UNIVERSITY OF EDINBURGH

EDINBURGH REGIONAL
COMPUTING CENTRE

Second Annual Report

(1st August 1967 to 31st July 1968)

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Introduction

The second full year of the Regional Centre's operation has been marked by perceptible improvement in the scale and quality of service offered on the currently accessible computers, and marred by continuing uncertainty and frustration with regard to the future machine provision for the Centre and its uses. The KDF9 workhorse has been intensively flogged, and has survived admirably, but there has been growing concern, as its life-span has been extended to match the receding advent of a fully working System 4-75, that Edinburgh users are suffering undesirable delay in making the transition to the computing standards typified by the System 4 and IBM 360 series. Much effort has been expended therefore in the year under review in seeking ways of maintaining some momentum towards this transition. As explained in more detail later in this Report, these attempts were made in the knowledge of a rapidly increasing excess of demand over supply, particularly among the University users of the Regional Centre.

Installation of Equipment

The KDF9 configuration in the year under review has rémained unchanged, except for the addition of a Calcomp graph plotter in February 1968. From 1st August 1967 full three-shift working on at least five days per week has been implemented, with further shifts being mounted when necessary on Saturdays and occasionally on Sundays. Growth in the volume of work put through the machine during the year therefore has been achieved only by the incorporation of improved compilers and by stricter concentration on the Atlas Autocode work with which the KDF9 can most efficiently deal.

The intimation in the late summer of 1967 of a three-month delay (from June to September 1968) in the delivery of the initial System 4 installation has been followed by a year in which the doubts of Regional Centre staff about even the later delivery date have been gradually shown to be justified. This Report is not concerned with apportioning blame for this state of affairs. Suffice it to say that the past twelve months have seen considerable uncertainty and upheaval in the British computer industry, and the fact that delay in delivery proved unavoidable does not redound wholly to the discredit of the manufacturers. The repercussions in Edinburgh, however, have been diverse and far-reaching, as will be apparent in many sections of this Report, and it is a matter of great concern that the Regional Centre is unlikely to be able to offer a general service to its users on the System 4 installation before 1970, the middle of the Centre's fourth full year of operation.

During the year the Computer Board has agreed to provide funds for certain additional items of capital equipment. For the central System 4 installation an on-line card punch operating at 100 cards per minute will be provided. The Board has also approved a proposal to purchase a plotting table attachment to allow the transfer of the Calcomp graph plotter from the

KDF9 to the System 4, but before implementing the proposal the Regional Centre are reassessing the economics and convenience of the various possible methods of using the graph plotter. Provision of terminal equipment for the multi-access operation of the installation has been made initially in two stages. The first stage will comprise 32 teletype terminals and 4 video-display terminals, with the necessary associated equipment, which will be used initially for system testing and for evaluation by both Regional Centre staff and prospective departmental users. The second stage, which will commence, it is hoped, in mid-1969, will include a further 64 teleprinter terminals—a total of 100 terminals being considered the full channel capacity of the single multiplexor communications control unit which is included in the initial System 4-75 installation. The total sanctioned capital investment in the Centre (including buildings and furnishings but excluding the KDF9 installation which is rented) is now of the order of £1·4 million.

Buildings and Accommodation

The Regional Centre is to be the sole occupant of the first phase of the University's Mathematics/Physics Institute on the King's Buildings site, which, more or less according to schedule, was brought to a sufficient state of completion by the summer of 1968 to be ready to accept the System 4 installation. Many of the Regional Centre staff will be transferred to this new building in September/October 1968—not least in order to allow the University to reallocate the Buccleuch Place accommodation to other departments—but two groups will remain in the central area. The operation of the KDF9 service from Buccleuch Place is likely to continue for at least another 12 months, and will require the retention in the central area of many of the operating and support staff. Moreover, Alison House has been further developed as the Regional Centre's major data preparation area, currently having 16 card punches and 25 Teletypes or Flexowriters, and it is not proposed to transfer these operations to the new building. On the contrary, as Alison House also accommodates the card reader/line printer link to the Newcastle University 360/67 installation and has suitable rooms for lectures and seminars, it is hoped to develop it as the main Regional Centre focus of activity in the central area. After considerable deliberation and consideration of alternatives, it has been decided to accommodate the programming staff on an open-plan basis within the Regional Centre building.

The planning and bringing into commission of a building for a large computing centre intended to service a number of on-line users have posed a number of novel problems. The planned arrangements for interconnecting the computers with a variety of G.P.O. circuits are more comprehensive and flexible than those of any previous installation in this country, and this is only one feature of the complex of specially designed and interconnecting computing areas and work rooms.

Staffing

Analysis of the current and projected establishment of the Centre shows the following figures :

GROUP	IN POST		GROUP (REVISED TITLES)	IN POST	PROJECTED	
	at 1st August 1966	at 1st August 1967		at 1st August 1968	1968/69	1969/70
Administration and Operations	8	56	Administrative Services	14	22	23
Software	1	12	Systems Evaluation and Operations	63	84	85
			Information and Applications	25	32	38
Consulting and Engineering	—	2	Consulting and Engineering	6	14	15
Total	9	70		108	152	161

The structural organisation of the Centre was altered during the year, principally by the re-alignment of the systems programming teams with the operations staff. The Software Group was accordingly re-titled the Information and Applications Group. The table above, therefore, cannot present a very clear picture of the growth of the various staff categories during the year. Recruitment has been concentrated on obtaining experienced and well-qualified systems analysts and systems programmers needed to support the System 4-75 development. The establishment for applications programmers has not been met, and while the post of Program Librarian has been filled, it has not yet proved possible to make a satisfactory appointment as Assistant Program Librarian. Among the operating and data preparation staff recruitment difficulties are much fewer, but there has arisen a considerable turnover of staff, to which must be added the complications of day-release and continuous training in the use of systems software.

The projected establishment of the Centre has been increased over previous estimates in only two areas—operations and engineering. The multifarious nature of the off-site computers used by the Centre and the complexity of organising flows of work to these machines have rendered necessary an increase in the more junior grades of the Operations group. With regard to the maintenance of Teletype and other terminal equipment, the Centre already has assumed a large measure of responsibility in the provision of spares, standby machines, workshop facilities, and transport. The training and supervision of maintenance staff seem easily assimilable additional tasks, and the decision has therefore been taken to terminate the present maintenance contract with I.C.L. and to recruit technicians to the Regional Centre's staff for this work. This will produce a significant saving in costs even at present when only about 120 Teletypes are covered by the arrangements, and the saving will grow as the machine population increases.

In recent months it has proved possible to implement in a few cases the policy of arranging joint appointments between the Centre and teaching departments of the University. Examples to date have been in association with either the Department of Computer Science or the Department of Physics. Moreover, several appointments have been made, either wholly in the Regional Centre, or jointly with the Department of Computer Science, of senior staff whose interests and previous experience are closely related to a specific discipline with which they will continue to be involved. Engineering and computer graphics are two areas covered by current appointments, and it is hoped that suitable arrangements can be made soon in fields such as medicine and accounting, possibly, as in the case of engineering, by the short-term appointment of staff from American universities. Joint appointments are a relatively rare device in British Universities, but undoubtedly they can play an invaluable role in the cross-fertilisation process which is so indispensable to the development of a comprehensive and efficient computing service in a research and teaching environment. Research Council users cannot benefit so easily from such appointments, and the Regional Centre's most significant contribution to their computing manpower in the year under review has been the appointment of an experienced systems analyst who will concentrate on the development and evaluation of the large scale data storage facilities which are of particular relevance to many of the Research Council units.

Services

The KDF9 service was operated on a full three-shift basis throughout the year. As was to be hoped for on a well-proven machine, preventive maintenance reduced mechanical breakdown to minimal proportions. In addition to 24-hour working from Mondays to Fridays, Saturday shifts were mounted either to meet special needs or to clear undesirably heavy backlogs of work, but as far as possible Sunday working was resisted. Saturation of the KDF9 induced increased efforts to ensure that the machine's capacity was deployed as efficiently as possible. Improved versions of Atlas Autocode compilers were written, tested, and incorporated for general use. As far as possible these new compilers were made compatible with earlier compilers, but offered advantages such as more optimisation, optional card or paper tape input, and much improved diagnostic facilities—the latter proving of especial benefit in undergraduate teaching and in the development of programs. An editor system developed in the Department of Physics, and the advice of the developers, were gratefully welcomed as valuable aids to the more efficient development of programs. The only addition to the KDF9 installation has been the attachment of the Calcomp graph plotter in February 1968.

An analysis of the usage of the KDF9 during the year is given later in this Report and in Appendix A. By the second half of the year the pressure of demand from users had become such that delays in turnround were causing increasing frustration, particularly among users developing programs. The daily schedule and in particular the concept of bookable queue-sessions, was subject to considerable criticism among users. At the end of the year

when a revised schedule was devised, principally to take account of the charging and allocation system introduced from 1st August 1968, the queue sessions were abolished as having outlived their usefulness.

In anticipation of saturation of existing facilities during the year, unremitting efforts were made to secure adequate capacity on appropriate off-site computers. As indicated in the First Annual Report, a daily van service to the Univac 1108 computer at the National Engineering Laboratory, East Kilbride, was instituted in July 1967, principally for the handling of Fortran programs. The development of this facility was hampered, however, by the fact that the installation had been intended not for general service, but for specialised use, and accordingly had not been staffed to a level at which outside users like the Regional Centre could gain adequate service. Attempts were made, through the Computer Board and with the support of the Director of the Chilton Atlas Laboratory, to persuade the Ministry of Technology to allow the substantial unused capacity of the 1108 installation to be made available to the Scottish Universities as a general overflow facility, but these attempts proved unsuccessful, and the Regional Centre's use of the 1108 accordingly has levelled off at a disappointingly low volume.

Use of the Atlas computer at the Science Research Council's Chilton Laboratory has continued. For practical considerations, the chief of which is the effect of long turnround times on the development of programs, few new users have attempted to use this service.

The problems of interchanging files of data between programs written in different languages on the same computer and in the same language on different computers have been recurring ones in the history of Edinburgh computing. There are additional and severe hazards in attempting to maintain adequate advisory services on too wide a range of alternative systems. Towards the end of the year it became necessary to concentrate more on these systems which are reasonably compatible one with the other and which ensure the easiest degree of convertibility in the future, namely the I.C.L. System 4 and the IBM 360 series. Service on Atlas and the 1108 will be maintained, particularly in respect of fully developed programs or facilities which are not otherwise available (although strenuous efforts are being made to cater for users of large files by the use of disc and magnetic tape facilities on the Newcastle University 360/67), but little assistance can now be provided to users developing new programs on these machines.

Edinburgh Corporation accepted delivery, after considerable delay, of a System 4-50 computer in March 1968, to which the Regional Centre had negotiated access, both on behalf of the Multi-Access Project and so as to afford early experience on the System 4 range to its own staff and possibly to selected users. In the event, the difficulties experienced with the basic operating system have been so great that only the systems specialists in the Project and in the Regional Centre have been able to use the machine with any profit. No contribution towards the general service needs of the Centre from this source has been achieved, nor is now expected. Similarly the System 4-50 now installed at Aberdeen University has been used by the Centre only for systems development.

The most promising avenue for overflow facilities has been, and seems likely to remain for the next year or so, the IBM 360/67 installation at Newcastle University. In the absence of any comparable local overflow facility, the Regional Centre's efforts have now been almost entirely diverted to developing efficient methods of using this installation, which most significantly is of similar structure and comparable power to the Centre's promised System 4-75. Despite the likelihood therefore that the Regional Centre will have to operate the "interim" KDF9 for at least a year longer than the Flowers Report originally envisaged, there is some consolation that through Newcastle University certain of the Regional Centre's users will soon gain experience of third-generation computing with Fortran. Fortran because of its international predominance is one of the main languages to be developed for interactive use on the System 4-75. The original daily van service to Newcastle has now been most satisfyingly supplemented by the installation in July 1968 of a direct card reader/line printer link located in Alison House.

The data preparation service has developed on the lines indicated in the First Annual Report. It is now considered to be sufficiently securely established to be included as a proffered and chargeable service in the University's charging and allocation system. The service has been particularly active on the punched card side. Programs in several languages and large quantities of data derived from questionnaires, research surveys, medical records, and student registration records, have been punched. The data preparation service is housed on two floors of Alison House, one being used almost exclusively for "do-it-yourself" data preparation by undergraduate and postgraduate students and research workers, the other being operated mainly on a closed-shop basis by the Regional Centre's data preparation staff. First-aid programming facilities are also made available, mainly through the part-time employment of postgraduate students.

The proposed application programming service has not advanced to a comparable stage. Partly this reflects a great difficulty in recruiting staff with experience of large advanced systems in a university and research environment. Progress has been made, however, with the development and exploitation of a program library and in supporting the advisory services, and it is anticipated that, as an advanced and stable installation comes into operation work in the applications area will assume increasing significance and the Applications Group will become involved with a much larger number of user departments in joint programming activities.

The formal advisory service to programmers and potential users has been given a focus during the current year with the location of a Duty Officer and an assistant in close proximity to the Job Reception area of the KDF9 service at Buccleuch Place. A rota of Duty Officers drawn from the Applications and Systems Evaluation Groups has provided a spread of experience and the duty assistants have provided the necessary degree of day-to-day continuity. Nevertheless, with the concentration of all the senior programming and design staff at the new accommodation at the King's Buildings, the continuation of the KDF9 service at Buccleuch Place, and the

development of the use of the IBM 360/67 via the link at Alison House, some improved method of advising users on the use of the Centre's facilities will be required in the coming year.

Experience already gained in running the Centre and the increased necessity to use diverse large off-site computer installations indicated that the original concept of covering training needs by the appointment of a single Training Officer was inappropriate; this has been replaced by a team activity, coordinated by the Operations Manager. The initial team comprised staff from other universities, retained on a formal consultancy basis, together with members of the Regional Centre who had previous experience in a similar environment. The operating systems for the KDF9, Univac 1108, and the Atlas, and the underlying principles on which the 4-75 Edinburgh Multi-Access system will be based, have been covered.

To focus attention on the resolution of problems encountered in moving work across machines, the idea of "Compatibility Thursday" was introduced. By this the first Thursday in each month was devoted to a seminar on topics of direct concern to Edinburgh users, with special emphasis on the facilities provided by the Fortran compiler of a particular operating system, Fortran being the only language supported at that time across all the installations. This work is now being consolidated by the provision of detailed lectures, designed in consultation with the users. Priority is being given to the potential of the operating system of the Newcastle University 360/67, initially in Fortran only; and to the use of certain compilers on that machine, including the WATFOR compiler and in due course the Atlas Autocode compiler being developed by the Regional Centre.

The Program Library Sub-Committee, set up in November 1967 under the chairmanship of Professor Finney, has in its first year of work established and published standards for program documentation and for program abstracts, which it believes can be usefully adopted by contributing users and which will of course be followed by Regional Centre staff. The Sub-Committee has also imposed order on a mass of uncoordinated programs, and supervised the definition of a new classification scheme and the publication of a catalogue of programs. It is now turning its attention to program validation and to the acquisition of programs from user departments.

The Centre's Program Library, since January 1967 under the control of a professionally-qualified Librarian who has also had computing experience, contains programs for the three computers most used—the KDF9, the 360/67, and the Univac 1108. Including the manufacturers' own mathematical and statistical packages on the latter two machines, there are some 500 programs and subroutines available—many of them acquired from other British or American universities and adapted for Edinburgh users.

Programming Languages

The general policy on the programming languages to be made available on the System 4-75 has remained unchanged. For reasons explained in the

First Annual Report it was decided that effort should be concentrated on the provision and operation of IMP and Fortran compilers for the conversational use of the 4-75. An additional commitment imposed on the Regional Centre by the delays in delivery of the System 4-75 is a requirement for an Atlas Autocode compiler for the conversion of Atlas Autocode programs to run on the Newcastle University 360/67. This compiler, which is being developed from earlier work done for the System 4, should be available for use at Newcastle in the first half of 1969.

The development of IMP (Interactive Multi-Access Programming Language), an advanced variant of Atlas Autocode, is the special responsibility of the Multi-Access Project associated with the Department of Computer Science. This major Project comprising some 25 programmers provided partly by English Electric Computers Ltd. (I.C.L.) and partly by the University with Ministry of Technology support, has had to overcome several obstacles in the past year, some in connection with the design of the system and subsystems, but more in the implementation phase where the lack of suitable and conveniently located hardware for testing has considerably hampered progress. The most optimistic assessment remains that the Project team will be able to hand over a working and adequately tested system to the Regional Centre some six months after delivery of working System 4-75 hardware in Edinburgh. Recommendations have accordingly been submitted by the Management Committee for the Project to the Ministry of Technology and to ICL to the effect that the period of the originally specified Project should be extended for eight months to September 1969, and that a further extension of three months should be considered to allow the Project team to cater for the incorporation of the large fixed disc in the system. (The large disc was a subsequently approved extension to the initial System 4-75 configuration, and, although envisaged, could not formally be included in the originally negotiated scope of the Project).

Since October 1967, a team of four systems programmers led by Mr. G. E. Millard has been working within the Regional Centre, but in close association with the Multi-Access Project, on the preparation of batch and conversational Fortran compilers. This team has been somewhat handicapped by the quality of the manufacturers' operating systems on their early installations. Most work has been carried out on the Edinburgh Corporation System 4-50, where much effort has had to be expended in trial and error experimentation with operating systems before the team could use it with confidence. Edinburgh Corporation and Aberdeen University have co-operated to the full in the provision of comprehensive service on their respective System 4-50 installations, and the resulting free exchange of experience, to which also the staff from University College, Cardiff, have contributed, has been of considerable collective benefit.

The pressure of work on the KDF9 has been sufficient effectively to preclude the use of the Algol compilers during term time. Heriot-Watt University has agreed, however, that, as soon as service is established on its Elliott 4130 computer, any residual use of Algol can be catered for on that installation, on behalf of the Regional Centre.

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Analysis of Usage

An analysis of the usage of the KDF9 computer is given in Appendix A, together with a list of user departments. Comparisons with the previous year's figures are difficult to draw clearly, as the KDF9 service was in operation for only seven months of the period covered by the First Annual Report. The table in Appendix A includes this seven-month usage for each category of user and in broad terms the substantially increased usage can be confirmed. The columns showing the percentage of total usage for each category of user for each of the two periods are remarkably similar, the only slight swing arising from an increase in the Heriot-Watt University usage from 1·1 to 4·6 per cent. and a compensating decrease in the University of Edinburgh and Multi-Access Project usage. Part of this Heriot-Watt University increase is to be accounted for by the fact that it was active for only three of the seven months covered by the first set of figures. An attempt was made to assess the growth factor between the two years by analysing the usage in March 1967 and March 1968—March being considered in general a good specimen month with two weeks of University term and two weeks of vacation, March 1967 being sufficiently removed from the initial disturbance caused by the introduction of the KDF9, and March 1968 being possibly the last point before saturation at which usage could reasonably be considered as an indicator of demand. An overall growth rate of 1·95 is suggested, with the Research Council sector higher at about 2·3 and the University of Edinburgh (undergraduate teaching as well as research) almost exactly on 1·95. If the Multi-Access Project and the Regional Centre usage is excluded, the overall growth rate is of the order of 2·3. This is significantly higher than the 1·8 per annum growth quoted in the Flowers Report as "not unreasonable".

The growth in the number of users has been much less, at least if undergraduate teaching is excluded. In the two main categories of users, the increases have been from 274 to 321 among University users, and from 45 to 83 among Research Council users. Appendix A includes also lists of user departments for both the University of Edinburgh and the Research Councils. Almost all Research Council Institutes or Units in the Edinburgh area are now making some use of the Regional Centre's services. Within the University, although the large science departments still account for a high proportion of the total usage, there is increasing evidence of a high growth rate in the social sciences. Over the whole year, the usage of social science departments amounted to 7·2 per cent. of the total University usage (excluding undergraduate teaching), but this figure masks a steady increase from less than 4 per cent. in the early part of the year to 9·6 per cent. over the last two months. Users from these departments formed 14·3 per cent. of the total University research users. Usage by departments of the Faculty of Medicine remains surprisingly and disappointingly low, but undoubtedly there is vast, largely untapped, demand in the medical field which will erupt during the next few years. Hitherto active users in the medical departments have been able to turn to a number of sources for satisfaction of their computing needs, but it has to be assumed that increasingly they will turn to the more powerful facilities of the Regional Centre. Usage in medical departments is likely to be

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stimulated further by various projects being mounted within the hospital area with support from the Scottish Home and Health Department or the Medical Research Council, and in the longer term by the interest likely to be aroused in the undergraduates who take the new optional course being given for the first time in session 1968-69.

In the First Annual Report very tentative conclusions were drawn from the first seven months' statistics of the KDF9, regarding the pattern of usage by University and Research Council users respectively. Over that period, each Research Council user on average consumed over 50 per cent. more time than the average University user. This difference almost entirely disappeared in 1967-68 when the average time used per University user rose from approximately 24 minutes per month in January-July 1967 to 32·1 minutes per month in 1967-68, while the average time used per Research Council user decreased from 37 to 32·5 minutes per month. A possible explanation of this convergence is that the Research Council sector has now built up a similar mix of users, major and minor, experienced and experimenting, to that existing in the University since the institution of the Regional Centre.

Appendix A also includes a summary of the use made in the year under review of the three off-site computers which made significant contributions towards meeting the general service needs of Edinburgh users. In addition the Regional Centre and the Multi-Access Project for systems work used 268 hours on the Edinburgh Corporation System 4-50, plus a not insignificant total on other System 4 machines throughout the United Kingdom.

Undergraduate Teaching

It will be apparent from the analysis of the KDF9 usage that the year 1967-68 has seen a substantial increase in the amount of time devoted to the needs of undergraduates, within both the University of Edinburgh and the Heriot-Watt University. Over 1,000 undergraduates were exposed to computing as part of their courses, in almost all cases their initial exposure. Yet the demand is far from being satisfied. Not only has the University had to impose a strict quota on the numbers admitted to the main general course, Computer Science I, but in many courses the amount of practical work afforded to the students has also had to be carefully controlled. Furthermore, there is a widespread wish to see computing as an integral, if small, part of more undergraduate courses, and a specific desire within the Department of Computer Science to mount a full Honours curriculum in Computer Science as soon as staffing and the availability of computing resources will allow. Even such course-work may in the longer-term be only the tip of the iceberg, as one must anticipate undergraduates increasingly wishing to use computers in the later years of their curricula as tools in their individual studies.

Such developments, however welcome in principle within a University, are much less favourably viewed if a consequence is a serious deficiency in the computing resources available for research purposes. The Computer Board's terms of reference restrict it to the provision of computers for research, and presumably in its assessment of the needs of individual universities and regional centres the use of computers in teaching has not been taken into

account. This deficiency has now, it is hoped, been at least partially remedied by the formation of a Joint Working Party of the University Grants Committee and the Computer Board "to examine some questions associated with teaching computing". Nevertheless, it is unlikely that the recommendations to be made by the Working Party can be brought to fruition for a considerable time, and for at least the next two years the University will have to continue to make policy decisions on the respective rates of growth of research work and teaching that can be accommodated on the University's share of the Regional Centre's resources.

Charging and Allocation System

For reasons set out in some detail in the First Annual Report, the Executive Committee had accepted in principle that some form of charging or allocation system would be necessary. The steady increase in demand throughout the year 1967-68, together with the inability to secure adequate supplementary facilities either locally or on off-site computers for the year 1968-69, made it indispensable that a scheme be introduced in the University sector with effect from August 1968. Demand from Research Council users still falls considerably short of the 40 per cent. of resources to which they have first right, and accordingly no scheme will be operated in the Research Council sector at present.

A Sub-Committee, under the convenership of Professor Black, was set up to work out a detailed scheme, which subsequently received the approval of the Executive Committee, the Committee on Educational Policy, and the University Court. Under this scheme, an early decision has to be made each year on the subdivision of the University's share of the Regional Centre's resources between teaching and research purposes. While the inevitable restrictions in undergraduate use can be met by the maintenance of quotas on the number of students admitted to certain courses or by reductions in the scale of practical work carried out by students on courses, the effects on research workers are likely to be much more severe. During term when time has to be allocated to teaching purposes, many University departments will find their allocations of guaranteed computer time much reduced from the level at which they were operating in the later months of the year 1967-68. Some amelioration of the position will be effected by the use of off-site computers and by the overflow of University research work into the unused capacity in the Research Council sector, but it is a matter of great concern to the University that no more effective measures to cover the period up to the still indeterminable date when the System 4-75 will be giving a general service to users have as yet received complete Government approval.

It is realised that there will be many complications in operating the charging and allocation scheme, and that much frustration may be engendered. Both the Sub-Committee and the Executive Committee will keep the operation of the scheme under regular review, and in the next Annual Report it should be possible to draw up a balance sheet of merits and demerits which may be of interest and benefit to installations facing similar problems.

Future Development

In January of this year a series of visits was made to a selection of the more advanced university computing centres in the U.S.A. to collect material for a long range plan of development for the Regional Centre and the University. An immediate moral was drawn from the difficulties being experienced at relatively well endowed centres such as the Carnegie Institute and Wisconsin University in reconciling the current manufacturers' product with their rapidly expanding needs for research and teaching. At the University of Michigan and Dartmouth College there were signs of recovery from the prolonged development problems associated with their interactive computing facilities on the IBM 360/67 and General Electric 635 respectively. At the Massachusetts Institute of Technology service and development activities had of necessity been segregated and both seemed to have lost their pristine lustre.

In April a draft plan was submitted to the Executive Committee of the Regional Centre (and passed for information to the Chairman of the Computer Board) as a result of which further study on behalf of the Research Councils was requested so that both University and Research Council needs could be catered for in the same document. The revision of the plan has been in suspense while present uncertainties on the role and effective contribution of the System 4-75 are being resolved. There is now danger of all forward planning coming to a halt while the somewhat conflicting needs of developing a British large scale multi-access computing system compete for inadequate funds with the need to satisfy the long delayed requirements for a stable and continuous computer service for University and Research Council users.

The immediate effects of the present indecision have been an increasing dependence on external facilities particularly those at Newcastle University. There is no satisfactory formal machinery for co-ordinating the joint development requirements of Edinburgh, Newcastle and Durham and indeed such an alignment is in direct conflict with the original objective of providing Edinburgh with sufficient computing power to act as a focus for universities at least in the East of Scotland, not to act as a subsidiary to those in the North East of England.

It is hoped that the coming year will see some resolution of the present hardware and constitutional constraints and that progress can be resumed towards the original objective of providing a genuine focus of computer service development at Edinburgh. Both London and Manchester, the other two Regional Centres designated by the Flowers Report, are still to obtain any equipment and are at least two years in arrears. This might be of some comfort to Edinburgh, but it is not a happy situation for university computing in Britain.

APPENDIX A

(I) ANALYSIS OF KDF9 USAGE

(Time = hours : minutes of KDF9 elapsed time)

Category of User	JANUARY–JULY 1967				AUGUST 1967–JULY 1968			
	No. of users	No. of jobs	Time used (hrs./mins.)	Percentage of total usage (excluding Regional Centre's own use)	No. of users	No. of jobs	Time used (hrs./mins.)	Percentage of total usage (excluding Regional Centre's own use)
1. All categories	873	33,873	2623 : 57		1,660	86,742	6198 : 36	
2. University of Edinburgh (excluding undergraduate teaching)	274	12,807	765 : 44	58·1%	321	24,681	2056 : 07	55·8%
3. University of Edinburgh—undergraduate teaching	438	6,188	104 : 03	7·9%	875	18,539	295 : 48	8·0%
4. Heriot-Watt University (excluding undergraduate teaching)	6	103	13 : 54	1·1%	18	1,205	76 : 49	2·1%
5. Heriot-Watt University—undergraduate teaching					192	3,301	102 : 43	2·8%
6. Research Councils	45	3,588	194 : 21	14·8%	83	9,673	540 : 28	14·7%
7. Other Treasury-funded users	4	107	4 : 31	0·3%	9	575	38 : 33	1·0%
8. Commercial users	6	296	9 : 34	0·7%	6	823	30 : 58	0·9%
9. Multi-Access Project	25	1,779	225 : 31	17·1%	29	4,449	540 : 52	14·7%
10. Regional Centre (maintenance, development and training)	75	9,005	1306 : 19		127	23,496	2516 : 18	

	MARCH 1967	MARCH 1968	% increase
1. All categories :			
No. of users	306	722	
No. of jobs	3,984	8,676	
Time used (hrs./mins.)	238 : 22	463 : 56	95%
2. University of Edinburgh (excluding undergraduate teaching) :			
No. of users	149	248	
No. of jobs	2,259	3,089	
Time used (hrs./mins.)	119 : 44	209 : 36	76%
3. University of Edinburgh—undergraduate teaching :			
No. of users	93	245	
No. of jobs	530	2,059	
Time used (hrs./mins.)	6 : 25	37 : 32	500%
4. Heriot-Watt University (excluding undergraduate teaching) :			
No. of users	—	6	
No. of jobs	—	146	
Time used (hrs./mins.)	—	8 : 07	—
5. Heriot-Watt University—undergraduate teaching :			
No. of users	—	108	
No. of jobs	—	982	
Time used (hrs./mins.)	—	27 : 30	—
6. Research Councils :			
No. of users	26	47	
No. of jobs	553	1,046	
Time used (hrs./mins.)	25 : 06	57 : 30	130%
7. Other Treasury-funded users :			
No. of users	2	6	
No. of jobs	22	81	
Time used (hrs./mins.)	0 : 34	4 : 40	800%
8. Commercial users :			
No. of users	3	3	
No. of jobs	53	115	
Time used (hrs./mins.)	1 : 03	4 : 37	350%
9. Multi-Access Project :			
No. of users	13	12	
No. of jobs	177	406	
Time used (hrs./mins.)	40 : 45	55 : 58	38%
10. Regional Centre (Maintenance, development and training) :			
No. of users	20	47	
No. of jobs	390	802	
Time used (hrs./mins.)	44 : 45	58 : 36	31%

(III) USAGE OF OFF-SITE COMPUTERS

Category of user	CHILTON ATLAS			NATIONAL ENGINEERING LABORATORY (UNIVAC 1108)			NEWCASTLE UNIVERSITY IBM 360/67		
	No. of users	No. of jobs	Time used (hrs./mins./secs. of Atlas time)	No. of users	No. of jobs	Time used (hrs./mins. of 1108 time)	No. of users	No. of jobs	Time used (hrs./mins./secs. of 360/67 time)
1. All categories	37	1,675	41 : 52 : 15	43	1,305	34 : 57	28	482	5 : 16 : 16
2. University of Edinburgh (excluding undergraduate teaching)	25	1,065	33 : 46 : 19	18	422	11 : 01	7	104	1 : 15 : 47
3. University of Edinburgh—undergraduate teaching	—	—	—	5	46	1 : 23	1	2	0 : 33
4. Heriot-Watt University (excluding undergraduate teaching)	—	—	—	8	69	0 : 11	—	—	—
5. Heriot-Watt University—undergraduate teaching	—	—	—	2	2	0 : 01	1	5	0 : 01 : 50
6. Research Councils	6	116	2 : 27 : 33	2	—	—	—	—	—
7. Other Treasury-funded users	3	312	4 : 25 : 23	1	9	0 : 02	—	—	—
8. Commercial users	—	—	—	—	—	—	—	—	—
9. Multi-Access Project	—	—	—	—	—	—	—	—	—
10. Regional Centre (Maintenance, development and training)	3	182	1 : 13 : 00	9	757	22 : 19	19	371	3 : 58 : 06

Note : The Newcastle University 360/67 was used by the Regional Centre only from March 1968.

(IV) LIST OF USER DEPARTMENTS

(a) University of Edinburgh

Accountant's Office
Agriculture
Animal Health
Applied Lingustics
Architecture
Astronomy
Bacteriology
Biochemistry
Botany
Business Studies
Cardiology
Chemical Engineering
Chemistry
Civil Engineering
Clinical Surgery
Computer Science
  Computer-Aided Design
  Metamathematics
Criminal Law and Criminology
Dentistry
Economics
Education Research Unit
Electrical Engineering
English Language
Forestry and Natural Resources
Genetics

Geography
Geology
Machine Intelligence and Perception
Mathematical Physics
Mathematics
  Technical Mathematics
Mechanical Engineering
Medical Physics
Meteorology
New Testament Language
Pharmacology
Phonetics and Linguistics
Physical Education
Physics
Preventive Dentistry
Psychology
  Applied Psychology Unit
Secretary's Office
Seismology
Social Medicine
Sociology
Statistics
Students Representative Council
Surgical Science
Veterinary Physiology
Zoology

(b) Research Council Institutes

ARC   Animal Breeding Research Organisation
ARC   Unit of Animal Genetics
ARC   Animal Diseases Research Association
ARC   National Institute of Agricultural Engineering
ARC   Poultry Research Centre
ARC   Unit of Statistics
ARC   Scottish Plant Breeding Station
MRC   Unit for Research in the Epidemiology of Psychiatric Illness
MRC   Clinical and Population Cytogenetics Research Unit
MRC   Speech and Communication Research Unit
MRC   Clinical Endocrinology Research Unit
NERC Oceanographic Laboratory of the Scottish Marine Biological Association
SRC   Royal Observatory and Seismological Research Centre.

APPENDIX B

Income and Expenditure Account for the year 1st August 1967–31st July 1968

Expenditure		Income	
Salaries, National Insurance and Superannuation	£107,702	Sale of Computer Time :	
Travel and Subsistence	4,634	Multi Access Project	£10,773
Computer Materials	14,989	Other	9,406
External Service and Maintenance	25,589		£20,179
Rental of Equipment	45,071	Sale of Materials	4,380
Hire of Computer Time	14,527	Computer Board Grant for KDF9 Rental	33,000
General Expenses and Materials	7,450	Net Deficit : shared by	
University Fixed Charges	6,900	Agricultural Research Council	67,720
		University Court	101,583
	£226,862		£226,862