COMPUTER LABORATORY

ANNUAL REPORT - 1991/92

SUMMARY

The purpose of this Summary is to highlight the key message contained in the Annual Report, a message which is masked by the detailed information which the main document must contain for record purposes.

Computing and Information Technology services in College, which have been under pressure for several years, are **now under very great strain and at risk of major breakdown.** Staff numbers, equipment, and software are grossly inadequate for the task to be performed and facilities are lagging well behind those available in comparable institutions elsewhere in this country. For example:

> The availability of existing facilities is poor because of inadequate staff resources.
>
> Certain key administrative systems in College are close to collapse.
>
> Large sections of College are not yet served by the Ethernet network, the installation of which began in 1988.
>
> Including both central and departmental equipment, it is estimated that, at best, there is one workstation per 35 students compared to other Irish universities which vary between 23 to 1 and 8 to 1.

This situation has arisen from the enormous increase in demand for services in recent years which has arisen largely, but not exclusively, in the traditionally non-computer oriented areas where wordprocessing, electronic mail, and on-line library access have generated a large upsurge in usage.

Information Technology is an integral component of College's administration also. The enormous growth in the volume of financial transactions, the demands for more and more information such as unit costings and VAT returns for example, could not be met without IT but have swamped Colleges modest computing resources.

If Trinity is to restore an acceptable standard of academic computing service and put its IT systems on a secure footing there is an urgent need for a major increase in staff, equipment, and software. A detailed plan to meet these requirements will be completed shortly by the Computer Management Committee and sent to Board.

8-2-1993

COMPUTER LABORATORY

ANNUAL REPORT

1991/92

CONTENTS

Section 1 Introduction.

In many respects, 1991/92 was another very difficult year for both the Computer Laboratory and for users of its services. Demand far outstripped the Laboratory's capacity with the result that existing backlogs increased and delays in the repair of equipment and in meeting requests for new services lengthened even further. The Laboratory's submission to the Comprehensive Academic Review process highlighted a number of major shortcomings, as follows:

The number of workstations, both microcomputers and terminals, is grossly inadequate for the student numbers involved. This situation has prevailed for many years as demand has consistently outpaced our ability to expand facilities. At present, the number of students per workstation is approximately 65 to 1 compared to a recommended norm of under 10 to 1. While this figure does not take departmental equipment into account, it is considerably worse than other Irish universities which have ratios of students per workstation ranging from 8 to 1 to 30 to 1.

This shortfall in workstations is parallelled in almost every area of the service but particularly so in the provision of staff, especially at experienced supervisory levels. In a submission on staffing in February 1990, a staff shortfall of 14 was identified in the context of the activity then prevailing. While six new positions have been authorised since then, demand has grown at an even faster rate especially from areas such as Arts which were traditionally not computer oriented. In the intervening years, installed computing power, file capacity, and data communication bandwidth have all more than doubled and in addition to new facilities such as the Beckett Laboratory, over 500 microcomputers have been sold to members of College by the Computer Shop. The user population has increased considerably as computer usage, initially for word processing purposes and now extending to electronic mail and other applications, gathers momentum in the Arts and related areas. This increase in activity and complexity is swamping the already overloaded staff resources in the Computer Laboratory.

Every aspect of the service is affected by this resulting in (a) delays in the introduction of new systems, (b) the repairing of faulty equipment and (c) responding to user requests. Growing backlogs of requests for additional features or for important changes are building up, especially from the library and administrative ares which rely on the Laboratory programming staff to a much greater extent than the academic sector does.

Efforts to maximise use of limited resources have resulted in the cutting of many corners. Among the items which have suffered in this way are the training of both computer staff and users, the gathering of usage statistics and the production of operational documentation. Furthermore, the inability of the central service to fund many user needs has resulted in the piecemeal implementation of locally-funded incremental developments which have introduced a diversity of equipment and software which is difficult and expensive to support.

In addition, the fragmentation of the department which arose when it became impossible to move the entire Laboratory into the O'Reilly Institute as originally planned has further added to the operational and management difficulties and introduced undesirable inefficiencies.

However, the year was not all "doom and gloom" and was marked by a number of very positive developments. Perhaps the most important of these was the financial approval to proceed with the installation of the second phase of the three stage microcomputer development which commenced in 1990 with the introduction of the BECKETT microcomputer laboratory. Detailed planning for this next phase, BECKETT II, was carried out during the year although actual installation was unable to proceed until the end of September, due to conference commitments in the area. Conference commitments, also, made it necessary to temporarily dismantle the original BECKETT laboratory during the summer, a step which made major demands on very scarce manpower.

Due, perhaps, to the prevailing economic climate, the Laboratory enjoyed an exceptional level of staff stability during the year losing only one temporary staff member and also filled a new senior programming vacancy which had been authorised in 1990/91.

Section 2 Use of Services

In quantitative terms, the Laboratory's activity is again expressed in financial units in the following tables, which show how the cost of running the Laboratory relates to the principal services offered and to the main categories of user served. These tables are based on actual recurrent expenditure as recorded in the College accounts but are analysed, in this report, under sub-headings for which the accounting system does not make provision. It must be emphasised, therefore, that much of the analysis is based on estimates rather than on measurement. While usage measurement software is in place for all mainframes and for some network activities, it is not feasible to record most microcomputer activity or use of the Local Area Network by individuals.

It should also be pointed out that, in addition to its annual recurrent budget, a sum of £100,000 was received from the Dean's Capital Equipment Grant for the provision of microcomputer teaching facilities and this amount is additional to the figures included in the following tables.

TABLE 1 - OVERALL COST OF SERVICES

	Mainframe	Micro.	Comms.	Total
Academic Users	438735 (32.6%)	166141 (12.3%)	167702 (12.4%)	772579 (57.3%)
Academic Services	121783 (9.0%)	68585 (5.1%)	65793 (4.9%)	256160 (19.0%)
Administration	142431 (10.6%)	113727 (8.4%)	63020 (4.7%)	319177 (23.7%)
Total	702949 (52.2%)	348453 (25.9%)	296515 (22.0%)	1347916 (100.0%)

TABLE 2 - OVERALL COST - PAY v NON-PAY

	Academic	Academic Services	Admin.	Total
Pay Costs				
- Mainframe Services	159932	71895	88950	320777
- Microcomputing	108381	52936	98079	259395
- Communications	80586	41099	38988	160673
Total Pay Costs	348898	165930	226016	740845
Non-Pay Costs				
- Mainframe Services	278804	49888	53481	382172
- Microcomputing	57761	15648	15648	89058
- Communications	87116	24694	24032	135842
Total Non-pay Costs	423680	90230	93161	607071
Total Cost	772579	256160	319177	1347916

2.1 Mainframe Computing

The following tables summarise use of the central machines which, for brevity, are identified by their network names. The machines themselves are described in Appendix A.

TABLE 3 - USE OF CENTRAL SYSTEMS BY USER CATEGORY

System	User Category			
	Academic	Academic Services	Admin.	Total
VAX1	333910	128	933	334971
LIB1	0	121655	0	121655
ADVAX1-4	0	0	141497	141497
UNIX1	52413	0	0	50230
UNIX2	52413	0	0	52413
Total	438735	121783	142431	702949

TABLE 4 - ACADEMIC USE BY FACULTY

Faculty	VAX1	UNIX1	UNIX2	Total
Arts (Humanities)	6103	90	0	6193
Arts (Letters)	5214	0	0	5214
B.E. & S.S.	11835	0	0	11835
Engineering	129531	15254	9924	154709
Health Sciences	4250	0	0	4250
Science	176978	37069	42488	256535
Total	333910	52413	52413	438735

VAX1, the VAX6230 system, remains the main central machine for academic users and is the only one offering a VMS service and continues to be heavily loaded during peak periods. Some additional disk storage was added during the year but, apart from this, the machine has not been upgraded since its installation in 1988. Among the applications which it supports is the Genetics department's DNA database which has attracted considerable interest and is used by several researchers in other colleges. Advantage was taken of a revised educational price structure to order a major upgrade for the existing very limited version of the SPSS statistical application software package on VAX1 This upgrade has been sought by users for several years. Advantage was also taken of another academic discount to order the Geographic Information System, ARC/INFO, which has not, however, been installed at the time of writing.

The new library DECsystem-5000, LIB1, continued to perform satisfactorily and a processor upgrade, included in the original purchase contract, was installed in July and further enhanced the response time of the system. During the year, much of the Laboratory's effort was concerned with consolidation of the new equipment and the concurrent upgrade to a new version of the Dynix software. In addition to supporting a greater number of terminals, the new facilities have permitted the incorporation of a machine readable version of the card catalogue although this is not yet accessible to readers for practical reasons.

Implementation of the administrative development plan continued, on schedule, during the year. In the

student administration area, a new version of the ORACLE software required a review and updating of all the existing applications. It was also possible, within existing financial constraints, to upgrade the ADVAX1 machine from a MicroVAX 3500 to a more powerful MicroVAX 3100 in September to cope with the growing workload. A new payroll system went into operation on ADVAX3, during the year. This replaced the aging PASCAL payroll which had operated on two IBM PCs for several years. ADVAX3 also runs the ORACLE based Fees system and the on-line access to this which is now possible proved of great value during registration. However, as highlighted in the CARC Report, the existing computer-based systems still fall far short of the ideal academic administration facilities.

ADVAX4, the other administration MicroVAX which serves the Accommodation and Buildings areas, also assumed a substantial workload during the year as existing PC based applications were integrated with it.

2.2 Microcomputer related Services

The BECKETT Microcomputer Teaching Facility was very heavily used during the year by a broad spectrum of users from every faculty in College. The IBM PC compatible units in the Arches, which are available for individual as distinct from class use, were upgraded to level compatible with those in the BECKETT and connected to the College network. The systems software in the BECKETT was upgraded during the summer to LANmanager 2.1, DOS 5.0, and Windows 3.1.

Work commenced on the installation of a second teaching area, to be equipped with Apple Macintosh machines, in a room adjacent to the existing BECKETT unit and this was nearly completed by the end of the year.

The Laboratory entered into a number of special microcomputer software licensing arrangements with suppliers. These include a major agreement with Borland which provides access to several of the latter company's products on very favourable terms.

The sale of microcomputer equipment within College is mentioned in more detail in Section 3.1.

2.3 Communications

2.3.1 Internal Communications

The Computer Management Committee decided that when applying the limited funds available for new network development, priority should be given to the extension of the fibre-optic backbone infrastructure to buildings not already connected in preference to the installation of internal local distribution wiring within those buildings which are already linked. Work commenced on connecting the Moyne Institute the Museum Building, Genetics, and the Parsons Building to the backbone and, under the four-year development plan for administrative systems, cables were laid to East and West Chapel, and to some administrative areas in the Arts Building and in Westland Row.

The volume of traffic on the network grew considerably during the year and the resulting pressure

revealed a number of faults in wiring and equipment. These necessitated the development of a new range of skills on the part of the Laboratory's technicians and systems programmers and entailed a considerable investment in specialised network diagnostic and management tools. These problems caused very considerable difficulty for many users, particularly in the Arts Building and in some administrative areas. However, the experience gained will be of great value in the longer term and has already made possible a reconfiguration of the network backbone which will provide greater resilience and a higher level of security.

2.3.2 External Networking

The use of external network services is a major growth area. Only a few years ago, this was used to a significant extent only by computer staff and some users from scientific areas of College. However, users from most areas of College now use it heavily, particularly for e-mail purposes.

College continued to participate in HEANET during the year. The new 64kbps EIRPAC Virtual Private Network provided to HEANET by Telecom Eireann operated throughout the year. This provided a service between the Irish colleges for a cost which was independent of the actual traffic volumes transmitted. However, indications are that this contract will not be renewed by Telecom at the end of the calendar year and alternatives are currently under consideration. One major development has been the HEA's decision to appoint a Network Co-ordinator, based in the Authority's offices, to assist in the planning and operation of the network, which currently depends entirely on the voluntary efforts of computer service staff in the participating colleges. It is hoped that this appointment will prove to be the first step in the establishment of a central network executive which will run the shared facilities and make the overall service less vulnerable to local pressures than it is at present.

International network services were also heavily used. This aspect of the service has accounted for much of the increase in usage from arts and related areas as academic staff discovered the value of e-mail for communicating with colleagues abroad. Like the national network, the international services are currently in a state of change. These services have relied extensively on pilot links, many of which have been subsidised by external agencies, and which are now either terminating or evolving from the subsidised pilot stage to become full-cost commercial services. Several options are being examined at present to ensure continuity of service to users but it is certain that the cost of both national and international communications will increase again during the coming year.

Section 3. Other Activities

3.1 Sale of Equipment and Supplies

The Laboratory's Computer Shop had another very successful year and sales increased from £722,020 to £912,253. While this upward trend has continued since the Shop was first established in 1987, a lowering of dealer margins generally and the appearance of microcomputer equipment in discount retail shops suggest that College's advantage in this area may be eroded in future and the upward sales trend may not continue indefinitely.

3.2 Sale of Services

The sale of mainframe computer time increased slightly due to the activities of one user. This is not indicative of a trend and the sale of machine time should no longer be regarded as a significant part of the Laboratory's income. Some income also arose from participation by Laboratory staff in an EC funded project undertaken by the Library. Much of the income recorded under this heading comes from those internal services for which the Laboratory makes a charge, such as the issuing of "Entacards" and the sale of laser printing tokens.

Section 4 Future Developments

In 1991, the Computer Management Committee embarked on the development of a long-term plan, the main features of which are as follows:

a. A data communications network extending to all work positions and used in day-to-day activities as an essential facility by virtually everyone.

b. A central facility with large data banks, shared processors and software, a supercomputer, multi-media electronic mail system, and central publishing facilities.

c. A large number of general-purpose service points and workstations.

d. Special-purpose service points with additional features such as CAD facilities.

e. A College-wide information service accessible by everyone from conveniently located service points.

f. Enhanced training and support services to facilitate the assimilation of information technology into the day-to-day life of College.

g. The evolution of a situation where all students carry their own "notebook" computers which can connect to the core College facilities from many points in laboratories, libraries, etc.

This planning exercise was eclipsed somewhat by the Comprehensive Academic Review activity and lost some momentum as a result. However, it can now proceed in a way which will take the CARC findings into consideration. In particular, these highlight the need for a more extensive training programme to raise the level of computer skills among the college community. CARC recommendations for increased automation in the Library and for the provision of more extensive information systems in the finance and student administration areas will also have significant implications for the Computer Laboratory's Information Systems Group which is responsible for computer systems development in these areas. Together with the Computer Management Committee's emerging long term plans, the CARC recommendations have major resource implications and the scope for major change within the existing level of staffing is limited.

The most pressing need is for more workstations on open access for use by the general undergraduate student body. The present number of such units for general use, both terminals and microcomputers, of 140 is grossly inadequate for an institution of this size and compares very unfavourably with UCD's 600 units, UCG's 260, and UCC's 390, numbers which are still regarded as insufficient. This situation is exacerbated by the fact that over half of the existing units are character-oriented terminals without graphics capability which is now essential for many applications.

Extension of the internal network to reach all College buildings, including locations outside the main site, such as the Medical School, together with the internal wiring to make the system accessible from individual workplaces, is another high priority.

Extension of the network and the connection of more workstations to it will generate increased pressure on the central computers and fileservers which must be enhanced correspondingly. Expansion must, therefore, take place in a phased way to ensure that the resources are balanced in a way that ensures maximum benefit from the investment.

The development element of the Laboratory's recurrent budget is fully committed, until 1993/94, to paying for the existing academic VAX machine and the Library system and more and more of the limited staff resources are engaged in coping with the ever-increasing volume and complexity of user demand. Consequently only marginal improvements can be expected within existing financial constraints. A substantial investment is needed in additional equipment and software and in the consequential recurrent staff and operational costs which will arise from this if College is to regain an information technology service of acceptable standard.

APPENDIX A

EQUIPMENT

The specifications of the equipment in service on September 30th, 1992, are as follows:

Digital DECsystem-5000: **LIB1**

1 x DECsystem-5000 Model 200 with 96 Mb of memory,
9 Gb of disc storage, and an Exabyte tape cartridge unit.

Digital VAX 6230: **VAX1**

1 x VAX6230 CPU with 32 Mb of memory, an Ethernet port.
2 x SA482 2.5 Gbyte disc storage unit
1 x RA60 600 Mb disc storage drive
2 x RA82 600 Mb disc storage drives
2 x TA81 Magnetic Tape Drive
1 x LA100 Console printer
1 x Houston Plotter
1 x Kaiser Optical Mark Reader
1 x Exabyte tape cartridge unit

Digital MicroVAX 3100: **ADVAX1**

1 x MicroVAX 3100 M80 with 72 Mbyte of memory, an Ethernet port,
and 2.2 Gbytes of disc storage and a CD-ROM reader

Digital MicroVAX 3100 **ADVAX3**

1 x MicroVAX 3100 with 32 Mbyte of memory, Ethernet port,
and 1.1 Gbyte of disc storage

Digital MicroVAX 3100 **ADVAX4**

1 x MicroVAX 3100 with 20 Mbyte of memory, Ethernet port,
and 1.1 Gbyte of disc storage

ICL DRS 500/75 **UNIX1**

1 x ICL DRS 500/75 Processor with 32 Mbytes of memory, 1500 Mbytes
of disc storage, Ethernet port, magnetic tape cartridge drive,
and half-inch magnetic tape drive.

ICL DRS 500/75 **UNIX2**

1 x ICL DRS 500/75 Processor with 32 Mbytes of memory, 1200 Mbytes
of disc storage, Ethernet port, and magnetic tape cartridge drive.

Communications

It is estimated that several hundred terminals and microcomputers, most of which belong to user departments, have access to the College network. Many of these compete for the limited number of entry ports on the central computers via College's Ericsson MD110 Voice and Data telephone exchange while some are connected via a Gandalf PACX IV switching unit. Most, however, including the public access Library terminals and those terminals which may be booked in advance and are located in the Terminal Rooms of the Laboratory, are connected directly to the Ethernet via terminal servers. Individual servers use only one communications protocol, either LAT or TCP/IP, but terminals attached to either type may access hosts using either by means of a Xyplex protocol converter. The Laboratory is a node of HEANET which links the major HEA funded institutions and is connected to EIRPAC, Telecom Eireann's packet switched public network via a 64 kb/s line. A direct 64 kb/s line to UCD Computer Services and a direct 9.6 kb/s line to the international Internet are also operated. Other direct lines link the Laboratory with off-site College locations including Pharmacy in Shrewsbury Road and the Library in Santry.

Microcomputers

The microcomputer laboratory located under the railway arches at the east end of College has the following equipment:

13 x 386-33 based PCs
16 x Apple Macintoshes
1 x Apple LaserWriter
1 x QMS Laser Printer

The microcomputer facility is located in Beckett Room I of the Arts Building has the following equipment:

28 x 80386 based IBM compatible PC's with colour monitors
2 x Hewlett Packard LaserJet III printers

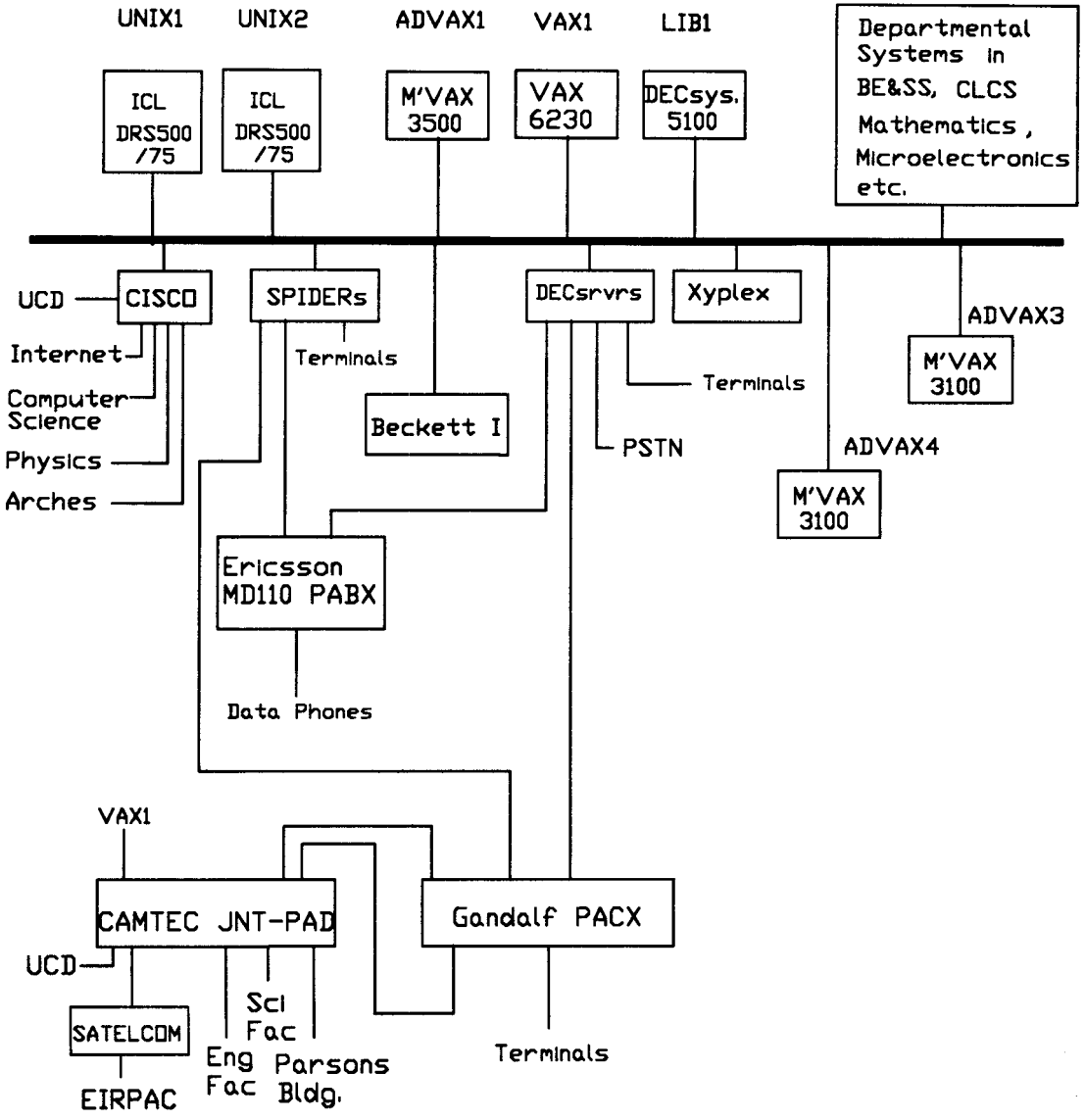
A new microcomputer facility, to be commissioned by November 1992, in Beckett Room II of the Arts Building, will be equipped with 24 networked Apple Macintosh LC II machines.

The PCs in the Arches and Beckett laboratories are networked to an 80486 based fileserver using 3COM + network software running on the main Ethernet cabling.

A selection of microcomputers and specialised peripherals are available to users in the Laboratory at 200/201 Pearse Street. These include the following:

1 x Apple Macintosh with CD-ROM
1 x Amstrad PCW8256
1 x Apple LaserWriter
1 x ICL 55SX PC
1 x Optical Mark Reader for test scoring.

A Prompt PC with Braille printer and VOTRAX voice output unit are located in the Disabled Students' Room in the Arts Building.



COMPUTER LABORATORY

Central Equipment

Figure A.1

30-9-1992

APPENDIX B

ORGANISATION

The Computer Laboratory is supervised by the **Computer Management Committee**, a standing Committee of the Board which is chaired by the Bursar. It is advised by the **Academic Users' Committee** and the **Administrative Users' Committee** which report to it and by working groups which it sets up from time-to-time. There are currently two of these in existence, the **Microcomputer Policy Group** which is responsible for the planning and implementation of the three stage microcomputer development, and the **Computer Planning Group**, which is responsible for long-term planning.

The Laboratory staff is organised as shown in Figure B.1. The functions of the main groups are as follows:

ACADEMIC USER SERVICES GROUP

This Group, comprised of programming staff, provides assistance to computer users by means of:

- an advisory service
- courses for users
- publications such as the Users' Guide and Computer Laboratory Newsletter.

COMPUTER SERVICES GROUP

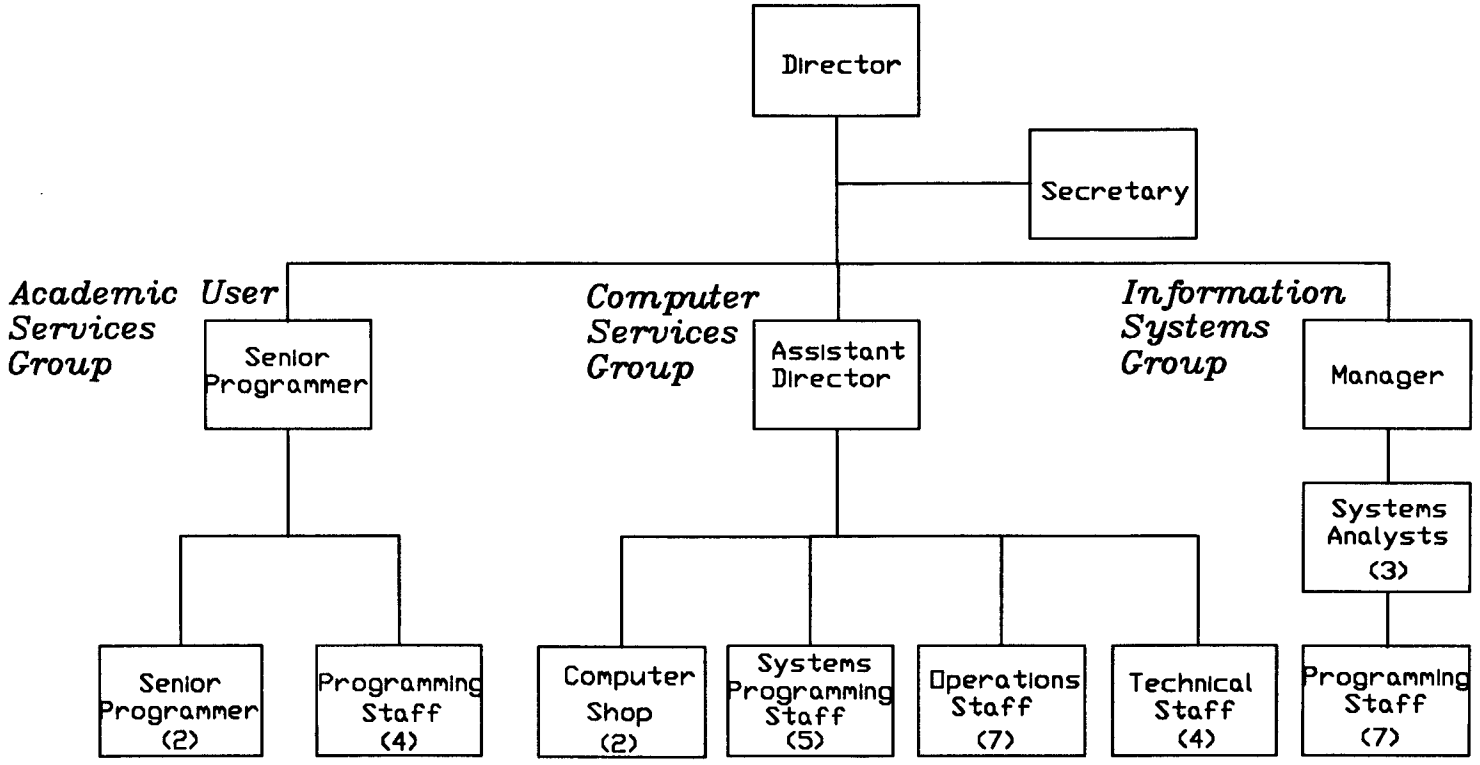
This Group is responsible for the running of the central computer equipment. It is staffed by operations personnel who look after the running of the machines and perform the associated ancillary functions, systems programmers who generate and maintain the central systems and network software, technicians, and janitors who are responsible for security. This Group is also responsible for the provision of specialised technical advice and support on both mainframe, microcomputer, and communications matters to the other two user oriented Groups in the Laboratory.

The Computer Shop which retails microcomputer equipment and supplies within College is also part of this Group.

INFORMATION SYSTEMS GROUP

This Group is responsible for the regular operation of existing administrative and Library mainframe computer applications and for the development of new ones.

Development of new projects is performed by Systems Analysts and Programmers who design the applications and perform an ongoing supervisory role in the running of the more complex systems.



COMPUTER LABORATORY ORGANISATION

(Including temporary appointments)

Figure B.1

30-9-1992

APPENDIX C

COSTS

The services provided by the Laboratory may be divided into those related to the central mainframe systems, microcomputers, and communications. The total cost of running the Laboratory is shown below under the main expenditure headings used in the College accounts. The cost of providing each of the three categories of service mentioned above was estimated by analysing all the categories of expenditure shown in Table C.1 to estimate the fraction of each used to provide each service. For example, in the case of salaries, an estimate of the time spent by each individual member of the Laboratory's staff on each of the three activities was made and the individual's salary costs allocated accordingly. In the case of Mainframe Machine Service, the expenditure was further apportioned between the seven machines currently operated by the Laboratory. Allocation of the costs among the different categories of user is based on measured usage in the case of mainframe activity and on estimates in the case of microcomputers and communications.

ACCOUNTS for Year Ended 30th September, 1992

		Actual	Budget
Income:	Sale of Services	28589	9809
	Net Sale of Goods	29043	18287
	Miscellaneous Income	0	0
	Underspending B/Forward	6904	6904
	Total Income	64536	35000
Expenditure:	Salaries	725934	728000
	Wages	14911	14829
	Total Pay Cost	740845	742829
	Rentals of Equipment	64574	76000
	Equipment Purchase	374904	307787
	Maintenance	192444	193000
	Consumable Supplies	25898	29000
	Cost of External Services	4647	7000
	Insurance Charges	3645	4500
	Telephone Charges	6582	8800
	Miscellaneous Expenses	8511	14000
	Total Non-Pay Cost	681205	640087
	Total expenditure:	1422050	1382916
	Net annual cost:	1357514	1347916
	Overspending C/F	(9598)	0
Total Annual Cost:		1347916	1347916