# UNIVERSITY OF DUBLIN TRINITY COLLEGE COMPUTER LABORATORY

ANNUAL REPORT 1982/83

## CONTENTS

Section 1	Introduction
Section 2	Machine Utilisation and Performance
Section 3	Application Development
3.1 3.2 3.3	Academic Library Administration
Section 4	Computing Service Development
4.1 4.2	Equipment Software
Section 5	Other Activities
5.1 5.2	Teaching and Publications Sale of Computer Services
Section 6	Future Developments
Appendix A	Equipment
Appendix B	Staff
Appendix C	Costs
Appendix D	Glossary

## SECTION 1 INTRODUCTION

1982/83 was a difficult year for most computer users as the growing workload caused heavy congestion which increased response times to frustrating levels and made access at peak times very difficult.

On the brighter side, the new technical unit established within the Laboratory proved extremely valuable and without it, the commissioning of additional communications equipment, terminals and microcomputers would have been severely impeded. Towards the latter half of the year also, renewed activity on the part of the Post Office gave rise to hopes that the availability of lines might improve in the near future although it will not now be possible to avail of this until the central facilities are expanded to cater for the increased workload which will result.

Lack of financial resources again forced the deferrment of a number of planned developments. The installation of an undergraduate processor and of a pilot local area network, both of which were scheduled for 1983 in the Laboratory's five-year plan, did not take place. Several administrative applications including a computer based staff records system, for example, which have been awaited for some years were again deferred due to shortage of development staff and a number of developments in the library area were similarly affected.

The Computer Users' Committee and the Computer Management Committee were both active throughout the year and both the structure and role of the latter body were reviewed by the Board of the College in the light of current requirements.

## 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 made very extensive use of the UCD DECsystem-2060 during the year due mainly to work originating in the Department of Chemistry. 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 equiupment was very satisfactory during the year as can be seen from Tables 11 and 12 and no abnormal breakdowns were experienced.

The experimental NBST/TCD/UCD network 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£)

	User Category							
Month	Library	Academic (Note 2)	Admin	Outside	Support	- TOTAL		
10/82 11/82 12/82 1/83 2/83 3/83 4/83 5/83 6/83 7/83 8/83 9/83 VAX/PDP11 (Note 1)	4077 8045 4700 4047 2905 3527 3376 3180 2977 3331 4247 3758 4853	35813 28341 25185 35873 28175 26252 29114 25686 16149 26251 18209 12684 40794	8981 7272 3696 5143 4622 4830 5073 4852 4628 5044 5817 5967 0	702 377 231 112 133 924 870 206 714 1523 331 275 0	1338 2316 1320 1256 1258 1202 1886 2484 1435 1932 2008 2401 0	50911 46351 35132 46432 37094 36736 40319 36408 25902 38081 30613 25085 45647		
TOTAL	53022	348528	65926	6399	20836	494712		

## 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

	10 Main aire ann ann ann ann ann ann ann ann					
Month	Library	Academic (Note 2)	Admin	Outside	Support	- TOTAL
10/82	8.01	70.34	17.64	1.38	2.63	100.00
11/82	17.36	61.14	15.69	. 81	5.00	100.00
12/82	13.38	71.69	10.52	. 66	3.76	100.00
1/83	8.72	77.26	11.08	. 24	2.70	100.00
2/83	7.83	75.96	12.46	. 36	3.39	100.00
3/83	9.60	71.46	13.15	2.52	3.27	100.00
4/83	8.37	72.21	12.58	2.16	4.68	100.00
5/83	8.73	70.55	13.33	. 57	6.82	100.00
6/83	11.49	62.35	17.87	2.76	5.54	100.00
7/83	8.75	68.94	13.24	4.00	5.07	100.00
8/83	13.87	59.48	19.00	1.08	6.56	100.00
9/83	14.98	50.56	23.79	1.10	9.57	100.00
VAX/PDP11	10.63	89.37	.00	.00	.00	100.00
(Note 1)						
TOTAL	10.72	70.45	13.33	1.29	4.21	100.00

## Table<sup>2</sup>

- 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.

	User Category							
macnine	Library	Academic	ic Admin Outsid		Support	TOTAL		
DEC2020 DEC2060 VAX11/780 PDP11/34	44184 3985 0 4853	329 307405 40794 0	65260 666 0 0	865 5535 0 0	1585 19252 0 0	112222 336843 40794 4853		
TOTAL	53022	348528	65926	6399	20836	494712		

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

Table 3

Percent of Total Annual Cost per System per User Category

Machine	User Category					
	Library	Academic	Admin	Outside	Support	TOTAL
DEC2020 DEC2060 VAX11/780 PDP11/34	8.93 .81 .00 .98	.07 62.14 8.25 .00	13.19 .13 .00 .00	.17 1.12 .00 .00	. 32 3. 89 . 00 . 00	22.68 68.09 8.25 .98
TOTAL	10.72	70.45	13.33	1.29	4.21	100.00

Table 4

.

# Analysis of Academic Computer Use

by Machine by Department - Cost IR£

	Cost	ōf Comput	ēr Usē	
Department	-DEC2020-	DEC2060		TOTAL
Computer Science	329	121311	40794	162434
Chemistry	0	73757	0	73757
Statistics	0	27640	õ	27640
Pure Maths	0	14325	ů	14325
Applied Maths	0	9830	õ	0830
Microelectronics	Ó	9023	, õ	9030
Civil Eng.	Ó	5527	õ	5523
Business Studies	0	5360	ů.	5360
Zoology	Ō	5303	õ	5303
Mechanical Eng.	0	4976	ŏ	4976
Physics	0	4732	Ő	4732
uenet1cs	0	4047	0	4047
LCONOM1CS	0	3857	0	3857
Botany	0	3019	0	3019
rsychology	0	2643	0	2643
community Health	0	2259	0	2259
Geology	-0	2103	0	2103
Environmental Sci.	0	1607	0	1607
Sociology	0	1311	0	1311
Physiology	0	· 919	0	919
Political Sci.	0	666	0	666
Blochemistry	0	615	0	615
ueography	0	529	0	529
rnarmacology	0	351	0	351
Education	0	327	0	327
Others (14)	0	1366	Ō	1366
TOTAL	329	307405	40794	348528

Table 5

## Analysis of Academic Computer Use

## by Machine by Department - percent

	Percent	of Total	Computer	Use
Department	DEC2020	DEC2060	VAX	TOTAL
Computer Science	.07	24.52	8.25	32.83
Chemistry	.00	14.91	. 00	14.91
Statistics	.00	5.59	. 00	5.59
Pure Maths	.00	2.90	. 00	2.90
Applied Maths	.00	1.99	. 00	1.99
Microelectronics	.00	1.82	.00	1.82
Civil Eng.	.00	1.12	.00	1.12
Business Studies	.00	1.08	.00	1.08
Zoology	.00	1.07	. 00	1.07
Mechanical Eng.	.00	1.01	.00	1.01
Physics	. 00	. 96	.00	. 96
Genetics	. 00	. 82	. 00	. 82
Fconomics	. 00	. 78	.00	. 78
Rotany	.00	. 61	. 00	. 61
Psychology	.00	. 53	. 00	. 53
Community Health	.00	. 46	. 00	. 46
Geology	.00	. 43	.00	. 43
Environmental Sci	. 00	. 32	. 00	. 32
Sociology	×00	.26	. 00	. 26
Physiology	. 00	. 19	. 00	. 19
Political Sci.	. 00	.13	. 00	.13
Biochemistry	. 00	. 12	. 00	.12
Geography	.00	. 11	.00	.11
Pharmacology	.00	. 07	.00	.07
Education	.00	. 07	.00	.07
Others (14)	. 00	. 28	. 00	. 28
TOTAL	. 07	62.14	8.25	70.45

Analysis of Library Use Cost - IR£ Application Cost Cataloguing 35415 Accessions 11976 Circulation Control (Note 1) 4868 Reader Services 692 SDI 71 \_\_\_\_\_ Total 53022 Table 7 Note 1: Maintenance cost of the PDP 11/34 are paid by the Library. Analysis of Library Use Percent of Total Use Percent Application Cataloguing 7.17 Accessions 2.42 Circulation Control (Note 1) 0.98 Reader Services 0.14 SDI 0.01 Total 10.72 ------------Table 8 Note 1: Maintenance cost of the PDP 11/34 are paid by the Library

Analysis of Administrative Use

Cost - IR£

User	Cost		
Finance Office		32121	
Academic Administration:			
- Student and Graduate Records - Admissions - Faculty Offices - Miscellaneous	25391 2130 882 <u>684</u>		
	1	29087	
Accommodation Office Buildings Office Staff Office Information Office General Services Office		3706 79 32 736 165	
Total		65926	

Table 9

## Analysis of Administrative Use

N::

## percent

User	Percent of Total Use	*** *** ***
Finance Office	6.49	
Academic Administration: - Student and Graduate Records - Admissions - Faculty Offices - Miscellaneous	5.13 0.43 0.18 0.14	
	5.83	
Accommodation Office Buildings Office Staff Office Information Office General Services Office	0.75 0.02 0.01 0.15 0.03	
Total	13.33	

Table 10

DECsystem-2060 Availability

	ten ano lan ain an	System	Down-time	- Hou	r 5		
Month	Engin	ieering	Environ-	S. 64-		Availadi	Ilty
	Scheduled	Unscheduled	causes	ware	Total	Hours	×
10/82	3 12	Λ 6	^ ^	0 15	3 87	7/0 13	00 17
11/82	3.55	63.73	0 12	0 48	67 88	652 12	00 57
12/82	3,17	0.22	0.05	33.77	37 21	706 79	94 99
1/83	4.12	0.27	0	13.48	17.87	726.13	97.59
2/83	3.07	2.13	0.72	0.23	6.15	665.85	99.08
3/83	16.38	0.05	0	0.15	16.58	727.42	97.77
4/83	3.07	81.23	0.13	0.05	84.48	635.52	88.26
5/83	12.88	5.62	0.43	0.03	18,96	725.04	97.45
6/83	6.75	2.48	1.15	0.67	11.05	708.95	98.46
7/83	3.65	9.83	52.72	5.03	71.23	672.77	90.42
8/93	4.22	76.77	0.07	5.68	86.74	657.26	88.34
9/83	12.58	0.1	0.17	0.17	13.02	706.98	98.19
Överall	76.56	243.03	55.56	59.89	435.04	8324.96	95.03
	<b>1964 1995 6</b> 964 1968 1968 2969 6864 1966 5667 6868 596		able 11				
		DECsyste	em-20 <b>20</b> Ava	ilabili	ty		
		System	Down-time	- Hou	r 5	Availabi	
Month	Engin	ieering	Environ-	*****	da pain anin anto data ting ang data	AVAIIADI	iicy
			mental	Soft-			
	Scheduled	Unscheduled	causes	ware	lotal	Hours	1
10/82	22.15	5.57	0	0	27.72	716.28	96.27
11/82	7.33	0.10	Õ .	0.03	7.46	712.54	98.96
12/82	2.85	0.02	0.05	0.02	2.94	741.06	99.60
1/83	6.00	0.95	0	0.04	7.35	736.65	99.01
2/83	3.82	0.03	1.88	0	6.00	666.00	99.10
3/83	21.17	2.38	0	Ó	23.55	720.45	96.83
4/83	2.73	0.20	0.02	Ó	2.95	717.05	99.59
5/83	3.00	0	0.30	Ó	3.30	740.70	99.55
6/83	9.17	0.07	6.98	0	16.22	703.78	97.74
7/83	2.23	0.17	48.62	0	51.00	693.00	93.14
8/93	1.33	0.07	0.02	0	1.42	742.58	99.80
9/83	3.00	0	0	0	3.00	717.00	99.58
Överall	84.78	9.83	57.85	0.45	152.91	8607.09	98.25
		-	Table	12			

	•
Month	Cost of Use at UCD Rates IR£ (Note 1) DECsystem-2060
10/82 11/82	10.35 20.61
12/82	11.88
1/83	1365.47
2/83	1405.93
3/83	8586.40
4/83	14664.77
5/83	18187.28
6/83	35795.75
7/83	47361.59
8/83	26631.10
9/83	6176.75
Total	160217.88
Note 1:	This usage has been priced at UCD's billing rate to outside users and does not represent actual cost.
Note 2:	Work was also performed on the IBM 4300 in UCD. However, usage figures for the latter system were not provided.

Table 13

TCD Use of UCD Computers

## SECTION 3 APPLICATION DEVELOPMENT

## 3.1 Academic

During the year, the number of academic users registered on the DECsystem-2060 expanded to about 3000. This growth was due not only to increased activity on the part of traditional user groups in the scientific areas but also reflected an increasing intrerest from Arts users in departments such as French, German, History and Law. While the specific research applications consisted of the usual combination of computational projects and data handling tasks such as survey processing, there was a demand from virtually all academic user sectors for word processing and although the central service currently offers only poor facilities for this, an increasing number of papers and theses were prepared using the system.

## 3.2 The Library

newly developed circulation control system satisfactorily The completed its first full year of operation in the Lecky Library although plans to implement the next phase of the system in the Science Library were delayed because Post Office data lines were not available. Development work also continued throughout the a new book purchasing application to run on vear on a microcomputer and an extensive study to reassess the feasibility converting the existing card catalogue to machine readable of for incorporation into the existing computer system was form commenced and was still in progress at the end of the year. The existing applications of accessions processing and catalogue production operated satisfactorily during the year.

### 3.3 Administration

Most development in the administrarive area took place on the growing number of microcomputers installed in administrative and, in most csses, funded by the user departments offices themselves with the Laboratory providing the technical support at each stage of the acquisition and application needed For example, a multi-user microcomputer in development process. Senior Lecturer's area handles an increasing amount of the the student administration workload and will eventually take over all student and graduate record processing performed heretofore the on the DECsystem-2020 machine thus making capacity available on the latter machine for the growing Library catalogue workload and same time providing a more responsive service in the the at The Director of Buildings has introduced several records area. valuable new applications including a computer based buildings A microcomputer based telephone traffic monitoring atlas. chosen in consultation with the Computer Laboratory, was system. installed during the year and effected considerable savings. Additionally, all microcomputers in administrative offices are used to provide word processing facilities.

#### 4.1 Equipment

The additional 24 entry ports, ordered last year for DECsystem-2060, were installed at the beginning of the y the year together with a corresponding number of terminals. While this went a long way towards improving the severe shortage of student terminals, it contributed to the processor becoming seriously overloaded by early Hilary term and the expanded user population experienced considerable trouble for the remainder of the year. To improve the processor response and to ease the difficulty of finding an available entry port, additional memory, a disc drive, and 8 entry ports were ordered in May for installation by the beginning of the 1983/84 academic year. A small Optical Mark Reader was also installed early in the year and was extensively used for marking multiple choice examinations and for processing survevs.

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 installed single user Sheltons in the Finance Office and in the Laboratory itself for wordprocessing and financial applications.

The Post Office carried out major re-cabling work in College during Trinity term and this gave rise to hopes that the availibility of new data lines might improve. However, no substantial change had taken place by the end of the year.

### 4.2 Software

The principal change in the systems software area was the introduction of the new resource allocation system, designed by the Computer Users Committee and implemented by the Laboratory, to control the use of disc storage space. This complex system proved difficult for many users initially but eventually settled down satisfactorily.

A number of new application packages were installed on the DECsystem-2060 including INGRID, a grid analysis program, WMTS, a time-series package, and a general purpose econometric program called SHAZAM. A scientific word processing program, TEX, was also implemented but its usefulness is currently limited by the fact that no suitable printer is available in the Laboratory. New versions of a number of existing packages were also installed. These included SPSS, Minitab, BMDP, Clustan and IMSL.

## 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. A new introductory microcomputer course, run on a pilot basis in September, proved of exceptional interest and will form the basis of several future presentations. 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.

#### 5.2 Sale of Services

Contrary to expectations, income from sales rose from £9088 last year to £20488 in 1982/83. This should not be taken as an indication of future performance, however, since almost half of this amount arose from two exceptional contracts.

## SECTION 6 FUTURE DEVELOPMENTS

During the year, The Computer Management Committee prepared a five year development plan which outlined a broad strategy for computer growth in College and has already been considered by the Board and submitted to the HEA Advisory Group on Computer Services. The extent and the timing of its implementation will inevitably depend on the availibility of funds and it has already slipped by a year for this reason but nevertheless is still a good indication of direction which future development will take in the longer term.

In the more immediate future, it is hoped that with the assistance of the Computer Science Department a pilot Local Area Network linking the DECsystem-20 machines, the VAX 11/780, and the Trinity node of the experimental NBST/TCD/UCD network will be installed in the Laboratory. In addition, the HEA hopes to fund the latter network from the end of 1983 when NBST support terminates and expand it include most institutions funded by the Authority.

#### . APPENDIX A

#### EQUIPMENT

1. The specifications of the equipment installed on September 30th, 1983 are as follows:

Digital DECsystem-2060:

1 x 2060 CPU with 1024K words of memory and 80 asynchronous communications ports

- 3 x RPO6 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

On order:

additional RP06 disc drive

Digital DECsystem-2020:

1	Х	2020 CPU with	512K words of memory,	
		32 asynchrono	ous communications ports and	l
		1 synchronous	s communication port	
3	х	RP06 200 Mbyte	e disc drives	
2	~	THAS 120 KP 0_	-treat 900/1600 h n i	

- 2 x 1045 120 KB 9-track, 800/1600 D.p.1. magnetic tape drives
- 1 x LA36 Console

Digital PDP 11/34:

For real-time Library Circulation Control System:

CPU with 128K 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 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. The DECsystem-2060 is also connected to the experimental Irish Universities Network currently linking TCD, UCD and Euronet.



·•••

## INSTALLED EQUIPMENT CONFIGURATION. - 30.9.83 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, 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.

k with to The matter



COMPUTER LABORATORY

ORGANISATION

Figure B.1

#### APPENDIX C

#### COSTS

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

- 1. <u>Computer</u> <u>Service</u> 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 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.

n<u>7</u>

## COMPUTER LABORATORY

### ACCOUNTS

Year Ended 30 September 1983

Expenditure: Actual Budget £ ----F Cost of Staff: 306,808 315,000 - Salaries 14,944 17,000 Wages ---321.752 332.000 Total Pay Cost Rentals of Equipment Purchase of Ancillary 22,573 31,000 125,325 104,766 110,400 102,100 Equipment Maintenance 28,000 33,926 Consumable Supplies Cost of External Services 252 1,100 2,700 2,348 Insurance Charges 3,500 Miscellaneous Expenses 2,617 291,807 278,800 Total Non-Pay Cost 613,559 610,800 Recurrent Cost for Year

## Income:

Income from Sale of Computer Services - £20,488

Table C.1

## Analysis of Service Costs

.

User Category	Computer Service (Note 1)	Application Development Service (Note 2)	Total
Academic	363853	0	363853
Library	55353	46033	101386
Administrative	68826	72814	141640
Outside	6680	0	6680
Total	494712	118847	613559
Note 1: Note 2:	"Systems Supp as a overhead This breakdow based on the t	ort" use is i in these costs n is approxima otal developme	included 5. ate and ent cost
	distributed i number of assigned.	n proportion development	to the staff

Table C.2

1

# APPENDIX D

۹<u>س</u> ۲۰

# GLOSSARY

EURONET	:	An international computer network, spon- sored 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.
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.

ł

(\*

			and the second	
Processor	:	The central component system. Four College referred to in this DEC-2060, VAX 11/780	nt of a computer ge processors are report, DEC-2020, and a PDP 11/34.	-
SDI Service	•	The current awarenes individual interest p the Library.	s service based on rofiles operated by	
SPSS	•	Statistical Package Sciences. A set of s widely used for surve	for the <u>S</u> ocial tatistical programs y analysis, etc.	
System	:	This word is used in context: 1. An application computer prog associated man perform a specif Payroll System Catalogue Produc	two ways, accordin system is a set of rams and their ual procedures to ic task, e.g., the or the Library tion System.	ng to
		2. A computer sys computer consist the peripheral to it for input, file storage pur refers to fo systems, the D VAX 11/780 and t	tem is a complete ing of the CPU and machines connected output, and data poses. This report ur TCD computer EC-2020, DEc-2060, he PDP 11/34.	
System Support	•	This term is used describe use of Computer Laboratory software development commissioning new ap instructing users, computer usage, co security purposes, et	in the Report to the equipment by staff for central and maintenance, plication packages, accounting for pying files, for c.	
TOPS-20	:	The main control DECsystem-20.	program on the	

.