AN INVESTIGATION OF INFORMATION TECHNOLOGY PROVISION IN BTEC HND BUSINESS AND FINANCE AT CARDIFF INSTITUTE OF HIGHER EDUCATION

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I would like to express my gratitude to Dr. Eleri Jones for her support and encouragement throughout the preparation of this study.

Thanks also to my husband, Gareth.
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Chapter 1

The Evolution of the Computer and Information Technology Industry

Introduction

Forty years ago the computer industry simply did not exist. Today the UK market for computer hardware and software totals hundreds of millions of pounds a year, while hundreds of thousands of people are involved in the industry.

The term "information technology" has been coined to describe the phenomenon created by the convergence of the technologies associated with computing, communications and office systems. Information technology has cut across traditional organisational boundaries and has had an impact on all aspects of information handling whether in the form of data, text, image or voice.

The universal nature of information technology means that almost all occupational groups are affected but none more than those who deal with paper-based information, e.g. the administrator or office worker (Bamber and Lansbury, 1989). In the past 20 years white collar labour has been the fastest growing component of the workforce in every industrialised country, with jobs such as computer programmers, computer systems analysts and computer operators being amongst the fastest growing occupations (Harvey, 1988). A recent report "Information Technology Manpower into the 1990’s" (Conner and Pearson, 1989) estimates that there are a total of 200,000
professional IT staff in the United Kingdom of whom 70,000 are in the electronics related occupations and 130,000 in computing occupations. These figures do not include non-professional computing jobs such as those of operators or data entry clerks.

In addition to staff working directly within the computing industry itself, there are substantial numbers of IT employees within most large commercial companies. It has been estimated that the top 25,000 computer hardware installations in the United Kingdom employ 300,000 data processing staff, or more than one percent of the total United Kingdom workforce (Saxby, 1990).

Computers now roll off conveyor belts in their millions and we are now critically dependent upon their performance for a host of everyday activities e.g. banking systems, shop check-outs, telephone networks etc. The skills required to effectively operate such equipment are new and there is therefore a need for substantial training programmes to equip the workforce and thus help meet the demand for such skills.

The Early Computers
Computing is just one of a set of complementary technologies including telecommunications, telex, facsimile services, teletext (such as Prestel) and networks which go to make up what is now more properly called the Information Technology industry (Bamber and Lansbury, 1989)

The speed with which IT has changed is phenomenal. Early valve-driven computers once filled an entire room and required
continuous maintenance. Today, an ordinary pocket calculator has more power and memory than any of these machines.

An idea of the type of changes which have occurred within commercial computing is illustrated by events in the computing department of a large borough council. Back in 1962, Bournemouth became the first UK Computer customer for US supplier Honeywell. The Honeywell H400 Computer had a memory capacity of 1,000 words. It was 7 ft tall by 10 ft wide and cost $117,400. In 1987 the principal computer installed at Bournemouth has a memory capacity of 1 million words, stands about the size of an average office desk and costs $300,000. In 25 years, a thousand times the computer power is accommodated in half the space at only two and a half times the real cost (Saxby, 1990).

Initial efforts to build computers back in the 1940s were concentrated within research departments at Universities and at military establishments. These first machines were virtually handbuilt, assembled from valves and wiring and the programs which dictated their functions were often hardwired into the machine. Their primary function was to tackle mathematical and scientific calculations typically processing large quantities of numbers against a particular algorithm. Since the computer was handbuilt, it was difficult to copy, and as few people predicted the role computers could play in commercial life, the incentive to do so was small. Changing the algorithm meant rewiring the computer and this obviously did not facilitate the development of the general purpose machine, such as that envisaged by John Von Neumann which is such a prominent feature of today’s microcomputers.
The major computer users of the time tended to see the advantage of computer technology as reducing the labour needed to perform regular repetitive tasks, e.g. payroll processing. The software needed to run a particular application would be specially written and usually for that particular machine. It was often supplied by the computer manufacturer or, more rarely, developed by an in-house team. In contrast in this decade, in the United Kingdom, the software business is currently worth some £2.1 billion and employs 45,000 people (Saxby, 1990).

In the 1950 - 60s computer bureaux flourished as users companies bought processing time from an external company which actually owned the machines and took responsibility for running them. Bureau were well-suited to the largely batch-processing systems of the time. On a payroll application, for example, the user could fill in data entry sheets listing that week's details of employees to be paid, the lists went off to the bureau where they were punched in and processed when the run was ready, and the results were posted back, or collected a couple of days later.

A sharp decline in the fortunes of bureau began in the 70s with the move towards integrated circuit technology. Computers became smaller, faster, had larger memories, could process more data and even run applications concurrently.

The added functionality, plus the corresponding drop in hardware prices as computers began to use standard mass-produced components made owning a machine a much more attractive proposition for many companies.
Probably the biggest shake-up of the manufacturing side of the computer industry occurred around the 1980s with the arrival of the personal computer. The idea that a machine small enough to sit on a desk top but powerful enough to perform some of the basic calculations for business life had been around for a while. Significantly the major breakthrough was not made by one of the larger and long established firms (such as IBM, NCR, Burroughs - the tabulating machine and cash register manufacturers) but by two young Americans working in a rented garage (Palfreman and Swade, 1991).

Steve Jobs and Stephen Wozniak revolutionised the information technology industry with the Apple microcomputer. It was simple enough but sufficiently powerful to appeal to both the Office Manager and the layperson. It stimulated a huge interest in the potential of computers, demystifying the technology, removing machines from the hands of specialists and giving them to ordinary office workers and people with minimal training. The most important feature of the Apple revolution was a massively improved human-computer interface (HCI) utilising WIMP (Windows, Icons, Menus, Pointers) technology possible at an early stage on the Motorola 68000 microprocessor. The IBM Personal Computer using a character-based interface with its DOS commands was a much less user-friendly computing environment. Better HCI facilitates computer learning and reduces training times and therefore costs.
It is, therefore, not surprising that the new technologies involving microelectronics are profoundly affecting the nature of office work. All office equipment became smaller, cheaper and more reliable thus increasing the take-up. The computer on everyone's desk became a reality although this in itself was not free of problems as decentralised processing leads to the proliferation of computer peripherals and multiple independent development of applications. The new revolution is towards distributed processing and the networking of all these stand-alone PCs and remaining mainframes to facilitate sharing of data and peripherals, improve data security and provide superior communications within an organisation e.g. using fourth generation databases, client server architectures and electronic mail. Local area networks (LANs) are expected to continue to be a major growth area throughout the 1990s and have organisational implications in terms of their management.

In the United States, the Office of Technology Assessment (OTA), an advisory body to the US Congress, forecast that by this year (1991), one out of every three office workers would be using a computer terminal. By the year 2000 "terminals may be as commonplace on office desks as telephones were in the 1980s" (Bamber and Lambert, 1989).

Basic computer skills, therefore, are becoming essential for all office workers from secretary to manager; and not only inside the office - "lap-top" computers are accompanying many managers and executives when travelling. Information Technology has also started to encourage a new style of working relationship where employees are based at home but are linked to the office via a computer.
Xerox and ICL are two companies with small but significant numbers of homeworkers.

The introduction of new technologies has opened up new industries (manufacturing of hardware and software), new types of jobs (computer operators, analysts and programmers) and an even greater growth in services connected with technological invention which provide back-up such as disaster recovery and facilities management services. The United Kingdom market for facilities management services was valued at $200 million in 1987, with a projected growth rate of around 35 per cent (Saxby, 1990).

Technology has therefore created many new products and services and as a result created more job opportunities. The most dramatic employment effects being in banking, insurance, retailing, communications and printing. In contrast to the expectation that the new technology would lead to massive unemployment, it has in fact generated a enormous number of new jobs for which workers from more traditional industries are being retrained. Retraining is, and will continue to be, a major activity. Training for technology has to be seen in a institutional context and is as major a management issue as the technology itself.

Communication is not only important within an organisation but also is important between organisations. Wide Area Networks (WANs) are increasingly crucial as we progress towards the "global" office. Developments, such as Integrated Services Digital Networks (ISDN) allowing attachment of all the office hardware via a telephone line to anywhere in the world, will facilitate this
development - particularly if an international standard is achieved and interlinking of national ISDNs to form a global network. Organisations' databases are already able to plug into commercial data bases and interchange information. For example, mailing lists and information on the products of an industry can be obtained through access to outside viewdata or videotext banks of information, provided by such agencies as British Telecom through its public data system, Prestel.

Electronic mail, on-line ordering in shops and stores, booking at theatres and electronic banking are already commonplace. Viewdata systems are used by such stores as Debenhams where executives are linked into the group's computer network through which stock position can be checked and orders placed, and senior executives can interrogate the system to find out the previous day's performance while at home (Harvey, 1990).

Much of the technology required for office automation has already been developed and is in use. Scanners coupled with optical character reader (OCR) software to enter printed text are developing and will save the chore and cost of having to rekey information. Voice recognition is also improving for data input but the technology in this field has to be politely described as "evolving" as it still has to overcome the problem of recognising imprecise human speech and different accents. So until these systems are perfected, operators will still have to learn keyboard skills (Eyre, 1989).
The trend towards ever-more automation in the commercial world is gathering pace and will highlight the critical shortage of trained staff. Technological innovation tends to demand general knowledge and adaptability rather than a rigid set of specific abilities and recurrent rather than a once-and-for-all education.

It is this issue of the need for adequate training for people who will be engaged in such occupations that forms the basis of this study.
Chapter 2

THE STUDY

The previous introductory chapter highlights the technological revolution that has taken place over the last forty years and the need to provide a more flexible, computer literate workforce for industry and commerce.

This study sets out to examine whether or not the potential workforce of the Nineties both in secondary education and higher education are being provided with the necessary qualifications to meet this demand.

In particular it examines the provision of information technology training within a higher education establishment namely, the Cardiff Institute of Higher Education. It highlights such provision within a specific course, i.e. the Business and Technician Education Council (BTEC) Higher National Diploma (HND) in Business and Finance.

Three main areas of discussion have been identified to interrogate the question using the following model:

1. INPUT
Input refers to the secondary school sector where educational
experience relating to technology training is examined. Structured interviews were conducted in five schools within the Mid Glamorgan Education Authority area. These five schools were identified as being recipients of Technical Vocational and Education Initiative (TVEI) funding in the Eighties, an initiative set up in an attempt to produce a more technically skilled population.

National curriculum technology is also examined where the objectives are to enable all pupils to plan, design, make and systematically evaluate artifacts and/or systems as part of the 'broad and balanced' education up to the age of 16.

Discussions were held with the Technology Advisor within the County and statistics were obtained showing the growth in provision of hardware and Inservice (INSET) training.

Questionnaires were distributed to the students (the input) entering Year One (1991 and 1992) of the BTEC HND Course in Business and Finance at the Cardiff Institute of Higher Education (see Appendix 1 and 2) and the results of these Questionnaires indicate the technology skill of the output from schools.

2. PROCESS

This area deals with the BTEC philosophy which illustrates its desire to provide a student with a broad based business education and a variety of business knowledge and skills and its translation within the Cardiff Institute of Higher Education into the BTEC HND Business and Finance Course.
The material central to this study is contained in Chapter 5 and investigates the process whereby the BTEC HND Course in Business and Finance aims to provide a student with the necessary skills to take his/her place in a technologically oriented environment. It charts the progress made from the mid-Eighties to date within the Faculty of Business and Information Management as follows:

(i) hardware provision
(ii) software provision
(iii) staff development
(iv) IT policy

3. OUTPUT
This section of the model relates directly to the expectations of potential employers. Questionnaires were sent to ten organisations within the South Wales area and various data collected as to their hardware, software provision and their staff requirements relating to technological expertise.

Interviews were conducted with several of the Personnel Officers within these organisations to expand on the data received.
Chapter 3
The Changing Curriculum in Schools

Introduction

"The present systems of education were not designed to cope with the needs of ‘the information society’. They are geared to coping with the narrowly defined skills of industrialised society not the emerging broadly-scoped or multi-skilled jobs of the future."

(Stone, 1990)

The above quotation states the main challenge which changing technology poses for education. This chapter is concerned with this issue and particularly how the secondary sector has responded.

The first discernible recognition by the Government of the need for pupils aged 14-18 to experience a balanced education involving modern approaches to Science and Technology was the Technical and Vocational Educational Initiative (TVEI) which was launched as a small pilot scheme in 1982 (TVEI, 1988). A series of projects were set up (one per Authority) throughout England, Wales and Scotland and participating authorities were funded by the Manpower Services Commission (MSC) to explore and test different ways of developing and managing the curriculum to meet the needs of industry and commerce in the technological era. These projects tested a range of new or enhanced subjects and gave teachers the opportunity to practise new methods of teaching and learning styles. Particularly significant developments took place in subjects such as technology, electronics and business studies. (These subjects had not previously been part of the school curriculum). Industry links were extended
and work experience became part of the curriculum for 16 year olds (TVEI 1989).

An indication of the seriousness with which the Government viewed the need for the development of a broad and balanced curriculum was the amount of funding received by their participating authorities, i.e. £2 million per project covering 5 academic years (TVEI, 1988). This funding was to provide extra teachers to plan, write and teach new courses; in-service training for teachers, new equipment and extra technical and administrative staff.

The pilot projects profited from the fact that they had a comparatively small number of schools to manage, an identifiable cohort available for evaluation and extra TVEI financed resources in known areas of subject shortage and those ripe for educational innovation. They did, however, have obvious and serious drawbacks in terms of promoting change across a whole authority and total curriculum. The pilot cohorts were not always drawn from exact cross sections of the school population; testing and comparison with non-TVEI students was often neither precise nor helpful. However, the pilots were successful in raising the profile of a number of subjects, reducing sex-stereotyping (equality of opportunity was built into the criteria for acceptance) and it was popular with students who perceived TVEI courses as being more relevant than the traditional curriculum available at that time.

An example of the change which TVEI brought about to the curriculum can be seen in one school which was chosen as a pilot
scheme in Mid-Glamorgan starting in the academic year 1984.

The school in question (Pencoed Comprehensive) chose 35 pupils from its fourth year to be part of the TVEI pilot scheme and gave these pupils (18 girls and 17 boys) the choice of subjects never before offered, i.e. Business Studies, Electronics, Catering, Info. Tech.

The school had been successful in their bid to become a TVEI school as a number of staff had previously worked in industry or commerce prior to taking up a teaching career and therefore had experience of "the world of work". £25,000 was given to the school to equip a "model office"; computer labs and catering facilities (this sum also funded TVEI designated staff) in the first year. From being a school with only 6 microcomputers (held by the Maths Department) TVEI boosted the hardware resources to 35 microcomputers.

However, the introduction of TVEI was not all "plain-sailing" (Standing C.J. 1991). Many staff showed resentment to departments which now boasted the latest technology resources; and as a consequence often resisted being involved in In-service training on computers. Teacher's assessment techniques needed reappraisal as TVEI encouraged integration rather than isolated subject areas, and many staff were "afraid" of adopting techniques for which they had had no previous training. The biggest threat, however, seen by many staff was the introduction of Information Technology. Computers were installed in several departments outside TVEI-designated areas and were often left to gather dust on the shelf. To overcome this problem, the Business Studies Department offered short lunchtime courses to help familiarise teachers with the
capabilities of the computer and slowly erode the resistance to the new technology.

The TVEI pilot schemes showed how the curriculum could be enriched by opening up new opportunities such as work experience; the integration of information technology across the curriculum and a more practical approach to teaching, all being of direct value to pupils seeking qualifications/skills related to the world of employment.

**TVEI Extension**

To retain this momentum, the Government announced in the White Paper "Working Together - Education and Training" in July 1986, that the TVEI pilots would be extended into a national scheme commencing in September 1988.

The extension is much more ambitious than the pilot and, together with other educational developments, i.e. the National Curriculum (to be discussed later in this Chapter), aims to bring about more wide ranging and fundamental changes than were possible under the banner of the pilot.

The TVEI Extension policy is expressed in five specific ways:

* by relating the whole curriculum to the world of work.
* by equipping all young people with the knowledge, competencies and qualifications for working in a highly technological society which is itself part of Europe and the world economy.
by providing young people themselves with direct experience of the economy and the world of work e.g. through work experience, workshadowing, projects in the community.

* by enabling young people to learn how to be effective people, solve problems, work in teams, be enterprising and creative through the way they are taught.

* by making sure that young people have initial guidance and counselling and opportunities for education and training, and progression throughout their lives.

(Evans, A. 1989)

As TVEI moves into Extension its real work begins as entrenched attitudes and opinions need to be changed. Teachers must more closely relate their work to the needs of business and the nation’s economic life. Industry has to have confidence in the education system and its products. Therefore employers too must become actively involved in the educational process by offering work experience and linking with schools in their area as these students will often be their future workforce.

The National Curriculum

When TVEI was first introduced, there was no National Curriculum; the Education Reform Act (1988) (ERA) had not yet become law. However, the work pioneered by TVEI takes its place within the legal framework of the National Curriculum. Resources can be directed wholeheartedly into securing what has always been the main objective, that is to ensure that the whole curriculum is directly related to the ‘real’ world outside the schools.
The Education Reform Act 1988 was one of the most important pieces of legislation to affect the education service of England and Wales as it recognised that the school curriculum could often be narrow and unbalanced and the Act was intended to mark a radical shift in direction from a 'producer-dominated' education system to one which would:

* promote the spiritual, moral, cultural, mental and physical development of pupils at the school and of society, and

* prepare such pupils for the opportunities, responsibilities and experiences of adult life.

(NAHT, 1989)

The charge of producer-domination had been advanced, albeit in muted form, in 1976 by the then Prime Minister, James Callaghan, in his seminal Ruskin College address (18 October 1976) which became known as the "Great Debate".

A text of the speech appeared in the Times Educational Supplement on 22 October 1976 in which Mr Callaghan said:

"...I am concerned on my journeys to find complaints from industry that new recruits from the schools sometimes do not have the basic tools to do the job that is required.

I have been concerned to find that many of our best trained students who have completed the higher levels of education at university or polytechnic, have no desire or intention of joining industry. Their preferences are to stay in academic life (very pleasant I know) or to find their way into the civil service. There seems to be a need for a more technological bias
in science teaching that will lead towards practical applications in industry and commerce rather than towards academic studies.”

(Maclure, 1988)

The Great Debate therefore raised concern about standards in the education service and by the General Election of 1979 the time was ripe for an incoming government to bring about change. The Government recognised that industry had undergone a revolution with less reliance being placed upon heavy manufacturing and more upon service industries or those which were computer/electronic based (NAHT, 1989). It also realised that future managers required a high level of technological literacy to cope with the changes taking place in the labour market. Poorly trained managers had been recognised as one of the causes of poor industrial performance.

The key point about the 1987 General Election was the way in which education was brought to the forefront with the reforms contained in ERA forming part of the Conservative Party Manifesto.

The Education Reform Act 1988

The charge that the modern school curriculum in the 80s was often too narrow and unbalanced led to the construction of a national curriculum which would guarantee that all pupils would receive an education which is broad and balanced, and would prepare them better for adult responsibilities (CCW, 1989).

Core and foundations subjects comprise the national curriculum as follows (see also Appendix 3):
For the first time in education, technology was named as a subject to be included in the curriculum, though in practice, technology is best understood as embracing many aspects of design integrated throughout the curriculum.

In April 1988 the Secretary of State appointed a working group to advise them on attainment targets and programmes of study for technology (see Appendix 4) and the dates for compulsory implementation of technology across the curriculum are as follows:

<table>
<thead>
<tr>
<th>Key Stage</th>
<th>Date</th>
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<tr>
<td>1</td>
<td>1 August 1990</td>
</tr>
<tr>
<td>2</td>
<td>1 August 1990</td>
</tr>
<tr>
<td>3</td>
<td>1 August 1990</td>
</tr>
<tr>
<td>4</td>
<td>1 August 1993</td>
</tr>
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</table>

(See also Appendix 5 and 6)
The Act defines attainment targets as the knowledge skill and understanding which pupils of different abilities and maturities are expected to have by the end of each key stage. They provide the objectives for what is to be learned in each subject during that key stage. Programmes of study are defined in the Act as the matters, skills and processes which are required to be taught to pupils of different abilities and maturities during each key stage. They set out the essential ground to be covered to enable pupils to meet the attainment targets at the range of levels specified at each key stage. The programmes of study for technology are grouped under each key stage but include some material which relates to individual levels of attainment appropriate to the key stage in question (Patrick, 1990).

Technology lessons require pupils to use and learn about computers: other National Curriculum subjects also involve computing. It is however up to the schools themselves to decide how far to use other forms of IT, e.g. television or radio programmes and videos, in such curriculum delivery.

Implementation and Co-ordination of IT provision

As a result of the initiatives previously described in this Chapter, education authorities realised the necessity of introducing some administrative mechanism for coordinating the implementation of IT provision in schools.

One such County is Mid Glamorgan which in 1987 outlined an IT strategy for implementation in all its primary and secondary schools (Appendix 7).
In 1988 the County appointed an IT adviser to co-ordinate and promote the use of IT across the curriculum in each of the Mid Glamorgan’s primary and secondary schools. Nine advisory teachers were also seconded to the IT unit for a maximum of three years and this was funded by the Education Support Grant.

The work of all advisory teachers is predominantly school based and to emphasise the provision of support to teachers which is directly related to their classroom practise.

A typical week’s work activity consists of the following:

3 days - working in schools
1 day - contributing to programme of INSET courses
1 day - administration, preparation of materials and personal Inset (In-Service Training)

*(Gambie, F.W. 1990)*

The Education Support Grant has given financial support to the Mid Glamorgan Education Authority for five years commencing in 1988 “to improve access to microcomputers as tools for learning, across the curriculum. Within the first year of funding, equipment in secondary schools grew quickly (see Appendix 8) with an average pupil:computer ratio of 23:1.

In 1990/91 the ratio is now 17:1 (see Appendix 9). No statistics are available for the years prior to 1988 for the whole of the county, but 5
schools were visited by the author and after discussions with the IT coordinators, the following data emerged:

<table>
<thead>
<tr>
<th>School No.</th>
<th>PUPILS:COMPUTERS</th>
<th>Prior to 1988</th>
<th>1991</th>
</tr>
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<tr>
<td>No. 1</td>
<td></td>
<td>20:1</td>
<td>15:1</td>
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<tr>
<td>No. 2</td>
<td></td>
<td>19:1</td>
<td>15:1</td>
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<tr>
<td>No. 2</td>
<td></td>
<td>20:1</td>
<td>13:1</td>
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<tr>
<td>No. 4*</td>
<td></td>
<td>18:1</td>
<td>10:1</td>
</tr>
<tr>
<td>No. 5*</td>
<td></td>
<td>16:1</td>
<td>12:1</td>
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The two schools asterisked were TVEI pilot schools from 1984 and were seen as "trendsetters" in information technology in the latter part of the 80s.

Mr F Gambie, the County Adviser for IT, took up his post in 1988. Since that time he has been responsible for the growth of IT across the curriculum both in primary and secondary schools within the Mid Glamorgan County area.

In discussion on the county summary of IT hardware provision for 1989/1990, (see Appendix 10) it was pointed out that many schools seem very well equipped with a ratio of computer to pupils as low as 5:1 with 301 pupils on roll, to 15:1 with 1300 pupils on roll. However, Mr Gambie felt it was important to note that whilst the demands for IT knowledge were laid down by the National Curriculum and TVEI Extension, it was possible to find some schools where the hardware is underused.
This underuse must be laid firmly at the feet of the management of the school and/or at the resistance which is still in being among many teachers who are either disinterested in technology or, who have found that the many initiatives brought about by the Government, particularly the National Curriculum, during the last decade have been a heavy enough burden without tackling technology.

He is sure, however, that this problem will soon disappear as in all appointments being made within the authority over the last year (particularly those involving Heads of Department and Management posts) candidates are always questioned on their IT knowledge and their intentions to use it as part of their subject area.

Inspection of the statistics and discussions with the IT adviser, advisory teachers and staff of various secondary schools, shows that tremendous inroads are being made to provide pupils with the necessary IT skills and/or access to the hardware provided. Of the five schools visited, ambitious programmes have already been set up for pupils entering their first year of comprehensive schooling in September 1991.

School No.1  IT skills workshop for 2 weeks (one hour per day)
School No.2  IT skills workshop/DCT/Home economics on a rotation basis - one hour per week during the academic year
School No. 3  IT skills as part of English lesson, one 35 min. session per week, then similarly in Maths and Art. Taking up three terms.
School No. 4  
One computer literacy lesson per week during the academic year

School No. 5  
Design and Make lesson, one period per week during the academic year

These programmes have been instigated with the help and encouragement of the County IT advisory team. However, it will not be until 1997 that colleges and universities will reap the benefit of information technology across the curriculum and receive pupils who have had ‘hands on’ experience during their comprehensive schooling.

IT, is of course, being integrated throughout the curriculum in many subject areas e.g. business studies, art, English, geography etc. but again, there is disparity in schools as to the amount of access and use a pupil will receive. It depends entirely on the school philosophy and the teacher’s confidence or expertise in this area.

In the schools visited, two are at present refurbishing rooms for use as self supported study areas for their sixth formers. They were both well-equipped with hardware, and these pupils had access to one hour computer literacy lessons. Many staff encouraged these pupils to word process their essays and in fact, in one of the schools, this was mandatory.

Although technology across the curriculum is progressing, the quality of instruction in many schools is debatable. One reason for this can be related to the amount of training, or not as the case may be, that teachers have received. Two of the five schools visited
showed quite a marked difference in the amount of IT training for teachers as indicated in the Table below:

**School No. 3**

65 Staff

- 20 staff attended InService training for one day at the County’s Resource Centre at Porth
- 5 staff had attended a three day training course on word processing
- 10 staff had attended courses relating to their subject areas and the use of software within those areas
- 2 staff had attended a week’s course on Records of Achievement using IBMs (these members of staff were both on the management team) i.e. one Head of Upper School and one Deputy Head

**School No. 4**

68 Staff

- 34 staff had attended word processing courses of one day’s duration at the County Training Centre at Porth
- 12 staff had attended three day courses relating to their subject area and the use of software within those subject areas
- 2 senior management staff had attended a week’s course on Timetabling
- 1 Head Teacher, 1 Head of Year, 1 Head of Computer Studies had attended a course using Sims package for record keeping.
Schools 1, 2 and 5 were unable to give such detailed information on the amount of training their staff as a whole had received in relation to information technology. However, all their Head Teachers and Deputies had received In Service training relating to timetabling and student records.

In School No. 4's case, the Deputy Head (Academic) ensured that those members of staff who had attended courses in IT briefed other staff in their particular departments on the knowledge gained on the various courses attended. However, it must be noted that no specific time was allocated for this "cascading" and staff carried out this task usually in their lunchtime or free periods. However, time was often given over on "Baker Days" (so called after Sir Kenneth Baker when he was Minister for Education - certain days were allocated throughout the academic year for In-service training without pupils being present) to allow all staff to take advantage of computer familiarisation classes.

Within these two schools one can see the disparity of training provision and the very limited type of training provided during the 1990/91 academic year. School No. 3 did point out, however, that they did try to arrange "cascading" of IT training as and when possible but again, this was something carried out on a purely ad hoc basis.

The Education Support Grant allowed for sums of money to be used for INSET, but it is a mammoth task to ensure that each teacher in the county receives adequate training. Difficulties arise because of
the amount of money each school puts aside for supply teachers who 
have to be called in when any member of staff attends an INSET day, 
is on sick leave, or otherwise absent from duty. This can limit a 
school's ability to send teachers on these training courses so 
sometimes IT instruction is carried out on a purely ad hoc basis, 
probably at lunch time by an enthusiastic coordinator, and attended 
by an even more enthusiastic teacher.

**Mid Glamorgan County Council Schools Networking**

The IT County Co-ordinator was anxious to make the point that the 
42 comprehensive schools in the area are electronically linked 
together via Mid Glamorgan's X.24 network. They have a system 
which is run on IBM mini computers called AS400. Each AS400 has 
an electronic mail system called OFFICE so that the schools can 
communicate electronically with each other. This system gives 
pupils exposure to true industry environments. Terminals or PCs 
are situated around the school so that pupils and teachers can 
communicate with each other internally. They can also 
communicate with the County Council and other schools in the 
county.

At the IT resources centre at Porth, Mid Glamorgan, there are plans 
to build curriculum databases which will be held centrally and every 
school will have access to the information. Mid Glamorgan’s 
mainframe computer also has a connection to the IBM International 
Network, which enables messages and documents to be sent to any 
other user whose system is also linked to the same network. Soon 
pupils in Mid Glamorgan will be able to exchange ideas with pupils 
in New York or Japan.
Theoretically, although the IT provision for Mid Glamorgan County Education Authority looks excellent, there is still a tremendous amount of work to be done to ensure that all pupils gain the same experience of IT. To some extent, of course, the National Curriculum and TVEI Extension demand that pupils do experience technology in many ways, but it is the quality of training which is now in question.

**London Docklands Project**

A comparison of attitudes to training can be seen when looking at a scheme at present in force in London’s docklands. The Department of the Environment has spent £2 million on new computers for thirty three schools in their area, and this money is being channelled through the London Docklands Development Corporation (LDDC) which is working towards the regeneration of the docklands area.

The investment in technology has been matched by one in training. Over 450 local teachers have been trained in the use of a networked system at a cost of around £750,000. The project has equipped seven secondary, twenty two primary and four special schools with 550 computers linked to a network. It has brought the ratio of pupils to computers down to 20:1 in primary schools; 7:1 in secondary schools and 5:1 in special schools. These ratios approach those recommended by the Parliamentary Office of Science and Technology for the level of computers needed to deliver the national curriculum (*TES, July 1991*).
The purpose of this investment is to ensure that local people in the docklands boroughs are equipped to take advantage of the new job opportunities being created. The old London docks are being converted to offices in what is often described as Britain's biggest building project. An estimated 200,000 jobs could be located there by the year 2000, all of them very different from the original riverside occupations.

With all the initiatives which have been set up during the last decade, and the apparent huge investment in hardware, the signs are good for industry and commerce - their future workforce appears to be gaining the experience employers require to work in a world dominated by technology. However, it would appear that the provision is very different from school to school and the most obvious reason for this is that teachers have been involved in a very academic environment never having probably moved out of academic circles i.e. school to college, college to school. It is essential that those teachers already in the profession became technologically sound, and that those about to enter the profession gain IT experience at college.

**Initial Teacher Training**

In order to modify the curriculum to accommodate changing needs in education (e.g. TVEI, National Curriculum) it is important that teaching training institutions should respond to the changing system so that all new teachers entering the profession are aware that teaching is now a hi-tech activity.
In September 1988 the then Secretary of State for Education, Kenneth Baker, set up an Expert Working Group chaired by Janet Trotter, principal of Gloucester College of Higher Education and commissioned a report on computers in initial teacher training.

The report commented that the working group was “greatly disturbed by the patchiness evident in all dimensions of IT provision” (TES, July 1991) and subsequently a Department of Education and Science (DES) survey was commissioned in 1989 which looked at the whole issue of resources in teacher training institutions.

The DES findings revealed that only eight colleges (out of 113) in England and Wales matched the criteria of “at least one microcomputer per five students” as suggested by the Expert Working group chaired by Janet Trotter. If computers over five years old and those shared with other degree areas were extracted from this figure, most of the eight colleges failed the criteria too.

Two years on from this survey, the Times Education Supplement (TES) and the Information Technology In Teacher Education association (IT) surveyed the 113 institutions originally looked at in the DES survey to ascertain whether or not training institutions had responded, and found that:

* more than three quarters of the training colleges had a formal policy for IT
* 95% had recently revised courses in the light of IT developments
* 50% of colleges already differentiate students on entry by IT capability
* 46% have advanced courses for IT specialists
* 69% welcome the idea of a fixed level of competency for new teachers probably around level 6 of national curriculum attainment target 5 (technology) before they can begin teaching

(TES, July 1991)

But the survey is not all good news, and however keen the colleges are, there is no substitute for government financial support. Almost every time a national initiative has been announced to support schools in their information technology provision, the institutions responsible for training the teachers who will be in those schools, have been left out as they have not received any of the funding available.

When the National Council for Accreditation of Teacher Education (CATE) changed its regulations to insist that all teaching students achieve capability in information technology before qualifying, there was no financial recognition of this change. Yet the number of computers in the colleges could be doubled for as little as £7.5 million (TES, July 1991)

National support for Information Technology in initial teacher education is therefore vital, not only to students but also to schools throughout the UK if the government wishes to produce a workforce that is technologically competent.
Chapter 4

Business and Technician Education Council (BTEC)

Introduction

Chapter 3 refers to the existing provision of IT training in schools and teacher training establishments, revealing a disparity in approach, with some providing significant learning experiences for students, whilst others offer a more limited range.

It was suggested by Mr. Gambie, the Information Technology Advisor for Mid Glamorgan that this disparity would disappear as the provision offered through the National Curriculum begins to take effect. Nevertheless at the time of writing, this has not occurred and students embarking on Business and Technician Education Council Higher National Diploma courses (BTEC HND) therefore have widely differing levels of competency in IT skills which reflect the nature of their previous experience in schools or colleges. Students with 'A' level background entering the HND courses having followed a rigid academic curriculum have probably not received any training in computers (apart from those following IT/Computers 'A' level courses) whilst those entering through BTEC National Courses will have become familiar with IT and have some competence in this area.

The question with which this chapter is concerned is the response higher education has made to the need for increased training in IT skills and in particular the approach adopted by the Business and Technical Education Council (BTEC) in those courses which it
approves.

Historical Background to BTEC

BTEC was established by the Government in 1983, as a result of the merging of the Business Education Council (BEC) and the Technician Education Council (TEC).

These two Councils had been instigated as a result of the Haslegrave Report on Technician Courses and Examinations (1969). Dr. H L Haslegrave, former Vice-Chancellor of Loughborough University chaired the Committee which had been asked by the government to review the national pattern and organisation of technician level courses, in both the technical and the business sectors.

Haslegrave's Committee noted that such courses were unstructured and uncoordinated and that the existing provision of vocational education was unsuitable for existing employers and also unsatisfactory for future requirements.

The main elements of technician level courses at that time included:

* national certificate and diploma schemes

These were set up in 1921 to lead to Ordinary and Higher National Diplomas (ONDs and HNDs) and Certificates (ONCs and HNCs). Each course was administered by a Joint Committee comprising representatives of industry, commerce and education, as appropriate.
* 'G' (General) course and 'T' (Technician) courses

These were established in response to the White Paper
Better Opportunities in Technical Education (1961)

The Courses were examined by the City and Guilds of London
Institute, together with six Regional Examining Boards (REBs)

Haslegrave's Committee recognised the value of these schemes but
was most concerned about the lack of an overall coordinating
machinery and was convinced of the need for a "modern, flexible
and well-conceived pattern of technician courses and examinations"
(BTEC, 1987). To that end, it recommended the establishment of the
Technical Education Council (TEC) and the Business Education
Council (BEC). and these were formed in 1973-74.

Both BEC and TEC were committed to vocational relevance but
differed in their curriculum structure. BEC used a course structure
made up from core and option modules. Core modules entailed the
compulsory study of centrally-important themes like people, money
and communication. They were specified as aims and objectives.
TEC courses were based on essential and optional units of study at
various levels. Each unit was expressed in terms of specific aims and
specific objectives.

The Haslegrave Committee had envisaged as far back as 1972, that
these two examining boards would eventually be merged to
rationalise vocational education further and by the end of 1982, BTEC
was formed producing a single national body with wide ranging
responsibilities for non-degree education and the resources for
carrying them out. The new Council aimed to cater for up to 500,000 students.

The most important reasons for the merger were as follows:

* requirements of industry for courses containing both technical and commercial studies
* the need for broader-based studies, especially in the 16-19 age group
* more economic use of resources in areas where both Councils were involved e.g. supervisory studies
* greater uniformity of approach to help employers and centres

BTEC made no immediate big changes to the courses, but instead consulted with employers, trade unions and educationalists to evaluate the strengths and weaknesses of the courses taken over from BEC and TEC. From this point in time, recognition was given to the need to provide the workplace with prospective employees who had had a realistic, relevant and work-related education, in which students' achievements had been measured in terms of their ability to apply knowledge and skills.

BTEC Philosophy and Course Design
In order to understand how BTEC courses should enhance the employment prospects of students following HNDs in this technological era, it is necessary to look at the BTEC philosophy and course organisation.
BTEC itself is not an examining body but uses its authority to establish educational qualifications, design course specifications, approve centres and also validate and monitor courses which have been submitted by centres.

Courses can be run by centres e.g colleges, polytechnics, schools and by giving these centres influence over course design BTEC enables them to respond to local employment opportunities. This has become more significant for as the pace of technological change has accelerated, so have the needs of industry, commerce and the public services for a consistent and reliable supply of suitably educated, skilled and motivated people.

Cardiff Institute of Higher Education, whose HND Business Studies Course is the subject of this study, is a centre which should take into account this need for a more adequate supply of technologically skilled personnel as it is situated on the “high-tech corridor” - the M4 - in an area which continues to attract many high technology industries, as well as being the headquarters of many commercial businesses and public services e.g. the Business Statistics Office, Newport, Companies House, Crown Way, Cardiff and the whole of the Cardiff Bay Development.

Structure of BTEC Courses
As has been previously stated, the function of BTEC is to provide rationalised, vocationally orientated qualifications. Furthermore, they were to provide a variety of courses at differing levels so that a student could progress from one to another as their competencies grew.
Thus the full range of BTEC qualifications are:

BTEC First Certificates & Diplomas
BTEC National Certificates and Diplomas
BTEC Higher National Certificates and Diplomas

Each successive level of a BTEC Course is more demanding than the last. First and National Certificates and Diplomas are Non-Advanced Further Education (NAFE); and Higher National Certificates and Diplomas are Advanced Further Education (AFE) or Higher Education (HE). Whilst each of these levels requires students to use Information Technology, the focus of the research described in this study is the role performed of IT in higher education and is therefore restricted to BTEC HND level.

Entry requirements and duration of courses are shown in Table 4.1.

| TABLE 4.1 |
| COURSE DURATIONS AND ENTRANCE REQUIREMENTS |

| FIRST |
| Age | from 16 |
| Diploma | 1 year full-time |
| | 2 years part-time |
| Certificate | 1 year part-time (in employment) |
| Requirements | completion of UK compulsory school education or equivalent |
NATIONAL
Age from 16
Diploma 2 years full-time
3 years minimum part-time
Certificate 2 years part-time (in employment or with relevant work experience/training)
Requirements completion of UK compulsory school education or equivalent appropriate attainment in previous study e.g BTEC First, CPVE with suitable level of attainment, GCSE in four subjects at grade C or equivalent.

HIGHER NATIONAL
Age from 18
Diploma 2 years full-time
3 years minimum part-time
Certificate 2 years part-time (in employment or with relevant work experience/training)
Requirements possession of BTEC National Diploma or Certificate, or at least one GCE 'A' level with supporting GCSEs or equivalent

In order to gain BTEC approval for a course, the Council will first have to satisfy itself that the centre has the appropriately qualified staff to teach on the course and that there are also adequate resources to support it. This refers particularly to library and technological support. It is also essential that centres maintain strong links with industry and commerce because of the need to keep teaching relevant and up-to-date, and to provide students with work placement opportunities (BTEC, 1986).
The quality of course management and the commitment of staff working together as a team are, in BTEC's opinion, probably the most important factors in providing effective employment-related education. Staff development therefore also plays a crucial part in the provision particularly for those staff who are involved in delivering the technology skills.

Courses are likely to be structured in two ways:

(a) Unit-based - a combination of units of study with progression through the Course depending on success in each Unit and with credit being given for each Unit achieved - whether or not the whole course is completed.

(b) Grouped - the elements grouped in successive stages, with progression to each stage normally depending on success in the previous stage.

Whatever structure is chosen by a centre, BTEC requires that the programme of study (a single unit or a collection of units leading to a BTEC award) be planned, managed, taught and assessed so that students experience it as a coherent whole in which all parts are well related to each other, with the overall aim dominant throughout (BTEC, 1987).

BTEC emphasises in its document "Policies and Priorities into the 90s" (BTEC, 1987) that centres should produce programmes of work which have a multi disciplinary theme. Thus traditional subject areas are delivered through units which will indicate the application
of that subject area in the business world e.g. economics, is delivered in a unit “Business Environment” or “Organisational and Environmental Structures”.

This programme of integrated work enables students to apply knowledge and understanding to real situations, to cope with problems of an unpredictable nature, and to acquire new knowledge. Information technology is seen as an essential aspect of this integrative approach. Indeed it is one of the Common Skills identified by BTEC as requiring competency (BTEC 1986). Information Technology skills can be achieved by students through a variety of learning mechanisms e.g. in a formal accounting unit the question of stock control could be tackled by using a software stock control package, e.g. Paradox.

This commitment by BTEC has important implications for centres which conduct such courses as the impact of technology changes the patterns of work organisations. Individuals may work more on their own e.g. from personal work stations or even from their homes; future managers are likely to be more innovative and pro-active in relation to the new technology. The high productivity office of the future will be one in which the traditional manual support functions, such as business analysis and projections, and time and resources management are automated in conjunction with operational tasks such as the reporting of meetings and budgetary control.

To this end BTEC states in its document Policies and Priorities into the 90s that administrators should “... understand better the scope
and applications of computer technology". Indeed a student’s possession of these skills can make the difference between success and failure at work.

It is critical therefore, that programmes of study reflect the above-mentioned skills so that students can meet the demand for a technology-skilled workforce. This applies in particular to management and professional staff whom employers see as a key to business success in a changing environment.

**BTEC HND Business & Finance - Cardiff Institute of Higher Education**

The remainder of this chapter is concerned with the way in which one centre, namely Cardiff Institute of Higher Education, has sought to implement the BTEC philosophy in the course design of the Business and Finance Higher National Diploma.

It is intended to demonstrate that due recognition was given in the design of the course to the role IT was to play. Indeed, it will be seen that it was regarded as one of the key mechanisms whereby integration of learning was to take place. However, the chapter does not attempt an assessment as to the success or otherwise of the course team in actually delivering such an integrative experience, for this is left to the next chapter where this and other related issues are examined.

The HND Business & Finance course at the Cardiff Institute is designed as an introduction to the business environment, its organisations, systems and people. It has been specifically designed
to respond to the needs of students following a vocationally oriented programme of study in business studies, providing opportunities for students to -

* develop potential as individuals and as future employees
* gain vocationally relevant knowledge and skills
* achieve competence in skill use in organisational contexts
* establish links with business organisations as a basis for future employment

*(SGIHE, 1988)*

To this end the principles of an integrative approach to learning with an emphasis on the acquisition of certain skills which has consistently been articulated by BTEC, has found expression in the current BTEC HND course document. There, emphasis is placed on the importance of integrative focal themes which are assessed through the programme of integrated assignments (PIA). In this way, it is hoped to avoid the dangers of excessive compartmentalisation of knowledge acquisition. The importance of skills acquisition is also emphasised as well as the need to “relate learning to problems faced by work organisations” *(SGIHE, 1988)*.

Nevertheless, despite this integrative approach, subject areas remain distinct and the structure of the course reflects this. In detailing that structure, however, it must, once again, be emphasised that though they may be distinct units, integration is attained through the programme of integrated assignments previously referred to.
Course structure

The course is comprised of two types of unit, compulsory and optional. In the first year of the course the compulsory units have a unit value of 5 and optional units have a value of 3, while in the second year, the respective ratio is reversed.

TABLE 4.2
HND BUSINESS STUDIES

YEAR 1

INTEGRATIVE FOcal Theme

<table>
<thead>
<tr>
<th>CORE UNITS</th>
<th>Inter-personal and Managerial Processes</th>
<th>Quantitative and Financial Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational Structures and Processes</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>UNIT VALUE</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>CAREER STREAMS</td>
<td>Business Admin</td>
<td>Public Admin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tourism</td>
</tr>
</tbody>
</table>

RECOMMENDED OPTION UNITS

<table>
<thead>
<tr>
<th>UNIT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
</tr>
</tbody>
</table>

INTRODUCTION TO PUBLIC ADMINISTRATION

SELECTED OPTION UNITS

<table>
<thead>
<tr>
<th>UNIT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
</tr>
</tbody>
</table>

2 APPROPRIATE OPTIONS FROM:

- Personnel Management
- Language 1 (Post GCSE level French, Ab initio German, Spanish)
- Business law 1
- Introduction to Public Administration

TOTAL UNITS

UNITS 8 + SKILLS WORKSHOP 1
<table>
<thead>
<tr>
<th>TABLE 4.3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR 2</strong> (Includes Work Placement of 5 weeks)</td>
</tr>
</tbody>
</table>

**INTEGRATIVE FOCAL THEME**
- Business Decision Making Strategies

**CORE UNITS**
- Organisational Adaptation and Environmental Change
- Financial Strategies for Business

**UNIT VALUE**
- 1.5

**CAREER STREAMS**
- Business Admin
- Public Admin
- Tourism

**RECOMMENDED OPTION UNITS**

<table>
<thead>
<tr>
<th>Management (UNIT VALUE 1.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative Methods</td>
</tr>
<tr>
<td>Government Policy Making</td>
</tr>
<tr>
<td>Marketing</td>
</tr>
<tr>
<td>Local Government Admin</td>
</tr>
<tr>
<td>Tourism Env'ment</td>
</tr>
<tr>
<td>Business Law 11</td>
</tr>
<tr>
<td>Social Policy</td>
</tr>
<tr>
<td>Tourism Law</td>
</tr>
<tr>
<td>Human Resource Management</td>
</tr>
<tr>
<td>Understanding Europe</td>
</tr>
<tr>
<td>Marketing for Tourism</td>
</tr>
<tr>
<td>Employee Relations</td>
</tr>
</tbody>
</table>

**SELECTED OPTION UNIT (UNIT VALUE 1.0)**
- NOTE: Where appropriate, students may select instead of the above options:
  - (i) Language 1 or 11
  - (ii) Office Management
  - (iii) Any acceptable Unit from the above lists

**TOTAL UNITS**
- Units 8 + workshop 1
The Skills Workshop

The Information Technology Workshop proposed in the resubmission document 1988 was intended to "form the basis of a progressive development of skills throughout the two years of the course." Such workshop was not seen as an activity to be used for the purposes of assessment but instead to provide the basis for the demonstration of skill-competencies in other areas. It was intended that the information technology element of the workshop would emphasise skills associated with:

* the use and application of Information Technology in the workplace
* the role of Information Technology in acquiring information and communicating information to other people and organisations
* the range of software available for use within the work organisation
* the implications of Information Technology usage for the management of organisations.

To this end, therefore, one hour workshop time was allocated to the HND Business Studies course in order to pursue the objectives named above.

Cardiff Institute of Higher Education has been offering HND Courses in Business Studies since 1982 and previous to that HNC courses were on offer as far back as 1972.
The present HND Course was revalidated by BTEC in September 1988 and was intended "to provide a broad business education, with a wide variety of business knowledge and skills being developed in each area of the course (SGIHE, 1988). Recruitment of students to the HND Business Studies Course has grown steadily since its inception (See Table 4.5 and Figure 1). This type of course has become attractive to students following GCSE and 'A' level Business Studies courses and has particular appeal to those students who do not wish to follow a strictly academic course at a higher education establishment. The opportunity to take part in work placement also contributes to its popularity, as in many instances it gives them an insight into what type of commercial undertaking they might eventually wish to work in. In many instances students are offered full time work, in their work placement, after successfully completing the course.

Table 4.5 shows student numbers in Years 1 and 2 since 1982:

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>46</td>
<td>48</td>
<td>70</td>
<td>70</td>
<td>72</td>
<td>68</td>
<td>62</td>
<td>67</td>
<td>90</td>
<td>101</td>
</tr>
<tr>
<td>Drop out (%)</td>
<td>24</td>
<td>6</td>
<td>24</td>
<td>23</td>
<td>26</td>
<td>15</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>n/a</td>
</tr>
<tr>
<td>Year 2</td>
<td>35</td>
<td>45</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>57</td>
<td>60</td>
<td>64</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

The "drop out " rate between Year 1 and Year 2 has fallen dramatically over the last few years. The considerable drop in numbers of students failing to return for the second year of the course could possibly be due to the high levels of unemployment.
presently being experienced which may well encourage students to continue their studies rather than enter a shrinking job market.

The reasons for students leaving the Course after the first year have been quite difficult to assess as records do not always show exactly what has happened to each student but Table 4.6 shows the official reasons given by students for not returning to complete the second year:

![Percentage Dropout for each Year](chart)

**TABLE 4.6**

Reasons why students did not return to the 2nd Year

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Found a job</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Change of career</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Family reasons</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cash problems</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Failing 1st year</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>11</td>
<td>3</td>
<td>17</td>
<td>16</td>
<td>19</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>
During 1991, over 450 applications were received from students for 100 places wishing to take up a place on the first year of the HND course (the highest number recorded) again highlighting the popularity of this type of course (see fig. 4.2 overleaf).

![Student Enrolment on HND Business Studies 1982-91](image)

Because of the marked increase in numbers of students applying to take up places on the HND Business Studies course at Cardiff Institute, the HND Course Committee, which comprises all lecturers who teach on the course, is trying to initiate and improve their educational programme, but the development and assessment of viable 'hi-tech' education programmes is taking a long time. The requirement for cost-effective instruction for prospective employees of the technologically oriented society is forcing a reassessment of the magnitude of the financial investment for IT within the Faculty which will be necessitated in order to satisfy this. Such investment will require a comprehensive and coherent IT development programme to address hardware provision, software provision and staff development.
In conclusion, this chapter has sought to demonstrate that just as the secondary sector has responded with curriculum changes to the altered technological environment, so too has higher education. The approach of BTEC has been to seek greater levels of integration of IT with other areas of knowledge and skills acquisition.

It was shown that in the design of the HND course at the Institute, these philosophies and approaches found expression in the course re-submission document of 1988. In that document the importance of IT provision was emphasised, especially its integrative role in the learning process.

Finally, the major issue of actual delivery of IT was touched upon, especially the difficulties encountered within the Faculty in restructuring its hardware and software provisions to meet the increasing needs of both students and employers. Attention is now turned to the implementational difficulties associated with these issues and is discussed by the author in the next Chapter.
Chapter 5

The Growth of IT within HND Business Studies at Cardiff Institute of Higher Education

The intention in this Chapter is to look at the development of information technology from 1982 (when the HND in Business Studies was first introduced to the Faculty of Business Information and Management) until the present (1991) in relation to the HND Business Studies Course, and to comment on the effectiveness or otherwise of the success in integrating it into the overall learning experience of students on that course.

Hardware provision
During the first six years of the Course (1982-1986) the hardware provision was, by today’s standards, extremely limited. The Faculty boasted only 20 Tandy computers and several printers. Students access was also very limited as only those involved in the second year option of Quantitative Methods were encouraged to use these computers.

In 1988, however, the Faculty was required to prepare a resubmission document to BTEC in order that the HND Course in Business and Finance could be validated for a further five years. The Course Committee at this time recognised the fact that a skills workshop both in communications and information technology should be provided so that students could develop those skills and through the confidence so gained be willing and able to use them in an integrated way in other areas of the course. Such an expansion of the role of IT could only occur with an expansion of hardware and by
1988 this was beginning to occur. At the time the course resubmission was produced the level of hardware provision on the Colchester Avenue site of the Faculty was as follows:

48 Tandy, twin disk, 64k microcomputers with printers
26 Macintosh, 512K microcomputers with printers
12 Opus Microcomputers
1 Laser printer

By 1990, the provision had again increased. The Tandy machines which had been obsolete since before 1988 were finally replaced by 18 Opus Microcomputers and another laser printer. Together with the Macintosh microcomputers, three rooms were now available for students to improve their skills in information technology. However, increasing the hardware provision alone did not increase the students' training in IT skills as there was a deficit of lecturing staff able to offer such training and the applications software offered was extremely limited.

In 1991, the Faculty of Business and Information Management made available funds in order to increase hardware provision while three further rooms were refurbished and designated as Information Technology rooms. A further 55 IBM PCs were installed in these rooms (see Fig. 5.1) together with peripherals e.g. six printers and an Ethernet network (LAN).
The hardware facilities are available for all students within the Faculty which covers a range of courses i.e. BA European Administration, BA Business Studies and the HND Year 1/2. The number of students amounts to 300, giving a ratio of computer:student of 3:1.

**Software provision**

The software provision in 1988 was as follows:

- Superscripsit - word processing
- Visicalc - spreadsheet
- Time Manager - business diary
- Project Manager - critical path analysis
- Profile - database
- MacWrite - word processing
- MacPaint - graphics
- Excel - spreadsheet

With the introduction of more Opus microcomputers, several more commercially accepted packages became available such as Microsoft
Word 3, Ability+ (an integrated package which included word processing, spreadsheet and database, and Supercalc4 (spreadsheet). These software packages were multiple individual copies issued under site licence.

In 1991, the software provision changed in line with that offered on the main college site at Llandaff where the Computer Services Unit operates. With networking, Microsoft Word 5, Supercalc5 and DBase IV 1.1 became the current packages in use.

**Staff Development for IT**

In the early days of the HND Course, the number of staff qualified to instruct in word processing, database and spreadsheets was quite limited, ie. two lecturers with accounting backgrounds gave the instruction which meant that students themselves had to ‘pick up’ word processing skills and, of course, keyboarding skills.

There was no IT policy specifically concerned with how to integrate IT into the HND course and no staff development to encourage more involvement in this area. Any staff development has been entirely voluntary. During 1986, one of the accounting lecturers attempted to hold lunchtime sessions for colleagues who were beginning to show interest in using computers, though it must be said not for teaching, but more for using it as a personal tool for preparing lectures etc. However, as with any voluntary scheme, this soon ‘tailed off’ due to conflicting commitments during the lunch hour and the lack of a structured programme.
The table below shows both the number of teaching staff involved in the teaching of IT since 1982:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>STAFF INVOLVED IN I. T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>2</td>
</tr>
<tr>
<td>1983</td>
<td>2</td>
</tr>
<tr>
<td>1984</td>
<td>2</td>
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<td>1985</td>
<td>3</td>
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<tr>
<td>1986</td>
<td>3</td>
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<td>1987</td>
<td>4</td>
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<tr>
<td>1988</td>
<td>5</td>
</tr>
<tr>
<td>1989</td>
<td>4</td>
</tr>
<tr>
<td>1990</td>
<td>5</td>
</tr>
<tr>
<td>1991</td>
<td>7</td>
</tr>
</tbody>
</table>

It must be noted that until 1988, the lecturers involved in using information technology were either accountants or systems engineers. In 1988, one lecturer joined this group from the secretarial section of the faculty and it was then that the first word processing instruction began.

At the beginning of the 1991\92 session, two more existing members of staff with substantial IT experience (who had previously been engaged on Secretarial Courses which were disbanded in July 1991) were brought into the existing IT teaching team.
Initial Attempts at the Provision of IT Workshops for HND students

From 1982-1987 workshops as such, did not exist. IT was taught purely through such options as Quantitative Methods, refer to Table Course Structure, (if a student did not take this option, however, he/she did not gain any experience in this area) and as a result much of the IT instruction centred around spreadsheet packages, such as Excel and Visicalc. Students had no formal instruction in word processing, for example, and were left very much to their own devices in this area.

When the resubmission document was prepared in 1988, recognition was given to the needs of students to acquire information technology skills “in the rapidly changing world of technology and technological application.” (SGIHE, 1988) As a result the students who commenced the course in 1988, were the first to receive instruction in a structured IT workshop. A lecturer from the secretarial studies section of the Faculty conducted workshops on a Friday afternoon for the HND Year 1 intake; the first section of the workshop was devoted to keyboarding skills followed by word processing using Microsoft Word3. One of the accounting lecturers then followed the second term using spreadsheets (Visicalc) and Database (DBase 111+) packages.
Many problems were encountered in this first year workshop for example:

(a) mixed ability entry
(b) large groups, resulting in two students per computer
(c) Friday afternoon scheduling of a workshop which students did not see as a mandatory part of the course, especially as there were no assignments or examination requirement
(d) one technician only to provide backup
(e) poor attendance
(f) second lecturer taking over in Spring term
(g) no integration of IT in assignments e.g. by wordprocessing
(h) lack of IT policy within the Faculty

As a result of the above, many students did not bother to attend on a regular basis so the initial intention of the Course Committee of the HND Course that IT be an integral part of the course did not bear fruit.

The Year 1 1988 intake, who proceeded to Year 2 (1989) did not have any time allocated to them in their second year for Information Technology workshop. Only those students who took the Quantitative Methods option carried on using computers and this was in fact restricted to using the Apple Macintosh microcomputers where they mainly used the Excel Package (spreadsheets)
In 1989, the new first year intake were allocated an IT workshop but unfortunately this time no member of staff from the secretarial section was able to spend time instructing in word processing as they were fully committed teaching IT on their own courses. As a result students were left very much on their own during that year and although time was available for IT, there was no one to give full time instruction.

In summary therefore it can be stated that the BTEC HND course committee, which comprised of all staff teaching on the course, failed to develop an adequate IT policy. This lack of policy by the course team was reflected in a fragmented approach to the teaching of IT on the course.

Moreover, staff development had been virtually non-existent in this area and resulted in an enormous gap in the Faculty’s ability to provide staff with sufficient expertise in the field of information technology. Even compared to the minor staff development in primary and secondary education, higher education has been very slow to address such an important facet of students’ all round education.

The lack of an IT policy in particular was the subject of comment by HMI in their inspection of the course in January 1991. In particular the report of the HMI identified certain aspects of IT provision which seemed to them to merit attention. They noted:

1. Inadequate hardware facilities
2. Insufficient open access
3. The unsuitability of certain software packages for the commercial market.
4. The lack of adequate integration of IT throughout the course
5. Insufficient recognition of prior learning for those students who had previous IT experience.

(HMI, 1991)

Progress in 1990/91
The HND Course Committee however, were becoming increasingly aware of the inadequacy of IT provision and even before the HMI inspection had been announced, certain decisions had been taken by the Committee to attempt to improve IT provision to students. These steps took the form of staff development, the provision of more structured workshops for students on the course and greater attempts to integrate IT throughout the course.

With regard to staff development, staff were identified as being willing to undertake and capable of benefiting from the degree in Business Information Systems offered by the Faculty on the Llandaff site. It was felt that such training would provide them with a greater understanding of computer systems and enable them to more effectively undertake their role in providing IT instruction on the HND and other courses. At the moment of writing, one member of staff is on the second year of the three year part-time degree, and another in the first year. In addition to this development of teaching staff, an additional full time technician with an HND in Computer Studies has been appointed to the Colchester Avenue site and the other technician given day release to undertake a BTEC HNC in
Computer Studies.

In relation to the provision of workshops, in September 1990, the new intake of HND students were allocated one hour per week Information Technology workshop and this time, the workshops were conducted by two lecturers, both with IT expertise. A programme of study was put together as follows:

Term 1 - Keyboard instruction
         Word Processing (Ability)
Term 2 - Spreadsheets (Ability)
Term 3 - Database (Ability)

By the end of the first term all students were capable of word processing their in-course assignments, and many lecturers made it mandatory for them to hand in their assignments word-processed. The first integrated assignment (PIA1) had to be word processed as part of the programme and students gained credit for doing so.

Before actually commencing the workshops a questionnaire (referred to in Chapter 2) was given to ascertain students' capabilities as far as word processing/keyboarding skills and the results were as follows:

1990 Intake (68 students completed questionnaire)

<table>
<thead>
<tr>
<th>Computer Literate</th>
<th>Keyboard Literate</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>24</td>
</tr>
</tbody>
</table>

1991 Intake (84 students completed questionnaire)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>41</td>
</tr>
</tbody>
</table>
It is interesting to note the rise in the numbers of students with computer and keyboard skills between the 1990 and 1991 entry.

Another interesting feature derived from the questionnaire shows that out of 24 students in the 1990 intake, only two were male; the 1991 intake showed that out of the 41 students with these skills only 6 were male. Schools have still to break down the gender association with this particular skill.

By the end of the second term, students were now familiar with the Ability Spreadsheet package and this was used in the PIA2, as part of the the Accounts section of the assignment and proved to be a very demanding part of the course for the students.

The third term was quite short, and a fair amount of time was spent letting students use the workshop for completion of assignments besides taking brief look at databases.

However, staff were aware that this programme might not be necessarily the most appropriate way of imparting IT skills and therefore in order to assess what the students themselves thought of information technology workshops, a number of students with varying entry backgrounds were interviewed (see Appendix 11). It was felt that as a result of these interviews, the next year's programme could be modified to meet, in part, the needs of our clients.

**Summary of Student Interviews**
The student interviews revealed that the workshops had provided
them which enhanced skills and whatever ability they had entered such workshops with, they had all improved in some respect.

Most students felt that the greatest benefit their new-found technology skills gave them was that it made them a much more viable prospect as a future employee. They also felt more comfortable with technology than they had when first starting the course. These were all positive statements and the lecturers concerned felt that their first steps in providing information technology into the curriculum had been successful.

Much criticism was levelled at the working environment and this was very understandable. Two rooms were allocated for workshops, namely C101A and C101B; in essence this was one room which had been partitioned into two, several years previously. Although there were 15 computers in each section, this meant that each group had to be split into two - therefore any general instructions which had to be issued had to be done at the beginning of the session (not always practicable) and lecturers found themselves having to go from one room to the other as students encountered problems etc.

In fact, some of the criticisms made by the students echoed those of the HMIs in their report, namely that the printing of work was very often restricted by the fact that printers did not always function correctly causing frustration and much time-wasting. Open access was limited mostly because only two evenings had been set aside for this purpose resulting in overuse and difficulty in actually obtaining a workstation.
It was becoming apparent that the IT provision within the Faculty, though improving was still beset with problems. However, it was felt that these were the consequence of having the beginnings of a successful IT policy and staff development programme and were largely attributable to the increase in student numbers and the consequent pressure this has placed on existing facilities.

**Conclusion**

This Chapter has sought to outline the development of IT provision in the BTEC HND course in Business and Finance taught in the Faculty of Business Information and Management.

In the early years of the course little attention was paid to IT apart from its use in the Quantitative Methods Unit and here it was largely restricted to the use of spreadsheets. This lack of a clear integrative role for IT was compounded by the absence of any staff development in this area. Moreover, the hardware and software facilities were relatively poor.

At the time of the resubmission of the course to BTEC for further approval, these faults were recognised and the resubmission document sought to address these issues and it emphasised the key role which IT should play in delivery of the course. However, there were implementational difficulties in the early years of administering the course and though there was some improvement in hardware and software provision, it was not keeping pace with the growth in student numbers. A lack of staff to deliver the IT workshops which formed an intrinsic part of the resubmission
proposals, further exacerbated these problems.

The Chapter reveals how certain measures were taken to seek to correct these problems and that though begun before the HMI report, that report nevertheless provided further impetus for these measures to be fully implemented.

Finally, it must be stated that though certain measures have been taken, the issue of the integration of IT into the whole course has still not been satisfactorily resolved. Too many staff consider IT integration to be merely getting students to word process their assignments. However, this is beginning to change and since the last Course Committee (December 1991), the Languages Department have consulted with one of the IT lecturers in order to prepare an assignment using DBase IV; the Financial Services to Business (FSB) assignment contains a large spreadsheet for use with Supercalc5; the Communications lecturer set a task specifically using word processing for production of CVs, so some progress is being made. It is the intention of the IT lecturers to consult with each lecturer during the next academic term in order to ascertain exactly how IT can be effectively integrated into their subject area.

The staff currently engaged on HND workshops have also sought to provide a more cohesive structure to this area and have prepared teaching booklets on the three major software packages e.g. Word5, Supercalc5 and DBase IV.
It is this wider integration of IT that is so important and it is the skill to use IT in this way that employers seek. It is with this aspect of IT provision that the next chapter is concerned.
Chapter 6

THE EMPLOYERS

Most predictions about the social impact of computers have been wide of the mark; it was argued in 1966 that computers would take away people's jobs and produce enormous amounts of enforced leisure time (Palfreran & Swade, 1991). This, of course, has not happened; the computer has replaced some jobs but has created many others as stated in Chapter 1.

What has occurred, is a shift in the types of jobs available to meet the technological environment and the skills required from the future workforce. It is, therefore, the students such as those undertaking the BTEC in Business & Finance, who will be uniquely qualified to make a contribution to today's businesses.

It is the intention in this Chapter to look at a small sample of business organisations within the South Wales area to ascertain their information technology commitment and indeed whether or not they look for technological skill when recruiting.

Ten companies were chosen at random from a list of employers who, over the years, have taken second year HND Business Studies students for their obligatory work experience period. It was extremely interesting to note that even in a random selection of organisations, every questionnaire (see Appendix 12) returned showed that some item of information technology and a variety of software was in every day use.
The two Tables below show the hardware and software available in the ten organisations surveyed:

### TABLE 6.1

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Types of Hardware</th>
<th>Mainframe</th>
<th>Mini</th>
<th>N/wk PC</th>
<th>Stand-Alone PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clwb Cymraeg</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YMCA</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malpas Road Post Office</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barclays Bank Sub Branch, Rhondda</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Cleaning Services, Cardiff</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Trading, Cardiff</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>South Glam. County Council</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>South Glam. Health Authority</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Lloyds Bank, Cardiff</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Western Mail, Cardiff</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

### TABLE 6.2

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Types of Software</th>
<th>Database</th>
<th>Spreadsheet</th>
<th>Graphics</th>
<th>WP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Office</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Clwb Cymraeg</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Capital Trading, Cardiff</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Western Mail</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
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<tr>
<td>YMCA</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>x</td>
</tr>
<tr>
<td>Barclays Bank</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>South Glam Health</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>South Glam CC</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Lloyds Bank, Cardiff</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>General Cleaning, Cardiff</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

This survey shows that in all cases of the random sample, there is some form of automation with most of the smaller companies using stand alone PCs and the larger companies a variety of hardware as one would expect.
The main software packages used in the surveyed organisations (Table 6.2) were those concerned with spreadsheets, databases and word processing. These are the type of software packages it would be expected to find in such organisations and are indeed the ones which form the basis of the IT component in the BTEC HND Business Studies Course at the Institute.

One way of ensuring that students are being trained to meet the demands of new technology is to ensure that links with industry are built-up and maintained. Although CIHE ensures that its second year students obtain work placement, there is no policy of continuous involvement whereby staff are made aware of the developments taking place within the workplace as far as technology and technology management are concerned. If links could be established with industry and commerce, then they could be instrumental in ensuring that the provision within a skills-based course such as the HND in Business Studies matched the requirements of employers. These links would also highlight the facilities available in the College and employers would be made aware of the training currently being undertaken by students within the Business Studies Faculty.

Another way of liaising with industry would be to run short-courses for their staff, designed to train those requiring information technology skills. A prepackaged course designed specifically for that organisation would be an excellent way of increasing funds into the Faculty.
Staffing

The majority of these organisations surveyed are now looking for some expertise in information technology skills. Half the organisations surveyed provided in-house training for specific needs but there was little opportunity for day or other release to gain IT skills.

One interesting point to note was that all organisations expected their executive personnel (i.e. managers and above) to be able to understand and use computers. This draws attention to the need to provide such training for students wishing to work in a managerial capacity and further highlights the different skills now required in this area of work.

The role of the manager in today's technological environment is to make sure that there are sufficient systems within the organisation to make it work. Essential ingredients in the development of good systems are good communications channels and information systems. In the near future we shall see the advent of so-called 'expert systems' which will of enormous help to managers, especially for decision-making. Such systems will provide the manager with all the information needed in his area of expertise at the touch of a button. Flexibility in the design of systems is likely to be of considerable importance in the future, and to this end the introduction of desktop computers and similar devices is timely.

The Personnel Officer of Lloyds Bank stated in his observations that any student wishing to pursue a career in finance or accounting must
be computer literate. He felt that besides having the traditional qualifications of English and Mathematics that the future managerial trainee in this area, such students should have had experience particularly using spreadsheets, or at least, have an interest in computers.

An interesting point was also made by the Personnel Officer of the South Glamorgan Area Health Authority who stated

"... the main thing I feel that is necessary, is overcoming students' fear of computers and increasing their aptitude and interest to learn new packages."

This substantiates a quote from the Guardian newspaper in January 1992 where the Director General of the British Institute of Management stated that

"...there are cultural and psychological barriers to be overcome in the word of technology and this means training. But if schools, colleges and universities fulfil the task of training, those new entering the job market should feel no such 'technofear'."

All the organisations surveyed stated categorically that they were looking for a workforce which was technologically aware, and that if a prospective employee had this qualification or knowledge, they would be seen as a potentially good management prospect.

To this end, it is felt that by providing technology workshops using commercially viable hardware and software, Cardiff Institute's HND Course in Business Studies is taking on the challenge of meeting the needs of employers.
Chapter 7

CONCLUSION

This study has sought to examine the provision of information technology training in education, with particular reference to higher education.

The Input, Process, Output theme was the model around which this investigation was structured in order to follow the logical progression of such training from schools through to the world of work.

The vision of the Conservative Government in the Eighties to produce a more technically skilled workforce has had, perhaps, a limited impact in spite of such innovations as TVEI and National Curriculum technology. It would appear that the main reason for this is meagre funding which does not allow for sufficient technical training of student teachers and retraining of more established teachers who still fear technology, or are dismissive of its use in academia.

Despite this, however, a measure of progress has been made in technology training as can be seen in the light of the student survey carried out on those entering Cardiff Institute of Higher Education in September 1991. Compared to the 1990 intake, their computer/keyboarding skills were higher giving credence to some of the work being done within our schools to promote a more flexible, broad-based technical education.
These skills accomplished in schools, give the higher education institutions a good foundation from which they can further the students' knowledge and awareness of technology and channel this into a business-oriented programme of study.

The process, being undertaken at Cardiff Institute of Higher Education, of preparing HND Business and Finance students to take their place in industry and commerce has certainly improved during the five years since it sought approval from BTEC for the second time in its history of offering such a course.

The Faculty of Business Information and Management at the above-named Institute's Colchester Avenue site, has recognised the need to upgrade its facilities to meet the demands of industry and commerce, and to provide a medium for teaching the relevant skills through an integrated approach within the HND course. The ratio of students/computers stands at 3:1 which is an enviable position at present, although with the introduction of a new degree course in September 1992, and a possible increase in the number of students admitted to the Faculty, it is one which must be carefully monitored.

Software provision is adequate at present but although word processing, spreadsheet and database packages are in use, there is need to branch out into desktop publishing and statistics packages to ensure an all-round education in the basics of computing and its uses within industry.
The increase in staffing and subsequent staff development for those teaching IT augurs well for the future but attention must be paid to in-service training in order that all lecturers involved in the HND course become more competent in the use of computers, especially in terms of providing integrated assignments using the technology available.

Since the writer commenced this study efforts have been made to create an IT policy within the Institute incorporating all Faculties. The Faculty of Business Information and Management at Colchester Avenue has also begun weekly meetings with its senior management, IT lecturers and technicians joining together in discussing problems, future plans, teaching strategies etc. providing a cohesive approach to the fundamental process of training the future workforce.

One area which needs attention, however, is that of establishing links with industry. Tenuous links are present as all second year HND students must undertake four weeks' compulsory work experience but such links should be given higher profile and used in a more constructive manner. Perhaps the appointment of an Industrial Liaison Officer who could provide an essential service in visiting industry and commerce to see exactly what their technical provision requires from our students. This would give a better reflection of the 'real world' in assignments and training provision and provide positive benefits for the Faculty in terms of consultancy and the provision of short courses.
These links could also lead to industry coming into the College itself to see what is on offer to our students, and perhaps give advice in general terms.

And so to the Output - Industry and Commerce. A recent survey of managers conducted by the British Institute of Management reveals that

"... 95% of managers state categorically that IT is the way forward in successful business terms but an alarming 5% only have any expertise in this area"

(Guardian, January 1992)

There is still a deficit of skilled technology-trained staff and there is still 'technofear'. It is incumbent upon Institutions such as Cardiff Institute of Higher Education to provide this training and to break down the barriers surrounding this once 'elitist' skill.

Unless Government meets the high cost of providing technology education, on anything like our European counterparts, then we may be left with the worst of both worlds - technology for a self-selecting minority on the cheap. Which is more or less where we came in.
APPENDICES

1. Student questionnaire 1990.
2. Student questionnaire 1991
3. The Curriculum
4. Statements of Attainment
5. Commencement Dates (Technology)
6. The Key Stages - Annex 1
7. Mid Glamorgan Education Committee - IT for Schools Policy Statement
10. ESG IT Hardware 1989/90 - Allocation to Schools
11. Student Interviews - HND Intake 1990
12. Questionnaire to Employers
APPENDIX 1

QUESTIONNAIRE - HND BUSINESS STUDIES
SEPTEMBER 1990 INTAKE
HND BUSINESS STUDIES

This questionnaire relates to your pre course knowledge of Information Technology

Please tick in the appropriate box

Previous Study

1. Have you followed a course in Computer Studies?
   
   1 - Yes .......  2 - No .......

2. Have you passed an examination in Computer Studies?
   
   1 - A level .......  2 - GCSE .......  3 - Other .......
   (please specify "other") ..................................

3. Have you passed an examination in a subject which required the use of computers? e.g. Word Processing?

   1 - Yes .......  2 - No .......

4. Have you followed a non-examinable course e.g. computer literacy, computer familiarisation?

   1 - Yes .......  2 - No .......

Previous Skills

5. Do you have access to a computer at home?

   1 - Yes .......  2 - No .......

6. Are you familiar with any computer software packages? e.g. Word Processing?

   1 - Yes .......  2 - No .......

7. Please tick Male or Female

   1 - Male .......  2 - Female .......

8. Age, please tick

   1 - 18-20 .......  2 - 21 and over .......

C JONES
October 1990
APPENDIX 2

QUESTIONNAIRE - HND BUSINESS STUDIES

OCTOBER 1991 INTAKE
QUESTIONNAIRE

HND BUSINESS AND FINANCE - YEAR 1 (1991/92)

1. Prior to commencing this course, were you aware that information technology workshops are an essential requirement of the course?
   
   YES..........   NO..........   (Please tick appropriate boxes)

2. Do you understand what the term "information technology" means?
   
   YES..........   NO..........   

3. Are you aware that word processing, spreadsheets and databases will be integrated in assignments?
   
   YES..........   NO..........   

4. Have you undertaken any of the following courses?

   GCSE Computer Studies .........
   'A' LEVEL Computer Studies .........
   RSA (or similar) Word Processing .........
   RSA (or similar) Typewriting Skills .........

   If so, what level or grade, did you achieve?
   .............................................................................

5. You may not have taken part in any of the above courses but have you had any experience of computers?
   
   YES..........   NO..........   

   If Yes, please give details of your experience
   .............................................................................

5. Do you have a computer at home?
   
   YES..........   NO..........
APPENDIX 3

CORE AND FOUNDATION SUBJECTS

THE NATIONAL CURRICULUM
PART 2
THE CURRICULUM

1. THE NATIONAL CURRICULUM—, which only applies to maintained schools (including Grant Maintained) has four main elements.

Fig (i) SUMMARY OF THE IMPORTANT ASPECTS OF CURRICULUM PROVISION

BASIC CURRICULUM = RELIGIOUS EDUCATION + NATIONAL CURRICULUM + OTHER SUBJECTS
APPENDIX 4

ATTAINMENT TARGETS & PROGRAMMES OF STUDY
OR TECHNOLOGY
<table>
<thead>
<tr>
<th>LEVEL</th>
<th>STATEMENTS OF ATTAINMENT</th>
<th>EXAMPLES</th>
</tr>
</thead>
</table>
| 6     | 6a) use information technology to combine and organise different forms of information for a presentation to an audience.  
6b) understand that devices can be made to respond to data from sensors.  
6c) identify advantages and limitations of data-handling programs and graphics programs and recognise when these offer solutions to a problem of data handling.  
6d) investigate and assess the consequences of varying the data or the rules within a simple computer model.  
6e) review experiences of using information technology and consider other applications and their impact on everyday life. | Produce a report which involves use of different fonts and letter sizes, and illustrations.  
Use a computer to draw a graph of the temperature of a liquid as it cools; write a procedure, using a software package, to provide a warning sound if a light beam is interrupted.  
Use a desk-top publishing program to integrate text and images in the report of a scientific experiment; choose a data-handling program for processing the results of sports day.  
Define or change the way information is grouped into columns in a spreadsheet showing the nutritional values of types of meals; modify a turtle graphics procedure or its parameters to draw a variety of shapes and transform them.  
Compare own use of control devices with bar codes used for automatic stock control in supermarkets; compare own expression of information using IT with computer-produced bills or personalised mail and consider the implications of access to personal information. |
| 7     | 7a) select software and use it to produce reports which combine different forms of information to fulfil specific purposes for a variety of audiences.  
7b) design, use and construct a computer model of a situation or process and construct computer procedures involving variables.  
7c) understand that the results of experiments can be obtained over long or short periods or at a distance using data-logging equipment.  
7d) select and interrogate a computer database to obtain information needed for a task.  
7e) know when it is appropriate to use a software package for a task rather than other means of information handling.  
7f) understand that dangerous or costly investigations, or those not easily measured can be simulated by information technology. | Produce a presentation suited to a specific audience, combining graphics and text.  
Model the queue of people waiting at a supermarket check-out and vary the service time, number of customers and number of check-outs.  
Use information technology to measure the acceleration of a model car as it runs down a ramp; interpret data transmitted by a weather satellite.  
Make use of a large database about careers or courses, and refine techniques of enquiry to select relevant information.  
Consider the usefulness of a computer-aided design package to investigate the ergonomics of kitchen design.  
Experiment with the operation of a simulated nuclear reactor. |
APPENDIX 5

ATTAINMENT TARGETS & PROGRAMMES OF STUDY

COMMENCEMENT DATES
### TABLE 1

**TECHNOLOGY—SECTION 4 ORDER—**

(ATTAINMENT TARGETS AND PROGRAMMES OF STUDY)

**COMMENCEMENT DATES**

<table>
<thead>
<tr>
<th>Key Stage 1</th>
<th>Key Stage 2</th>
<th>Key Stage 3</th>
<th>Key Stage 4</th>
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<td>(Year 3)</td>
<td>(Year 7)</td>
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<tr>
<td>1991</td>
<td>1st and 2nd</td>
<td>1st and 2nd</td>
<td>1st and 2nd</td>
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<td>cohorts</td>
<td>cohorts</td>
<td>cohorts</td>
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<td>(Years 3 &amp; 4)</td>
<td>(Years 7 &amp; 8)</td>
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<td>parents</td>
<td>(Years 3, 4, 5)</td>
<td>(Years 7, 8 &amp; 9)</td>
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<td>1st, 2nd, 3rd</td>
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<tr>
<td>(d)</td>
<td></td>
<td></td>
<td>(c)</td>
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<tr>
<td>1994</td>
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<td>1st reported</td>
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<td>assessment</td>
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<td>(c)</td>
<td>(d)</td>
<td>(Year 10 &amp; 11)</td>
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<td>(c)</td>
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<tr>
<td>assessment</td>
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</table>

(a) Commencement dates for attainment targets and programmes of study are 1 August in each year. Assessment will take place in the summer term of the calendar year. Section 4 Orders covering assessment will be laid in due course.

(b) Reference in brackets to year numbers follow terminology recommended by NCC and approved by the Secretary of State (see Annex 2).

(c) The results of the first assessment at the end of key stages 1, 2 and 3 will only be required to be reported to parents in respect of their own children. This assessment will apply to the first cohort of pupils who have followed the attainment targets and programmes of study. Thus in 1992 pupils in Year 2 will be assessed at the end of Key Stage 1. In 1993 pupils in Year 9 will be assessed at the end of Key Stage 3 and in 1994 pupils in Year 6 will be assessed at the end of Key Stage 2.

(d) The first reported aggregate assessment will be of the second cohort of pupils who have followed the attainment targets and programmes of study.

3.
APPENDIX 6

THE KEY STAGES
THE KEY STAGES

For the purposes of the National Curriculum the Act divides the period of compulsory schooling into four key stages.

Key Stage 1 begins with a pupil becoming of compulsory school age (that is, the start of the term after his or her fifth birthday), and ends at the end of the school year in which the majority of pupils in his or her class or teaching group attain the age of seven.

Key Stage 2 for a pupil is the period beginning at the start of the school year in which the majority of pupils in his or her class attain the age of eight and ends at the end of the school year in which the majority of pupils in his or her class attain the age of eleven.

Key Stage 3 for a pupil is the period beginning at the start of the school year in which the majority of pupils in his or her class attain the age of twelve and ends at the end of the school year in which the majority of pupils in his or her class attain the age of fourteen.

Key Stage 4 for a pupil is the period beginning at the start of the school year in which the majority of pupils in his or her class attain the age of fifteen and ends when the majority of pupils in his or her class cease to be of compulsory school age.

An individual pupil in a teaching group may of course be younger or older than the age of the majority. Section 3(6) of the Act makes clear that it is the teaching group which a pupil is in for each foundation subject, not the registration class, which determines the key stage which is applicable to the pupil for that subject. So a pupil could be taught with another age group for one or more subjects where appropriate, eg in order to pursue that subject at a higher or lower level, while being taught with his or her peer group for other subjects. There is nothing, however, in the Act to require pupils to repeat a year, or to move early to a higher year group.

In some cases, for example in small primary schools, pupils may be in classes or teaching groups spanning more than one age group. To deal with this, Section 3(5) of the Act gives head teachers the right to determine the key stage appropriate to a pupil according to his or her chronological age, rather than according to the age of the majority of pupils in the class or teaching group.
APPENDIX 7

MID GLAMORGAN EDUCATION COMMITTEE
POLICY STATEMENT
CURRENT STRATEGY

The Authority has a well developed strategy which it has followed for many years for the development of information technology in all schools. The main objectives are:

(i) The development of a strong support unit at the Education Resources Centre, both giving guidance, support and in-service training to all teachers, in all phases of education, involved in I.T. developments.

(ii) The active promotion of I.T. in all areas of the curriculum where the provision of good software allows the necessary developments to take place and so improve the quality of the learning experiences of the pupils.

(iii) The development and provision of hardware in all schools in the Authority rather than a concentration on a few establishments so that all pupils in the Authority are given the opportunity of encountering the new technologies.

(iv) The development of teacher groups in certain curriculum areas to prepare software and course materials for use in schools.

(v) The provision of a good software library which is readily accessible to teachers in all schools.

(vi) The development of a good maintenance provision for the hardware in use in schools and the provision of suitable technical support for all teachers.

(vii) Standardisation of hardware in all schools by strictly controlling all hardware purchases.

SUGGESTED POLICY FRAMEWORK

The Authority believes that pupils' experience of new technologies should be continuous and unbroken throughout their period of education and should be used by them where appropriate, in all disciplines. In order to achieve this the Authority's policy for future developments of Information Technology in schools will need to include all the following elements:

(i) All pupils, of all abilities, should be computer literate.

(ii) Continuity in the use of information technology must be achieved between the primary and secondary phases of education.

(iii) There should be no sex-stereotyping in the use of information technology.

(iv) Support will be given to all schools, in all phases, to continue to improve the provision of hardware provided finance allows. There will need to be strict control over the purchase of hardware to ensure uniformity across the Authority.
(v) Although development of information technology will be actively supported in all areas of the curriculum in both content and delivery, initially, because of known strength, priority will be given to the following areas:


Future developments will take place in:

Physical Education, Humanities, Language, Home Economics.

(vi) Support for all developments involving information technology should be organised from the Education Resources Centre, Porth. In order to achieve this, there should be a continuous review of both the hardware provision at Porth and the range and expertise of the support staff available including technician support.

(vii) The provision of the maintenance and support services should move in tandem with the increased hardware provision in schools so that the hardware is used to maximum effect, and equipment is always in good working order.

(viii) The support of the advisory service for all developments involving information technology should continue with one adviser having special responsibility for the encouragement of the use of information technology in all schools.

(ix) Headteachers and senior staff in all schools should promote the use of information technology in the curriculum and will be expected to translate the Authority's policy into a school policy.

(x) A clear management structure outlining the lines of responsibility for the development of the use of Information Technology should be formalised. A suggested structure is outlined below:

```
DIRECTOR OF EDUCATION

DEPARTMENTAL SENIOR MANAGEMENT GROUP

<table>
<thead>
<tr>
<th>[SCHOOLS' CURRICULUM]</th>
<th>[ADMINISTRATION]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIEF ADVISER</td>
<td>DEPARTMENTAL IT GROUP</td>
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<tr>
<td>ADVISER IN BUSINESS STUDIES/IT</td>
<td>SENIOR ADVISER (INSET)</td>
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<td>DEPUTY DIRECTOR</td>
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<tr>
<td>ADVISORY STAFF</td>
<td>ASSISTANT DIRECTOR</td>
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<td>(PLANNING &amp; RESOURCES)</td>
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<td>PRINCIPAL EDUCATION OFFICER</td>
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<tr>
<td></td>
<td>OFFICE SYSTEMS CO-ORDINATOR</td>
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</tbody>
</table>
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(xi) Co-operation with other authorities in Wales through M.E.U. Cymru, the INSET support group formed in Wales and the T.V.E.I. Co-ordinator to encourage curriculum development and establish joint activities should continue.

(xii) The links already established with the Polytechnic of Wales and University College, Cardiff, should be enhanced.

(xiii) The involvement of industry and commerce in the financing of initiatives involving information technology should be encouraged by schools in a similar way to the current practice in Further Education. The Authority's Industry Liaison Officer should be responsible for the development of the necessary links with industry and commerce.

(xiv) The Authority's E.S.G. funding for Information Technology should be used to enhance the provision of hardware in schools and to appoint advisory teachers in several curriculum areas where known strengths exist.

(xv) The work involved in co-ordinating the development of information technology in schools should be the responsibility of "Schools Information Technology Steering Group". This group would ensure that funds available from sources such as the Authority, the INSET Grant, T.V.E.I., E.S.G., D.T.I. and contributions from industry/commerce are all used to ensure the coherent development of information technology in all schools.

IMPLEMENTATION

The successful implementation of the policy will depend on several factors, the most important of which is finance. Before detailed implementation plans can be determined, the resources available over the five year period will need to be identified as early as possible. Staff development should, if possible, precede the acquisition of equipment.

KD/AN
23.11.87
APPENDIX B

COMPUTERS IN SECONDARY SCHOOLS

APRIL 1989
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<tr>
<th>School</th>
<th>Roll</th>
<th>BBC</th>
<th>IBM</th>
<th>Network</th>
<th>B + W</th>
<th>Col.</th>
<th>Pupil Ratio</th>
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APPENDIX 9

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APPENDIX 11

INDUSTRY QUESTIONNAIRE
QUESTIONNAIRE

1. Which of the following IT facilities does your organisation use?
   - Mainframe
   - Mini Computer
   - Microcomputer Network
   - Stand-alone PCs

2. What software do you use?
   (a) a standard commercial package
   (please give name)
   (b) bespoke/in house package
   (c) Provided by consultants etc

3. Which of the following are used in your administration offices?
   - Database
   - Word Processing
   - Accounting
   - Communications
   - Graphics
   - Desktop Publishing
   - MicroMainframe links
   - Expert Systems
   - Other

4. Staffing - to operate IT equipment at what level do you like this type of personnel to enter your firm?
   (a) Post graduate
   (b) Graduate
   (c) HND/HNC
   (d) A level
   (e) GCSE
   (f) no specific qualifications

5. Do you offer in-house training for specific posts relating to IT?
QUESTIONNAIRE

1 Which of the following IT facilities does your organisation use?

Mainframe .... Mini Computer .... Microcomputer Network ....

Stand-alone PCs ....

2. What software do you use?

(a) a standard commercial package ...................... (please give name)

(b) bespoke/in house package .............................

(c) Provided by consultants etc ...........................

3. Which of the following are used in your administration offices?

Database ..................

Word Processing ............

Accounting .................

Communications ............

Graphics ..................

Desktop Publishing ..........

MicroMainframe links .......

Expert Systems ............

Other ........................

4. Staffing - to operate IT equipment at what level do you like this type of personnel to enter your firm?

(a) Pcs: graduate ..............

(b) Graduate ..................

(c) HND/HNC .................

(d) A level ...................

(e) GCSE ....................

(f) no specific qualifications ..........................

5. Do you offer in-house training for specific posts relating to IT? ..........................................................
APPENDIX 12

STUDENT INTERVIEWS
STUDENT INTERVIEWS

Student No. 1 - no knowledge of computers or keyboarding skills (male)

This student started the Course with no skills either in computers or keyboarding and confessed to complete ignorance when faced with IT workshop on his timetable. He found coming to grips with the keyboard during the induction weeks extremely difficult and was not really competent at the end of that time (Students had been given two hours induction prior to IT workshops)

During the first term, which was devoted to familiarisation with the Ability+ software package and basic skills using the IBM Microcomputers, he struggled and felt that he was still struggling even at the end of one year. Basically though he admitted to a strong dislike of computers which he feels even now inhibits his inability to complete assignments using technology.

As far as spreadsheets and database were concerned, he found them difficult to understand and an effort to use.

Nonetheless, he felt that his knowledge had obviously increased and that by continuing to use the workshop facility in Year 2, this would perhaps make him more confident. He agreed that if he had spent more of his own time coming to terms with the equipment and furthering his keyboarding skills in the beginning, he would have been better equipped to face the work.
He was critical of the workshop environment as he felt it did not lend itself to working unsupervised as it was often noisy at these times.

**Student No 2 - No computer or keyboarding skills (female)**

Like student No. 1, this student had no computer or keyboarding skills prior to commencement of the course in September 1990.

She had no conception of what an IT workshop would entail and was filled with trepidation at the beginning. At first she found workshop sessions difficult because of her lack of keyboarding skills which she felt hampered her initial session.

Unlike Student No 1, however, she spent some of her induction weeks and her own personal time following induction, using the Accutype keyboarding package in order to become fairly competent at the keyboard.

After 9 month’s workshop experience, she now feels confident using the Word Processing package and actually enjoys using it. All her assignments are completed using the word processing package.

In January 1991, when faced with spreadsheet work and then using the Ability database, she found she actually looked forward to the workshops and found this aspect of computers fascinating.

Facilities in the Computer workshop were criticised, particularly the large numbers using the rooms as she felt they were all "squeezing"
into every available space.

She described her year in workshop as having given her the confidence to tackle any package or machine in any future employment, as it has given her a basic understanding of terms used etc.

She would also like workshops to continue into the second year and feels that one hour timetabled would be better than not having any time, and she would like to have an opportunity to learn more packages and perhaps use a selection of different hardware.

**Student No.3 - Excellent Keyboard Skills (RSA 3) - no computer skills (female)**

This student started the course with RSA Typewriting Skills (S3) but no experience whatsoever of using a computer.

She found the induction fortnight useful to “brush up” her keyboarding skills after a long break and enjoyed using the Accutype package where she set herself the task of improving her speed. After nine months' hourly workshop, she now feels computer literate and was quite happy with the Ability+ package. She found all aspects of the workshop interesting and extremely helpful. All her assignments were word processed and she would not think of handing in written work.

She felt that the knowledge gained has already enhanced her job prospects which she sees as a great advantage, particularly as she wishes to assume a career in administration.
Criticism was again levelled at the workshop equipment and environment. She felt that students were hampered by inadequate printing facilities, inadequate space and "grotty" furniture.

She also hoped that there would be workshop time in Year Two to enable her to gain further knowledge of different packages and equipment.

**Student No. 4 - 2 years BTEC National experience and word processing experience**

This student had previously completed two years' study on the BTEC National Diploma at another College. During that time she had covered word processing skills (using WordStar) and had successfully gained the RSA S1 Word Processing Certificate. Part of the Diploma course had entailed looking at spreadsheets and database but she felt her knowledge was very limited.

After completing the first year HND course at the college she felt that she had benefited from the thorough training in Wordprocessing, spreadsheets and database.

Concern was expressed, however, at the facilities within the Computer Room. The student felt as though the seating arrangements were uncomfortable e.g. having to sit close together, and that the standard of equipment was poor in comparison to her previous college. This criticism was directed mainly at the printers which very often broke down or "mangled" the paper.
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