UNIVERSITY OF DUBLIN TRINITY COLLEGE COMPUTER LABORATORY

ANNUAL REPORT 1975/6

CONTENTS

Section	1	Introduction
Section	2	Machine Utilisation
	2.1	Computer Activity
	2.2	Ancillary Operations
Section	3	Application Development
	3.1	Library
	3.2	Academic
	3.3	Administration
Section	4	Central Service Development
	4.1	Equipment
	4.2	Software
Section	5	Other Activities
	5.1	Teaching and Publications
	5.2	Sale of Computer Services
	5.3	External Contacts
Section	6	Future Developments
Appendia	κΑ	Equipment
Appendia	с D	
whheuary		JUAII
Appendix	k C	Costs
Appendix	к D	Glossary

.

SECTION 1 INTRODUCTION

As in the previous year, 1975/6 saw no significant expansion in the scope of the central computing service and although the demand continued to grow the only increases in capacity were those resulting from the constant effort to improve efficiency, an activity which at this stage is subject to the law diminishing returns. Unattended running of the equipment, initially intrøduced last year, was also extended to provide greater availability within the constraints of the existing budget and to make more effective use of operating staff.

The HEA Advisory Group on Computer Services considered the College's needs and there was some optimism that a significant improvement could be made in the near future. However, it is felt that this should be viewed with considerable caution in view of the present state of public finances. Furthermore, it must again be stressed that College currently enjoys a level of computer service out of all proportion to its annual expenditure in this area. This is due to the fact that the biggest item in a normal computer budget, namely the cost of the central equipment itself, has been completely written off and has not appeared in the Laboratory accounts for a number of years.

SECTION 2 MACHINE UTILISATION

2.1 Computer Activity

A new and much more precise method of recording computer use was introduced at the beginning of the year and forms the basis for most of the statistics included in this year's report. All use is recorded in terms of money at a rate which represents the actual portion of the Laboratory's expenditure involved in providing the service in question. The basis of this costing is provided in Appendix C from which it can been seen that £122,000 of the Laboratory's total extenditure of £185,914 went towards the provision of computer service. In general, the figures for relative use by different groups are not comparable with those for previous years except on a percentage basis and even here comparisons are of limited value because of the changes resulting from the improved accuracy of the new system.

As in last year's report Tables 1 and 2 show usage by month by the main categories of users on an absolute and on a percentage basis respectively. Table 3, which is directly comparable with the corresponding table last year, summarises the use of the GUTS system and it can been seen that the number of jobs submitted to the machine via terminals increased from 41,288 in 1974/75 to 55,528 in 1975/76. The GUTS system availability and the total terminal time used have also increased by around 50% due largely to the extended use of unattended system operation. Tables 4 and 5 show activity by academic departments and this year it has been possible to separate use for research and for teaching purposes. Tables 6 to 9 analyse the library and administrative activity while Table 10 summarises the overall operation of the system. It is interesting to note from the latter table that despite the heavy work-load and the age of the equipment its reliability has proved extremely high and the total system "down time" was lower than the previous year.

Analysis of Computer Use Total Monthly Use per User Category

	User Category					
Month	Library	Academic	Admin	Outside	Systems Support	
	£	£	£	£	£	
10/75	702.99	3877.32	3288.91	146.18	2365.11	
11/75	765.77	6166.36	1953.00	123.08	1947.00	
12/75	614.30	5986.15	1363.72	194.95	1318.69	
1/76	956.63	6653.49	1584.73	110.53	1318.65	
2/76	974.62	6763.78	1832.42	23.38	1036.95	
3/76	770.26	8198.98	1863.45	228.83	911.72	
4/76	1040.28	7765.73	1753.27	151.64	1004.75	
5/76	1081.95	5658.65	2126.60	194.56	1078.06	
6/76	1307.26	3760.36	2651.63	376.77	1286.00	
7/76	1377.53	5003.79	1511.51	792.98	1031.67	
8/76	2195.26	4215.82	1523.69	496.26	551.57	
9/76	809.09	3467.83	2839.17	292.93	511.44	
Overall	12595.94	67518.26	24292.10	3132.09	14461.61	

- "Systems Support" includes central software maintenance, etc., and certain GUTS use which it is not feasible to analyse, by Library, Academic and Administrative users.

Analysis of Computer Use Percent of Total Monthly Use per User Category

	User Category					
Month	Library	Academic	Admin.	Outside	Systems Support	
10/75	% 6.77	% 37.35	% 31.68	% 1.41	% 22.79	
11/75	6.99	56.29	17.83	1.12	17.77	
12/75	6.48	63.16	14.39	2.06	13.91	
1/76	9.00	62.63	14.92	1.04	12.41	
2/76	9.17	63.62	17.24	0.22	9.75	
3/76	6.43	68.49	15.56	1.91	7.61	
4/76	8.88	66.28	14.97	1.29	8.58	
5/76	10.67	55.81	20.97	1.92	10.63	
6/76	13.93	40.08	28.26	4.02	13.71	
7/76	14.18	51.49	15.55	8.16	10.62	
8/76	24.44	46.94	16.96	5.52	6.14	
9/76	10.09	43.24	35.40	3.65	7.62	
Overall	10.32	55.35	19.91	2.57	11.85	

- The percentages in this table are based on the cost distribution shown in Table 1.

- "Systems Support" includes time required for central software maintenance, central systems software operation, and "housekeeping" activities. In addition, it contains certain GUTS use by Library, Academic and Administrative applications which it is not feasible to analyse further.

Month	GUTS Availability (Hours)	Terminal Time Used (Hours)	User "Log-on" Requests	Jobs Submitted via GUTS
10/75	436.99	1132.17	3159	3405
11/75	272.45	1855.28	5448	4894
12/75	229.43	1680.28	5284	4741
1/76	290.45	1726.63	4930	5004
2/76	311.18	2121.80	6368	6135
3/76	342.77	2513.28	7491	6690
4/76	262.13	2091.18	7486	5419
5/76	302.03	1406.78	4763	4039
6/76	275.74	1043.47	4269	4066
7/76	266.35	1172.17	4642	4482
8/76	272.03	813.02	3532	3274
9/76	329.33	723.05	3013	3376
Total	3572.88	18279.11	60385	55525

Analysis of Academic Use by Department - Cost

	С	ost - £	
Department	Research	Teaching	Total
		· · · · · · · · · · · · · · · · · · ·	
Engineering	6392.69	13027.09	19419.78
Computer Science	5616.01	9448.71	15064.72
Statistics	8063.19	1181.23	9244.42
Genetics	2229.99	2960.33	5190.32
Pure Mathematics	333.44	2290.62	2624.06
Chemistry	2374.27	239.19	2613.46
Physics	1446.13	1121.96	2568.09
Social Medicine	2408.94	0.00	2408.94
Education	1864.42	94.00	1958.42
Economics	1286.61	123.01	1409.62
Psychology	1287.34	11.12	1298.46
Business Studies	108.68	858.53	967.21
Geography	213.49	599.99	813.48
Applied Mahtematics	364.16	179.54	543.70
Physiology	377.67	0.00	377.67
Zoology	91.91	281.64	373.55
Obstetrics & Gynaecology	192.56	0.00	192.56
Geology	34.55	87.85	122.40
Pharmacology	93.44	0.00	93.44
Social Studies	32.60	43.86	76.46
Political Science	0.00	70.48	70.48
Biochemistry	44.90	2.08	46.98
Veterinary Medicine	25.19	0.00	25.19
Botany	8.38	1.29	9.67
Dentistry	0.00	4.30	4.30
Surgery	0.88	0.00	0.88
Total	34891.44	32626.82	67518.26

Ananylis of Academic Use

by Department - Percentage

	Percent of Total Computer Use				
Department	Research	Teaching	Total		
Engineering	5.24	10.68	15.92		
Computer Science	4.60	7.75	12.35		
Statistics	6.61	0.97	7.58		
Genetics	1.83	2.42	4.25		
Pure Mathematics	0.27	1.88	2.15		
Chemistry	1.94	0.20	2.14		
Physics	1.19	0.91	2.10		
Social Medicine	1.97	0.00	1.97		
Education	1.53	0.08	1.61		
Economics	1.06	0.10	1.16		
Psychology	1.05	0.01	1.06		
Business Studies	0.09	0.70	0.79		
Geography	0.17	0.49	0.66		
Applied Mathematics	0.30	0.15	0.45		
Physiology	0.31	ം.oo	0.31		
Zoology	0.08	0.23	0.31		
Obstetrics and Gynaecology	0.16	0.00	0.16		
Geology	0.03	0.07	0.10		
Pharmacology	0.08	0.00	0.08		
Social Studies	0.03	0.04	0.07		
Political Science	0.00	0.06	0.06		
Biochemistry	0.04	0.00	0.04		
Veterinary Medicine	0.02	0.00	0.02		
Botany	0.01	0.00	0.01		
Dentistry	0.00	0.00	0.00		
Surgery	0.00	0.00	0.00		
Total	28.61	26.74	55.35		

Analysis of Library Use Cost

	Cost - £				
Application	Development and Maintenance	Production	Total		
Accessions System	3.21	2207.17	2210.38		
Catalogue System	4756.51	5057.65	9814.16		
SDI Service	6.74	463.39	470.13		
Other	101.25	0.02	101.27		
Total	4867.71	7728.23	12595.94		

Table 6

Analysis of Library Use Percent

	Percent of Total Computer Use			
Application	Development and Maintenance	Production	Total	
Accessions System	0.00	1.81	1.81	
Catalogue System	3.90	4.14	8.04	
SDI Service	0.01	0.38	0.39	
Other	0.08	0.00	0.08	
Total	3.99	6.33	10.32	

Analysis	of	Administrative	Use
		Cost	

		Cost - £	
Application	Development and Maintenance	Production	Total
Admissions	417.91	2454.22	2872.13
Student Records (Old System)	520.59	2955.65	3476.24
Student Records (New System)	5301.57	0.00	5301.57
Examination Processing	0.00	100.59	100.59
Staff Statistics	271.25	0.00	271.25
Salaries	2324.54	421.54	2746.08
Wages	64.48	2360.62	2425.10
Debtors Ledgers	1917.45	3511.41	5428.86
Creditors Ledgers	0.00	882.57	882.57
Nominal Ledger	577.16	0.00	577.16
Buildings Office Costing	31.97	178.58	210.55
Total	11426.92	12865.18	24292.10

Analysis of Administrative Use Percent

	Percent of Total Computer Use				
Application	Development and Maintenance	Production	Total		
Admissions	0.34	2.01	2.35		
Student Records (Old System)	0.43	2.42	2.85		
Student Records (New System)	4.35	0.00	4.35		
Examination Processing	0.00	0.08	0.08		
Staff Statistics	0.22	0.00	0.22		
Salaries	1.91	0.35	2.26		
Wages	0.05	1.93	1.98		
Debtors Ledgers	1.57	2.88	4.45		
Creditors Ledgers	0.00	0.72	0.72		
Nominal Ledger	0.47	0.00	0.47		
Buildings Office Costing	0.03	0.15	0.18		
Total	9.37	10.54	19.91		

Computer Activity

Total System Elapsed Hours

Month	GUTS	0.S. Alone	Other	Total	Main- tenance	Total Activity
10/75	436.99	83.60	11.70	532.30	4.80	537.10
11/75	272.45	221.48	26.23	520.17	7.45	527.62
12/75	229.43	233.38	0.32	463.13	13.23	476.37
1/76	290.45	255.93	0.48	546.87	11.37	558.23
2/76	311.18	270.35	9.25	590.78	1.00	591.78
3/76	342.77	240.72	0.0	565.48	2.63	568.11
4/76	262.13	318.78	2.05	582.96	0.88	583.85
5/76	302.03	314.02	1.42	617.46	0.0	617.46
6/76	275.74	285.38	2.57	563.68	0.0	563.68
7/76	266.35	352.00	12.38	630.73	6.52	637.25
8/76	272.03	280.42	0.87	553.31	4.53	557.85
9/76	329.33	269.98	0.62	599.93	2.85	602.78
	3572.88	3126.03	67.88	6766.80	55.27	6822.07

GUTS	:	Gothenburg	Universities	Terminal	System
------	---	------------	--------------	----------	--------

l

- 0.S. : Operating System/360. This is the main multi-programming control program in use.
- Other : "Stand-alone" use of the system without the normal control program.

2.2 Ancillary Operations

For the second successive year the overall consumption of punch cards has fallen thanks to the increasing use of terminals for data entry. Details of the data preparation activities of the Laboratory are shown in Table 11. The Operations Section now uses about 1,000 magnetic tapes some of which are processed very frequently and are several years old. To reduce the increasing amount of machine time lost due to tape problems, a second-hand magnetic tape cleaner was purchased during the year and a regular programme of tape cleaning is now in operation.

Data Preparation

Cards punched by Laboratory staff for:

-	- Academic Users	:	22,500
•	- The Library	:	54,000
-	- The Administration	:	210,300
-	- Outside Users	:	9,900
Cards	punched by outside agencies	:	23,400
Cards	punched by users themselves	:	424,000
Cards the	punched automatically by computer	:	436,000

Table 11

SECTION 3 APPLICATION DEVELOPMENT

3.1 Library

Most of the effort in this field was spent in refining the existing catalogue application to enable it cope with the ever increasing size of the catalgoue file within the relatively limited resources of the system. As a result it was possible to process 942,867 microfilm entries this year in 20 hours 22 minutes of CPU time compared to 751,637 images in 1974/75 in a CPU time of 18 hours 28 minutes representing a reduction of 12.5% in the processing time per image.

During the year, the Cambridge University Library expressed considerable interest in the Trinity Library application and it seems likely they may adopt it for use there. To confirm the technical feasibility of this, Mr. Alan Tucker was invited to visit Cambridge to run the Trinity programs with local modifications in the Cambridge Computer Laboratory and did so very successfully.

3.2 Academic

No major changes took place in the pattern of academic activity other than the now normal increase in demand. The level of academic user service continued to suffer somewhat as a result of the staff turnover in September 1975 and difficulty in filling a senior programming vacancy. However, it appears that these difficulties will shortly be resolved and plans are in hand for re-organisation of user service activities in the coming year.

3.3 Administration

To relieve the central system of some administrative processing and to improve the level of user control over certain data entry and validation processes, an "intelligent" terminal was located in the Accountant's Office and is used off-line

for data recording and the performance of data checking hitherto performed on the 360. It is also used on-line for the direct submission of administrative work to the 360. Also in the financial area an application program package for nominal ledger processing was ordered after a study performed initially within the framework of the Joint Working Group on Information Systems. In the field of student administration, the data processing aspects of the 1975/76 registration and the 1976/77 admissions processing were very satisfactory. The new student records system developed by the Joint Working Group also went into operation on a trial basis towards the end of the year. As part of this system, a report generator software package called EASYTRIEVE was acquired and used to produce most of the analyses required by the HEA. EASYTRIEVE has also proved useful outside the student record area as a convenient tool for the production of unscheduled analyses and has already been used in the payroll area for this purpose.

SECTION 4 CENTRAL SERVICE DEVELOPMENT



4.1 Hardware

No additional central hardware was installed during the year. A CASE 640 PACX automatic terminal line switching unit and an additional post office data line were ordered during the year to facilitate the extension of unattended system operation. This will permit all remote terminals to compete for access during such periods and remove the present restriction whereby only terminals which have been connected in advance may operate. During the year additional data lines were installed to the Department of Business Studies and to Accountant's Office in 201 Pearse Street.

4.2 Software

Two significant control software items were installed during the year. The first of these was the Gothenburg Accounting System which has made possible the more accurate statistics contained in this report. The other is a program which enables the IBM 3704 transmission control unit to recognise the transmission speed of each remote terminal and automatically adapt itself to match this. This has considerably reduced the need for operator action and provided a better response to users.

A number of application packages were also acquired including a report generator program, EASYTRIEVE, a statistical package called OSIRIS, and Archiver, a program for the management of data files.

SECTION 5 OTHER ACTIVITIES

5.1 Teaching and Publications

As in previous years, lectures were given by the Assistant Director (Systems), and by the Director to medical undergraduates, and MBA students respectively. The Computer Laboratory Newsletter was not published during the year but it is hoped that publication can be resumed in 1976/77 when more resources will be available for user services.

5.2 Sale of Services

Use by outside organisations accounted for 2.7% of computer activity during the year. The revenue from this and from college departments performing sponsored research amounted to £9,444. This considerably exceeded the target of £6,000 but is not indicative of a general increase in such activity as unusually heavy use by one client during the months of June, July and August, accounted for most of the increase.

5.3 External Contacts

Mr. A. Tucker, Systems Analyst, made two visits to the University of Cambridge in connection with the possible use there of our library software as mentioned in Section 3.1.

The Laboratory continued its active membership of GUIDE and SEAS, the European computer user organisations and the Director retired from the Board of the latter organisation in November after four years in office. The Laboratory maintained its high level of participation in the activities of the Joint Working Group on Information Systems which extended its activities into the area of accounting applications during the year.

The Director was a member of a group of European university computer centre directors which visited eleven academic and research centres in North America in April organised by IBM and also visited the University of Nijmegen in May at the invitation of the Faculty of Science there.

Mr. J.P. Kirwin, Systems Analyst, was assigned on secondment to the Admissions Office as Admissions Procedures Officer in October 1975. In his absence, Mr. F. Murray is acting Systems Analyst and, after some re-organisation of programming activity, a programmer has been recruited on a temporary basis to fill the resulting vacancy.

SECTION 6 FUTURE DEVELOPMENTS

During the year the HEA Advisory Group on Computer Services met on several occasions and its recommendations, which included the provision of additional funds for Trinity "ear-marked" for computing, were accepted by the Authority subject to their grant from the government proving adequate. While it is by no means certain that these funds will materialise in 1976/77, the possibility of improvement does exist and the urgent need of College in this regard has been recognised. In preparation for possible equipment acquisition, proposals were invited from a number of major vendors and much of the preliminary evaluation carried out. Plans were also made to carry out bench-marks tests on the most likely equipment in October of 1976.

In the event of additional funds not being received in 1976/77, there is very little scope for extension of service other than by increasing the extent and scope of "unattended" running of the system. The new Gothenburg Accounting System does include facilities, currently unused, to restrict the total access to the system by any one user so that it is now technically possible to implement a rationing system if necessary.

APPENDIX A

EQUIPMENT

The specifications of the equipment currently installed are as follows:

1 x IBM 2044 Model H Central Processing Unit with 262,144 bytes (256K) of core storage and with

- One Multiplexor Channel
- Two high speed multiplexor channels
- Single disc storage drive in CPU
- Store and fetch protection
- Floating point arithmetic
- Console printer keyboard
- Interval timer
- Commercial Feature (Full 360 instruction set)
- High Speed General Registers

1 x IBM 2941 Model 1 Storage Control with

- File Scan

and

- Record Overflow
- 1 x IBM 2415 Model 4, Magnetic Tape Unit and Control
 (2 drives) with 9-track compatibility,
 i.e., 800 b.p.i. tape at 15000 b.p.s.
 or 1600 b.p.i. tape or 30000 b.p.s.

1 x IBM 2821 Model 2 Control Unit (for 1403 printer)

1 x IBM 1403 Model 2 Printer with Universal Character Set feature and interchangeable Chain Cartridge adapter Print Positions: 132 Maximum Rated Speed: 600 lines/minute Chains: Normal - PN3 Also Available: TN modified for Library Use & QN2.

1 x IBM 2501 Model B2 Card Reader with Card Image Feature

- 1 x IBM 1442 Model N2 Card Punch with Card Image Feature Speed: 91 to 256 cards/minute depending on number of columns punched.
- 8 x IBM 2260 Display Stations Model 1 with alphameric keyboards
- 1 x IBM 1053 Model 4 Printer with pin-feed platen and accelerated carriage return
- 4 x IBM 2311 Model 1 Direct Access Storage Units
- 1 x IBM 2314, 2312 and 2312 Model Al Direct Access
 Storage Facility (5 spindles)
- 1 x IBM 3704 Transmission Control Unit
- 2 x ASR 33 Teletype Terminals in user locations
- 4 x Decscope terminals in the Laboratory and user locations
- 3 x Decwriter terminals in the Laboratory and user locations
- 1 x Hazeltine 1200 terminal in a user location
- 1 x Datapoint 1100 terminal in a user location

- - B1714 CPU and SPO including 40K memory
 - A9480-12 Dual Disc Unit
 - A9115 Card Reader
 - A9349.2 Line Printer

APPENDIX B

STAFF

The Laboratory has a staff of 26 organised as shown in Figure B.l. The functions of the main groups are as follows:

DEVELOPMENT STAFF

This section is responsible for the development of new applications, as follows:-

Systems Analysts study the requirements of new systems in the library and administrative fields and design computer based procedures to implement them.

<u>Programmers</u> write and test the computer programs called for by the Systems Analysts' designs. They also act as advisors to academic users who do their own programming.

Systems Programmers. Systems Programmers are responsible for the generation and maintenance of internal control programs needed to run the computer.

OPERATIONS STAFF

This section is responsible for the day-to-day operation of the Laboratory and duties are as follows:-

Data preparation and control is performed by Data Processing Assistants and consists of card punching and verification, reception and dispatch of work, and control of the magnetic disc and tape library and of documents in progress. Computer operation is performed by <u>Operators</u> who are normally organised into teams of two people, one of whom is shift leader. Operators work permanently on a shift rota.

Janitors work on permanent night shift and are responsible for general security.



Development Staff

RY 0 H 4 പ്പ 0 മ L A

> പ്പ щ ы Þ

> ሲ

C 0 M

ALL IN

Operations Staff

30 September 1976

0 н EH 4 ഗ н RGAN 0

N

Figure B.1

APPENDIX C COSTS

The services provided by the Laboratory may be divided into three 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. <u>Application Development Service</u>. 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" and "Data Preparation Service" for test purposes on behalf of the user departments.
- <u>Data Preparation Service</u>. This is, at present, a card punching service provided on a limited scale to all user sectors.

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 three 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 of the three services. 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 the three in proportion to the estimated effort spent on each by the individuals concerned. For the purpose of "charging", this analysis was carried out at the beginning of the year on the budget figures and the resulting estimated cost of Computer Service was used as a target to be recovered during the year. This together with estimates of the level of usage were used to determine the actual rates charged for those activities which constitute "Computer Service". These rates are shown in Table C.2.

The total recovered amounted to £135517.16 compared to the actual cost of £122000 and the detailed usage figures were then scaled down to the actual level before use in this report.

Table C.3 shows use of the three services by user category.

COMPUTER LABORATORY

ACCOUNTS

Year Ended 30 September 1976

Expenditure:

	Actual	Budget
Cost of Staff:	£	£
- Salaries	106,534	113,000
- Wages	6,441	7,100
Rentals of Equipment	16,786	18,300
Purchases of Ancillary Equipment	24,047	13,900
Maintenance	17,430	17,500
Consumable Supplies	9,947	8,500
Cost of External Services	441	600
Insurance Charges	1,035	1,000
Miscellaneous Expenses	3,253	2,400
Recurrent Cost for Year	185,914	183,200

Income:

Income from Sale of Computer Services - £9,444

This includes income amounting to £733.91 from computer use by externally funded research activities undertaken by the following departments:

Business Studies	£ 19.50
Education	£420.35
Statistics	£ <u>294.06</u>
	£733.91

UNIVERSITY OF DUBLIN TRINITY COLLEGE COMPUTER LABORATORY

INTERNAL CHARGES

Charges applicable to Normal Batch and GUTS Work

Virtual Time (Note 1)	£0.12	per requested 2Kb/hour
CPU 'i' Time	£7.92	per hour
2311 Disk I/O	£0.0004	per EXCP
2314 Disk I/O	£0.0002	per EXCP
2415 Tape I/O	£0.0004	per EXCP
Special Diskpack or		
Tape Mounting (Note 2)	£0.50	per volume
Input via HASP	£0.0003	p er car d image
Output via HASP (Note 3)	£0.0003	per line image
	£0.0089	per card punched
Special Printer Set-up	£1.00	per set-up

Additional Charges for GUTS Work

"Log-on" time	£0.0289	per minute
Input from Terminal	£0.0002	per line
Output to Terminal	£0.0002	per line
Foreground Execution (T.S.)	£0.024	per second

- Note 1 Virtual Time is an artificial approximation to elapsed time based on an amalgam of several factors and is the basis for charging for memory occupancy.
- Note 2 Requests for 2314 disk mounting will not normally be entertained.
- Note 3 In the case of 1403 output this includes the cost of standard single part stationery.

Analysis of Service Costs

User Category	Computer Service Note 1	Application Development Service Note 2	Data Prep. Service	Total
Academic	76598	0	879	77477 (41.67%)
Library	14290	17133	2110	33533 (18.04%)
Administrative	27559	34267	9136	70962 (38.17%)
Outside	3553	0	389	3942 (2.12%)
Total	122000	51400	12514	185914

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

CPU	:	Central Processing Unit. The major component of the computer system which in the College System/360 is an IBM 2044.
CPU Time	:	Time during which the CPU is actively pro- cessing and not waiting for a peripheral device to complete some ancillary operation.
Development Use	:	Use of the system by systems analysis and programming staff for the development of new applications or of major enhancements to existing ones including the productive running of new programs prior to their transfer to the Operations section for routine use.
Elapsed Time	:	Overall time span from start to finish on the whole system. Individual components may not be active for all of this period.
GUIDE	:	THE European GUIDE organisation. An association of administratively oriented users of large IBM computers.
GUTS	:	Gothenburg Universities Terminal System. A comprehensive set of control and service programs to permit the use of keyboard terminals for general computing purposes on an IBM system operating under O.S. with HASP.
GUTS Availability	•	The total number of hours for which the GUTS system was available in the machine for simultaneous use by up to sixteen terminal

users.

- GUTS Terminal : The total number of man-hours spent by Time users at active terminals.
- GUTS "Log-on" : The total number of occasions on which Requests individual terminal users attempted to use the GUTS system.
- HASP : The Houston Automatic Spooling Program. A control program to marshal the queue of incoming jobs, schedule them for processing, and release their results to the appropriate output device. It works in conjunction with 0.S.
- Joint Working Group : The Joint Working Group on Information Systems established on TCD initiative to share systems resources by the co-operative development of new systems which, when completed, can be operated independently by the participants who currently include the NUI colleges and TCD with HEA observers in attendance.
- Maintenance Use : Use of the machine by systems analysis and programming staff for the maintenance of existing programs.
- Meter Time : Time during which one or more jobs are active in the system, as recorded by meter.
- Modem : Modulator-demodulator unit, one of which is normally required for signal conversion purposes at each end of a data transmission line.
- 0.S. : IBM System/360 Operating System. This is the main complex of control programs and program libraries needed to run the machine.

Production Use : Use of the computer by Operations staff for routine productive work. SDI Service : The current awareness service based on individual interest profiles operated by

the Library.

SEAS : The SHARE European Association. A European association of scientifically oriented users of large IBM computers.