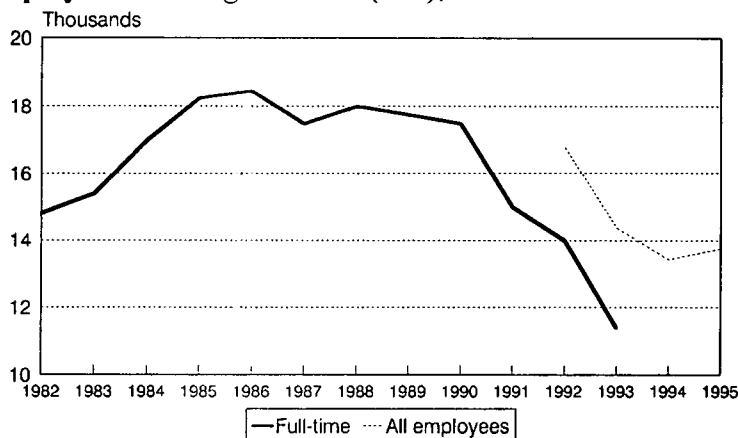
Figure 7.3 (above) shows the distribution of ICL's UK employment in 1996. The most noticeable difference when comparing the map with Figure 7.2 is that the shifting emphasis from hardware to software and service activity has favoured the ICL locations in the South East, and in particular Berkshire. Over the period April 1985 to June 1996, employment in Manchester fell by 750 to around 1500, while Kidsgrove lost some 400 jobs, falling to 2000. The Letchworth site, which employed 1700 staff in 1985, has been closed. Employment in the Greater London and Berkshire area has remained fairly stable at around 5000 in total, but this has become increasingly important as overall employment levels have fallen. Over the eleven year period there has been a marked decentralisation of employment from London, to Berkshire locations in particular. While London accounted for 2800 staff in 1995, this figure has now fallen to around 500. In contrast, employment in the Berkshire complex of offices (plus Basingstoke) has

increased from 2300 in 1985 to 3700 in mid-1996. This data clearly shows how the restructuring of ICL is favouring locations in the outer South East, and hence is contributing to the continued uneven development of the UK industry. Furthermore, as the firm continues to rationalise by disposing of hardware operations and acquiring software and service concerns, this pattern will develop further.

7.1.1.2 *The restructuring of IBM since the mid-1980s.*

IBM (UK) is undergoing a similar process of strategic realignment. Figure 7.4 illustrates the employment impacts of the ongoing restructuring process, with some 6000 permanent jobs having been lost since the employment high-point of the mid-1980s. Up until this time, IBM was able to proudly boast that in seventy years of European operations it had never made any workers redundant. Worldwide, the company has now cut its workforce by about 86000 to 215000 (*Financial Times* 5 June 1995). However, with revenues of over \$70bn in 1995, IBM is still clearly the largest IT company in the world. In terms of outsourcing and systems integration, its 1994 revenue of \$9.5bn was second only to the \$10bn earnings of EDS. Furthermore, IBM is the largest software company in the world, with revenues of \$12.6bn in 1994, although much of this revenue is from mainframe-related software. Table 7.3 gives the breakdown of IBM's 1994 revenue by activity, illustrating the impacts of almost a decade of reorganisation; nearly half (47.5 per cent) of the company's revenues now come from the 'computer service' activities of software, services and maintenance. As with ICL, this shift in focus is favouring locations in the South of England.

Figure 7.4: Employment change in IBM (UK), 1982 to 1995.



Source: IBM company literature.

'All employees' category includes part-time, temporary and fixed term contract employees.

Table 7.3: IBM 1994 worldwide revenues.

Business type	Revenues (\$ billions)	% of total revenues	1995 growth estimates (%)
Services	12.6	18.5	33
Software	12.3	18.1	9
Personal computers	10.6	15.6	13
Maintenance	7.4	10.9	3
Mainframe hardware	6.2	9.1	0
Minicomputers	4.2	6.1	14
Component technology	4.2	6.1	28
Rental / finance	3.4	5.0	-1
Storage products	3.2	4.7	-9
Workstations	3.1	4.6	51
Printers	0.9	1.3	3
Total	68.1	100.0	-

Source: *Business Week* 30 October 1995, IBM Annual Report 1995.

Hence, IBM provides another excellent example of the organisational changes that are occurring as the hardware giants have tried to re-orient themselves towards the high value-added areas of the IT market since the mid-1980s. Kelly and Keeble (1990) have described the organisational structures of IBM that prevailed until this time, many of which are still in place. Firstly, research and product development functions were undertaken on a global scale, based around a network of research laboratories (such as Hursley, Hampshire). Secondly, IBM's manufacturing operations were organised on a continental scale, with most products being manufactured in at least three different plants world-wide (Americas, Far East and Europe). As an example, the manufacturing plant in Greenock, Scotland, today has responsibility for the development, manufacture, fulfilment, servicing and support of IBM personal computers (PCs) for the European, Middle Eastern and African markets. Finally, marketing, at the bottom of the functional hierarchy, was carried out at the national level.

While the manufacturing and R&D divisions continue to be organised on an international basis, IBM has evolved the organisation of its third level functions that require interaction with clients. This is due largely to three forces; the growing importance of high value-added software and service revenues in IT projects, the increasingly competitive nature of the European IT market, and the rapid internationalisation of major clients. Whereas previously IBM relied on revenues from selling and supporting standardised products, the emphasis is now on providing highly specialised, integrated hardware and software systems to international clients. As Kelly and Keeble describe (1990, p.53);

'Geographically, its new commitment to increasing sales of software, computer services and value-added network-based services demands a more local and less global approach. Instead of selling the same

product in all locations, IBM is increasingly selling highly targeted products and services which are able to communicate between all locations.'

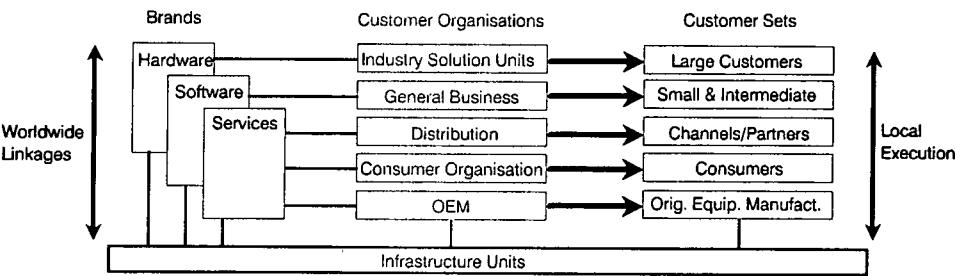
Changes were initiated in 1986 shifting the emphasis within the company from manufacturing to sales and marketing, software and product development, causing both changes in the occupational composition of the workforce, and the first of several waves of job losses. However, widespread organisational restructuring did not occur until the early 1990s.

IBM's 'Blueprint for the 1990s' was introduced in May 1991, and was based on six main principles, which were spelt out by Chief Executive Nick Temple in the IBM (UK) 1991 Annual Report. Firstly, customer contact was to be increased, and secondly, market specialisations were to be identified and developed. IBM would also aim to become a leading consultancy and software company in addition to its hardware business. The efficiency of internal procedures needed to be reviewed, and more power would be devolved to employees. Finally, further emphasis was to be placed on market driven quality. In many ways, the strategy simply reflected a codification of the changes being forced upon IBM by competitive pressures and the changing nature of the IT market. Central to the Blueprint was a comprehensive reorganisation of the company's structure in terms of *service and product provision*, with the old nationally-organised marketing and service-supply functions proving inflexible to their clients' evolving needs (Chairman, personal interview 21 November 1995).

Globally, IBM is now structured as a 'federation' of some 30 autonomous international businesses, which in the UK operate under the umbrella of the holding company, IBM (UK) Ltd. As in the case of ICL, these units are of three main types, industry businesses, product businesses and service businesses. There are 12 industry businesses active in the UK; banking, finance and securities, distribution, government, education, healthcare, insurance, manufacturing, petroleum, process industries, telecommunications and media, travel and transportation, and utilities. These units are responsible for the sales and marketing, and contract management of business in their sector, and co-ordinate their activities at both the European and global level. The 'IBM World Trade' organisation, which historically was responsible for IBM's sales and marketing operations outside North America, has been disbanded. As a result of these changes, IBM in the UK hosts the worldwide headquarters for the travel and transportation industry solution unit, and the European headquarters for the banking, finance and securities, government, education and insurance industry units. The European operations of the manufacturing unit are, however, run from IBM Germany. In addition to the sector units, there is a general business unit in each country which focuses specifically on the needs of small and medium enterprise customers, and units for servicing the needs of partners and

resellers, end consumers and OEMs (original equipment manufacturers). The new customer interface of IBM is summarised in Figure 7.5 (below).

Figure 7.5: The IBM - customer interface.



Source: IBM documentation January 1996.

Supporting these client-facing units are a range of service and software units which can provide skills and services to the various contracts established by the industry solutions units, as well as working on research and development. For example, in the UK, there is a general services unit, a general software unit, and units focusing on cross industry software applications, networking systems, and open client/server software. Any software developed in a particular country is then marketed and used throughout the world; for example IBM (UK) is currently developing software for the utilities market which will be sold globally (personal interview 21 November 1995). Such an approach helps to counteract both the short life cycle of many software projects and the high development costs involved. There are also six product businesses active in the UK, including mainframe, mid-range and PC divisions; these also support the contracts initiated by the industry units, as well as dealing direct with clients and other IT companies which simply want to purchase hardware. Two new divisions, Financial Administration Services and Business Administration Services, were created in the UK in 1994 as IBM has begun to compete in the outsourcing market (*Financial Times* 19 May 1994).

The rate of restructuring within IBM gathered further pace with the appointment of Louis Gerstner as Chief Executive in 1993, following annual losses of over \$6bn in both 1992 and 1993. Gerstner has continued the efforts to create a 'global' company, and has encouraged an ethos of collaboration between the various businesses and regions within IBM, rather than the rivalry that has existed in the past (*Financial Times* 12 January 1995). His central strategic aim is to realign IBM from a mainframe-oriented company (mainframe hardware and associated software and service still accounted for 40 per cent of revenues in 1994: *Financial Times* 5 June 1995) to one focused on providing software and services for desktop and network-based technologies (*Business Week* 30 October 1995). Gerstner has created two new divisions as part of this strategy; firstly an

Integrated Software Group to try and co-ordinate and market new software developed by IBM on a world-wide basis, and secondly, the largely US based Network Applications Services Division, charged with developing services to be used on digital networks (*Financial Times* 17 June 1994).

Overall, these various forms of restructuring mean that it has now become impossible to match the organisational structure of IBM with the geographic pattern of offices. IBM staff are organised to meet each particular contract in the most appropriate location, with the overall balance of industry solution, services and product staff depending on the exact nature of project. For example, after winning a large RAF logistics system contract, IBM (UK) opened an office in Stevenage to be within the required 50 mile radius of the RAF command centre, and there are presently around 600 staff at this site. While staff mobility between different areas of the country is high, in general it is perceived as being expensive, and to improve flexibility there has been an increase in the level of homeworking, concomitant with a growing number of staff being based on customer premises for much of the service provision. IBM is developing 'smart' offices where any employees can 'log-in' and work from. Nick Temple suggests that overall the spatial effects of the reorganisation process have been less than would be expected, and that effectively there has just been a reconfiguration of the existing office network (personal interview 21 November 1995). As an example, the old head office site in Portsmouth has now become a service centre.

The spatial organisation of IBM is changing, however, largely as a result of acquisition and sell-off activity aimed at creating a more service-oriented corporation. For example, the disk drive and networking equipment plant in Havant was sold to its management in 1994, creating a new 2000 employee venture called Xyratex, which now sells to other customers as well as IBM (*Financial Times* 15 December 1994). IBM has also started to pursue a more aggressive acquisition strategy in the 1990s, focusing in particular on software and service companies. In June 1995 IBM acquired the US software company Lotus in a \$3.5bn deal, the largest ever involving software companies (*Financial Times* 12 June 1995). In the UK this resulted in 380 Lotus staff becoming IBM employees, while IBM inherited the main Lotus premises in Staines, Middlesex. As another example, in early 1996 IBM purchased Data Sciences, one of the few remaining major UK-owned computer service companies, gaining 1500 staff from various UK locations, and a further 300 from the Netherlands and Germany.

After a painful period of transition, the prospects now look better for IBM, both in the UK and globally. The company made a profit in both 1994 and 1995, and employment levels are starting to rise slowly again. While IBM and ICL both seem to be restructuring successfully, smaller European hardware firms such as Bull and Olivetti

have struggled to regain profitability. The US company DEC, who once dominated the world hardware industry along with IBM, has been close to collapse. It is perhaps indicative of the changes that these once dominant hardware firms have had to undergo, that DEC's largest and most profitable division, Multivendor Customer Service Division, provides and supports the hardware and software of other IT companies (*Computing* 15 December 1994).

In summary, IBM and ICL are extensively restructuring their international operations in order to shift from being product-oriented businesses to more responsive, service-led firms, and this process is altering the spatial patterns of their employment. As manufacturing operations are wound down or sold off, and the firms pursue both employment growth and acquisitions in software and services markets, the relative importance of locations in the South East is increasing, thereby exacerbating further the existing pattern of uneven development in the sector.

7.1.2 The growth of the large outsourcing-led corporation - the case of EDS.

However, a different pattern of spatial development can be observed in businesses that are expanding rapidly in the outsourcing market, such as EDS. This is one of the largest and fastest growing IT companies in the world, with a total of around 80000 employees and a turnover of \$10bn in 1994. The company was started in 1962 by IBM employee Ross Perot, who saw the potential profitability of providing a complete management service for mainframes to client corporations. This was essentially the start of IT outsourcing, a market that EDS has led ever since.

EDS grew consistently during the 1960s and 1970s, and in 1984 was acquired by General Motors (GM). The two companies forged a strategic alliance in which GM gained access to a world-leading computer service provider, and EDS was provided with the resources to fund its global growth ambitions. Shortly after the acquisition, GM work accounted for some 75 per cent of EDS' turnover, but by 1995 this figure was down to only 35 per cent. EDS's presence in Europe grew rapidly with GM's takeover: for example, EDS was first established in the UK in 1984 to service GM's business. EDS has undertaken a series of acquisitions to supplement its organic growth in Europe, undertaking two strategic purchases in 1991. Firstly, EDS bought SD-Scicon, the UK-based software and systems integration company, to add the high-level technical skills, experience and client list needed to achieve major European growth. Secondly, the McDonnell Douglas systems integration business was purchased to obtain the Unigraphics engineering software range. Other acquisitions followed in Italy and Germany over the period 1992 to 1994. EDS now has operations in 20 European countries, accounting for approximately 18 per cent of the company's world-wide

turnover and over 16000 of its staff. In June 1996 EDS split from its parent company (*Computing* 6 June 1996a), in a deal which netted GM some \$20bn.

After considerable international growth over the period 1984 to 1990, EDS was re-aligned into 47 customer-facing strategic business units (SBUs) in 1990. This structure was designed to effectively address niche markets and allow entrepreneurialism. The structure of EDS in Europe is now divided into three geographic areas; North (Benelux, Africa, Nordic and UK), South (France, Italy, Iberia and Greece) and Central (Austria, Germany, Switzerland, Israel and the emerging markets of Eastern Europe). Within this structure, each major country market represents an SBU. Running across these geographic divisions are several pan-European SBUs including Unigraphics (CAD/CAM software), General Motors Europe and the Client/Server Group. In 1995, EDS evolved its European strategy further by developing several pan-European industry foci in order to continue to align itself with customers' businesses more closely. These new SBUs cover the communications, energy and petrochemicals, financial services, manufacturing, government and defence, retail and distribution, and travel and transportation sectors. Overall, this structure is designed to ensure that there is an appropriate balance between local requirements and pan-European industry needs.

EDS now offers a complete portfolio of IT-based services across Europe, ranging from management consulting through systems development, integration and management, to process management. In particular, the company is almost universally recognised as the market leader in IT outsourcing, whereby EDS takes over responsibility for the effective development and delivery of a customer's information systems. EDS has won many high profile outsourcing deals, including for Rank Xerox, Rolls Royce, Ford and the UK's Inland Revenue (see Section 7.3 & Table 7.6). Indeed, in the UK, facilities management and applications management contracts accounted for £312m of the £525m revenues accrued by EDS in the market in 1995 (*Computing* 6 June 1996b). Globally, approximately half of EDS' 80000 employees have joined the company as part of FM schemes; in the UK this process accounts for around 7000 of the 8500 workforce (UK marketing director, personal interview 29 November 1995). This rapid acquisition of experienced staff is another force behind the increasing specialisation of EDS towards target sectors.

The outsourcing-led nature of EDS' growth in the UK has had a crucial impact on the resulting geography of employment, illustrated in Figure 7.6 (below). EDS has a network of over 50 offices in the UK, with its headquarters in Uxbridge. The European headquarters of EDS is also based in the UK, in Fleet, Hampshire. Many of the industry SBUs in the UK are based on the Uxbridge site (communications and media, financial services, manufacturing, public sector and retail) which employs around 900 staff.

Defence and transport contracts are managed from Hook, Hampshire, energy projects from Milton Keynes, and utilities schemes from Camberley, Surrey. The Hook, Camberley, Fleet and Milton Keynes offices were all inherited from SD-Scicon. In addition, the Unigraphics SBU is based in Woking, Surrey, and EDS has a consultancy operation in central London, due to the takeover of AT Kearney in 1995.

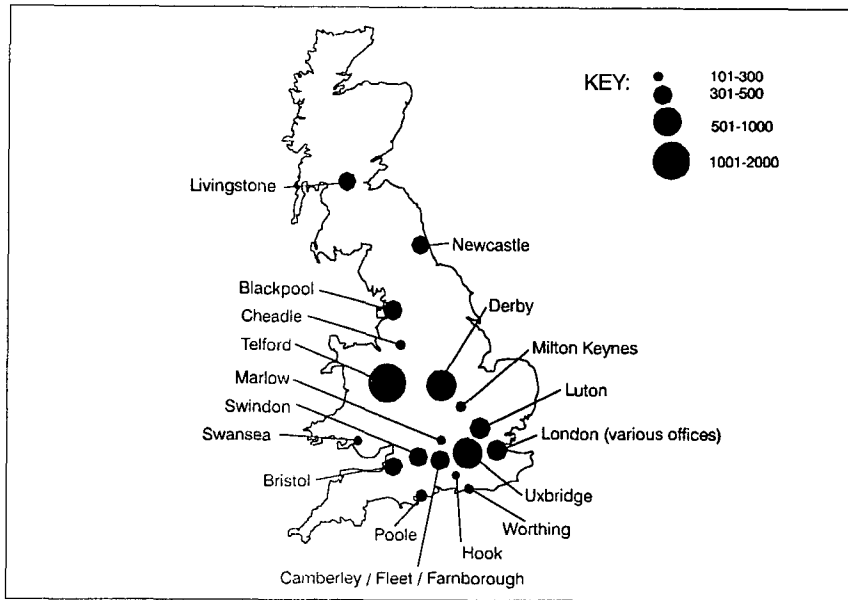
While the majority of employment in these systems integration and systems development units is based in the South East, many of the remaining EDS properties have been leased or purchased as part of FM deals and hence are spread more widely. Table 7.4 lists some of the major EDS employment centres and the contracts they serve. For example, EDS' single largest base is in Telford, Shropshire, where some 1800 staff transferred to the firm as a result of it winning the Inland Revenue contract. While this covers most of the major employment centres (100+), it is by no means an exhaustive list; for example there are more staff serving the Vauxhall contract in Liverpool and Ellesmere Port, and the Inland Revenue Division has its headquarters in Basingstoke. However, the table does give an indication of how huge numbers of workers previously in other sectors have now become EDS employees, and therefore more readily definable as 'computer service' staff. In addition, it illustrates, in combination with Figure 7.6, that the geography of employment in companies such as this is increasingly being determined by where client firms have located their main data centres; this will have implications for IBM and ICL as they become successfully established in this market. The employment and locational implications of the growth in IT outsourcing will be considered more fully in Section 7.3.

Table 7.4: Major EDS outsourcing employment centres in the UK.

Location	Contract	Approx. Staff
Telford	Inland Revenue	1800
Derby	Rolls Royce	600
Luton, Beds.	Vauxhall	500
Blackpool	Dept. Social Security	400
Swindon	Dept. Social Security	350
Newcastle	Dept. Social Security	350
Livingston, Scotland	Dept. Social Security	350
Swansea	DVLC	250
Marlow	Xerox	200
Worthing	Inland Revenue	200
Brent, London	Brent Borough Council	160
Bristol	Rolls Royce	150
St. Helens	Pilkingtons	40

Source: Personal interview, 29 November 1995.

Figure 7.6: Major EDS UK employment centres (>100), May 1996.



Source: Personal interview 30 May 1996.

7.1.3 The internationalisation strategies of traditional computer service firms.

Four of the nine interviewed firms have essentially been computer systems providers since their creation; Hoskyns (part of the international group Cap Gemini Sogeti), Sema, Syntegra and Logica. All four of these businesses are having to reorganise their operations in order to service international clients. As shown in figure 7.1, the former two companies are expanding into the FM business, and as with EDS, their spatial networks are expanding accordingly, while the latter two are concentrating on the provision of highly specialised consultancy and systems, and hence have a more concentrated employment structure. This section will consider the restructuring of these two pairs of businesses in turn.

7.1.3.1 The restructuring of Hoskyns and Sema.

'Cap Gemini Sogeti's over-riding goal is to leverage all its skills, expertise, organisational know-how and human resources to achieve a reliable "glo-cal" presence: global in orientation and scope, local in the specificity of its services' (Hoskyns Annual Report 1993, p.34).

'We want to give the regions some independence.....at the same time we must have a consistent delivery' (Hoskyns Regional Executive Director, personal interview 1 May 1995).

Hoskyns is a fairly broadly based computer services company, obtaining 64 per cent of its revenues from systems integration, 21 per cent from outsourcing, six per cent from both consulting and software products, and three per cent from education and training. If the revenues of the sister company Gemini Consulting are included, consultancy revenues increase to 28 per cent of the group total. Here, systems integration is taken as a broad category, covering all types of systems and software development, along with other professional services.

The firm was established in 1964, and until 1989 was organised on a geographic basis, with each main office being a separate, largely autonomous, profit centre (Corporate Development Manager, personal interview 29 November 1995). The services provided in the various regional offices reflected the nature of both the local market and IT industry. For example, the Manchester branch was biased towards developing manufacturing applications; these tended to run on Hewlett Packard (HP) hardware, due to HP's presence in Manchester. Similarly, the London offices exhibited a strong focus in retail and financial sectors, often running on Digital (DEC) equipment. The resulting structure of the company reflected the gradual, organic nature of its growth. Grouping of functions was extremely limited, the exception being the establishment of two FM data centres covering the North and South of England.

By the early 1990s, however, Hoskyns had become a company of some 3000 people, and organisational problems started to occur. Responsibility within the company was highly devolved, and as a result there was little co-operation between profit centres, and in some cases there was direct competition. As the size of computer services contracts increased, client requirements often covered the remits of several profit centres, and it became apparent that the existing structure was too rigid to allow the necessary co-operation (personal interview 29 November 1995). Hence, in 1993 a radical restructuring scheme named the Genesis Project was initiated, focusing on the need to effectively service large customer accounts. The catalyst for this change was the takeover of Hoskyns by the Cap Gemini Sogeti Group (CGS) in 1990, with the French group wanting to incorporate Hoskyns in a more flexible international structure. CGS' strategy was to develop an organisation made up of three types of operating units; traditional branches serving specific geographic territories, Market Development Units (MDUs) devoted to sales, and skill centres constituting repositories of expertise or specialisations. These units are structured into operational divisions which are grouped by geographic affinity into Strategic Business Areas (SBAs).

Five major sectors are now targeted by MDUs; industry (including the utilities and telecommunications industries), banking and finance, the public sector, retail, distribution and transport, and health care and pharmaceuticals. Sales representatives

from each of these lines of business are present in all the operational divisions of CGS. In the UK (SBA 2 in CGS), there are five such regions or divisions; London and the South East, the Midlands, the North West, Wales and the West, and Scotland and the North East. These are essentially based around the main Hoskyns employment centres of London, Birmingham, Manchester, Bristol and Glasgow respectively, which also all perform the role of traditional branches in attracting and servicing local business. The head manager for each sector MDU has a 'home' office or region. For example, the head of the public sector unit is based in Manchester, while the retail and distribution and transport unit is headquartered in London. These market sector MDUs are supposedly linked to similar units in other countries, thus providing a more effective service to multinational clients. Within CGS, each major SBA specialises in one market sector, finance in the case of the UK.

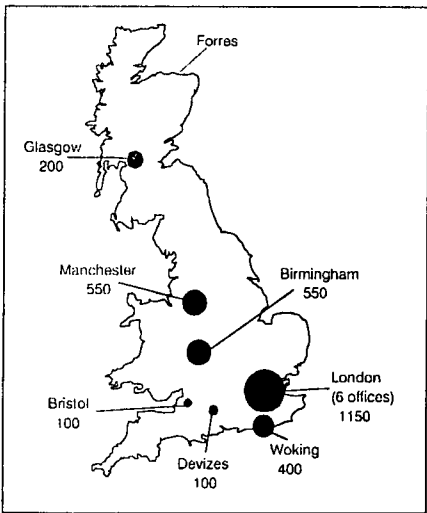
Alongside these sales strata lie the various MDUs responsible for service delivery, providing the skills any client might need, such as mainframe programming, applications development and systems integration. Again such functions are generally available in all five regions, and the manager responsible for each division also has a base office. For example, the Oracle programming leader is based in Manchester. Both sector and service based MDUs have contact with clients and are involved in the marketing of their particular specialisms. Beneath these divisions lie the skill centres, which are tasked with delivering the various services to the contracts signed by branches or the MDUs. In the UK it was originally intended to establish five regional skill centres, but these efforts proved premature due to the large movements of staff such a system would require, and at present there are just two major centres, in Birmingham and Manchester (personal interview 29 November 1995). Overall, while this restructuring means that the major Hoskyns offices still provide a broad variety of services, there is a greater tendency towards specialisation within the new structure, and there is far greater flexibility for serving large clients who require a combination of services in a number of locations. The company has tried to minimise the level of staff relocation required as a result of restructuring, as this was seen as not only expensive, but also as undesired by both employees and clients.

Hoskyns is also attempting to use the restructuring process as a means of improving the relative level of business undertaken outside London and the South East, which dropped significantly during the late 1980s and early 1990s. While Hoskyns was growing at up to 35 per cent annually during this period, business levels outside the core region were stagnant. For example, Hoskyns' clients in Manchester and Birmingham were typically small to medium sized manufacturing contracts, and as manufacturing employment declined in the 1980s, so the business conducted by these two offices contracted. Furthermore, business in the South East was boosted by the increasing number of larger

contracts procured by corporation headquarters, and the growth of IT-intensive business and financial services in and around London. By establishing representatives from all the various sector and service SBUs in each area, and by improving links with the other regional organisations, it is hoped that the Genesis Project will regenerate business for the company in the outer regions, and halt the migration of key staff to offices in the South-East (personal interview 29 November 1995). In particular, regional directors have been appointed, with the responsibility for stimulating and monitoring sales growth in each region, as well as performing another management task in the new three-tier structure.

The employment distribution within Hoskyns is illustrated by Figure 7.7 below. As the preceding account has described, the reorganisation of Hoskyns has largely occurred within the existing office network. The presence of large employment centres in the North-West, Midlands and Scotland reflects both the historic regional structure of the company, and its commitment to building sales outside the South East. Having a well established office network also reflects the need to service FM deals that are won. For example, the British Gas contract won by Hoskyns in 1995 added some 600 staff to the total, many of which are now attached to the Manchester office, and a further 300 employees have been recruited for the project by Hoskyns. Acquisition activity is being viewed as the best way to provide the skills necessary for such large schemes, and such deals will continue to alter the geography of the company. Over the period 1988 to 1991 alone, Hoskyns purchased some 18 companies, and the company is looking to expand its portfolio again in the mid-1990s as the economy improves. The company is distinctive in the industry in having a small teleworking based software centre at Forres, Scotland, that presently employs some 50 staff (*Economist* 4 May 1996a).

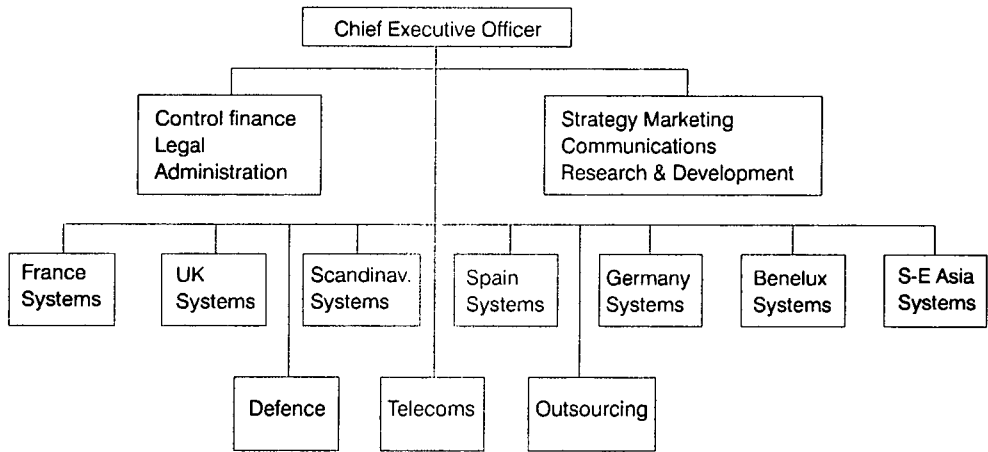
Figure 7.7: Hoskyn's UK employment distribution, late 1995.



Source: Personal interview 29 November 1995.

The Sema Group was created in 1988 by the merger of the CAP Group of the UK, and Sema Metra of France. As a result of the timing of this rationalisation, the new company reviewed its strategy and structure two or three years before other companies were forced to review their operations with the onset of recession and competitive pressures (Marketing Director, personal interview 28 November 1995). In 1989 the strategic decision was taken to focus on three main areas of business; systems integration and consultancy (64 per cent of revenues in 1994), outsourcing (29 per cent) and software products (seven per cent). The software products sold are developed from solutions offered to systems integration contracts. Some 38 per cent of 1994 revenues were derived from the UK market, with a further 27 per cent from France, and 19 per cent from Sweden. The latter share is almost entirely due to the £20m purchase of the IT operations of the Swedish company SKDforetagen in 1993 (*Financial Times* 10 February 1994). The Far East is seen as a major growth area for Sema, but the company is not targeting the already highly competitive IT market in the USA.

Figure 7.8: The organisational structure of Sema Group.



Source: Interview 28 November 1995, company literature.

The organisational structure of Sema is illustrated in Figure 7.8 (above). Although much of the firm's business is undertaken by the various national subsidiaries (e.g. UK Systems), three particular target markets have been identified; telecommunications, defence and outsourcing. These sectors are served by separate branches of the group, which are co-ordinated on an international basis. Hence, there are four main Sema Group companies in the UK; UK Systems, plus the telecomms, defence and outsourcing branches. Many of the defence contracts (both UK and overseas) are handled by BAeSEMA, a joint venture with British Aerospace. The main sectors of activity serviced by UK Systems are the energy industry, the public sector, banking and finance, commerce and services, and manufacturing. The relative balance of the four main areas

of activity varies across the seven main regional markets however. For example, Sema is highly active in the defence market in the UK, while business in South-East Asia is dominated by telecomms clients.

Sema has around 25 offices in the UK, housing 3300 of the company's 8500 staff, and these are mostly specialised centres for one or more of the four main divisions. Many of the BAeSEMA locations are in the south of England, for example in London, Surrey, Bristol, Wiltshire, Berkshire, Somerset and Hampshire, with a further two in Scotland, thereby reflecting the structure of the defence industry in the UK. The telecommunications branch of Sema has premises in Reading and central London, while UK Systems has bases in London, Cambridge, Reading and Wilmslow, Cheshire. All IT consultancy is handled from London. As in the case of Hoskyns, the company has a number of outsourcing data centres across the country, with offices in London (two), Cambridge, Birmingham (two), Gloucester, Liverpool and Glasgow. Further property has been acquired as a result of outsourcing deals, such as offices in Crawley and Andover from the TSB bank.

To briefly summarise, Sema and Hoskyns are pursuing similar growth strategies, focusing on certain vertical markets and key FM contracts. While both businesses have well-established national office networks, due partly to slow, organic growth in the 1980s, the majority of employment is concentrated in London and the South East. However, employment growth outside the South East is being fuelled by large FM contracts, resulting in both the acquisition of new properties and the expansion of existing data centres.

7.1.3.2 Syntegra and Logica: sectorally based growth strategies.

While the locational networks of companies such as Hoskyns and Sema are being extended as they move into the high-growth FM market, there are examples of other companies that are rationalising their operations both locationally and strategically. One such firm is Syntegra, the systems integration division of BT, which was the ninth largest provider of software and services to the UK market in 1994. The origins of the company date back to the privatisation of British Telecom in 1984 (from then on 'BT'). At that stage, the company began diversifying into related markets, including computer related businesses. By 1989, the group within BT providing IT services externally (known as Customer Systems) had grown into an operation covering 42 separate businesses and some 52 locations.

In 1990, a new management team was appointed, charged with rationalising the group in order to create a global systems integration company, and thereby complement BT's aspirations of becoming a globally significant telecommunications provider. The 42

businesses were merged into one, and the 52 offices were rationalised to just five. The emerging company was named Syntegra in 1993. Employment turnover was very high during this restructuring; the staff of 2500 was cut to 1500, of which 1000 were newly recruited. 22 central London offices were closed during the reorganisation, and replaced with a new headquarters in Fleet, Hampshire, where around 600 staff are now based. One office was kept in London, and others are maintained in Newcastle, Brighton and Leeds. In line with the trends in many large IT companies, Syntegra organises its staff on a contract by contract basis, with employees increasingly working on client sites. Around 200 of the total staff are employed on a contract basis to cope with fluctuations in short term demand. The Marketing Director describes the employment structure as '*very flat and very fluid*' (personal interview 12 December 1995), and the five offices are not specialised in terms of the services they provide.

Syntegra's core business is now the management or 'prime contracting' of large, one-off IT projects, with much of the actual hardware, software and network provision being subcontracted to other companies. Indeed, the firm has taken a strategic decision to avoid becoming involved in software products or FM. The firm's efforts are largely aimed towards a number of vertical markets, such as finance, transport, energy and certain manufacturing sectors, along with central government contracts. Within these industries, Syntegra targets three main kinds of client; transnational corporations, major national companies (largely in the UK), and 'extended enterprise partners'. This latter category refers to the establishment of electronic inter-firm networks between large multinationals and their partners, suppliers and clients. While at present the financial sector is the only industry provided for on a global basis, the overall aim is to increase Syntegra's global coverage by focusing on businesses in highly internationalised sectors (personal interview 12 December 1995). The company may also enter into acquisition activity in the near future. At present around 75 per cent of the company's revenues come from the UK, and it has no foreign offices as such, but the company has the advantage of being able to use BT's international communications and office infrastructure.

Another company with a systems integration based strategy is Logica, the UK's second largest independent computing service business after the Misys-ACT Group. Logica is structured around four geographical divisions; the UK (50 per cent of revenues, 9 offices), Europe (25 per cent, 12 offices), North America (15 per cent, 5 offices), and the Middle East and Asia Pacific (10 per cent, 6 offices). Running across these divisions are three main international lines of business, focusing on the banking and finance, telecommunications, and energy and utilities industries, and forming the basis of Logica's internationalisation strategy. Together these three lines provide 65 per cent of Logica's revenues, with the other main target sectors being the media, computing,

defence and government, industry, space and transport. As with Syntegra, Logica is largely avoiding FM contracts, although the company does undertake a limited amount of software applications management. Unlike the BT subsidiary however, Logica does support its project management and systems integration expertise with a host of software product and hardware offerings. The company has had essentially the same focus since its establishment in 1969, but has undergone some restructuring after a period of stagnation in the late 1980s. Under new leadership, the management structure has been simplified and the company is re-focusing around providing global solutions for the three main target sectors.

Hence, although approximately 1700 of Logica's 3800 staff work outside the UK, Logica is trying to expand its overseas business further. Many overseas contracts are at present undertaken in the UK, and as a result there is a high degree of staff mobility. There are already offices in 18 different countries, however, and part of Logica's globalisation strategy is to expand its network of offices in order to provide services as locally as possible. For example, the Prague office is one of the newest, opening in late 1995 (*Independent* 31 July 1995), and Eastern Europe, the Middle East and the Far East are all targeted as regions with great growth potential. Logica is also expanding its overseas business via acquisitions. In 1994, the company bought Precision Software and Synercom, two US software houses at a combined cost of around £5m. Another part of the internationalisation strategy is to promote the 'repeatability' of operations, which entails the transfer of core software across various market sectors and countries. For example, according to the Corporate Development Director, up to 60 per cent of the software can be transferred from a UK banking system to one used in a Middle Eastern country (personal interview 12 December 1995).

While the flexibility of the workforce has increased with reorganisation, the spatial structure of employment in Logica in the UK is, and has been historically, fairly stable. Some 1300 of the 2100 UK staff work in the company's three London offices, and there are five other offices in the South East; three in Surrey, one in Essex and one in Cambridge. The firm is slowly trying to move the core of its employment from central London to the Surrey area. Logica has only three small offices outside the South East, in Bristol, Stockport and Aberdeen. This spatial distribution of employment, with the core of staff being in the South East, with outposts in the North West and Scotland, is a common one in the computer services industry (see Section 5.2.1).

To summarise, both Syntegra and Logica are oriented solely towards high-value systems integration contracts in certain key markets, a fact reflected in their South-East dominated employment structures. This employment pattern reflects the historical roots of both firms in the South East, supported by the South East's disproportionate demand

for large specialised systems, and the fact that the high contract value makes travel to more distant (i.e. non-South East) clients viable (Illeris 1994a).

7.1.4 Software product oriented businesses.

Of the 'top 12' businesses introduced in Table 4.5, there are essentially two that are focused solely on the provision of software products, Microsoft and Oracle. Microsoft is unique amongst the top suppliers in that the company provides shrink-wrapped, completely standardised PC and desk-top software. Microsoft conforms to the model of US-owned PC software product companies introduced in Chapter Three (Section 3.4.4, Figure 3.4), with the majority of the firm's 600 UK employees (based in Reading, Berkshire) undertaking marketing, sales, support and training activities for products designed in the US and fabricated in Ireland. The product nature of the business means that Microsoft was the sixth largest computer software and services supplier to the UK market in 1994, while having a relatively low employment level (see Table 7.1).

However, the majority of software companies do not cater solely for the desk-top market, but instead produce software systems that need a degree of tailoring to a client's specific needs, as well as expert installation, training and support services. Oracle, a Californian based database company, was ranked the eleventh largest computer service provider to the UK market in 1994. Oracle essentially provides a suite of database software systems that run on all platforms, from mainframes to desk-top machines, along with various support services. Table 7.5 (above) illustrates the breakdown of Oracle's revenues in 1995, with almost half (46 per cent) of the total coming from support services such as consultancy and training, in addition to basic sales of software licenses. However, the company is different to the systems integration companies discussed earlier, in that all the services provided relate very closely to Oracle's own product range. A further difference is that approximately 40 per cent of Oracle's business comes from indirect sales channels, such as resellers and distributors who adapt and sell-on Oracle's products to certain niche and geographic markets (Head of Strategic Planning, personal interview 7 February 1996). Oracle became established in the UK in 1984, and this market has now become the firm's largest subsidiary, accounting for £200m (or ten per cent) of the £2bn total turnover in 1995.

During the late 1980s, Oracle maintained growth rates of around 100 per cent per annum, but in the 1990s these rates have fallen to around 50 per cent in the USA, and 35 to 40 per cent in Europe. In response to this slowing of growth rates, Oracle founder Larry Ellison brought in professional managers to run the company's operations in 1991. Since then, Oracle has been reorganising with the aim of becoming a truly 'global' business, which can provide a consistent standard of service to multinational customers in all regions. Whereas previously the various national subsidiaries had operated

relatively freely, they are presently grouped into four geographic divisions; the Americas; Europe, Middle East and Africa; Asia Pacific; and Japan. The long term aim is to reach a structure of some ten equally-sized divisions, of which three or four would be in Europe (personal interview 7 February 1996). While at present all vertical markets are served in each country of operation, Oracle aims to organise such units at a divisional or continental scale in the future. The company will also focus its growth around certain key sector markets which have yet to be revealed, and certain horizontal applications such as finance, human resources and manufacturing packages. Oracle already has global accounts teams working to support major international customers, which can be based in any country. In the UK in 1994, business from such 'named accounts' constituted some 23 per cent of the total revenues.

Table 7.5: Oracle breakdown of revenues for fiscal year 1995.

Product / Service	Revenues (\$m)	% of total revenues
Services (support, consulting and education)	1364	46
Servers (core database software)	1097	37
Tools (data management software)	356	12
Applications (specific packages)	148	5
Total	2966	100

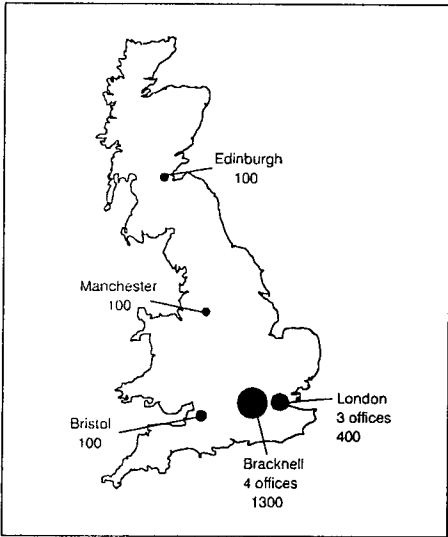
Source: Oracle Corporation Annual Report 1995.

In April 1996, the post of European general manager was scrapped as part of the strategy to centralise global control in California, and increase international sales (*Computing* 18 April 1996). This move was partly in response to the continued slow growth of European revenues. As a result, country general managers now solely have responsibility for sales, with global marketing, consultancy, education and support strategies being decided in the US. Oracle is also trying to progress towards simultaneous, global releases of products. At present, some 80 per cent of R&D is undertaken in the US, with only a limited amount of localisation and application development taking place in the subsidiaries. As a result, products can take up to a year to be transferred from the US to European markets, representing a large proportion of the life of most software releases (*Computing* 25 April 1996b). Like many companies, a further strand of Oracle's growth policy is to undertake acquisitions, and to improve Oracle's market coverage, these will increasingly be of database software companies serving specific vertical markets (*Computing* 15 September 1994).

Figure 7.9 (below) depicts the distribution of Oracle's 2000 employees in the UK, with some 1300 being located in the company's complex of four offices in Bracknell, Berkshire, also the base of the UK headquarters. The majority of consultancy, training and product support is conducted from Bracknell, and the offices in Richmond

(London), and Chertsey (Surrey). In addition there are regional sales offices in the City of London, Bristol, Manchester and Edinburgh. According to Oracle's Communications Manager, Bracknell was chosen as the hub of the company's UK operations due to the availability of large scale office space, the good communications, and proximity to Heathrow Airport (personal interview 8 February 1995). Many of the other US-owned database vendors are also located nearby, such as Sybase (Maidenhead) and Cognos (Bracknell), for reasons already discussed previously (see Section 5.2.1). This South East dominated employment distribution is very similar to those described for systems integrators Logica and Syntegra, but for different reasons. Here, the product nature of the core business means that only limited sales staff are needed outside the main employment centre.

Figure 7.9: Oracle's UK employment distribution, early 1996.



Source: Personal interview 7 February 1996.

Overall, the global software products industry is dominated by US firms (as described previously in Section 3.2), with the majority of such companies choosing to locate the hub of their operations in the core IT market of the South East. However, the level of standardisation of the software products involved influences the extent of the spatial network of such firms. As shown in Chapter Three, firms that produce highly-standardised PC software and sell largely through a retail network (such as Microsoft) often only have a limited presence in national markets. However, when software needs to be tailored for different clients and requires training and installation support (as with Oracle), businesses tend to have a larger and less concentrated employment distribution, although again this is usually focused on the South East.

7.1.5 International IT consultancies.

Multinational IT consultancies are also important suppliers in the computer services market, as illustrated by Andersen Consulting (AC), the fourth largest provider of such services to the UK market in 1994. The company provides just over half the revenues of the Arthur Andersen Worldwide Corporation, which also includes the sister accountancy company, Arthur Andersen. AC alone employs over 40000 staff in 47 different countries, accruing world-wide revenues of some \$4.2bn in 1995. CMG (600 UK IT consultants), Touche Ross Management Consulting (300), Coopers & Lybrand (250), Price Waterhouse (500) and KPMG Management Consulting (400) are other examples of consultancy businesses earning substantial revenues from IT-based contracts (*Financial Times* 22 February 1995). As with Syntegra and Logica, the high-level nature of the contracts undertaken by these companies contributes to their concentrated, South East dominated employment distributions

Three levels exist in the spatial organisation of AC: the world, continental and national scales. A number of activities are co-ordinated at the world level, such as group corporate strategy (with respect to finance, investment, human resources etc.), R&D (consulting and training methods, software development methods etc.) and training. There are three continental or 'regional' divisions in the organisation of AC; the Americas (56 per cent of 1994 revenues), Europe, the Middle East, Africa and India (EMEA: 34 per cent) and Asia/Pacific (10 per cent). These regions were created in 1988, to improve communication between national operations, to define common marketing policies and to strengthen internationalisation strategies (Moulaert 1996). At this level, the key sectors targeted by AC are split into three industry groups; industrial and consumer products (automotive, oil and gas, chemicals, electronics etc.) financial services (banking, insurance etc.) and government and services (defence, utilities, all levels of government, transport, leisure etc.). Various other functional groups have been established at this level, such as software, technology and the three support services, finance, human resources and marketing. Both these and the industry groups each have a managing partner, who on average will spend over half of their time outside their home country.

AC's operations are also divided into different types of services, known as 'product groups'. Four main service lines can be distinguished: strategic services, systems building/systems integration services, systems management services and change management services (see Figure 7.10 below). Although AC is often classified as a management consultancy firm, Figure 7.10 illustrates that a substantial proportion of its core activities relate to the design and integration of IT systems, and their subsequent management. In addition, AC also develops its own software. The organisation of both the industry and product groups is highly fluid in reality. As Moulaert (1996, p.86)

describes '.....such groups have no permanent administration support structure. Most of the time, they are led by a partner on a part-time basis, have an international and changing membership and will be abolished or reoriented when the need arises.' Such an approach gives AC the flexibility to respond to spatial, temporal, and geographic variations in demand.

Hence, how these product and industry groups intersect in the different AC national subsidiaries partly depends on the characteristics of the various national economies (Moulaert, Martinelli & Djellal 1991, Moulaert 1996). For example, in Italy, where the economy is fairly decentralised and exhibits regional specialisations, AC has a relatively decentralised structure with more specialised offices, such as the one in Turin, which focuses on the automotive industry. In France, the company's organisation exhibits a far more centralised structure around the Paris office, which co-ordinates and supports the activities of the other regional offices. However, despite these organisational differences, AC is well known for having a consistent consultancy methodology (the so-called 'Method 1') that is used in all countries of operation, thus facilitating the high degree of staff mobility and flexibility that is a key feature of AC's internationalisation strategy (*Economist* 4 May 1996b). This is also supported by an enterprise-wide human resources and training program.

Figure 7.10: Andersen Consulting service lines.

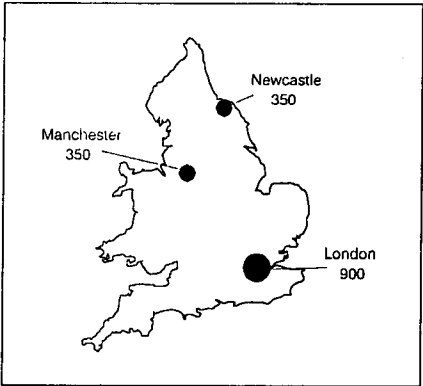
	<i>Strategic services;</i> Competitive and market strategy. Organisation and change strategy. Business operation strategy. Information and technology strategy.	
<i>Change management services;</i> Organisation change. Technology assimilation. Knowledge transfer.		<i>Systems integration;</i> Systems planning Systems design Systems building Systems implementation
	<i>Systems management;</i> Operations and network services. Facilities management services. Applications management. Recovery services.	

Source: Iwabuchi 1992, in Moulaert 1996, p.84, Figure 5.1.

The UK represents AC's second largest national market, accounting for around 13 per cent of worldwide revenues in 1992. The spatial organisation of AC in the UK is fairly centralised in contrast to the Italian case, and Figure 7.11 (below) illustrates the regional distribution of around 1600 of AC's 3800 UK staff. The London office dominates the distribution with approximately 900 staff, including the majority of support functions, and this office is also the headquarters of the EMEAI region. AC then has two main

regional offices, in Manchester and Newcastle. Two interesting points emerge from this map. Firstly, it is impossible to match the whole workforce with AC's three main locations, as over half of the total are based on client sites at any one time. By its nature, management consultancy often takes place at the headquarters of client corporations, perhaps explaining the concentration of office space in central London. Secondly, although there is no regional specialisation within the UK organisation, AC's business is characterised by a small number of large contracts, so that at present the employment in the Newcastle office is dominated by staff working for the DSS at Longbenton (Public Relations Officer, personal interview 30 November 1995). Although AC offers IT outsourcing services, it has yet to make an impact on this market in the UK. The company's recent success in winning the global JP Morgan contract in combination with CSC may change this picture, however, and as AC establishes itself in this sector of the UK market, the number and extent of its offices may grow.

Figure 7.11: Andersen Consulting's UK employment distribution, late 1995.



Source: Personal interview 30 November 1995.

In summary, like many international computer service operations, AC is focusing its efforts towards key vertical markets, and is perhaps unique in the extent to which it strives to ensure a consistency of service across geographic markets. The evidence considered here again confirms that consultancy and high-level systems based companies tend to operate from simple, South-East oriented spatial networks. In addition, the example of AC confirms the increasing levels of spatial flexibility within computer service workforces, with staff continually moving between contracts without having a permanent base.

7.2 The growth of strategic alliances.

As the preceding case studies have illustrated, large computer service firms appear to be engaging in a high level of merger and acquisition activity, both to realign the strategic development of their operations, and to gain access to new geographical markets. In turn, such activity is altering the spatial networks of major computer service suppliers.

As introduced in Section 4.3.3, this is a recognised feature of the IT industry, but Cooke (1992) asserts that merger and acquisition are just two kinds of joint venture or strategic alliance that can be undertaken to counter both the rapid pace of technological change and ever increasing competitive pressures. In this section, other types of alliances practised by computer service companies will be discussed; it is important to remember, however, that such relationships do not seem to depend on spatial proximity (see Section 6.5).

Table 7.6: Classifying modes of strategic technology alliances.

Mode of strategic technology alliance	Organisational interdependence
Joint ventures and research corporations	Large
Joint R&D , such as research pacts and joint development agreements	
Direct investment , minority and cross-holding	Medium
Customer-supplier relations , R&D contracts, coproduction, comakership	
Technology exchange agreements (mutual) , technology sharing, X-licensing, mutual second-sourcing	
One-directional technology flow , second sourcing, licensing	Small

Source: Hagedoorn 1990, in Hagedoorn 1993, p.129, Table 6.5.

Hagedoorn (1993) provides a detailed schema of the different strategic technology alliances that occur in a core technology sector such as the IT industry (see Table 7.6), and also indicates the level of organisational interdependence that these alliances imply. Of the alliances considered by Hagedoorn over the period 1980 to 1989, in the IT industry 45 per cent of agreements related to joint R&D pacts, 23 per cent to R&D joint ventures, 16 per cent to direct investment, and 17 per cent to other kinds of alliances. To give some examples of the scale of alliance activity undertaken by major firms, over the period 1985 to 1989 IBM was involved in 137 alliances and DEC in 92 alliances (Hagedoorn 1993; see also Benassi 1993). However, the inclusion of the major hardware companies in these analyses presents a slightly different picture to the one emerging if just the software and services sectors are considered. The evidence presented in the previous chapter (Section 6.5; Table 6.16) suggests that R&D based agreements are far less common between computer service firms than hardware firms. The most prevalent alliances in the services sector are those which Hagedoorn classifies as requiring only a low level of organisational interdependence, such as licensing agreements and joint marketing.

Another key feature of alliances in the computer services industry is that companies often come together on a contract by contract basis (see Table 6.16), with most of the top 12 UK providers having worked together at some stage. Hence, firms can be

partners, clients, customers and competitors simultaneously, and this form of relationship between the major companies is sometimes described as 'co-opetition'. As the UK Marketing Director of Sema Group suggests, *'no-one these days can fully meet the requirements of the customer - nor should they be allowed to do so'* (personal interview 28 November 1995). As an example, EDS buys large quantities of hardware, rating as IBM's second largest client in the world (after the US Government). EDS subcontracts all of its hardware maintenance, some of which will be undertaken by the service operations of IBM. However, when bidding for large outsourcing and systems integration contracts, IBM and EDS are often in direct competition.

As would be expected, the exact nature of the alliances undertaken by a firm depends on its main focus and strategy. As a systems integrator specialising in project management (prime contracting), Syntegra has relationships with software developers, network specialists and hardware vendors that are subcontracted to in various combinations for separate projects. As both a hardware and services supplier, IBM has relationships with a wide variety of business partners; companies manufacturing IBM technology under license, other IT firms that purchase consignments of IBM hardware, a whole series of sales and distribution outlets for IBM products, various software companies offering software solutions for IBM hardware, and customers of IBM multi-vendor services. Similarly, seeking to collaborate with other IT companies has been part of ICL's strategy for the last decade, and since 1987 ICL has been involved in 30 joint equity ventures, and some 140 to 150 joint marketing agreements.

Hoskyns provides a good example of the range of alliances undertaken by an international computer services company (personal interview 29 November 1995). Firstly, within the Cap Gemini Sogeti Group, Hoskyns collaborates with a variety of Strategic Business Units in other countries. Secondly, Hoskyns has purchasing agreements with a variety of hardware suppliers such as IBM, DEC and Sun Microsystems. Thirdly, the company has relationships with some 20 to 30 software vendors, such as the German financial systems company SAP, which allows them to sell and maintain whole ranges of software products. Fourthly, Hoskyns subcontracts all hardware maintenance to a mixture of hardware and independent maintenance companies. Fifthly, Hoskyns is increasingly establishing joint development initiatives with software developers in the Third World. Finally, as mentioned previously, the company collaborates with its competitors for certain large scale projects.

Very often it is these networks of relationships that link the large providers to the mass of smaller companies in this sector. For example, while software companies are often situated in specific market niches, many small value added resellers, network suppliers, independent maintenance firms and training companies are simply licensed to sell or

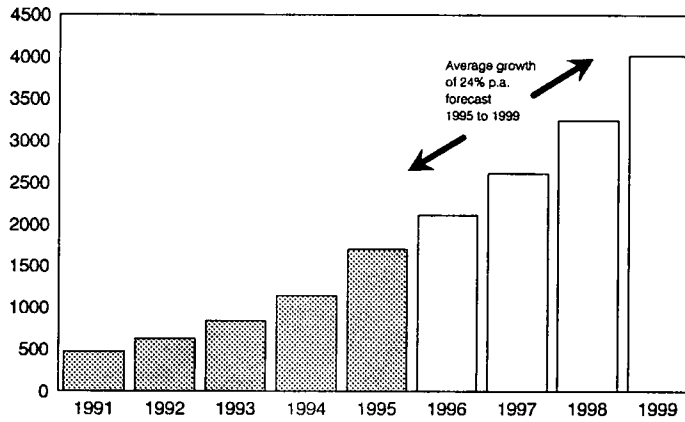
support various products from large multinationals, often in specified localities. The range of alliances operated by the software product company Oracle provide a good example of how a whole network of firms can develop from a market leading, multinational software company (personal interview 7 February 1996). At a global level, Oracle has licensing and marketing agreements with many hardware vendors, along with the major IT consultancies such as Andersen Consulting. Within the various national markets, Oracle then recognises a variety of independent software vendors (ISVs) which develop applications for Oracle databases, usually for specific vertical markets. Finally, there is then a geographically disaggregated network of resellers and distributors, selling on Oracle packages as part of wider product portfolios. In some cases, the ISV model can be taken further, as in the case of London based Soft Systems, who are part of Oracle's Co-operative Applications Initiative Programme (*Financial Times* 6 June 1995). Soft Systems co-operates closely with Oracle's marketing teams and the two companies combine to provide solutions for certain market niches. Sometimes in such dependent relationships the larger company takes a share in the smaller. For example, Nintendo took a 25 per cent stake in the UK games software company 'Rare' in April 1995.

Many computer service companies are now increasingly developing partnerships with key customers. For example, ICL already lists Marks and Spencer, Cathay Pacific and the National Westminster Bank as global business partners. Such relationships may deepen further as a result of the changing nature of the IT outsourcing business, a subject that will be considered in the next section.

7.3 The rise of IT outsourcing (FM).

The case studies presented in this chapter confirm that the expansion of the market for IT outsourcing is one of the most crucial dynamics of the UK computer services industry (see Section 4.3.4). This section will look in more detail at the structural and spatial impacts of this growth trend. The UK now represents the fastest growing FM market in the world, and the development and maturity of this market is second only to the USA. The size of the market has grown by a remarkable 360 per cent over the period 1991 to 1995, and this growth is expected to continue until the end of the century (see Figure 7.12). There are several factors behind the growth in IT outsourcing, but usually the client's objectives are both to control IT costs and to enable the IT function to deliver greater value to the organisation. In contrast with other services that are regularly contracted out, such as security, cleaning and catering, the rate of technological change in the IT industry is a major motivation for many clients, who can subsequently re-focus on their core operations.

Figure 7.12: The growth of the UK FM market, 1991 to 1999.



Source: Holway 1995b, *Computing* 6 June 1996b.

The rapid expansion of IT outsourcing in the UK suggests that in this particular sector, externalisation seems to be the dominant trend (see Section 2.2.1). Some outsourcing contracts, where internal IT departments contract-out for a particular service, simply reflect an externalisation of demand. However, many contracts involve a complete transfer of staff and infrastructure to the computer service provider, thereby representing an externalisation of the whole internal IT function, as described by Howells (1989). To quantify the growth in 'externalised' business, while the UK computer services market has grown from £5.5bn to £9.2bn over the period 1990 to 1995, the proportion of this revenue derived from FM has increased from 8.5 to 18.6 per cent (£468m to £1711m), and estimates suggest that by 1999 the proportion could be near 30 per cent (*Computing* 6 June 1996b). While some of this increase can be accounted for by the fact that firms are now classifying more revenues and activities under the 'FM' heading, for example work that was previously categorised as hardware or software maintenance, the overall trend is undeniable. In terms of the information economy perspective introduced in Chapter Two (Section 2.3), this represents an increasingly important role for the independent computer service sector in the servicing / facilitation / integration of information crucial to the functioning of other sectors.

7.3.1 The markets for IT FM in the private and public sectors.

As illustrated by Table 7.7, there are now many examples of major outsourcing contracts in both the public and private sectors. The table also confirms that the US firms EDS and CSC are starting to dominate the market, replacing the old UK market leader, Hoskyns (see Table 4.12 for the top ten FM providers in 1994). Some of the largest deals in the UK have been signed by various central government departments since the government announced its 'market testing' (competitive tendering) programme in November 1991. This scheme was introduced to improve the cost-effectiveness and flexibility of government IT functions. Over the period April 1992 to January 1995

around £384m of annual business was market tested, of which £317m went to private IT companies with no competition from an in-house bid. A further £18m was won by private companies against in-house bids, with only £49m being retained by in-house providers (*Computing* 19 January 1995). EDS in particular has had great success in winning the major contracts such as the £1.2bn Inland Revenue contract, a 'market test' in which there was no in-house bid. Another scheme to increase private sector involvement is the private finance initiative (PFI) under which companies can bid for large public IT projects in which they must assume any risk or liabilities. In return, the IT companies retain ownership of the systems which can then be sold to other clients. Over £3bn of projects have been earmarked for this initiative, an early example of which is Andersen Consulting's £150m contract to provide an updated National Insurance system (*Computing* 27 April 1995).

While such schemes fit well with the Conservative Government's ideologically-based desires to 'hollow out' the functions of government, many commentators have been highly critical on a number of points. Firstly, there are doubts as to whether the contracts can deliver the promised cost savings. For example, the ten year Inland Revenue contract was supposed to save some £225m, but less than two years into the contract, £263m worth of extra work has already been agreed with EDS, suggesting that anticipating the exact nature of IT requirements into the future is almost impossible. Secondly, there are worries over what will happen at the end of each contract. It is estimated that it could take around 5 years to take the Inland Revenue IT function back 'in house' and there would be huge costs (known as 'switching' costs) to be paid; the cost of preparing the Inland Revenue tender in the first place was £4m alone. Furthermore, the 1800 staff that have transferred to EDS will be well integrated into their new company by the end of the contract, and it may well not be feasible to offer the contract to any company except EDS in 2004. Thirdly, there are concerns about handing the 'machinery of government' to foreign-owned, private companies, and the associated loss of management capability that this entails. Finally, there are debates about protecting the employment rights of staff transferred to computer service companies, many of whom are members of public sector unions. In the case of the Inland Revenue, there were six months of negotiations before EDS reached a single-union agreement with the Inland Revenue Staff Federation, which preserved collective bargaining rights. EDS had never previously dealt with unions in the US (*Financial Times* 5 July 1994).

The government's opening of local government IT functions to CCT (Compulsory Competitive Tendering) has proved equally contentious for similar reasons. Between 1996 and 2000 all except the very small local government authorities will have to advertise the majority of their IT services and accept tenders from external suppliers. Only limited development work and contract monitoring staff will be permitted to

Table 7.7: Examples of recent major IT outsourcing deals in the UK.

Client	Value p.a. (£m)	Duration (yrs)	Total Value (£m)	Supplier	Year awarded
CENTRAL GOVERNMENT:					
Inland Revenue	120	10	1200	EDS	1994
ITSA (DSS)	82	10	820	EDS/Sema/ICL	1995
DVLC	25	5	125	EDS	1995
Scottish NHS	20	5	100	CSC	1995
HM Customs & Excise	14.5	5	72	In-house/Logica	1995
Home Office	10	5	50	Sema	1994
MOD Bureau West	4	5	20	Hoskyns	1994
Bank of England	1.2	5	6	Hoskyns	1992
LOCAL GOVERNMENT:					
South Thames Regional Health Authority	8	5	40	Hoskyns	1995
London Borough of Brent	6.3	8	50	EDS	1995
London Borough of Greenwich	5.6	5	28	CFM (ICL)	1994
London Borough of Southwark	4	5	20	Integriss (Bull) / Datasciences	1995
Bolton Borough Council	3	7	21	CFM (ICL)	1994
Hertfordshire County Council	2.2	5	11	ITnet	1993
PRIVATE COMPANIES:					
JP Morgan*	286	7	2000	CSC / Andersen Consulting	1996
Rank Xerox*	210	10	2100	EDS	1993
British Aerospace	90	10	900	CSC	1994
Roll-Royce Aerospace	60	10	600	EDS	1995
Sears retailing group*	34.5	10	345	Andersen Cons.	1996
Amex banking arm*	23	10	230	EDS	1994
Barclays Bank	20	5	100	Olivetti	1992
British Steel	20	5	100	Hoskyns	1996
Anglian Water	20	10	200	CSC	1995
Ford Europe parts and service	12	5	60	EDS	1994
British Gas	11	5	55	Hoskyns	1995
Airtours	10	10	100	EDS	1996
Massey Ferguson	3.2	5	16	Sema	1994
Woolworths	3.3	3	10	Hoskyns	1993
CO-OP Bank	2.6	5	13	IBM	1994
Galileo (airline reservations)	2.2	5	10	Olivetti	1994
Wesleyan Assurance Society	2	5	10	Hoskyns	1995
Bass (brewing)	1.3	3	3.9	Unisys	1994

Source: Author's interviews, Douglas Eycions personal communication 25 July 1994, *Computing* 23 June 1994b, 30 June 1994, 23 March 1995b, 4 May 1995, 20 July 1995b, 3 August 1995, 23 November 1995b, 14 December 1995, 18 January 1996b, 29 February 1996 & 27 June 1996, *Financial Times* 16 March 1994b, 1 June 1995, 5 July 1995, 7 February 1996 & 14 May 1996, *The Times* 20 November 1992.

* Global deals covering UK subsidiaries.

remain 'in-house' (*Computing* 5 January 1995). Over the period 1989 to 1995 some 49 local authorities awarded FM contracts, either as part of deliberate policy or in anticipation of CCT; interestingly there was only a slight bias to Conservative councils (*Computing* 12 January 1995). At present the leading three suppliers to the local government market are the CFM Group (part of ICL), ITnet and CMG, but as the number of large civil service contracts diminishes, the large US corporations EDS, CSC and IBM will increasingly bid for these smaller contracts (*Computer Weekly* 6 October 1994). For example, in 1995 EDS won an 8 year, £50m contract to manage the IT services of Brent Borough Council. The reformulation of the UK's regional health authorities has created another market for private sector companies.

The size of private sector outsourcing agreements is also continually rising. While all sectors of the economy now appear to be considering outsourcing as a viable option, traditionally manufacturing firms have lagged behind IT-intensive consumer and business service firms in their uptake of FM (CSA Director General, personal interview 25 July 1994). For example, the financial sector is a particularly active outsourcing market with data processing being a crucial back office activity and huge numbers of computer screens being required for retail operations. Indeed IT expenditure can reach 25 per cent of total costs in banks. Unlike in the case of the highly-specialised government systems, there is evidence that the increasing standardisation of computer systems means that IT firms cannot be assured of retaining certain private sector FM contracts. For example, in 1994 IBM won the Abbey National hardware maintenance contract previously operated by Olivetti and AT&T (*Financial Times* 5 July 1995). However, more strategic IT management and development agreements are more difficult to transfer successfully. It is also worth noting that companies do not always outsource all their IT requirements to one provider. For example, in 1994 United Distillers outsourced its desktop computer services to Computacenter and the running of its mainframe to Bull subsidiary Athesa, while CSC was contracted to provide the overall management and development of the firm's computer operations (*Computing* 20 October 1994).

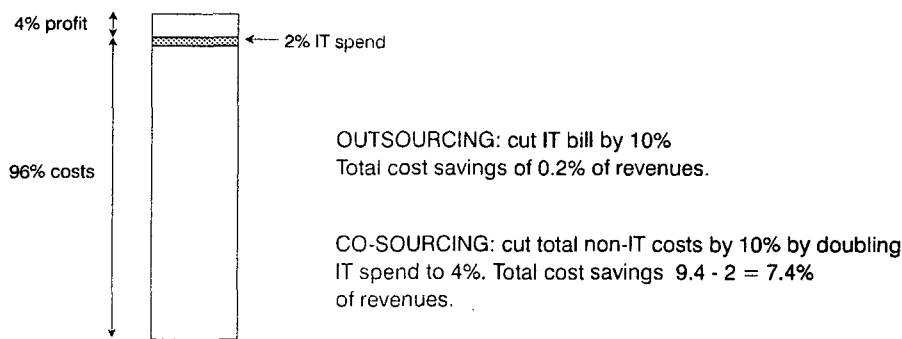
7.3.2 The changing nature of the FM market.

The FM market originated in the US in the 1960s as firms started to look after mainframe data centres for client corporations, using simple economies of scale to undercut the cost of providing such services internally. IT FM or outsourcing has now developed and spread to cover all levels of the IT infrastructure, with the fastest growing segments of the FM market now covering distributed, desktop and client-server networks. In standard outsourcing deals, computer service companies now provide fixed levels of service for fixed fees, which are invariably lower than those achievable by in-house providers. As well as benefiting from economies of scale, established providers

gain leverage from what the Marketing Director of EDS (UK) terms 'economies of experience' (personal interview 29 November 1995). This implies that further cost savings can be accrued as computer service companies apply the expert knowledge derived from supplying IT systems to many sectors over a period of time.

EDS and other major FM companies are now leading a shift to what is termed 'co-sourcing' or value-based partnering. Here the customer and the computer service company establish a long-term collaborative partnership in which they share skills and knowledge to improve business performance. Through 'business process re-engineering', the strategic application of IT and the management of business processes, such partnerships aim to deliver measurable performance improvements, the benefits of which are then shared by the client and the IT provider. In many cases, such partnerships may result in an increased investment in IT systems, with the aim of creating even greater cost savings to the business as a whole. The difference between co-sourcing and the standard form of outsourcing can be illustrated by a simple hypothetical example, UK plc (see Figure 7.13 below). By focusing on cutting overall costs by reducing business inefficiencies, rather than the IT spend, UK plc makes greater savings by actually doubling IT investment. Hence this paradigm shift actually increases the demand for IT staff, and at the time of interview both EDS and Hoskyns had around 300 vacancies to fill. On the other hand, contracts like this can reduce the need for certain middle management and administration tasks in client corporations.

Figure 7.13: 'UK plc' - the evolution of outsourcing into co-sourcing.



Source: Personal interview 29 November 1995.

Early UK examples of such business process management are Andersen Consulting's agreement with BP Exploration to run its accounting systems and do the accounts as well, EDS' contract to handle all of the Bank of Scotland's cheque processing, and ICL's contract with London Underground to improve the transport company's service and business performance. Once a particular system is in place, it can bring additional business in the same sector. For example, EDS has now gained additional cheque-processing business to accompany the Bank of Scotland contract. The company is so

convinced of the direction of the FM market that EDS actually declined to bid for a £50m British Gas contract because it simply covered the running of various mainframe sites. However, co-sourcing has yet to take off on a large scale in the UK; a 1995 survey of 210 companies found that two-thirds of businesses still saw the outsourcing of IT as routine and connected solely to the reduction in business costs (*Financial Times* 7 June 1995). The rate at which this market does grow may well depend on the success of these early contracts.

The Swiss Bank Corporation (SBC) has taken the co-sourcing concept further in its relationship with computer services provider Perot Systems. SBC is devolving nearly half of its IT functions to the American company, in a contract worth around £200m annually and involving the transfer of some 700 staff. While many banks have tended to use several suppliers, SBC has chosen just one partner world-wide, and furthermore, has taken a 24.9 per cent stake in Perot Systems to provide extra security (*Financial Times* 7 September 1995). However, these kind of schemes may be restricted in the long term by the relatively low number of independent FM vendors on the market that are available for investment.

7.3.3 The spatial impacts of the growth in IT FM.

As the various case studies presented earlier in this chapter have shown, the growth in outsourcing is having a considerable impact on the spatial networks of large computer service firms. Long term outsourcing deals usually involve the transfer of staff to the supplier, and in some contracts the ownership of computer hardware and the building leases are also transferred. This was the case in the Inland Revenue deal, with EDS acquiring over 1800 staff along with their computers and offices in Telford, Shropshire. Hence, firms that are successfully active in outsourcing markets are gaining premises, often outside the main core of employment in the South East, as the location of this new growth essentially reflects the location of the data centres of the client corporations. In civil service markets many data processing centres have historically been decentralised to locations outside the South East (Marshall 1992b), as the EDS case study has illustrated (see Table 7.4). Similarly, the onset of local government CCT will increase the level of non-South East activity and potentially bring more premises and staff. In contrast, the externalisation of activity from private sector firms will tend to favour the core region, due to the high level of decentralisation of data centres and back offices from London, to the towns of the outer South East since the 1960s. Such moves were particularly common in producer service sectors such as banking, finance and insurance, now key growth areas for outsourcing. However, as the outsourcing trend becomes established in all sectors of the economy, the opportunities for private sector growth outside the South East should improve.

It is difficult to predict the longer term spatial impacts of outsourcing. As their spatial network of offices becomes more developed across the UK, suppliers will almost certainly undertake to rationalise and consolidate their FM staff and operations, probably in the form of centralised regional data centres. There is already evidence for such a trend in the local government market, where contractors are looking for sites to develop as regional offices or data centres (*Independent* 14 November 1994). Another important factor will be the extent to which remote systems management increases. While at present this is not widespread, as computer systems and networks become even more powerful, reliable and standardised, the potential for running computer systems from a distant location will increase. This could promote another wave of consolidation. Established employment centres would presumably benefit from such rationalisations, favouring the key locations in the South East, North West and Scotland that characterise such computer service companies, rather than more peripheral urban areas such as Tyne & Wear (see Section 5.1.1).

7.4 Conclusion.

The restructuring and growth strategies of the top computer service firms are without doubt a crucial dynamic in the UK industry. The case studies presented in this chapter suggest that certain trends are developing in the way that firms are restructuring to provide for international clients. In particular, many firms are targeting certain key sectors that exhibit a high degree of transnational activity (such as energy, telecommunications and finance) and are organising their marketing efforts on a global basis to attract these corporations. However, the subsequent fulfilment of contracts still tends to be provided by the local structures of the IT companies in the various nations where their clients operate. Also, mergers and acquisitions (in combination with the disposal of certain operations) are repeatedly being used to realign the strategic direction of companies, as well as to increase the geographical scope of their markets.

These restructuring processes are affecting the geography of the computer services industry in various ways. As the old hardware giants IBM and ICL gradually become more service oriented, employment locations in the South are becoming relatively more important within the organisations. Furthermore, firms focusing largely on systems integration, consultancy or software products (such as Logica, Andersen Consulting and Oracle respectively) appear to be maintaining a fairly stable, South East dominated employment structure. However, for companies bidding successfully for large FM deals (such as EDS and Hoskyns), office networks are being extended as client data centres are acquired. This process is supporting a more spatially even growth in these companies, although their consultancy and systems integration operations still tend to be located in the South East. While the rapid growth of the outsourcing market may therefore be slightly eroding the established pattern of uneven development within the

independent computer services sector, the growth outside the South-East does not represent real growth or a relocation of staff, but the reclassification of IT workers from other sectors as independent computer services employees. However, as co-sourcing contracts become more prevalent in the near future, the opportunities for real employment growth in non-core regions will increase.

Chapter Eight: Conclusions and implications.

'Just as coal and steel were the essential ingredients in the Industrial Revolution, software drives the modern economy. It is necessary for every sector: for agriculture, manufacturing, for services. It pervades our lives.' (Industrial Development Authority of Ireland (IDA) 1992, p.1)

8.0 Introduction.

The computer services industry is undoubtedly a dynamic growth sector of great strategic importance, and one that is having an increasing impact on all parts of the economy, as the above quotation suggests. The central aim of this thesis has been to develop a 'service-informed' interpretation of the spatial and structural dynamics of this key sector in the UK (Marshall & Wood 1992). Under this central theme, the thesis had five main objectives (see Section 1.2); to examine the internationalisation processes operating in computer service markets; to profile the structural, locational and occupational characteristics of the UK industry; to explore the factors behind the uneven development pattern of the UK sector; to contribute to the theoretical understanding of uneven development in contemporary economies; and finally, to consider the policy implications of the growth of the industry.

This central objective of this final chapter is to draw together the key conclusions and theoretical contributions of this research within the context of the above aims. The first section will briefly summarise the structural characteristics of the European and UK computer services sectors. Secondly, the key factors behind the uneven development of the UK industry will be reviewed, and in the third section, the wider theoretical implications of the results are considered. The fourth section will detail some possible policy implications that emerge from the research, and finally, several ways in which this research can be developed and augmented in the future are discussed.

8.1 Key characteristics of the European and UK computer services industries.

This section addresses the first two aims of the thesis, summarising both the main internationalisation processes operating in the European computer services market, and the key characteristics of the contemporary UK industry.

8.1.1 Internationalisation processes and the European computer services industry.

As in many other manufacturing and service sectors, activity in the contemporary computer services industry is increasingly being organised on an international basis. While the global demand for computer services is characterised by the three main markets of the US (42 per cent of total value), Western Europe (30 per cent) and Japan

(17 per cent), the supply is dominated by US corporations. As an example, nine of the top 20 suppliers to the European market have their headquarters in the US, including four of the top six. This dominance is at its strongest in the software products market, where US-owned firms supply around 78 per cent of global requirements.

Hence, a key dynamic in the computer services industry is the internationalisation of large firms, especially those based in the US. While the levels of direct international trade in computer services are still relatively low, the main mode of internationalisation is via foreign direct investment. This takes two main forms, the establishment of subsidiaries, and mergers and acquisitions, and while as a result most multinationals have a base in the key markets of Europe, they are increasingly organising their activities on an international basis to meet the requirements of transnational clients. The deregulation of public sector IT procurement, and a growing international standardisation of hardware and software systems are two of the key processes driving this trend.

As the case studies in Chapter Seven have shown, while the strategy of large firms depends partly on their sectoral origins, within the industry at large there are two clear tendencies emerging. Firstly, many systems integration and consultancy firms are targeting certain key sectors that exhibit a high degree of transnational activity (such as energy, telecommunications and finance) and are organising their marketing efforts on a European or global basis to gain contracts with these corporations. Secondly, in general, geographically based organisational structures are being replaced by more functional ones, where individual locations have a specific role in the overall European structure. The subsequent fulfilment of contracts still tends to be provided by the local structures of the IT companies in the various nations or 'strategic business units' where their clients operate.

While proximity to clients is hence still important in the supply of most computer service sectors, the Ireland case study has shown how firms in the software package industry have the greatest opportunity to establish international divisions of labour, because of the transferable, 'product' nature of the activity. Due to a unique combination of language, education, policy and infrastructural factors, Ireland has managed to attract a considerable amount of investment from US software companies requiring a European manufacturing and localisation base for products researched and developed in the US market. While small software product firms may export their products to foreign clients directly, or through agents, many large software firms such as those based in Ireland maintain a considerable presence in the major markets of Europe, to provide functions that require some degree of client interaction, such as marketing, training and support. These findings concur with those of Gentle & Howells (1994, p.320), who suggest that;

'close physical contacts with customers are still the major factor in the location of the industry. However, with the increasing shift towards PC-based packaged software and the move to product market and strategic business unit (SBU) market serving.....these close physical links, at least in software production rather than software supply and marketing, may be loosening over time'.

8.1.2 The structure of the UK computer services industry.

This section will summarise the key spatial, structural and occupational characteristics of the UK computer services industry. As with many other producer service sectors (e.g. Howells 1988, Marshall *et al.* 1988), the distribution of computer services employment is dominated by London and the South East, which alone accounted for nearly 60 per cent of employment in 1993. Employment in the sector is mainly concentrated in urban areas, with the most important national concentration of employment being in a band of medium-sized and large towns that form an 'arc' to the west of Greater London. The most important change in the distribution since 1981 has been the relative shift in employment from London to the counties of the Rest of the South East, although the combined national share of these two regions has remained stable. At the local scale, it appears to be suburban locations that are growing most strongly.

The computer services market is no longer dominated by firms that started out as software or computer service firms. The top two suppliers in the UK market are ICL and IBM, both of whom were traditionally hardware vendors, but are now reorienting their businesses towards service functions as the profits on hardware have slumped. Management consultants and telecommunications operators are also increasing their market share, as the presence of Andersen Consulting, AT&T Istel and Syntegra in the list of top 12 suppliers to the UK market in 1994 indicates. Increasingly, and more so than in other countries of Europe, the largest firms in the UK market are becoming foreign-owned. Over the period 1985 to 1994, the proportion of the turnover of the top ten companies in the UK market accounted for by UK-owned firms has dropped massively from 66 to 14 per cent. Over the same period, US suppliers have increased their share from 34 to 52 per cent. These changes are the result of two main processes; firstly, the acquisition of leading UK companies by aggressive foreign (often US) firms looking to extend the extent of both their markets and their service portfolio, and secondly, strong growth in foreign-owned UK subsidiaries.

As a result of the continuous rounds of mergers and rationalisation among the leading suppliers, and the low barriers to entry for new firms, the structure of the UK industry is bifurcating into one of very large and very small firms. While the top 40 firms supply some 70 per cent of the market, the rest of the 42000 companies in the sector are on

average very small. Once established, many small firms lack the funding to grow substantially, with product or service development and marketing being the most expensive tasks. The lack of medium-sized businesses is compounded by the fact that the fastest growing small companies are usually targets for takeovers by market leading, multinational companies.

The subsectoral composition of the UK market is also changing. Two segments in particular are growing; software products and outsourcing. The growth of software products, which now account for around 16 per cent of the total market, reflects the increasing standardisation of basic hardware and software systems. The growth of outsourcing, which now constitutes 19 per cent of the market, is a result of both an increasing externalisation of IT functions from the private sector, but also the opening of local and central government IT activities to competitive tendering. The majority of large contracts are being won by a small group of foreign-owned multinational firms, including Hoskyns, EDS and CSC. Outsourcing represents an important component of the expansion of the independent sector, accounting for one third of the growth in value of the UK market over the period 1990 to 1995, suggesting that only the remaining two thirds is 'real', demand-driven growth. The rise of outsourcing seemingly provides the only countervailing trend to the dominance of the South East in employment terms, with corporations gaining substantial employment centres outside the region as they take control of both public and private sector data centres. As co-sourcing develops, a 'real' component of growth may be added to these new employment locations in the future.

The four county survey has revealed important regional variations within this overall structure. In terms of the subsectoral composition of the industry, the survey results suggest that while some activities such as IT training, maintenance and value added reselling are carried out locally on a geographic basis, other functions are more concentrated in the core South East region. The most striking feature here is the concentration of software product companies in Berkshire, where they accounted for 77 per cent of the surveyed workforce. This is in part due to the large number of foreign-owned software product companies that have located their UK headquarters in Berkshire towns along the M4, attracted by the international reputation of the area, the proximity to Heathrow and London, and the highly-skilled labour market. Another important variation is the higher levels of systems integrators in the two 'Southern' counties, reflecting the continued dominance of the South East in the more knowledge intensive computer service activities.

There are also variations in the status of computer service firms. While the structure of the industry in Hertfordshire and Berkshire is dominated by headquarters of both UK and foreign multi-plant firms, the northern counties of Cheshire and Tyne & Wear are

more reliant on branch establishments. This reflects the historical genesis of the industry around London, and how South East-based firms have opened branches to access regional markets in the North of England. For many companies based in the South, it appears that an M62 corridor location such as Cheshire is the natural place to situate a 'northern' office, especially given the historical growth of the hardware industry in the general area and the excellent communications. Similarly in the South, Berkshire is a particularly attractive location for the headquarters of foreign software firms, as described above. The regional variations in the status and subsectoral composition are important in underpinning the continued uneven development of the computer services industry, which will be discussed in the next section.

Finally, the occupational structure of the computer services industry is similar to that found in other high-tech sectors, in that it is dominated by full-time, male employees, who make up around two thirds of the total workforce. The largest category of employment in the survey firms was software engineering and consultancy, accounting for nearly 30 per cent of staff, while another 19 per cent were involved in other technical, engineering activities. Even in such a technologically advanced sector, around 40 per cent of the workforce are involved in support tasks such as administration, secretarial work and sales. Females dominate in administration and data entry tasks, have an equal share of training work, and constitute about one third of the sales and marketing workforce. In other more skilled and management categories, women are in the small minority. The small proportion of part-time workers (nine per cent of total) are typically women engaged in data entry or administration tasks.

8.2 Interpreting uneven development in the UK computer services industry.

To further investigate the uneven development pattern described in the previous section, this thesis has focused on the regional and internal variations in two key aspects of the sector; processes of new firm formation, and the linkages of computer service firms to their markets, suppliers and fellow IT companies.

It is particularly important to characterise the processes by which new firms are created in a relatively young and highly innovative sector such as computer services, and such growth continues to be a key dynamic in the industry. The results of this thesis have illustrated that the computer services industry can be seen largely as a product of the existing employment structure of the local area, with only 17 per cent of the survey firms being established as branches by firms based outside the home county. The majority of new firms are created by the movement of individuals from existing independent computer enterprises, both in the hardware and services sectors (which together accounted for over 60 per cent of new firm founders in the survey), rather than from any larger scale externalisation of IT functions from other sectors. Indeed, only

four of the 173 survey firms were created by the unbundling of IT units from manufacturing firms, thereby supporting the argument that real increases in demand best explain the growth in firms in this sector, rather than theories of vertical disintegration from manufacturing. This real growth suggests that professional service inputs are becoming increasingly important to the competitiveness of businesses in all sectors of the economy (Coffey & Bailly 1990).

New firm founders elect, almost exclusively, to establish their new businesses locally. For 65 per cent of the survey firms, the desire of the founder(s) to remain in the local area was the key locational factor. While proximity to clients and staff is an important consideration, most new firm founders then base their actual locational decision on the characteristics of the exact building and location (e.g. size, cost, availability, room for expansion, road access etc.), within a search area nearly always defined as a commutable radius from their existing job or home. Hence, in terms of the volume of new firm formation, the highest absolute numbers of new firms are in areas where the computer industry has a large base, and in particular the 'western arc' around London. The contemporary scale of the industry in the outer South East is a product of many factors, but the historical dispersal of the industry outwards from the 1960s data processing bureaux of central London, and the location of key hardware suppliers in the Thames Valley were key factors in initiating the growth patterns that have now become self-reinforcing. Conversely, deindustrialising areas with no history of development in the IT industry, such as Tyne & Wear, Merseyside and Sheffield, have experienced relatively low growth. Similarly, largely rural areas have a very low representation in this sector.

There also appear to be regional differences within the largely employment structure-driven process described above. The structural advantages of the South East economy are accentuated by regional variations in the level of entrepreneurship, which mean that the region actually performs better than the North, the North West, the West Midlands, Scotland and East Anglia in new firm formation terms than the size of their computer industry would suggest. There are also variations in the main modes of new firm formation. The larger population of computer service firms and in particular headquarters operations in the South East means that proportionately more firms are being created by takeovers, mergers and management buy-outs, rather than new start-ups and spin-offs initiated by individuals. Some authors suggest that this reflects a higher adoption of flexible production practices in the core region (e.g. Keeble, Bryson & Wood 1991). While financial barriers to entry are on the whole low in this sector, the low availability of start-up capital is a problem experienced by some firms in all areas. However, the survey results suggest that private and venture capital is used more in the South East, mirroring the availability of such capital in the UK economy. Hence, although industrial structure appears to be the key explaining factor, economic factors

such as capital availability should not be overlooked. Interestingly, the availability of skilled labour does not appear to be a constraint to growth in peripheral areas, indeed skills shortages are highest in the high-growth South East.

In addition to these quantitative and qualitative differences in the new firm formation process, firms in the computer services sector exhibit a high degree of locational inertia after start-up, with a very low number of firms showing any significant degree of spatial mobility, although there are local trends to more suburban locations. This creates difficulties for local authorities and development agencies in peripheral areas trying to promote development in high growth sectors such as computer services (see Section 8.2 for discussion). With foreign investors in computer services locating largely in the South East, the only way for other regions to enhance their local growth is to try and attract branch operations from companies based in the core region. However, this would only seem to offer opportunities to accessible locations located near the large regional market of the North West and West Yorkshire, and for the two major Scottish cities. While some national firms chose to locate offices in the Birmingham area, many access clients in the Midlands from the South East.

This thesis has also examined the market linkages of computer service companies, in particular in terms of the sectoral and spatial composition of markets. There are three important conclusions here; firstly, service industries themselves constitute a large proportion of the markets for computer services (73 per cent of market value on average in the survey); secondly, computer service firms as a whole 'export' a considerable proportion of their services to clients outside the home region (45 per cent on average in survey); and thirdly, that computer service firms engage in a very limited amount of international trade (6 per cent on average in survey). However, there is considerable regional variation within these patterns, and, as noted in the previous section, two crucial determinants of these regional variations are the status, and subsector of activity, of the individual computer service firms that make up the aggregate picture.

In terms of firm status, headquarters operations engage in a greater amount of extra-regional export activity than independent, and in particular, branch firms. Similarly, there are variations in the amenability to exports of the different subsectors of activity within computer services. Certain functions such as training, value added reselling, and recruitment services tend to be provided on a local basis, while firms involved in both software products, and high-value, knowledge-based functions such as custom software and consultancy engage in more export activity. The intersection of these two variables means that the computer services sectors of Cheshire and Tyne & Wear are more oriented towards the immediate local market than those in the South East counties of

Berkshire and Hertfordshire, where the regional market of London and the South East is dominant, with the large number of headquarters of foreign software firms in Berkshire being reflected in the strong extra-regional exports from the county. Regional variations in these two controlling variables are themselves intimately linked to the historical development of the industry and the structure and size of the regional economies in the UK. For example, the results from Tyne & Wear illustrate how firms are having to engage in inter-regional sales in order to grow, because of the limited market in the Northern (standard) region.

This research has also indicated that localised links to partner and supplier firms do not appear to be an important influence on the development pattern of the sector. In general, firms in the industry do not appear to be reliant on many knowledge-based commercial inputs. The most common activities that are subcontracted by computer service firms are hardware maintenance and networking, but these services are externalised to both local firms, and non-local firms who can service distant clients. In terms of joint ventures, selling and marketing agreements and joint bids for contracts are the most common forms of agreement, but although strategic alliances are an increasingly important competitive strategy in the industry, again spatial proximity was not found to be necessary for such relationships to develop. Overall, local linkages to other IT companies and producer services firms are fairly limited, and, in the two southern counties, are more confined to the South East region in general than to the specific local economy. When the fact that computer service firms do not rely heavily on local markets (10 per cent of sales on average in survey) is also considered, these conclusions have important implications for understanding the uneven development patterns in advanced producer service sectors.

8.3 The wider theoretical implications of the research.

This section will consider the implications of the analysis for explaining patterns of uneven regional development. While many authors suggest that producer service firms can reduce the costs of transactions with their suppliers and market by spatial agglomeration (e.g. Martinelli 1991, Coffey 1992), such direct agglomeration economies are in reality difficult to separate from other locational and employment structure influences. This research suggests that underlying economic structural conditions that promote or hinder the incubation and growth of firms appear to exert the most powerful influence on the uneven spatial development of producer service sectors. Such evidence supports Massey's (1984, 1995) thesis that while the growth of producer services can be interpreted as an extension of the division of labour as new industries and occupations emerge, the spatial manifestations of these developments are intimately related to pre-existing social and economic structures of different localities.

To summarise the argument from the computer services sector, the South East of England has great advantages in this respect; the historical core of the hardware and computer services industries, relatively high entrepreneurial rates and private capital availability, a highly skilled labour market, and a critical mass of firms that is fuelling both new start-ups, and other forms of new firm formation such as mergers, takeovers and management buyouts. The growth of new and existing firms is supported, however, by the scale and nature of the market of the 'greater' South East. In particular, the location of many service sector headquarters in this region is an important component of demand. The importance of these processes creates problems for peripheral urban areas such as Tyne & Wear, where growth in the IT services industry is restrained by the small size of both the indigenous IT industry, and the scale and industrial nature of the local market. Although the availability of detailed evidence is limited, it appears that similar processes are shaping the development of other high-growth sectors such as management consultancy and market research (Keeble, Bryson & Wood 1991).

As suggested in Chapter Six, this analysis casts doubt on theories of regional economic development which centre upon the direct agglomeration economies created by close proximity to markets and suppliers, such as the flexible specialisation thesis (see Section 2.4). Such conceptualisations appear to underplay not only importance of the existing historical and structural characteristics of regional economies (Massey 1995), but also the geographical extent of firms' linkages. Evidence from the computer services sector suggests that while producer service firms depend on intraregional clients to varying degrees, the need for proximity to suppliers and partners is universally low. This accords well with the conclusions of Cooke *et al.* (1992, p.213), who similarly argue that the emergence of localised industrial districts is an unrealistic expectation, and that while;

'.....there is substantial and increasing interaction between localised customers and suppliers for computer services.....the position in Britain is that, to the extent there is localised supply, it is throughout southern Britain, the key triangle being drawn by the M1, M4 and M5 motorways'.

Gordon (1991) also argues that such theories overplay the importance of localised inter-firm links. Hence, while the M4 corridor or the Cambridge Phenomenon are sometimes seen as examples of localised industrial districts based upon flexible inter-firm relations and low transaction costs, the survey evidence suggests that the growth of such areas needs to be seen within the context of a regionalised mode of service growth across the whole South East (Allen 1992), within which internationalisation processes are a key dynamic. For example, Daniels (1995a) illustrates how producer service firms in the core region undertake more business in the rest of the EU than do those in the provinces.

There is no doubt that internationalisation processes are increasingly impacting on the economic development of regions (Amin & Thrift 1994a). For example, since the mid-1980s, many new inward investors in the computer services industry have chosen to locate in the South East, both mutually resulting from, and enhancing, the primacy of the South East in that sector. Sjöholt (1994) suggests that the pre-existing spatial structure of the host country's economy is a centralising force for international investments across all producer service sectors; *'the perception of opportunities by the transnational corporation generally stops at the gate of the main metropolitan region or at a few economically important regions'* (1994, p.119). In particular, acquisitions and joint ventures established by multinationals tend to focus on the core region.

In a sense, the South East is 'holding down' the globalisation of producer service activities in the same way that the Dublin area is profiting from the internationalisation of packaged software production (Amin & Thrift 1994b). However, the concept of 'institutional thickness' (introduced in Section 3.4.3) does not seem to explain the pattern, with there being a far more developed industrial support network in the North East, for example, than the M4 corridor area (Amin & Thrift 1994a). This may be because both institutions and firms in old industrial areas can be 'locked-in' to a mode of growth surrounding externally-owned manufacturing plants from which it is difficult to engender the personal and institutional innovation required to generate service industry growth (Grabher 1993c). Conversely, the M4 corridor area is locked-in to a regional mode of internationally oriented, high-order, service-based growth in which the role of local institutions is limited (Allen 1992).

However, the economic structure of the UK's regions and the investment patterns of foreign companies cannot fully explain the dominance of the South East in producer service sectors. The South East and London perform better than many other regions in terms of new firm formation rates than its economic structure would suggest. While other regions such as Wales and the South West perform even more strongly, this can partly be explained by the very low starting level of computer service representation. One way to interpret these regional variations is to adopt Storper's (1993, 1995) notion of *'untraded interdependencies'*. Developing the work of the flexible specialisation thesis and the network approach (both introduced in Section 2.4), Storper suggests that agglomerations of firms develop interdependencies that go beyond input-output or network relations, for example with regard to common labour markets and conventions for developing, communicating and interpreting knowledge.

Crucially, such dependencies may be more territorialised than direct linkages, and for Storper, this may explain why the decentralisation of knowledge-based industries from core regions is limited.; *'might this be because the geographically-constrained untraded*

interdependencies outlive geographically constrained input-output linkages?' (1995, p.209). In other words, while many businesses are increasingly developing national and international patterns of market, supplier and partnership linkages, supported by advances in information technologies, there are less visible synergies that mean continued agglomeration in core regions is beneficial. For example, such an approach may explain the continued location of many indigenous and foreign-owned computer service firms in the M4 corridor, despite very high property prices and increasingly congested roads. The outcome of these territorialised interdependencies, Storper suggests, is that some regions develop higher levels of organisational and technological learning than others. While more research is needed to refine and develop such concepts, the idea of the 'learning' region would seem to be a profitable way in which to view the qualitatively different mode of growth in the core region that this thesis has identified.

8.4 Policy implications of the research.

This thesis has clearly illustrated the strategic importance of the computer services industry, and its contribution to the uneven development patterns of modern economies. As such, the low recognition of the industry in policy terms at all levels (see Section 1.4) is particularly surprising. This section will outline some of the main policy implications of the thesis and offer some normative suggestions as to what kind of policy developments could be beneficial. While it can be argued that such policies are unnecessary in such a high growth industry, the following proposals are grounded on two premises; firstly that the EU and national governments should try and improve the competitiveness and status of indigenous companies to counter the rapidly increasing share of a strategic market accounted for by US suppliers, and secondly, that efforts should be made to spread the knowledge and revenue benefits of local computer service firms to under-represented peripheral areas. As in the introductory chapter, the discussion will be structured around three levels of policy; European, national level and local.

The single most important issue affecting the European computer services industry would appear to be the continuing acquisition of leading indigenous suppliers by US corporations and the associated loss of market share; as noted in Chapter Three, nine of the top 20 suppliers in Europe in 1994 were US-owned, accounting alone for some 13 per cent of the total market. One counter-measure may be to lower the size ceiling of the 1990 EC Merger Regulation, which stipulates that only contracts involving a combined global turnover of over 5bn ECUs and a joint minimum EU turnover of 250m ECUs need to be referred for consideration. According to Morgan (1994), only three mergers involving computer service firms had been referred by 1994; those involving Drager/IBM/HMP, EDS/SD-Scicon and Digital/Philips (in relation to computer services

and maintenance), all in 1991. However, over time with inflation and the growing size of computer service firms more deals will exceed the ceiling. This would appear to be a crucial mechanism regulating the sales of major European corporations.

Another possible remediation would be to reduce the emphasis placed on market liberalisation and deregulation in EU 'Information Society' schemes, in the light of the dominant position of US suppliers in both the world IT and telecommunications markets. As described in Chapter Three, the recent opening up of public sector IT procurement across Europe has disproportionately benefited specialist US corporations. While in the UK the market liberalisation trends appear to be irreversible, in the more 'closed' markets of France and Italy, for example, indigenous corporations such as Cap Gemini Sogeti and Finsiel continue to benefit from long-term, publicly-funded projects (Howells 1996). Such countries may be able to learn from the results of market testing and competitive tendering in the UK; a potential approach would be to offer a larger number of smaller, short-term contracts than in the UK, thereby reducing the long-term dependency on one or two (often foreign-owned) key suppliers.

In addition to the US dominance of European markets, another problem facing European firms is their poor performance in non-European markets, and especially the USA. However, while the prospects for substantially improving the representation of European-owned firms in the US market look bleak, many commentators suggest that the next wave of computing will be focused around the largely US-based Internet (the global information network), and that this will offer great opportunities for small firms based outside the US market. By creating a single global market for software, the Internet may potentially remove many of the distribution and marketing barriers that have kept foreign software firms from making progress in the US market. As firms increasingly sell their software 'on-line', a physical location outside the US becomes less of a hindrance (*Economist* 25 May 1996). Such developments suggest that small firm funding and research initiatives at the European level could be beneficial.

In general, the computer services industry needs to receive more explicit recognition in EU 'Information Society' initiatives, which still tend to focus on the telecommunications and IT hardware sectors. Although the industry is seen as being 'strategic' by the European Commission, it should perhaps receive more direct policy attention, with increased funding being made available for small and medium-sized indigenous firms in peripheral areas, and other initiatives similar to the centrally-funded European Software Institute in Bilbao, Spain. At present the development of the sector is very much market driven (Cooke *et al.* 1992), but leading European suppliers are increasingly calling for a common software strategy that emphasises both the increasing cohesiveness of the European market, and the expertise of European suppliers. For example, The Services

Infomatics eXpertise lobby group (SIX), which includes Cap Gemini Sogeti, Sema and Logica, has been campaigning for such a strategy since 1992 (*Computing* 29 June 1995a).

It can also be argued that the scale and strategic importance of the computer services industry means that it similarly merits more policy attention at the level of UK national government. Most importantly, the sector needs to be recognised as a separate entity from the electronics industry, and as an important component of any 'information society', with the CSSA given a more central lobbying role. In the light of the growing US domination of the UK industry, it is important that a competitiveness policy is developed for the indigenous industry. One way to start this process would be to add the IT industry to the list of 15 sectors (including electronics and telecommunications) that have a 'sponsor division' within the DTI. Re-established in mid-1992, these divisions were created to ensure that Government decisions are taken with a better awareness of the key competitive factors in these sectors (Department of Trade and Industry 1995). Until these developments take place, it is highly unlikely that the industry will be given a higher priority in other funding and innovation initiatives.

At present the industry is developing outside the fairly narrow boundaries of regional policy and other DTI schemes. Unsurprisingly, the 1994 map of Assisted and Intermediate Areas closely reflects areas with a low representation of computer services, and the survey evidence suggests that less than 20 per cent of firms in Tyne & Wear (all with Assisted Area Status) have benefited from Regional Selective Assistance. While at present only export-oriented service firms qualify for assistance, the criteria should perhaps be widened to include more locally-oriented service firms, in order to help them reach a size where they can viably expand outside their home area. In general there is a low awareness of all DTI initiatives, with only around 20 per cent of surveyed firms using some kind of scheme at any time in their company history, suggesting that the DTI needs to do more to promote the grants available in both the Assisted Areas and nationally. In particular, the Small Firm Loan Guarantee Scheme appears not to be reaching computer service firms (2 per cent in the survey), and through this and other schemes, banks need to be encouraged to offer more support to service-based enterprises.

Central Government in the UK also needs to carefully monitor the development of public sector outsourcing. While the processes of market testing and compulsory competitive tendering may soon prove irreversible, long-term FM deals with private suppliers need to be monitored so that costs do not escalate and the contract terms are adhered to. However, such appraisals will have to be realistic; IT needs will undoubtedly change over a five or ten year period and some additional expenditure may well be

justified, especially as cost savings may be created elsewhere in the organisations. Additionally, when the first wave of contracts comes to an end, the re-tendering of the contracts must be undertaken fairly, to ensure that large businesses such as EDS and CSC cannot establish private sector monopolies. By that stage, however, it may well prove impossible for any company other than the incumbent viably to bid for ensuing contracts, especially as the ex-Civil Service staff will have dispersed through their new company.

Some of the implications of this research for local economic development strategies were introduced in Chapter Five; these will undoubtedly be most important for areas with a low representation in the industry where growth is not yet self-sustaining. The analysis presented in this thesis suggests that, due to the low level of long-distance relocations in this industry, the most effective way to stimulate the computer services sector in a local environment is to incubate and support the growth of new small firms. While there appears to be substantial regional variation in the level of entrepreneurial activity in computer services, the improved availability of start-up and research capital, management and consultancy advice, and subsidised premises could all be beneficial to new firms in any area. While many new firms do not appear to require substantial capital to start up, additional funds are often needed to penetrate new geographic markets, and to develop new and improved products or services. The Softnet scheme in Scotland (see Section 5.3.3) is an example of this kind of initiative. Peripheral areas should especially target embryonic firms in sectors such as IT consultancy and software products which have the potential to be 'exported' to non-contiguous regions and the core South East market, hence overcoming the small size and structural constraints of the local market. The results of this research also suggest that initiatives based on either improving the local stock of high quality office space or raising local IT skill levels would not have any major impact on the development of the sector.

There appears to be far less opportunity for attracting investment from outside local areas. Few areas offer incentives for foreign investors specifically in the computer services sector; it appears that most locations outside the South East are unlikely to attract such foreign investment, and areas like Berkshire have no need to offer incentives due to the international reputation of the Thames Valley in the IT industry. Even in the software manufacturing sector, the UK regions seem unable to compete with the unique combination of factors offered by the Dublin area. However, areas in the North West or along the M62 corridor such as Cheshire can attempt to attract investment from both indigenous and foreign-owned companies that are based in the South East, but looking to improve their market position in the North of the country. Local authorities in these areas should perhaps market the environmental, labour market and locational advantages of their localities to South East-based firms of a suitable size. The evidence in this thesis

of firms decentralising from central metropolitan areas to more suburban locations (e.g. from London to Herts. / Berks., from Manchester / Liverpool to Cheshire) suggests that counties adjacent to large cities may be able to attract relocations. Authorities in such areas could approach city centre firms looking to expand with promotional evidence and incentives.

Another potentially important approach is for authorities in more peripheral locations to try and expand the local market by encouraging the uptake of IT by other businesses. In particular, IT dependent, but potentially relatively mobile, sectors such as financial service back offices and telesales, can be targeted with relocation incentives. For example, Tyne & Wear has attracted seven telephone call centres from companies based outside the area over the period 1990 to 1994; four are involved in financial services, two in reservations and sales, and one in market research (Richardson & Marshall 1996). Such centres often depend on the availability of cheap female labour and good telecommunications, with rent and rate incentives from local agencies providing an added attraction. Due to the IT-intensive nature of their work, these firms may then provide business for local computer service suppliers, be they indigenous companies or branches of national or multinational suppliers. Similarly, the uptake of IT should be encouraged in all existing public and private enterprises, especially in sectors where the IT penetration levels are at present low. Overall, a concomitant growth in both computer hardware and services employment should result, thereby offering greater potential for new start-ups and spin-offs.

8.5 Assessing the methodology and future research directions.

This section will briefly examine the merits of the sectoral study in developing a 'service-informed' view of economic restructuring, before moving on to consider ways in which the research could be developed. There have been many calls for detailed sectoral data in producer services research, largely due to the huge variety of different service activities that exist (e.g. Marshall *et al.* 1987). There is no doubt that concentrating on closely-related sets of activities (such as computer services) is necessary to develop a detailed understanding of the specificities of each service industry in different places.

More importantly, this thesis has illustrated is that there is great internal structural and regional variation within a 'sector' such as computer services. Too often in service industries research, knowledge-based producer services are seen as a relatively homogenous group of activities, and very little work has looked at the differing characteristics of activities within sectors such as 'computer services', 'advertising' or 'management consultancy'. The computer services industry covers a huge variety of activities with vastly different patterns of interaction, ranging, for example, from small locally-based training firms, to multinational consultancy operations. Furthermore, there

are substantial regional variations not only in the subsectoral composition, but also the sizeband and status structure of the computer services industry, with the effect that the linkages and nature of the sector are qualitatively different in different localities. Hence it is crucial that service sector research does not just compare the characteristics of various growth sectors, but is sensitive to the regional structural variations that exist within 'sectors'.

This research has been able to contribute to a more service-informed view of economic restructuring, by focusing on the key aspects of new firm formation and company linkages. The former has illustrated that while growth in the sector is becoming increasingly self-generating, it still depends on developments in other sectors of the economy, such as the externalisation of demand from a variety of service and manufacturing sectors. The latter has shown how computer service firms depend on market linkages to a variety of industries, and that the sectoral and geographical composition of these factors varies between different types of firms and places. What this research also suggests, however, is that any service-informed approach has to take account of international forces. Growth processes cannot necessarily be explained in terms of the structure of local, regional and national economies, as firms are increasingly situated in supplier, partner and client networks that are international in their nature. It is impossible to interpret the growth of the sector in Dublin County or Berkshire, say, without an interpretation of these developments.

In order to try and address the lack of detailed information on the spatial and internal structure of the UK computer services industry, much of the research presented by this thesis has by definition been large-scale and empirical in its nature. However, far more regional and national-level data is still needed to corroborate and develop the evidence presented here, especially with regards to regional variations in the origins, activities and linkages of computer service operations. In particular, comparable data for largely rural areas, and also urban areas that are arguably less 'peripheral' than Tyne & Wear (e.g. Birmingham, Bristol, Edinburgh, Manchester, Leeds), would help develop the analysis. Similarly, data on the computer service industry's structure from areas with policies aimed at attracting software investment, such as Wales, Scotland and Northern Ireland is necessary. In general, service sector studies are still hampered by a lack of such basic, comparable data at the national level; without similar information on fast-growing advanced producer service sectors, it is difficult to contrast the results of this thesis with developments in other sectors (Harrington 1995a).

However, the results of the research have also highlighted several areas of interest that could usefully be developed by smaller-scale, more qualitatively-based work, five of which will be briefly outlined here. Firstly, further research is needed into the nature of

the entrepreneurial process by which new computer service firms are established. This thesis has shown that an important component of growth in this industry is the start-up of new firms by individuals leaving established enterprises in the local area. Hence, in local economic policy terms, it is important that the rate of entrepreneurship in each area is maximised. While this research has suggested that the major motivation for new start-ups is the perception of a market opportunity, and that the chief constraint is the availability of local capital, far more detail is needed on the background, experience and motivations of these key entrepreneurs. It particular it would be interesting to examine how these factors vary between start-ups in 'product' oriented computer services such as software products and value added reselling, and more 'service'-based activities such as consultancy, maintenance and training.

Secondly, as indicated in Chapter Six, while this research has indicated that locally-based networks of formal links to customers, suppliers, and collaborators are not a particularly important feature of agglomerations, it may be beneficial to examine the role of informal networks, which can be characterised as ongoing social and professional relationships. Cornish (1996) suggests that such relationships are fundamentally different processes to sales/purchase transactions or collaborative behaviour, and as such the spatial dimensions of this kind of network may be fundamentally different. The concept of 'social capital' (Coleman 1988), or the utility derived from such informal networks, can usefully be developed to examine how the importance of social relations relates to the spatial configuration of networks. Such research may, for example, provide a more enlightening explanation of the co-location of many US software firms in the Thames Valley or Dublin areas, reflecting the personal links between key managers. Similarly, information concerning informal staff connections may help interpret new firm formations and spin-offs involving multiple founders, as well as patterns of staff mobility and changing management structures. Harrington (1995b) suggests that developing some kind of network-based approach could help integrate service sector studies with wider debates in economic geography, such as the emergence of innovative milieux and industrial districts.

Thirdly, as was again identified in Chapter Six, a transactional approach to portraying the market linkages of computer service firms could profitably be developed, building on the work on Illeris (1994a, 1994b) and Tordoir (1994). The results of this thesis have shown that the spatial distribution of the sales of computer service firms varies considerably between the various subsectors of computer services, reflecting the different nature of the transactions involved. Hence, developing this approach requires the collection of detailed information on the spatial and temporal characteristics of supplier-client interactions. Such data can then be compared and contrasted with that from functions in other service sectors. For example, it is highly likely that the spatial

networks of computer maintenance firms are similar to maintenance operations in other sectors, that IT training operations show similar patterns to other business training activities, IT consultancy is similar to management and other forms of strategic consultancy, and so on. This may be a beneficial way to then interpret the uneven development patterns of the whole of the business services sector, highlighting a range of activities that are normally provided locally, and those which are more transferable and hence can support a more concentrated employment distribution.

A fourth area of potential research is related to such a transactional approach, and concerns monitoring the contribution of computer services, and other producer services to their client's businesses. As described in Chapter Two, this is an important component of Marshall and Wood's service-informed view of change, but such analysis is difficult in studies such as this thesis that are focused on the production of these services. Hence, more research is needed into the consumption of producer services, and if possible, some of this work should be undertaken at the level of the individual contract or project. For example, with a systems integration contract, the functional importance of the completed system in relation to the customer's core business needs to be considered in detail, in addition to the financial significance of the scheme. By comparing different scales of project across the spectrum of computer service activities, it should be possible to contrast the importance of easily transferable IT training or maintenance agreements with major commitments such as facilities management contracts and large software development schemes.

A final area of research prompted by this thesis concerns more detailed investigation of the restructuring and internationalisation of the operations of large computer service firms. As the case studies in Chapter Seven illustrated, multinational computer service firms are constantly adjusting their organisational structure to try and meet the requirements of a dynamic, international market place. While acquisition strategies and expansion in the facilities management market are both initiating spatial change within these companies, many have reorganised essentially within their existing spatial structures. Hence, detailed research is needed into the effectiveness of the supposedly more responsive structures that are being created, and the internal mechanisms by which they are organised. Again, if certain contracts or schemes could be monitored in detail, the extent to which the functional and spatial flexibility of the workforce within these businesses is increasing could be assessed. For example, case studies of contract-based team-working on client sites and the growth of 'hot-desking' and forms of teleworking could usefully contribute to debates surrounding the rise of more flexible workforces in modern economies.

8.6 Conclusion.

For the foreseeable future, the computer services industry will continue to be one of the fastest growing sectors in modern economies, and, as importantly, one of the most structurally dynamic. The high rate of innovation in the IT industry will continue to fuel changes, and new organisational and spatial structures will develop. For example, most commentators predict that the next stage of computing will develop around the Internet, and that this will begin to erode the spatial ties between producers and consumers for certain types of software (*Economist* 25 May 1996). The key shapers of these processes will be a relatively small number of largely unregulated private sector multinationals, although some new key firms will undoubtedly emerge from the mass of small suppliers that exist in this industry.

The challenge for national and local governments is to identify these international growth dynamics and to turn them to the advantage of certain regions and localities before they fade. The challenge for economic geographers is to further unravel the structural and spatial factors that underpin the uneven development patterns of key knowledge-based sectors of the economy.

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Appendix I: Example of the structured interview survey.

CONFIDENTIAL

CHESHIRE COMPUTER SERVICES QUESTIONNAIRE

Name of Company: _____

Name of Interviewee: _____

Position in Company: _____

Date: _____ Time Start: _____ Time Finish: _____

A: COMPANY ACTIVITY

(A1) Please describe the main activities of the company and their relative importance:

Please indicate which of the following activities you undertake (to any extent);

Software Products _____

Custom Software _____

Total Systems / Systems Integration _____

Consultancy _____

Facilities Management _____

Independent Maintenance _____

Processing _____

Education & Training _____

Recruitment & Contract Staff _____

Database Services _____

Software Maintenance _____

Value Added Reselling _____

Value Added Networks _____

Contingency Planning _____

Others (specify) _____

(A2) How has this pattern altered since setting up? _____

(A3) Is the firm;

(a) independent (only site)? _____

(b) HQ of independent company? _____

(c) one site of several of an independent company? _____

(d) a branch of an outside firm? _____ If so, specify HQ location _____
and ultimate HQ location? _____

(e) a subsidiary? _____ If so, give parent name, and HQ location _____

If (b) or (c) please list other sites and function: _____

If (d) why did the organisation set up this establishment in Cheshire? _____

If (e) give details of acquisition (and strategy) where appropriate _____

If not (d): how was the firm established (please give details)?

- (i) A spin-off from existing business _____
- (ii) Completely new start-up _____
- (iii) Management buyout _____
- (iv) Merger of existing firms _____
- (v) Other (specify) _____

(A4) Who founded the company, and roughly how old were they when they did so? _____

(A5) What size and type of firm did the founder(s) previously work for? _____

(A6) Where did the founder(s) obtain the capital to set up this firm? _____

(A7) What were the founder(s) prime motivations in setting up the firm? _____

(A8) Has the company benefitted from any Government policies / initiatives either at start up or subsequently (please specify)? _____

(A9) When was the business / part of co. established in this area? _____

(A10) Please estimate the turnover of the at this site. How has this changed since setting up? _____

B: LOCATION

(B1) Is this the only location the firm / part of firm has used? _____

If no, what previous locations have been used, and why did the firm move? _____

(B2) When did the firm move to the present location? _____

(B3) Why was the firm set up in _____? _____

(B4) What are its disadvantages? _____

(B5) Why was this particular building chosen? _____

C: LINKAGES

(C1) Please estimate the proportion (%) of your business that comes from:

- (a) Other Computer Services _____
- (b) Rest of Business Services _____
- (c) Financial Services _____
- (d) Central Government _____

- (e) Local Government _____
- (f) Other Services _____
- (g) Manufacturing & Construction _____
- (h) Private Households _____
- (i) The Utilities _____

If (a), (b) or (c) please try and specify firm types; _____

(C1a) If applicable, what proportion of your business is sold to end users via agents or resellers? _____

(C2) Please estimate the percentage of your total no. of clients that are:

- Small firms / Institutions (0-20 employees in total) _____
- Medium sized firms (21-100) _____
- Medium-Large firms (100-999) _____
- Large firms (1000+) _____

(C3) Please estimate the approx. proportion of business in the following areas:

- (a) Cheshire _____
- (b) Greater Manchester _____
- (c) Merseyside _____
- (d) Lancashire _____
- (e) South-East (incl. London) _____
- (f) Rest of the UK _____
- (g) Rest of the EU area _____
- (h) Rest of the world _____

(C3a) How much of your business comes from clients within a 10/15 mile radius? ____

(C4) Has this pattern altered since formation? Yes ____ No ____

If Yes give details _____

(C5) In which of the above regions do you expect the greatest sales increase over the next 5 years, and why? _____

(C6) How many regular clients have you got at present? _____

(C7) What proportion of your business comes from your largest client? _____

(C8) How does your firm obtain new clients? _____

(C9) Have you taken over work previously done by your clients? Yes ____ No ____

If Yes please give details and reasons _____

(C10) How much face to face contact is there with clients and at what stages does this occur? _____

(C11) Do you purchase business services from other firms? Yes ____ No ____

If Yes please give principle examples and their location _____

(C12) Do you purchase computer hardware for reselling? Yes ____ No ____

If Yes from who, and where? _____

What proportion of total revenues does this make up? _____

(C13) Do you work with other firms in supplying the service? Yes _____ No _____

If Yes please give main examples and their location _____

(C14) How many serious competitors are there in your main field and where are they located? _____

(C15) What would you say is the major strength of your company? _____

D: EMPLOYMENT

(D1) What is the total employment of this establishment? _____ Company total? _____

(D2) How has this changed since start up? _____

(D3) Please break down employment as below if possible:

	Male	Female	Total
Managerial	_____	_____	_____
Managerial & Soft. Eng.	_____	_____	_____
Software Engineers	_____	_____	_____
Training	_____	_____	_____
Other Technical	_____	_____	_____
Data Entry	_____	_____	_____
Clerical / Secretarial	_____	_____	_____
Sales / Marketing	_____	_____	_____
Other	_____	_____	_____

(D4) Are any of the above staff part-time? If Yes, please specify which _____

(D5) From what sources do you recruit professional staff? _____

(D6) Does your firm have problems with such recruitment? If Yes, specify _____

(D7) Does your firm provide any formal training for staff? If Yes, What? _____

E: TELECOMMS & TECHNOLOGY

(E1) Do you use Modems as remote links into clients systems? Yes _____ No _____

If Yes what proportion of testing / support etc. is carried out this way? _____

(E2) Are there any problems with the quality of such links? _____

(E3) Do you use ISDN or any other more advanced telecomms / networks? _____

(E4) Have you any future plans to use such services eg teleconferencing, telemagic? _____

(E5) How crucial to your success is keeping up with technology? How is this achieved?

(E6) What major technological changes do you see in your field in the near future?

F: RECESSION & THE FUTURE

(F1) Over the period June '90 - June '94 how did employment change?

What was the impact of recession on this?

(F2) Over the period June '90 - June '94 how did sales/business volume change (up, down, stable) and how was this affected by recession?

(F3) Has your firm faced any other growth restraints over the same period (specify)?

(F4) What kind of growth do you predict for your firm over the next 3 years?

Business will contract_____ Business will remain stable_____

Steady Growth_____ Rapid Growth_____

Stay same by choice_____ Other (specify)_____

(F5) Do you plan to recruit more staff over the next year? Yes_____ No_____

If Yes please specify_____

(F6) Do you plan to move or open new premises over the next year? Yes__ No__

If Yes please specify_____

(F7) Has the European Union had any affect on your business since 1992?_____

Appendix II: Example of letter of approach for interview.

University of Durham

Department of Geography

Science Laboratories, South Road, Durham DH1 3LE

Telephone : (0191) 374 2472
(0191) 374 2462 (Secretary)
Facsimile : (0191) 374 2456



name~
position~
co. name~
address 1~
address 2~
postcode~

10th April 1995

Dear name~

I am currently undertaking PhD research into the U.K. computer services sector at the University of Durham Geography Department for the Economic and Social Research Council (ESRC), and over the last few months I have completed successful surveys of over 40 relevant firms in each of Hertfordshire, Berkshire and Tyne & Wear.

Over the next few weeks I shall be undertaking a survey of a sample of software and computer service companies in Cheshire, based on a list of companies compiled from the Cheshire County Council Business Directory (along with similar District and Borough Directories). In particular I am interested in the extent to which firms in this sector can be a source of economic growth, both in their own right and by supporting other businesses in the area. I was therefore hoping it would be possible to arrange a short interview with you (or anyone else you feel would be appropriate) to discuss these and other issues; this would only require about 30 minutes of your time. My questions would be about the basic profile and growth of your company in Cheshire, and would be treated in the strictest confidence. At the end of the survey I will put together a summary of results which I would be happy to send to you.

I would be very grateful if you could contact me with a suitable date and time for a meeting. If I have not heard from you in the next week, I will, if I may, contact you (or your secretary) after Easter to arrange a suitable appointment.

I look forward to hearing from you.

Yours sincerely

Neil M. Coe, BA (Dunelm)

Appendix III: Interview schedule - Tyne & Wear.

No.	COMPANY	INTERVIEWEE	POSITION	DATE	TIME
1	Conex Data Comms.	Mr M Douglas	Director	15/3/94	9.15am
2	GEC Marconi	Mr Ray Hutchings	Devt. Centre Manager	15/3/94	11am
3	Mari Computer Systems	Mr Z Rzepczynski	Business Manager	15/3/94	2.15pm
4	Mari Computer Training	Mr John Steel	Project Manager	18/3/94	10am
5	Quality Software Products	Mr Richard Hannon	Corporate Comms. Man.	18/3/94	2.45pm
6	Calidore Computer Systems	Mr K Wilson	Partner	22/3/94	9.15am
7	Sage	Mr Goldman	Chairman	24/3/94	2.30pm
8	MTC	Mr David Wood	Deputy Director	25/3/94	9am
9	IBM	Mr Peter Austin	Location Manager	20/6/94	9am
10	Durham Computer Services	Mr Ron Dixon	Partner	20/6/94	11.30am
11	ITEC North-East	Ms Gail Richardson	IT Trainer	20/6/94	2.30pm
12	ICL	Mr Charles Handley	Senior Resident Exec.	20/6/94	4pm
13	Northern Electronic Techn.	Mr Croucher	Managing Director	21/6/94	9am
14	Tailor Made Solutions	Mr Adrian Teasdale	Sales & Marketing Man.	21/6/94	10am
15	Coates Computer Services	Mr Coates	Managing Director	22/6/94	9am
16	Beauchamp Comp. Services	Mr Tony Cootts	Managing Director	22/6/94	11am
17	Washington Data	Ms Kamara	Partner	22/6/94	1.30pm
18	The Mailing House	Ms J Peddy	Proprietor	23/6/94	10am
19	Croft Computers	Mr David Anderson	Sales Manager	23/6/94	2pm
20	Reg Walton Associates	Mr Reg Walton	Managing Director	24/6/94	9am
21	Compower	Mr T Cawson	Customer Serv. Manager	24/6/94	10am
22	K V Computer Services	Mr Phil Twedell	Accountant	24/6/94	12 noon
23	Prism Technologies	Mr Phil Wright	Financial Director	24/6/94	1.30pm
24	N E Brass Tacks	Mr A Simm	Operations Manager	27/6/94	9am
25	Limat Computer Services	Mr W Doyle	Managing Director	27/6/94	11am
26	Mills Associates	Mr David Hegarty	Bureaux Manager	29/6/94	10am
27	Integrated Automation Syst.	Ms Susan Johnston	Group Marketing Man.	29/6/94	2pm
28	The User Group	Mr Dixon	Managing Director	30/6/94	9am
29	Sectortime	Mr Ed Morrow	Managing Director	30/6/94	10.30am
30	Computer Concepts (North)	Mr David Lightfoot	Managing Director	30/6/94	2.30pm
31	Mandata	Mr A Wilson	Managing Director	1/7/94	9am
32	Halcyon Computers	Mr Geoff Bulman	Managing Manager	1/7/94	10.30am
33	Semimetrics	Mr Dale Page	Managing Director	1/7/94	12 noon
34	F H S Unit	Mr Richard Turner	Business Manager	1/7/94	2pm
35	Bull Information Systems	Mr Alex Wintrip	PC Installation Manager	1/7/94	3.15pm
36	Datawright	Mr David Wright	Managing Director	5/7/94	10am
37	Regional Technology Centre	Mr Paul Mitchell	Marketing Manager	5/7/94	11.30am
38	DEC	Mr Mike Willshare	Branch Manager	6/7/94	9am
39	Datatab	Mr Ames	Managing Director	6/7/94	10am
40	IMASS	Mr Bernard Newman	G I S Manager	8/7/94	9.30am
41	Hewlett Packard	Mr Peter Ridout	District Manager	11/7/94	10.30am
42	Batch CAD	Dr Wright	Managing Director	12/7/94	10am
43	S I T Group	Ms Fiona Thompson	Group Marketing Exec.	13/7/94	2pm
44	K B R Hardware	Mr Robin Price	Sales Director	13/7/94	4pm
45	Kvaerner Comp. Services	Mr Stewart	Managing Director	20/7/94	3.30pm
46	A T & T Istel	Mr Paul Clark	Client Services Director	22/7/94	10am

Appendix IV: Interview schedule - Hertfordshire.

No.	COMPANY	INTERVIEWEE	POSITION	DATE	TIME
1	ABC Workstation Solutions	Mr David Grivell	Director	12/9/94	9.30am
2	Ason Electronics	Mr Dugmore	Managing Director	12/9/94	2pm
3	Vega Group	Mr Strafford Watson	Marketing	12/9/94	4.30pm
4	Data Sound Laboratories	Mr Derek Carpenter	Managing Director	13/9/94	9.30am
5	Anvil Technology	Mr Mark Bentley	Managing Director	13/9/94	11am
6	Apache Solutions	Mr Adam Vahed	Co-Director	13/9/94	3pm
7	H+H Software	Mr Ian Hamilton	Managing Director	14/9/94	9.30am
8	Catalyst	Mr Nick Horan	Managing Director	14/9/94	3pm
9	H G Computer Services	Mr Bradley	Managing Director	15/9/94	9.30am
10	ICL	Mr Alan King	Marketing / Public Rel.	15/9/94	12 noon
11	LBT Computer Services	Mr Robert Pearce	Managing Director	15/9/94	4.30pm
12	Brett Business Systems	Mr Colin Brett	Managing Director	16/9/94	9am
13	Concita Micro Systems	Mr Tony Wynn	Managing Director	16/9/94	11am
14	Bull Information Systems	Mr Mervin Bidwell	Field Service Manager	19/9/94	10am
15	F H Consultants	Mr Chris Hoad	Managing Director	19/9/94	2pm
16	Intech Connections	Mr Philip Halton	Co-Director	19/9/94	4pm
17	Entec	Mr Ian Brown	Managing Director	20/9/94	9am
18	DCM Services	Mr Philip Wilson	Managing Director	20/9/94	11am
19	Omniledger	Mr Barry Banbury	Director	20/9/94	2pm
20	O H M Computers	Mr Varu	Managing Director	21/9/94	9.30am
21	Software AG of the UK	Mr Mark Wells	Marketing Director	21/9/94	11am
22	Telematic Systems	Mr Graham Clark	Managing Director	21/9/94	2.15pm
23	Profile Micros	Mr David Egerton	Managing Director	21/9/94	4pm
24	BISS	Mr Chas Juniper	Marketing Manager	22/9/94	9am
25	E M Consultants	Mr John Farrer	Managing Director	22/9/94	11am
26	Dynatech	Mr Ken Gooding	Managing Director	23/9/94	2pm
27	Datashield	Mr Kerby	Managing Director	26/9/94	10.30am
28	Xavier Systems	Mr Mike Munelly	Managing Director	26/9/94	2pm
29	S D R C	Mr Geoff Sutcliffe	Bus. Devt. Manager	3/10/94	9am
30	Interactive	Mr Bruce Leith	Managing Director	3/10/94	11am
31	Dunstable Comp. Services	Mr Dave Smith	Managing Director	5/10/94	10am
32	ACT Business Systems	Ms Georgina Heathcote	Marketing Manager	5/10/94	3pm
33	The Advisory Unit	Mr Mike Aston	Director	6/10/94	1pm
34	P+P	Mr Paul Jordan	Marketing Manager	6/10/94	3pm
35	Madics Systems	Mr Tony Reynolds	Managing Director	7/10/94	9.30am
36	Computer People	Ms Sue Cliff	Director	7/10/94	4.15pm
37	Mass Micros	Mr Graham Drury	Director	10/10/94	2pm
38	Compel Systems	Mr John Kemp	Managing Director	11/10/94	10am
39	ServiceTec	Mr Philip Partington	Marketing Director	9/11/94	10am
40	Star Computers	Mr David Cotton	Sales Director	9/11/94	4.30pm
41	Castle Business Systems	Ms Rachel Dealey	Marketing Manager	11/11/94	9.30am
42	PCL Computer Services	Mr Trevor Clarke	Chairman	11/11/94	3.30pm
43	Santa Cruz Operation	Mr Bernhard Hulme	Managing Director	15/11/94	11am

Appendix V: Interview schedule - Berkshire.

No.	COMPANY	INTERVIEWEE	POSITION	DATE	TIME
1	Network Systems	Mr Ron Leigh	Managing Director	24/1/95	5pm (T)
2	Arete Software	Mr Tony Brown	Managing Director	30/1/95	11am
3	Crystalclear Computer Services	Mr Ian Bucklar	Managing Director	30/1/95	2pm
4	Cavendish Ltd.	Mr John Millard	Sales & Marketing Dir.	30/1/95	4pm
5	Mantix Systems	Mr Tom Ulrich	Managing Director	31/1/95	10am
6	Q Associates	Mr Andrew Griffiths	Marketing Manager	31/1/95	2.30pm
7	Dallas Systems	Mr Rob Sheppardson	Admin. Manager	1/2/95	9.30am
8	Leonardo Information Systems	Mr Alan Goswell	Managing Director	1/2/95	11am
9	Safetynet Plc	Mr Paul Barry-Walsh	Managing Director	1/2/95	4.30pm
10	Adroit Software	Mr Mike Harrison	Managing Director	2/2/95	9.30am
11	CBT Systems	Mr John Todd	Managing Director, UK	2/2/95	12.30pm
12	DBSS Ltd.	Mr Mike Coleman	Consultant	2/2/95	2pm
13	Alliant Computer Systems	Mr Paul Griffiths	Senior Engineer	2/2/95	4.30pm
14	Cray Research	Mr John Fleming	Marketing Director	3/2/95	9.15am
15	International Business Systems	Mr Richard Ormond	Managing Director	3/2/95	2pm
16	Kerridge Computers	Mr Chris Poulter	Managing Director	3/2/95	3.30pm
17	Data Cell Ltd.	Mr M Brook	Chairman	6/2/95	9am
18	Tecfac Ltd.	Mr F Carstairs	Managing Director	6/2/95	11am
19	Orac Information Systems	Mr Michael Hayter	Marketing Director	6/2/95	2pm
20	Targetfour Ltd.	Mr Roy Price	Marketing Director	6/2/95	4pm
21	Transoft	Mr Mike Edwards	Managing Director	7/2/95	10.30am
22	Bellini Systems	Mr David Dew	Managing Director	7/2/95	4.30pm
23	Transaction Technology	Mr David Guest	Managing Director	8/2/95	10am
24	Oracle Corporation	Mr Michael Spring	Communications Man.	8/2/95	12 noon
25	Tetra Ltd.	Mr Ian Raddlesden	Marketing Manager	8/2/95	2pm
26	Databasix Computer Services	Ms Andrea Hope	Managing Director	9/2/95	8.30am
27	Key Training Solutions	Mr Robert Eighteen	Managing Director	9/2/95	10.30am
28	CPMS	Mr Peter Beckley	Marketing Manager	9/2/95	2.30pm
29	Aran Ltd.	Mr Adrian Batten	Managing Director	9/2/95	4.30pm
30	Legent Plc	Ms Annabel Nally	Marketing Manager	10/2/95	11.30am (T)
31	RCMS	Ms Ross Roy	Marketing Manager	10/2/95	12.30pm (T)
32	Computer Associates	Mr John Reid	Technical Manager	13/2/95	10am
33	Computer Systems for Business	Mr Colin Smith	Managing Director	13/2/95	11.30am
34	European Software Publishers	Mr Andy McBean	Technical Director	13/2/95	2pm
35	RMA Ltd.	Mr Ali Tebatabi	Technical Director	13/2/95	4.30pm
36	Level 7 Ltd.	Mr Rob Newman	Senior Consultant	14/2/95	10am
37	Recital Corporation	Mr Barry Betts	Managing Director	14/2/95	11am
38	Apac Training	Mr T Benson	Managing Director	16/2/95	2pm
39	DESC Ltd.	Mr George Brody	Business Devt. Manager	16/2/95	5pm
40	Cognos Ltd.	Mr Kim Lewin	Services Director	17/2/95	10am
41	Ultracomp Ltd.	Mr Olivee	Managing Director	23/2/95	2.30pm (T)

Appendix VI: Interview schedule - Cheshire.

No.	COMPANY	INTERVIEWEE	POSITION	DATE	TIME
1	Data Guardian	Ms Sarah Connelly	Area Sales Manager	24/4/95	12 noon
2	Accounts 2000	Mr David Adams	Managing Director	24/4/95	2.15pm
3	Restore Computer Services	Mr Don Couper	Director	24/4/95	4pm
4	Northern Indep. Consultants	Mr Paul Richards	Managing Director	25/4/95	9am
5	Cheshire Technology Services	Ms Rebecca Henshaw	Marketing Officer	25/4/95	10am
6	Bladebrook Computer Services	Mr Leadbetter	Managing Director	25/4/95	2.30pm
7	Chester Business Computers	Mr Mike Dugan	Managing Director	26/4/95	9am
8	Boldon James	Mr Ted Gateskill	Development Manager	26/4/95	11am
9	RKD Computers	Mr Geoff Davies	Managing Director	26/4/95	1pm
10	Fairhurst Computers	Mrs Robinson	Branch Manager	26/4/95	3pm
11	D+H Computer Services	Mr Cliff Astles	Marketing Manager	27/4/95	9.15am
12	Silkmoth Systems	Mr Brian Jones	Managing Director	27/4/95	11am
13	Europress Software	Ms Barbara McCullough	Company Secretary	27/4/95	12.30pm
14	Contour Computer Consultants	Mr John Pountain	Marketing Manager	27/4/95	2pm
15	Systems Technol. Consultants	Dr Taylor	Managing Manager	27/4/95	4pm
16	April Training Executive	Mr Julio Faria	Managing Director	28/4/95	9am
17	Thurston Software Consultants	Mr John Stott	Managing Director	28/4/95	10am
18	Rockliff Computers	Mr Richard Cain	Finance Director	28/4/95	12 noon
19	Ultimate Systems	Mr Ken Mackay	Managing Director	28/4/95	2.10pm
20	Specialist Computer Company	Mrs Gill Plaistow	Sales Manager	28/4/95	3.30pm
21	Manor Park Systems	Mr John Pope	Managing Director	1/5/95	9am
22	Hoskyns	Mr Chris Moffat	Regional Exec. Director	1/5/95	11am
23	Officecraft	Mr Dave Craggs	Managing Director	1/5/95	1.15pm
24	BACG	Ms Cathy Honeybone	Company Secretary	1/5/95	2.30pm
25	Spider Networks	Ms Lynn Hammond	Northern Area Manager	1/5/95	4pm
26	Companion Systems	Mr D Roberts	Managing Director	2/5/95	9am
27	SDM Computer Services	Mr Kevin Dohrew	Managing Director	2/5/95	10.30am
28	CE Services	Mr Ralph	Sales Director	2/5/95	2pm
29	MDIS	Mr Philip Brotherston	Regional Director	2/5/95	3pm
30	Construction Systems Assoc.	Mr Nightingale	Managing Director	2/5/95	4.30pm
31	Applecetre Warrington	Mr Joe Mitchell	Sales Director	3/5/95	9am
32	LSI Computers	Mr S McLaughlin	Managing Director	3/5/95	10.30am
33	GB Mailing Systems	Mr John Metcalfe	Development Manager	3/5/95	2pm
34	Nano Computing	Mr Nigel Ball	Sales Director	4/5/95	10am
35	Information Builders (UK)	Mr Peter Watson	Branch Manager	4/5/95	4pm
36	Bridge Computer Services	Mr Waby	Managing Director	5/5/95	10am
37	Compass Business Systems	Mr Ray Drinkwater	Managing Director	5/5/95	2pm
38	Quintech Computer Services	Mr Rick Pollitt	Managing Director	5/5/95	4pm
39	Microview	Dr Keith Standish	Managing Director	10/5/95	2pm (T)
40	Microvitec	Mr Roger Moore	Sales & Mark. Manager	11/5/95	9.30am (T)
41	Mentec	Mr Frances Waring	Marketing Manager	15/5/95	10am (T)
42	Systems Direct	Mr Austin Ambrose	Marketing Manager	22/5/95	3pm (T)
43	DEC	Mr Rob Jones	Business Ops Manager	10/7/95	4pm (T)

Appendix VII: Interview schedule - Top 12 suppliers.

No.	COMPANY	INTERVIEWEE	POSITION	DATE	TIME
1	IBM (UK) Ltd	Mr Nick Temple	Chairman	21/11/95	11am
2	ICL	Mr Ian Neill	Corporate Strategy Manager	28/11/95	10am
3	Sema Group	Mr Martin Trees	Marketing Director	28/11/95	4.30pm
4	Hoskyns	Mr John Kelly	Business Devt. Director	29/11/95	11am
5	EDS (UK) Ltd	Mr Chris Stone	Marketing Director	29/11/95	3pm
6	Andersen Consulting	Ms Freeman-Owen	Public Relations Officer	30/11/95	11am
7	Syntegra	Mr John Priestly	Marketing Director	12/12/95	8.30am
8	Logica	Mr Mario Anid	Corporate Devt. Director	12/12/95	4.30pm
9	Oracle	Mr James Dobrie	Head of Strategic Planning	19/1/96	11am

Appendix VIII: Interview schedule - Irish software industry.

No.	COMPANY/ORGANISATION	INTERVIEWEE	POSITION	DATE	TIME
1	Lotus Corporation	Mr Mike Cusack	Marketing Manager	19/6/95	11.15am
2	Iona Software	Ms Anne Brennan	Marketing Director	19/6/95	2pm
3	SMS (Ireland)	Mr Pat Cassidy	Marketing Manager	19/6/95	4pm
4	Software Directorate, IDA	Mr Barry Murphy	Director	20/6/95	10am
5	Irish Trade Board	Mr Seamus Bannon	Director	20/6/95	12 noon
6	Boole & Babbage (Europe)	Mr Tony Gilligan	Managing Director	20/6/95	2.30pm
7	Oracle Corporation	Dr Michelle Cullen	Communications Manager	20/6/95	4pm
8	Symantec	Mr Austin McCabe	Managing Director	21/6/95	9.30am
9	Unisys	Mr Robert Johnson	Managing Director	21/6/95	11.30am
10	SNI / SSE	Ms Mary Sweetman	Public Relations Officer	21/6/95	3.30pm
11	EDS (Ireland)	Mr M McDermot	Accounts Manager	22/6/95	10.30am
12	AT&T Network Systems	Mr Dan Tracey	Financial Manager	22/6/95	2pm
13	Quarterdeck International	Mr A Rowsome	General Manager	22/6/95	4.15pm
14	Microsoft	Ms Helen Norton	Human Resources	23/6/95	9am
15	Claris	Ms Terese Gavin	Human Resources	23/6/95	2.15pm
16	Quark Media House	Mr John Crowley	Marketing Manager	26/6/95	11am
17	BMDP Statistical Software	Ms Helen Murphy	Marketing Manager	26/6/95	2pm

