COMPUTER LABORATORY

SUMMARY ANNUAL REPORT
1983/84

In the interests of economy, this abridged version of the Laboratory's annual report is being circulated in place of the full document. The latter is, however, available on request from the Secretary's office.

Summary

The highlight of the year was the placing of an order for a major new system from ICL for installation in mid-1985. This did much to compensate users for the continuing problems arising from overloading of the central systems and offers the prospect of considerable improvement next year. The backlog of data line orders was cleared by Telecom Eireann but no new line requests were processed to prevent further overload of the central machine.

Usage Statistics

Percent of Use per System per User Category:

Machine	User Category					
	Library	Academic	Admin	Outside	Support	TOTAL
DEC2020	8.50	.02	12.26	.26	.63	21.67
DEC2060	.46	51.03	.25	.79	6.11	58.64
VAX11/780	.00	16.66	.00	.00	.00	16.66
PDP11/34	3.03	.00	.00	.00	.00	3.03
TOTAL	11.99	67.70	12.51	1.05	6.74	100.00

Analysis of Academic Computer Use:

Faculty	Percent of Total Computer Use			
	DEC2020	DEC2060	VAX	TOTAL
Eng. & System Sci.	.02	27.34	16.66	44.02
Science	.00	19.21	.00	19.21
Econ. & Social Std.	.00	2.42	.00	2.42
Med. & Dent. Sci.	.00	1.48	.00	1.48
Arts(Humanities)	.00	0.41	.00	0.41
Arts(Letters)	.00	0.16	.00	0.16
TOTAL	.02	51.02	16.66	67.70

Significant use was also made of the DEC system 2060 and the IBM system in UCD.

Machine Performance

DECsystem-2060 availability: 8612.78 hours (98.05%)
DECsystem-2020 availability: 8623.74 hours (98.18%)

Cost Summary

Expenditure:		Actual £	Budget £
	Pay Cost	358,357	363,000
	Non-Pay Cost	399,415	401,242
	Total	757,772	764,242
Income:	Income from Sales:	9,876	12,000
Net Annual Cost:		747,896	752,242

Analysis of Service Costs:

User Category	Computer Service (Note 1)	Application Development (Note 2)	Total
Academic	453993	0	453993
Library	80417	47371	127788
Administrative	83880	74930	158810
Outside	7055	0	7055
Total	625345	122301	747646

Note 1: "Systems Support" use is included as a overhead in these costs.

Note 2: This breakdown is approximate and based on the total development cost distributed in proportion to the number of development staff assigned.

UNIVERSITY OF DUBLIN

TRINITY COLLEGE

COMPUTER LABORATORY

ANNUAL REPORT 1983/84

CONTENTS

SECTION 1 INTRODUCTION

The highlight of 1983/84 in the Computer Laboratory was the signing of a contract for a large new system from ICL. The decision was the outcome of extensive discussion with user interests, at the Computer Management Committee, and with nine potential vendors and overshadowed the operational problems associated with the heavily loaded existing equipment which persisted throughout the year. The new large mainframe is due for installation in the summer of 1985 but a smaller temporary machine will be installed in Michaelmas term of 1984 and will make some additional capacity available in the coming academic year.

Another development during the year was the clearing, by Telecom Eireann, of the backlog of uninstalled data lines and while this brought some relief to the users concerned, it was not possible to benefit from the improved availibility of circuits by ordering more because the overloaded central facilities could not support the extra load which would result.

The installation of microcomputers continued to accelerate throughout College and the need to provide support in the form of advice in the selection of equipment and in its subsequent use made increasing demands on the Laboratory's resources. Agreement was reached with a number of companies for the supply of microsystems to College purchasers on very favourable discount terms. Included in this are vendors selling Apple, IBM, ICL, Shelton SIG/NET, and a number of other machines.

The Computer Management Committee and the Computer User's Committee met much more frequently than usual during the year because of the activity arising from the selection of the new system.

SECTION 2 MACHINE UTILISATION AND PERFORMANCE

The use of the central equipment by various College departments is described in the following tables in both percentage and cost terms. The basis of this costing is set out in Appendix C and it must be emphasised that they reflect only the equipment funded by the Computer Laboratory and are not a measure of the total computing activity in College since many users have access to other equipment ranging from substantial mini-computers to small personal machines located in many departments.

Trinity again made extensive use of the UCD DECsystem-2060 during the year. While it is believed that heavy use was also made of UCD's IBM machine, no figures for this activity were received from the UCD Computer Centre.

The reliability of the central equipment was very satisfactory during the year as can be see from Tables 11 and 12 and no abnormal breakdowns were experienced.

The experimental network linking the DECsystem-2060 with UCD and Euronet operated throughout the year although its reliability was disappointing. In general, it was not heavily used and most of the limited traffic arose from activity on the part of computer staff in both colleges. Some use was made of the facility to access computer installations abroad via the network's EURONET connection.

Analysis of Computer Use

Cost of Monthly Use per User Category (IR£)

Month	User Category					TOTAL
	Library	Academic (Note 2)	Admin	Outside	Support	
10/83	5184	17836	7169	310	3300	33798
11/83	7973	25374	7286	396	2772	43801
12/83	6113	20749	4879	443	2496	34680
1/84	3640	34318	6273	395	3604	48230
2/84	4673	33567	5994	178	5492	49904
3/84	3334	38440	6204	647	3564	52189
4/84	3896	34032	5497	797	3781	48003
5/84	4572	32553	6367	295	3116	46902
6/84	5553	20762	6722	1063	3021	37120
7/84	3574	17978	6801	357	3618	32329
8/84	4261	21781	7564	761	4095	38464
9/84	3289	21829	7468	937	3308	36831
VAX/PDP11 (Note 1)	18933	104162	0	0	0	123095
TOTAL	74995	423380	78224	6579	42167	625345

Table 1

Note 1: The operational cost to the Computer Laboratory of the VAX 11/780 located in the Computer Science Department and of the PDP 11/34 Library circulation control machine are only available on a full-year basis.

Note 2: In addition to this usage, processing was performed at UCD, at no cost to TCD. This is shown in Table 13.

Analysis of Computer Use

Percent of Total Monthly Use per User Category

Month	User Category					TOTAL
	Library	Academic (Note 2)	Admin	Outside	Support	
10/83	15.34	52.77	21.21	.92	9.76	100.00
11/83	18.20	57.93	16.63	.90	6.33	100.00
12/83	17.63	59.83	14.07	1.28	7.20	100.00
1/84	7.55	71.16	13.01	.82	7.47	100.00
2/84	9.36	67.26	12.01	.36	11.01	100.00
3/84	6.39	73.66	11.89	1.24	6.83	100.00
4/84	8.12	70.90	11.45	1.66	7.88	100.00
5/84	9.75	69.41	13.57	.63	6.64	100.00
6/84	14.96	55.93	18.11	2.86	8.14	100.00
7/84	11.06	55.61	21.04	1.10	11.19	100.00
8/84	11.08	56.63	19.67	1.98	10.65	100.00
9/84	8.93	59.27	20.28	2.54	8.98	100.00
VAX/PDP11 (Note 1)	15.38	84.62	.00	.00	.00	100.00
TOTAL	11.99	67.70	12.51	1.05	6.74	100.00

Table 2

Note 1: The operational cost to the Computer Laboratory of the VAX 11/780 located in the Computer Science Department and of the PDP 11/34 Library circulation control machine are only available on a full-year basis.

Note 2: In addition to this usage, processing was performed at UCD, at no cost to TCD. This is shown in Table 13.

Total Annual Cost per System per User Category (IR£)

Machine	User Category					
	Library	Academic	Admin	Outside	Support	TOTAL
DEC2020	53172	101	76672	1640	3939	135525
DEC2060	2890	319117	1552	4939	38227	366725
VAX11/780	0	104162	0	0	0	104162
PDP11/34	18933	0	0	0	0	18933
TOTAL	74995	423380	78224	6579	42167	625345

Table 3

Percent of Total Annual Cost per System per User Category

Machine	User Category					
	Library	Academic	Admin	Outside	Support	TOTAL
DEC2020	8.50	.02	12.26	.26	.63	21.67
DEC2060	.46	51.02	.25	.79	6.11	58.64
VAX11/780	.00	16.66	.00	.00	.00	16.66
PDP11/34	3.03	.00	.00	.00	.00	3.03
TOTAL	11.99	67.70	12.51	1.05	6.74	100.00

Table 4

Analysis of Academic Computer Use
by Machine by Department - Cost IR£

Department	Cost of Computer Use DEC2020	DEC2060	VAX	TOTAL
Computer Science	101	125694	104162	229958
Chemistry	0	60206	0	60206
Statistics	0	29689	0	29689
Pure Maths	0	18079	0	18079
Business Studies	0	8152	0	8152
Genetics	0	6626	0	6626
Physics	0	6302	0	6302
Microelectronics	0	5915	0	5915
Botany	0	5879	0	5879
Community Health	0	5756	0	5756
Zoology	0	5667	0	5667
Civil Eng.	0	5276	0	5276
Applied Maths	0	4714	0	4714
Mechanical Eng.	0	4126	0	4126
Sociology	0	3524	0	3524
Psychology	0	3106	0	3106
Economics	0	2786	0	2786
Geology	0	2639	0	2639
Environmental Science	0	2376	0	2376
Physiology	0	1978	0	1978
Geography	0	1726	0	1726
Pharmacy	0	1604	0	1604
Biochemistry	0	1116	0	1116
Education	0	895	0	895
Political Sci.	0	695	0	695
Spanish	0	642	0	642
Teacher Ed	0	618	0	618
Lang.& Comms	0	527	0	527
Surgery	0	456	0	456
Pharmacology	0	371	0	371
SDP	0	266	0	266
Dentistry	0	260	0	260
Remedial L.	0	215	0	215
German	0	214	0	214
Curriculum Dev.	0	195	0	195
Paediatrics	0	192	0	192
Modern Hist.	0	180	0	180
French	0	146	0	146
Clinical Med.	0	118	0	118
Medicine	0	66	0	66
Physiotherapy	0	33	0	33
Microbiology	0	26	0	26
Psychiatry	0	24	0	24
Philosophy	0	12	0	12
Irish	0	11	0	11
Obstetrics	0	8	0	8
Haematology	0	7	0	7
Social Studies	0	2	0	2
TOTAL	101	319115	104162	423379

Table 5

Analysis of Academic Computer Use
by Machine by Department - percent

Department	Percent of Total Computer Use DEC2020	DEC2060	VAX	TOTAL
Computer Science	.02	20.10	16.66	36.77
Chemistry	.00	9.63	.00	9.63
Statistics	.00	4.75	.00	4.75
Pure Maths	.00	2.89	.00	2.89
Business Studies	.00	1.30	.00	1.30
Genetics	.00	1.06	.00	1.06
Physics	.00	1.01	.00	1.01
Microelectronics	.00	.95	.00	.95
Botany	.00	.94	.00	.94
Community Health	.00	.92	.00	.92
Zoology	.00	.91	.00	.91
Civil Eng.	.00	.84	.00	.84
Applied Maths	.00	.75	.00	.75
Mechanical Eng.	.00	.66	.00	.66
Sociology	.00	.56	.00	.56
Psychology	.00	.50	.00	.50
Economics	.00	.45	.00	.45
Geology	.00	.42	.00	.42
Environmental Science	.00	.38	.00	.38
Physiology	.00	.32	.00	.32
Geography	.00	.28	.00	.28
Pharmacy	.00	.26	.00	.26
Biochemistry	.00	.18	.00	.18
Education	.00	.14	.00	.14
Political Sci.	.00	.11	.00	.11
Spanish	.00	.10	.00	.10
Teacher Ed.	.00	.10	.00	.10
Lang.& Comms	.00	.08	.00	.08
Surgery	.00	.07	.00	.07
Pharmacology	.00	.06	.00	.06
SDP	.00	.04	.00	.04
Dentistry	.00	.04	.00	.04
Remedial L.	.00	.03	.00	.03
German	.00	.03	.00	.03
Curriculum Dev.	.00	.03	.00	.03
Paediatrics	.00	.03	.00	.03
Modern Hist.	.00	.03	.00	.03
French	.00	.02	.00	.02
Clinical Med.	.00	.02	.00	.02
Medicine	.00	.01	.00	.01
Physiotherapy	.00	.01	.00	.01
Microbiology	.00	.00	.00	.00
Psychiatry	.00	.00	.00	.00
Philosophy	.00	.00	.00	.00
Irish	.00	.00	.00	.00
Obstetrics	.00	.00	.00	.00
Haematology	.00	.00	.00	.00
Social Studies	.00	.00	.00	.00
TOTAL	.02	51.02	16.66	67.70

Table 6

Analysis of Library Use

Cost - IR£

Application	Cost
Cataloguing	31903
Accessions	23224
Circulation Control (Note 1)	18933
Reader Services	597
SDI	65
Miscellaneous	273
Total	74994

Table 7

Note 1: Maintenance cost of the PDP 11/34 are paid by the Library.

Analysis of Library Use

Percent of Total Use

Application	Percent
Cataloguing	5.10
Accessions	3.71
Circulation Control (Note 1)	3.03
Reader Services	.10
SDI	.01
Miscellaneous	.04
Total	11.99

Table 8

Note 1: Maintenance cost of the PDP 11/34 are paid by the Library

Analysis of Administrative Use

Cost - IRL

User		Cost
Finance Office:		35360
Academic Administration:		
- Student and Graduate Records	27195	
- Admissions	5446	
- Faculty Offices:	2523	
- Miscellaneous	1289	
		36452
Accommodation Office		4669
Buildings Office		9
Staff Office		312
Information Office		123
General Services Office		32
Other		1266
Total		78224

Table 9

Analysis of Administrative Use

percent

User	Percent of Total Use	
Finance Office:		5.65
Academic Administration:		
- Student and Graduate Records	4.35	
- Admissions	.87	
- Faculty Offices:	.40	
- Miscellaneous	.21	
		5.83
Accommodation Office		.75
Buildings Office		.00
Staff Office		.05
Information Office		.02
General Services Office		.01
Other		.20
Total		12.51

Table 10

DECsystem-2060 Availability

Month	System Down-time - Hours					Availability	
	Engineering		Environ-mental	Soft-ware			
	Scheduled	Unscheduled	causes		Total	Hours	%
10/83	2.93	0.17	0	0.78	3.88	740.12	99.48
11/83	3.20	0.10	0.63	0.12	4.05	715.95	99.44
12/83	10.88	20.98	0.13	6.43	38.43	705.57	94.83
1/84	2.42	0.65	0	4.48	7.55	736.45	98.98
2/84	12.10	27.68	1.52	0.45	41.75	654.25	94.00
3/84	2.87	0.18	0.63	0.17	3.85	740.15	99.48
4/84	2.53	5.00	0.03	0.08	7.65	712.35	98.94
5/84	3.17	0.23	0	0.12	3.51	740.48	99.53
6/84	2.82	0	0.40	0.05	3.27	716.73	99.55
7/84	3.43	0.05	21.13	0	24.62	719.38	96.69
8/84	3.02	0.32	9.27	0.02	12.61	731.39	98.30
9/84	2.75	0.33	16.95	0.02	20.05	699.95	97.21
verall	52.11	55.70	50.70	12.71	171.22	8612.78	98.05

Table 11

DECsystem-2020 Availability

Month	System Down-time - Hours					Availability	
	Engineering		Environ-mental	Soft-ware			
	Scheduled	Unscheduled	causes		Total	Hours	%
10/83	2.02	0.02	0	0.07	2.10	741.90	99.72
11/83	2.05	0.13	0	0.07	2.25	717.75	99.69
12/83	0	0	0	0	0	744.00	100.00
1/84	2.95	0.03	0	0	2.98	741.02	99.60
2/84	2.45	0.10	1.52	0.07	4.13	691.87	99.41
3/84	2.33	0.02	0.27	0.05	2.66	741.33	99.64
4/84	2.65	0.73	0.03	0	3.42	716.58	99.53
5/84	2.88	0	0	0	2.88	741.12	99.61
6/84	2.10	72.07	0	0	74.17	645.83	89.70
7/84	0	0	20.73	0	20.73	723.27	97.21
8/84	3.78	0.32	21.58	0	25.68	718.32	96.55
9/84	2.70	0	16.53	0.02	19.25	700.75	97.32
Overall	25.91	73.41	60.66	0.26	160.26	8623.74	98.18

Table 12

SECTION 3 APPLICATIONS

3.1 Academic

The basic pattern of academic usage continued with most activity coming from the scientific areas. However, interest in word-processing continued to grow in all areas and there was a considerable growth in requirement to support users with their own microcomputers. The number of users interested in computer graphics has also increased following the installation, two years ago, of the samll Calcomp plotter and some graphics terminals. A user from the Faculty of Arts(Letters) made extensive use of the Kurzweil Data Entry Machine in UCD to prepare medieval text material for computer analysis and it is believed that this offers considerable scope for data entry in areas where normal keyboard entry would not be feasible.

3.2 The Library

In the Library area, the circulation control system, which was introduced initially in the Lecky Library last year, was extended to the Science Library during the year. Development work on a book acquisition system continued on schedule for its introduction into regular operation in the coming academic year. Work continued on the study of possible conversion of the card catalogue to computer form although no economically feasible plan has yet been identified. The Laboratory was also active in a sub-committee set up under HEA auspices to examine possible scope for using computers more extensively in libraries throughout the institutions funded by the Authority.

3.3 Administration

Most effort in the administrative area was directed towards the implementation of applications on decentralised microcomputers. Foe example, the Nominal Ledger application which ran for several years on the DECsystem-2020 was transferred to the Shelton machine in the Finance Office in the last quarter of the year. The installation of microcomputers for wordprocessing and other local administrative tasks continued at an even faster pace and required extensive support form the Laboratory.

SECTION 4 COMPUTING SERVICE DEVELOPMENT

4.1 Equipment

While the main DECsystem-2060 was not further enhanced during the year, a number of smaller changes took place involving peripheral equipment. The Gandalf PACX was upgraded to a more recent engineering change level which provided some useful facilities such as the ability to queue requests for connection to busy computer ports. A small Toshiba printer was acquired to satisify some of the demand for high quality text output. A DEC Professional 350 and a DEC Rainbow microcomputer were presented on indefinite loan by Digital and are a valuable help to Laboratory staff supporting the growing number of microcomputing activities in College. The administrative and library DECsystem-2020 was not expanded during the year but the Laboratory did expand the Shelton microcomputer used for development by the Information Systems Group and upgraded the Shelton in the Finance Office.

4.2 Software

During the year, a survey of software package usage was carried out and as a result, the program libraries were rationalised to make more effective use of limited disc storage space. Among the new facilities introduced were a major enhancement to FORTRAN to bring it up to full FORTRAN-77 level. Graphic drivers were also written for a number of peripherals to help the growing number of users preparing material for plotting and new versions of several popular programs, including SPSS, Minitab, IMSL, and Reduce were introduced.

SECTION 5 OTHER ACTIVITIES

5.1 Teaching and Publications

The Academic User Services Group ran several courses for users ranging from introductory topics to advanced courses on the use of various application program packages. In addition to the Computer Laboratory Newsletter which was published as usual during the year, updated and expanded versions of most of the Groups introductory pamphlets were produced. Many of these are now available in machine readable form on the DECsystem-2060 and may be consulted on-line or printed off by users as required.

5.2 Sale of Services

As expected, income from sale of computer time did not reach last year's exceptional figure of over £20,000. At £9,876, it fell well short of the target of £12,000 originally hoped for and this reflects both the impact of microcomputers on our traditional outside users and also the poor level of service available from the heavily overloaded Trinity machine. This happened notwithstanding the fact that under revised accounting procedures introduced this year the Laboratory's budget was reduced by the income target and actual revenue accrued to the Laboratory rather than to the cista communis as heretofore.

SECTION 6 FUTURE DEVELOPMENTS

The Board's decision to install ICL equipment in 1984/5 represents a major step in the implementation of the five-year development plan for computing in College. It will relieve the shortfall in resources which developed in recent years and will define the framework within which the computing service will develop for several years to come. Preparation for the incorporation of ICL equipment and software into Laboratory's service will dominate developments during the academic year 1984/5. Procedures for registering users, controlling and monitoring usage, allocating file space, etc must be devised and a programme drawn up for the transfer of program packages and user groups to the new equipment. To assist in this preparatory work, a smaller interim machine is to be installed in Michaelmas term and it is planned that preparations for the introduction of ICL facilities into full service will be complete by the time the main machine is commissioned next summer.

The ICL contract provides for the installation of a small Local Area Network which will link the new and existing machines and the present terminal network. This, together with a decision by the Board to earmark some £20,000 p.a. of the Laboratory's annual budget for internal network development means that the coming years will see a considerable growth in data communications within College with improvements in both ease of connection and speed of transmission.

The pilot inter-college network being developed under HEA auspices is also likely to go into full operation in 1984/5 and will facilitate collaborative research users and, in the longer term, offer an opportunity to share expensive applications software and avoid the extensive duplication which exists at present. It is now planned that this network will use the new EIRPAC public data transmission facilities to be provided by Telecom Eireann which it is hoped will offer a more reliable service than the system based on leased lines which was originally planned.

APPENDIX A

EQUIPMENT

1. The specifications of the equipment installed on September 30th, 1984 are as follows:

Digital DECsystem-2060:

1 x 2060 CPU with 1024K words of memory and 80 asynchronous communications ports
4 x RP06 200 Mbyte disc drives
2 x TU45 120Kb, 9-track, 800/1600 b.p.i. tape drives
1 x CD20-A 300 card/minute card reader
1 x DN20 synchronous communications port
1 x LA36 Console
1 x Calcomp Model 81 Ploter
1 x Kaiser Optical Mark Reader

Digital DECsystem-2020:

1 x 2020 CPU with 512K words of memory, 32 asynchronous communications ports and 1 synchronous communication port
3 x RP06 200 Mbyte disc drives
2 x TU45 120 KB 9-track, 800/1600 b.p.i. magnetic tape drives
1 x LA36 Console

Digital PDP 11/34:

For real-time Library Circulation Control System:

- CPU with 256K memory
- 8 asychronous lines
- 2 x RL01 Disc drives
- 1 x RL02 Disc drive
- 1 x LA36 Console

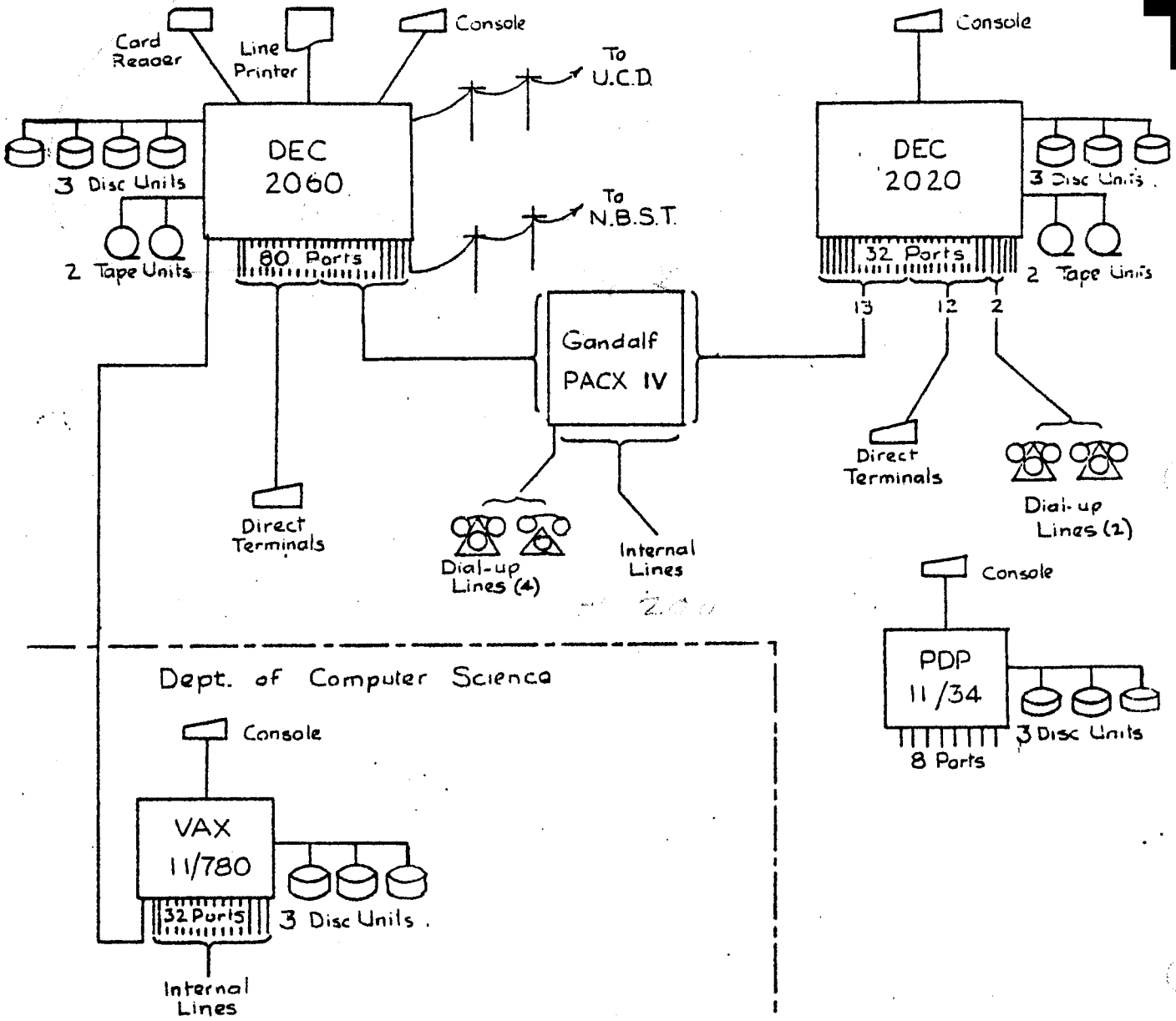
Digital VAX 11/780:

1 x VAX 11/780 system in the Department of Computer Science comprising the following:

- Central Processor with 1.75 Mbyte of memory
- 32 asynchronous lines
- 1 x LA120 Console
- 3 x RK06 Disc drives
- 1 x TS11 Magnetic tape drive

Communications

Approximately 140 terminals, most of which belong to user departments, have access to the equipment. These compete for the limited number of entry ports on the appropriate computer via a Gandalf PACX IV switching unit. The public terminals which may be booked in advance and located in the Terminal Room of the Laboratory have dedicated ports, however, to guarantee access. A high-speed data-line connects the DECsystem-2060 with the IBM 4341 machine in UCD. The DECsystem-2060 is also connected to the experimental Irish Universities Network currently linking TCD, UCD and Euronet.



INSTALLED EQUIPMENT CONFIGURATION - 30.9.84

FIGURE A.1

APPENDIX B

STAFF

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.

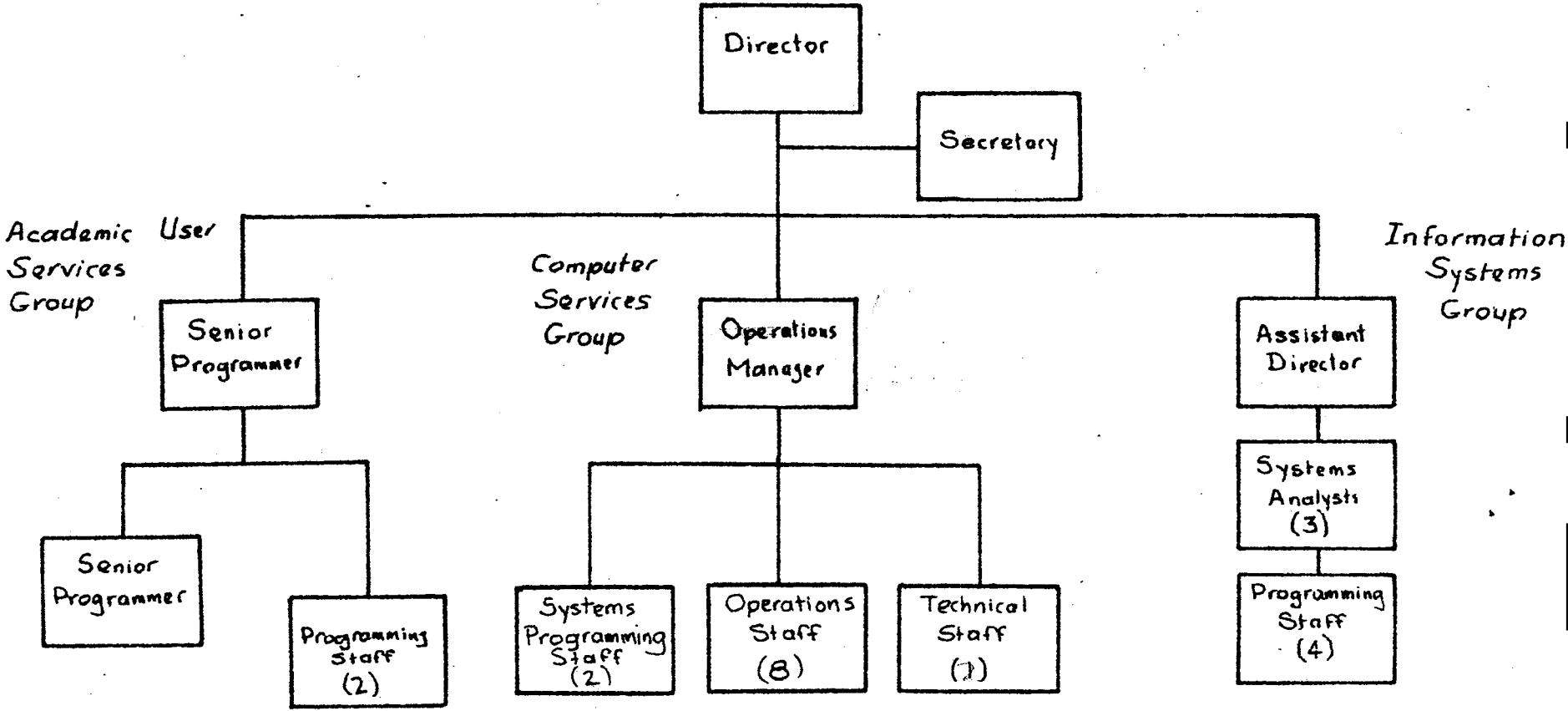
COMPUTER SERVICES GROUP

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 software, a technician, and janitors who are responsible for security.

INFORMATION SYSTEMS GROUP

This Group is responsible for the regular operation of existing administrative and Library 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

Figure B.1

APPENDIX C

COSTS

The services provided by the Laboratory may be divided into two groups:

1. Computer Service consisting of computer time together with the appropriate materials and support facilities. This is available to all college departments and to outside users.

2. Application Development Service This is a full system analysis and programming service provided for library and administrative applications design. The Laboratory staff who perform this work normally use the "Computing Service" for test purposes on behalf of the user departments.

The total cost of running the Laboratory is shown in Table C.1 under the main expenditure headings used in the College accounts. The cost of providing each of the two services was determined 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 the cost of Systems Analysts is charged to Application Development, Operators to Computer Service, while the cost of others such as the Director is distributed over both in proportion to the estimated effort spent on each by the individuals concerned.

In the case of Computer Service, the expenditure was further apportioned between the DECsystem-2020, the DECsystem-2060, the PDP 11/34 and the machine operated by the Computer Science Department. In the case of the two DECsystem-20 machines the records of time used were then costed for use in this report. Income from sale of computer time has been credited to the appropriate machine when allocating the costs.

Table C.2 shows use of the two services by user category.

COMPUTER LABORATORY

ACCOUNTS

Year Ended 30 September 1984

	Actual	Budget
	£	£
Income:		
Income from Sale of Computer Services:	9,876	12,000
Expenditure:		
Cost of Staff:		
- Salaries	340,338	346,000
- Wages	18,019	17,000
Total Pay Cost	358,357	363,000
Rentals of Equipment	40,718	34,000
Purchase of Ancillary Equipment	224,252	229,742
Maintenance	94,592	103,000
Consumable Supplies	30,672	27,000
Cost of External Services	311	1,000
Insurance Charges	3,118	3,500
Miscellaneous Expenses	5,752	3,000
Total Non-Pay Cost	399,415	401,242
Total expenditure:	757,772	764,242
Net annual cost:	747,896	752,242

Table C.1

Analysis of Service Costs

User Category	Computer Service (Note 1)	Application Development Service (Note 2)	Total
Academic	453993	0	453993
Library	80417	47621	128038
Administrative	83880	74930	158810
Outside	7055	0	7055
Total	625345	122551	747896

Note 1: "Systems Support" use is included as a overhead in these costs.

Note 2: This breakdown is approximate and based on the total development cost distributed in proportion to the number of development staff assigned.

Table C.2