UNIVERSITY OF DUBLIN TRINITY COLLEGE COMPUTER LABORATORY

ANNUAL REPORT 1981/82

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SECTION 1 INTRODUCTION

From a computing standpoint, the year 1981/82 was a reasonably satisfactory one with no major problems arising other than the usual case of user demand exceeding the available capacity. Notwithstanding the difficult financial situation, it was possible to undertake some modest upgrading of both machines although most of the additional facilities were not scheduled for installation until Michaelmas Term 1982/83.

Steps were also taken to establish the badly needed technical unit within the Laboratory and as a first step towards this a technician was appointed with effect from October 1st, 1982. This appointment, made at the expense of a programmer vacancy in the administrative area, is regarded as a major step in the development of the service.

Shortage of data lines remained a problem although some improvement was achieved in this area by the introduction of multiplexors to increase the capacity of existing lines.

A significant feature during the year was the rate at which microcomputers were installed in several departments, both academic and administrative. This development has highlighted the need for a revision of the financial and administrative structure of the computing service to operate more effectively in an environment of decentralisation.

The Computer Users' Committee met several times throughout the year and made a number of representations to the Laboratory and to the Computer Management Committee.

SECTION 2 MACHINE UTILISATION AND PERFORMANCE

As usual, the demand for access to the facilities for academic purposes greatly exceeded the number of terminals available for entry. Once connected to the machine, however, academic users enjoyed very good performance from the DECsystem-2060 since the power of the processor was more than adequate to deal with the number of entry ports available. Library and administrative users of the DECsystem-2020 were not so fortunate early in the year. However, the installation of additional memory on this machine improved the situation during Michaelmas Term and a further memory upgrade ordered towards the end of the year together with the transfer of some work to microcomputers should improve the situation further in 1982/83.

Both systems performed satisfactorily as shown in Tables 11 and 12 and were available for use for over 95% of the total time. There was no repetition of the serious breakdown of the 2060 machine which took place in January and February 1981 although the 2020 still remained the more reliable unit.

Use of the UCD DECsystem-2060 by Trinity users declined during the year due to the availability of the newly installed plotter in the Laboratory. Heavy use was still made, however, of the direct link to UCD's IBM machine although usage accounting figures for this were not available this year from the UCD Computer Centre.

As in previous years, computer usage figures are expressed in the following tables in cost terms and the basis of this costing is explained in Appendix C. It should be noted, however, that the figures relate only to those machines funded by the Computer Laboratory and do not necessarily reflect the total computing activity of users since many have access to other equipment, ranging from substantial mini-computers to small personal machines, located in various areas of College.

Cost of Monthly Use per User Category (IRE)

	User Category					
Month	Library	Academic (Note 2)	Admin.	Outside	System Support	Total
10/81	3087	13325	7457	611	1870	26350
11/81	3686	12068	6654	2033	1664	26105
12/81	3284	4488	3852	256	1267	13147
1/82	2200	11798	5303	2158	2273	23732
2/82	2975	20733	5095	1989	995	31787
3/82	2614	24341	5025	1192	3604	36776
4/82	2637	26626	4710	93	3718	37784
5/82	3841	25704	4869	114	3796	38324
6/82	4082	28527	5481	247	3541	41878
7/82	4236	25495	5260	197	3343	38531
8/82	3546	26303	4987	211	3064	38111
9/82	3350	34905	6107	375	744	45481
VAX/ PDP11 (Note 1)	3081	28235	0	0	0	31316
Total	42619	282548	64800	9476	29879	429322

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 PDP11/34 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

			Maria Cal	· · · ·		1
			User Categ	Jory		mat a l
Month	Library	Academic (Note 2)	Admin.	Outside	System Support	TOTAL
10/81	11.72	50.56	28.30	2.32	7.10	100.00
11/81	14.12	46.23	25.49	7.79	6.37	100.00
12/81	24.98	34.13	29.30	1.95	9.64	100.00
1/82	9.27	49.71	22.35	9.09	9.58	100.00
2/82	9.36	65.22	16.03	6.26	3.13	100.00
3/82	7.11	66.19	13.66	3.24	9.80	100.00
4/82	6.98	70.46	12.47	.25	9.84	100.00
5/82	10.02	67.07	12.70	.30	9.91	100.00
6/82	9.75	68.11	13.09	.59	8.46	100.00
7/82	10.99	66.17	13.65	.51	8.68	100.00
8/82	9.30	69.02	13.09	.55	8.04	100.00
9/82	7.37	76.74	13.43	. 82	1.64	100.00
VAX/ PDP11 (Note 1)	9.84	90.16	.00	.00	.00	100.00
Total	9.93	65.81	15.09	2.21	6.96	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 PDP11/34 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.

Machine	Library	Academic	Admin.	Outside	Systems Support	Total	
DEC2020	38313	113	64550	1069	1156	105201	
DEC2060	1225	254200	250	8407	28723	292805	
VAX11/780	0	28235	0	0	0	28235	
PDP11/34	3081	0	0	0	0	3081	
Orotal	42619	282548	64800	9476	29879	429322	

Table 3

Percent of Total Annual Cost per System per User Category

		Total				
Öchine	Library	Academic	Admin.	Outside	Systems Support	
DEC2020	8.92	.03	15.03	.25	.27	24.50
DEC2060	.29	59.20	.06	1.96	6.69	68.20
VAX11/780	.00	6.58	.00	.00	.00	6.58
PDP11/34	.72	.00	.00	.00	.00	.72
Total	9.93	65.81	15.09	2.21	6.96	100.00

Analysis of Academic Computer Use by Machine by Department - Cost IRE

	Cost of Computer Use					
Department	DEC- 2020	DEC- 2060	VAX 11/780	Total		
Commutant C. J.						
Computer Science	113	77754	28235	106102		
Chemistry	0	91060	0	91060		
Microelectronics	0	17544		17544		
Statistics	0	16620	0	16620		
Zoology	0	9652	0	9652		
Genetics	0	6367	0	6367		
Pure Mathematics	0	5418	о	5418		
Physics	0	4504	0	4504		
Applied Mathematics	0	3927	0	3927		
Business Studies	0	3124	0	3124		
Mechanical Engineering	0	2938	0	2938		
Psychology	0	2424	0	2424		
Community Health	0	1863	0	1863		
Civil Engineering	0	1431	0	1431		
Sociology	0	1280	0	1280		
Biochemistry	0	1073	0	1073		
Environmental Science	0	935	0	935		
Physiology	0	900	0	900		
Education	0	756	0	756		
Botany	0	734	0	734		
Economics	0	691	0	691		
Language and Communication	0	629	0	629		
Geography	0	585	0	585		
Pharmacy	0	366	0	366		
Dentistry	0	341	0	341		
Others (12)	0	1284	0	1284		
Total	113	254200	28235	282548		

	Percent of Total Computer Cost					
Department	DEC- 2020	DEC- 2060	VAX 11/780	Total		
Computer Science	.03	18.10	6.58	24.71		
Chemistry	.00	21.21	.00	21.21		
Microelectronics	.00	4.09	.00	4.09		
Statistics	.00	3.87	.00	3.87		
Zoology	.00	2.25	.00	2.25		
Genetics	.00	1.48	.00	1.48		
Pure Mathematics	.00	1.26	.00	1.26		
Physics	.00	1.05	.00	1.05		
Applied Mathematics	.00	.91	.00	.91		
Business Studies	.00	.73	.00	.73		
Mechanical Engineering	.00	. 68	00	د ٥		
Psychology	.00	56	.00	.00		
Community Health	.00	.50	.00	.50		
Civil Engineering	00	• = 3	.00	•43		
Sociology	.00	• 30	.00			
Biochemistry	•00	• 50	.00	.30		
Environmental Sciences	.00	• 25	.00	.25		
Physiology	.00	• 2 2	.00	.22		
Education	.00	• 2 1	.00	.21		
Potonu	.00	.18	.00	.18		
Economica	.00	•1/	.00	.17		
	.00	• 16	.00	.16		
Communication	.00	.15	.00	.15		
Geography	.00	.14	.00	.14		
Pharmacy	.00	.09	.00	.09		
Dentistry	.00	.08	.00	.08		
Others (12)	.00	.30	.00	. 30		
Total	.03	59.20	6.58	65.81		

Analysis of Library Use Cost - IR£

Application	Cost
Cataloguing	27 1 38
Accessions	10672
Circulation Control (Note 1)	4218
Reader Services	504
SDI	87
Total	42619

Table 7

Note 1: Maintenance costs of the PDP11/34 are paid by the Library

Analysis of Library Use Percent of Total Use

Application	Percent
Cataloguing	6.32
Accessions	2.49
Circulation Control (Note 1)	0.98
Reader Services	0.12
SDI	0.02
Total	9.93

Table 8

Note 1: Maintenance costs of the PDP11/34 are paid by the Library

Analysis of Administrative Use

Cost - IRE

User	Cost
Finance Office	35194
Academic Administration:	
- Student and Graduate Records	22945
- Admissions	1684
- Faculty Offices	305
- Miscellaneous	128
	24962
Accommodation Office	2120
Buildings Office	939
Staff Office	243
Information Office	1042
General Services Office	300
Total	64800

Analysis of Administrative Use

percent

User	Percent of Total Use	
Finance Office	8.19	
Academic Administration:		
- Student and Graduate Records	5.33	
- Admissions	0.39	
- Faculty Offices	0.07	
- Miscellaneous	0.03	
	5.82	
Accommodation Office	0.49	
Buildings Office	0.22	
Staff Office	0.06	
Information Office	0.24	
General Services Office	0.07	
Total	15.08	

	System Down-time - Hours					······································	
Month	Engineering		Environ-			Availability	
	Scheduled	Unscheduled	mental causes	mental Soft- causes ware	Total	Hours	8
10/81	0	10.38	6.57	0.77	17.72	726.28	97.62
11/81	8.07	17.83	0.03	0.30	26.23	693.77	96.36
12/81	8.30	16.78	0.02	0.60	25.70	718.30	96.55
1/82	2.35	47.13	68.73	0	118.21	625.79	84.11
82	7.02	112.00	0	9.65	128.67	543.33	80.85
3/82	12.38	0.85	0.38	0.20	13.81	730.19	98.14
4/82	3.00	0	1.08	0.27	4.35	715.65	99.40
5/82	3.38	46.28	0	0.12	49.78	694.22	93.31
6/82	3.20	0	4.10	0.23	7.53	712.47	98.95
7/82	7.23	0	0.80	0.60	8.63	735.37	98.84
8/82	6.28	14.17	1.30	0	21.75	722.25	97.08
9/82	3.12	1.00	0	0	4.12	715.88	99.43
Overall	64.33	266.42	83.01	12.74	426.50	8333.50	95.13

Table 11

DECsystem-2020 Availability

		Dana d 1 - 1 - 1 - 1 - 1 - 1					
Month	Engin Scheduled	eering Unscheduled	Environ- mental causes	Soft- ware	Total	Hours	e tity
10/81	1.00	0	1.27	0.23	2.50	741.50	99.66
11/81	4.42	2.75	0.03	0.10	7.30	712.70	98.99
12/81	1.58	53.63	0.02	0.03	55.26	688.74	92.57
1/82	5.42	0	69.23	0	74.65	669.35	89.97
82	2.87	0.02	0	0.43	3.32	668.68	99.51
3/82	0	0.05	0.33	0.11	0.49	743.51	99.93
4/82	11.17	39.57	1.17	0.03	51.94	668.06	92.79
5/82	3.00	0	0	0	3.00	741.00	99.60
6/82	3.12	0	7.25	0	10.37	709.63	98.56
7/82	3.12	55.13	0	0	58.25	685.75	92.17
8/82	3.18	1.12	49.00	0	53.30	690.70	92.84
9/82	3.08	0.75	7.12	0.10	11.05	708.95	98.47
Overall	41.96	153.02	135.42	1.03	331.43	8428.57	96.22

Month	Cost of Use at UCD Rates - IRE (Note 1)				
	DECsystem-2060				
10/81	3854.84				
11/81	4469.54				
12/81	1844.09				
1/82	696.79				
2/82	2161.86				
3/82	214.78				
4/82	105.13				
5/82	71.05				
6/82	228.93				
7/82	118.71				
8/82	78.65				
9/82	52.65				
Total	13897.02				

- Note 1: This usage has been priced at UCD's billing rate to outside users and does not represent actual cost
- Note 2: It is believed that most TCD work in UCD was performed on the IBM 4300. However, usage figures for the latter system were not provided this year.

Table 13

SECTION 3 APPLICATION DEVELOPMENT

3.1 Academic

The installation of a plotter and the acquisition and implementation of a general purpose graphics package, PLOT79, constituted the most interesting development during the year. Together with some graphics terminals acquired by users, these made possible a number of projects hitherto impossible on College equipment. Among these were the development of a contour map showing the variation in concentrations of various minerals in a selection of Irish Lakes, an analysis of soil content, and a package used by the Chemistry Department to produce graphic representations of molecular structures.

3.2 The Library

The completion and commissioning of the first phase of the circulation control system covering the Lecky Library was the main development in library computing during the year. The system completed its tests during the summer in readiness for Michaelmas Term 1982. In the case of the main library catalogue application, 1981/82 was primarily a year of consolidation following the previous year's transfer of this major application from IBM equipment to the DECsystem-20. It operated satisfactorily and the annual production of the complete catalogue, the Laboratory's biggest single computer task, presented no significant problems.

3.3 Administration

The most significant development in administrative computing was the decision to install a number of microcomputers in several offices including the Buildings Office, the

Staff Office, the Senior Lecturer's Area, and the Secretary's Office. While this equipment was generally funded by the users themselves, the installation planning and equipment acquisition was done by the Laboratory. Some of the units will take over applications currently running on the DECsystem-2020 and all will provide word processing facilities. No major new developments took place in existing applications. The Student Records system was modified to print machine readable bar codes on student identification cards for use in connection with the library circulation control system which obtains borrowers' identification from the Student Records computer file. An extension of the records system to produce examination seating lists gave rise to some initial problems but it is hoped that these have been resolved and Admissions computer procedures operated smoothly.

SECTION 4 COMPUTING SERVICE DEVELOPMENT

4.1 Equipment

An additional eight entry ports, ordered in 1981, were installed on the DEC-2060 during Hilary Term and eased the problems of access. A further 24 were ordered in Trinity Term for installation by the beginning of the following academic year. These will bring the total number of ports installed to 64. A CALCOMP Model 81 Plotter, the first plotter to be installed in the Laboratory, went into service during Michaelmas Term and filled a long felt need.

On the administrative DECsystem-2020 the extra memory ordered the previous year was installed with a marked improvement in response time and in Trinity Term, a further memory upgrade was ordered which will bring this machine to its maximum memory capacity of 512K words.

The delays in the installation of new data lines by the Post Office continued. The rising cost of Post Office charges, however, compared to the stable price of communications equipment made it reasonable to provide a number of extra circuits by means of multiplexors which permit existing lines to carry multiple channels. Four such links, provided a net increase of 28 circuits, were ordered during the year and in addition, some 20 local lines were installed for new terminals within the Laboratory premises in Pearse Street.

An Apple microcomputer and a single user Shelton microcomputer were also ordered for use by Laboratory staff who provide support for the growing number of College users with such equipment. The experimental packet-switched network developed by the Computer Science Department in collaboration with UCD and the NBST became available for practical use during the summer providing access to EURONET and to the UCD DECsystem-2060 for Trinity terminal users.

4.2 Software

The system software remained relatively stable during the In the interests of conserving disc storage space, year. a system for automatically removing inactive files to magnetic tape on a monthly basis was introduced during the year to considerable advantage. The software development for implementation of the new resource allocation system proved considerably more complex than originally anticipated and it is unlikely to go into service until the end of Michaelmas Term 1982. Among the application packages installed were PLUTO, a graphic representation of molecular structures, LINDO, a linear programming package, MACPUF, a package simulating the human respiratory system and PLOT79, a general purpose graphics package. As well as these new versions of Minitab, SPSS, IMSL, BMDP and FORTRAN were installed.

SECTION 5 OTHER ACTIVITIES

5.1 Teaching and Publications

The Academic User Services Group ran several courses for users during the year on both introductory and advanced topics and, as before, these were attended by about 200 people. The Computer Laboratory Newsletter was published as usual and the range of introductory leaflets has been expanded to include documentation on the FORTRAN language and the BMDP statistical package. A computer hardware catalogue listing all known computer equipment in College was produced and circulated during the year as a reference document. However, the high rate of acquisition of microcomputers throughout College made it quickly obsolete and it is hoped that an updated version will be produced shortly.

5.2 Sale of Services

Income from sale of computer services fell from £16,958 last year to £9,088 in 1981/82. This is a more realistic figure than the previous one which was inflated by two exceptionally large transactions, as mentioned in last year's report. It is not expected that there will be a significant increase in 1982/83.

SECTION 6 FUTURE DEVELOPMENTS

With the addition of the extra ports ordered during the year, the DECsystem-2060 will be unable to support further simultaneous users without a memory upgrade. Furthermore, the present number of ports is barely adequate to serve the number of terminal lines, installed or on order, which compete for access to them. In view of the age of the machine it seems unlikely that it will be further upgraded and that future capacity will be provided by the installation of an additional system, possibly to relieve it of some undergraduate work.

The belief that much future development will involve the installation of decentralised equipment was reinforced during the year as the number of microcomputers installed in departments, both academic and administrative, grew. Many of these are linked, in a relatively inefficient manner, to the relevant central machine using existing terminal lines and it seems certain that the development of a high-speed data network to facilitate the inter-connection of such equipment will assume a high priority.

APPENDIX A

EQUIPMENT

 The specifications of the equipment installed on September 30th, 1982 are as follows:

Digital DECsystem-2060:

- 1 x 2060 CPU with 512K words of memory and 64 asynchronous communications ports
- 3 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 Plotter
- 1 x Kaiser Optical Mark Reader

Digital DECsystem-2020:

- 1 x 2020 CPU with 384K 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

On order:

- additional 128K words of memory

For real-time Library Circulation Control system:

- CPU with 128K memory
- 8 asynchronous lines
- 2 x RLO1 Disc drives
- 1 x RLO2 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 Disk drives
 - 1 x TS11 Magnetic tape drive

Communications

Approximately 120 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 III 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.



INSTALLED EQUIPMENT CONFIGURATION - 30.9.82 Figure A.1

APPENDIX B

STAFF

The Laboratory staff is organised as shown in Figure B.l. 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, 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 who design the applications and Programmers who write and test the computer programs needed for their implementation.



COMPUTER LABORATORY

ORGANISATION

Figure B.l

APPENDIX C

COSTS

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

 <u>Computer Service</u> consisting of computer time together with the appropriate materials and supporting facilities. This is available to all college departments and to outside users.

2. Application Development Service

This is a full systems 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.

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

COMPUTER LABORATORY

ACCOUNTS

Year Ended 30 September 1982

Expenditure:

	Actual	Budget
Cost of Staff:	£	£
- Salaries	277,392	287,000
- Wages	14,890	16,700
Total Pay Cost	292,282	302,700
Rentals of Equipment	27,853	28,100
Purchase of Ancillary Equipment	106,368	110,200
Maintenance	79,007	79,000
Consumable Supplies	23,922	23,600
Cost of External Services	866	600
Insurance Charges	2,325	2,200
Miscellaneous Expenses	3,215	3,100
Total Non-Pay Cost	243,556	249,500
Recurrent Cost for Year	535,838	553,200
	1	

Income:

Income from Sale of Computer Services - £9,088

Table C.1

User Category	Computer Service (Note 1)	Application Development Service (Note 2)	Total
Academic	303683	0	303683
Library	45807	41257	87064
Administrative	69647	65259	134906
Outside	10185	0	10185
Total	429322	106516	535838

- Note 1: "Systems Support" use is included as an 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.

APPENDIX D GLOSSARY

1

- EURONET : An international computer network, sponsored by the Commission of the European Communities, providing access to large data banks and computer systems.
- IMSL : International Mathematical Subroutine Library. A set of mathematical computer programs.
- Memory : Storage within a CPU used to store programs and data currently in use. In general the speed of a computer system increases as the memory in its CPU is expanded. Memory is "working" storage unlike magnetic discs or tapes which are used for the longer term storage of data files.
- P.A.C.X. : Private automatic computer exchange. A device, similar to an automatic telephone exchange, which enables many terminals to compete for access to a limited number of entry ports on one or more computers.
- Packet-Switching : A data communication technique which permits transmission of data between many machines, operating at different speeds, on the same network.
- Plotting : The production of computer output on paper in the form of graphs, drawings or maps, etc. The
- Port : An entry channel through which one terminal at a time can communicate with the computer. Ports may be "synchronous" or "asynchronous", depending on the communications technique used. The former are normally used for high speed communication only.

- Processor : The central component of a computer system. Six College processors are referred to in this report, DEC-2020, DEC-2040, DEC-2060, VAX 11/780, Burroughs B1714 and a PDP 11/34.
- SDI Service : The current awareness service based on individual interest profiles operated by the Library.
- SPSS : <u>Statistical Package for the Social Sciences</u>. A set of statistical programs widely used for survey analysis, etc.
- System : This word is used in two ways, according to context:
 - An application system is a set of computer programs and their associated manual procedures to perform a specific task, e.g., the Payroll System or the Library Catalogue Production System.
 - 2. A computer system is a complete computer consisting of the CPU and the peripheral machines connected to it for input, output, and data file storage purposes. This report refers to five TCD computer systems, the DEC-2020, DEC-2060, VAX 11/780, Burroughs B1700 and the PDP 11/34.
- System Support : This term is used in the Report to describe use of the equipment by Computer Laboratory staff for central software development and maintenance, commissioning new application packages, instructing users, accounting for computer usage, copying files, for security purposes etc.

TOPS-20 : The main control program on the DECsystem-20.