DEVELOPMENT OF A COMPUTERISED LIBRARY SYSTEM IN THE CONSTRUCTION INDUSTRY

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S U M M A R Y

This thesis examines the ways that libraries have employed computers to assist with housekeeping operations. It considers the relevance of such applications to company libraries in the construction industry, and describes more specifically the development of an integrated cataloguing and loan system.

A review of the main features in the development of computerised ordering, cataloguing and circulation control systems shows that fully integrated packages are beginning to be completed, and that some libraries are introducing second generation programs. Cataloguing is the most common activity to be computerised, both at national and company level.

Results from a sample of libraries in the construction industry suggest that the only computerised housekeeping system is at Taylor Woodrow. Most of the firms have access to an in-house computer, and some of the libraries, particularly those in firms of consulting engineers, might benefit from computerisation, but there are differing attitudes amongst the librarians towards the computer. A detailed study of the library at Taylor Woodrow resulted in a feasibility report covering all the areas of its activities. One of the main suggestions was the possible use of a computerised loans and cataloguing system.

An integrated system to cover these two areas was programmed in Fortran and implemented. This new system provides certain benefits and saves staff time, but at the cost of time on the computer. Some improvements could be made by reprogramming, but it provides a general system for small

technical libraries. A general equation comparing costs for manual and computerised operations is progressively simplified to a form where the annual saving from the computerised system is expressed in terms of staff and computer costs and the size of the library. This equation gives any library an indication of the savings or extra cost which would result from using the computerised system.

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C O N T E N T S

But remember, please, the Law by which we live,
    We were not built to comprehend a lie,
We can neither love nor pity nor forgive.
    If you make a slip in handling us you die!
We are greater than the Peoples or the Kings -
    Be humble, as you crawl beneath our rods! -
Our touch can alter all created things,
    We are everything on earth - except The Gods!

Rudyard Kipling, 1911
from "The Secret of the Machines"
(Modern Machinery)

CHAPTER 1

I N T R O D U C T I O N

The need for the project and aims of the research

The computer has now been brought into almost every part of modern society, and libraries have not been neglected. Computers can record the loan of books, produce purchase orders, maintain catalogues and indexes, and search files for relevant documents. Developments have included large national information retrieval (IR) and selective dissemination of information (SDI) systems, as well as small in-house SDI/IR systems. Many large academic and public libraries have introduced computer operations to replace their previous manual housekeeping procedures. Housekeeping for the small technical library has received little attention to date.

Many companies have their own internal library, which provides a service to a research department and others within the company, and will occasionally answer queries on its speciality from people outside the organisation. To satisfy the needs of the company it can draw on many sources, probably making considerable use of the British Library Lending Division at Boston Spa. However, except for internal reports, it may have only small collections of its own. As a result, few have felt it worth while to consider the use of a computer to alleviate the clerical burden of a company library's housekeeping system. However, with rapidly rising labour costs, commercial firms will increasingly turn to the computer for assistance with even this small manual task.

This research project has looked at the problems of computerising the housekeeping side of a small technical library. Programs were written to handle the loans and cataloguing at Taylor Woodrow's library. Significant parameters were identified and used to formulate a cost model for comparison of the computerised and manual systems in small libraries.

The setting up of the project and expectations of the library

In 1971, Taylor Woodrow Construction wanted an evaluation of their library to see how the service could be improved, using the company's computer where appropriate. This seemed a good opportunity to study the cost and value of using a computer for housekeeping in a small technical library, so a project was arranged with the Inter-Disciplinary Higher Degrees Scheme at the University of Aston in Birmingham.

The call on the library service had increased continuously since its inception; but economically difficult times had made it impossible to increase the staff at the same rate. As a result, work had built up in the library, and the staff were not able to devote sufficient time to answering queries and maintaining the less immediate parts of the manual system. Having experimented with a limited use of the computer, the head of the technical library and information group wanted to use the machine to take over some of the clerical work, improve the service and alleviate the routine demands on the staff, thus leaving them free to help those using the library.

A study of the library's existing activities was therefore needed to show how the service of the library could be improved and expanded. The intention was to obtain the best computer/manual mix using the simplest clerical procedures and making the optimum use of the machine. After this detailed look at the library had been documented in a feasibility report, the research concentrated on the development of systems and programs to assist with the general running of the library. The costs of the new procedures were then evaluated.

PART I

COMPUTERS IN LIBRARIES

CHAPTER 2 THE GENERAL USE OF COMPUTERS IN LIBRARIES

The current state of library automation

Literature is doubling every 10 - 15 years, and in chemistry the number of articles appearing has trebled in 14 years. At any one time there are 3000 million books in print with over a quarter of a million being produced per year, one third of them in English. (See W. Ashworth, 1974 & D.H. Barlow, 1972). This is the kind of problem which libraries are having to face, and the computer is being increasingly used to tackle it. By March, 1973, there were some 135 U.K. libraries out of around 5000 which were operating computer systems to cover a total of 425 applications (R.M. Duchesne, 1974). This is the number of systems known about, and is not exhaustive, because Taylor Woodrow, for example, is not included and has performed some operations on the computer since 1967. Duchesne estimates that in 1973 there were about 60 formal British projects concerned with the application of computers to library and information work, spending about £540,000 per year, of which 66% was provided by the Office for Scientific & Technical Information (OSTI). His analyses of the type of application give the following table:-

Type of Library	Special	Academic	Public	Consortia	Total	%
Application\Number	61	38	33	2	135	.
Cataloguing	98	69	54	5	226	53
Current Awareness/IR	59	8	-	-	67	16
Circulation	14	11	21	-	46	11
Acquisition	11	14	15	1	41	9
Accounting	5	9	7	-	21	5
Other	10	9	5	-	24	6
Total	197	120	102	6	425	100
%	46	28	24	2	100	

Table 1. Numbers of Operational Operations

In this table the two consortia are the Birmingham Libraries Co-operative Mechanisation Project (BLCMP) and the London and South East Regional Bureau (LASER). There is a difficulty in defining special libraries, in that several universities have special libraries attached to them, such as London Univeristy's Institute of Computer Science and the Rock Mechanics Information Service at Imperial College, London; both of which have computerised operations. The figure for cataloguing is higher than is perhaps justified, since those who catalogue by computer mostly also produce lists or subject indexes, which increases the number of applications. In fact, of the 61 special libraries, 8 have no computerised cataloguing operations at all, so the remaining 53 have an average of nearly two operations each.

This research concentrates on computerised housekeeping activities, and industrial libraries. Of the 61 special libraries above, 7 are research associations, 10 are Government supported research establishments, 11 libraries represent 6 national bodies, and the remaining 33 libraries are operated by only 20 industrial companies, of which six libraries do not have any computerised housekeeping. Some of the systems operated in industrial libraries are reviewed in a later section.

A report on the Computer Applications Group's meeting in May 1974 (Computer Applications Group, 1974), illustrates well the current situation with regard to computerisation in libraries. West Sussex County Library reported that its ordering, cataloguing, stock control and circulation have been fully integrated. This is something which has been discussed frequently by librarians in the literature, and is now beginning to be achieved. Camden Public Libraries too are about to implement an ordering and revised cataloguing system to work with their loans system. This will operate on a dedicated mini-computer. Southampton University too is hoping to replace one of its computerised systems; they are looking for a replacement for their Collectadata circulation system. From these two examples it can be seen that libraries are just beginning to discard their first attempts at computerisation and introduce improved systems. However, the University of Surrey reports that their experimental on-line project may have to be discontinued for lack of funds.

The current position in automation is thus one of increasing activity with half a million pounds being spent on research each year. Special libraries are particularly active in current awareness and information retrieval. Some libraries are beginning to achieve complete integrated library housekeeping systems, while other are moving into second generation systems. Over everything hangs the economic crisis which may bring about the demise of some of the research projects.

Reviews of computer applications

Over the past few years there have been a number of reviews of computerised library activities, of which the two most important ones for British libraries are both by Aslib. The Directory of Computer Applications in United Kingdom Libraries (C.W.J. Wilson, 1973, (i)) is the most comprehensive list of U.K. library computer systems yet published, and gives details of 135 libraries. The main entries are in alphabetical order by library, and describe the type of equipment used and the operations performed. J. Wainwright (1974) estimates that by November 1974 about 5 of the applications had been discontinued. Where no other reference is given for systems in the following sections, the source of the information may be taken as being the Directory. The other publication (J. Wainwright, 1975) has yet to be published, but describes the computer provision in British libraries in more general terms. It is written for the librarian who knows very little about computers, and contains a very extensive bibliography of "Library Automation in Britain".

As discussed previously, OSTI is responsible for most of the funding of research projects into computerisation of library activities, and a collection of short reports on some of the larger projects of summer 1973 has been compiled (C.M. Overton, 1973). Mechanisation in in the United States (S.W. Massil, 1974), the USSR (A.I. Batenko, 1970), and West Germany (W. Lingenberg, 1971) has progressed in much the same way as in Britain, but although library automation in France began in 1968, by 1971 only two libraries, Grenoble and Marseille, had automated their catalogues, and the National Bibliography was going over to the computer (M. Chauveinc, 1971). Surprisingly only eighteen libraries had computerised loans systems in the United States by April, 1972 (L. McCann et al, 1973). At that time, Britain had about the same number (see C.W.J. Wilson 1973 (ii)). In 1971 there were 69 operational computer applications with a further 125 planned (R.M. Duchesne et al, 1971).

The most popular computer application in this country has been the production of catalogues (R.M. Duchesne, 1974). In 1972 Campey published a list of generally available index generation packages designed to produce printed subject indexes (L.H. Campey, 1972). This was brought up to date by a supplement which added 36 new systems and corrected some previous ones, bringing the total number up to 118 (L. Campey, 1974).

Despite the greater popularity of cataloguing systems, there have been more frequent reviews of computer-based loans systems. Wilson described the four systems existing in 1969 (C.W.J. Wilson, 1969), a review found five in 1970 (Computer Applications Group, 1970), there were thirteen systems in 1973, which increased to 32 a year later (C.W.J. Wilson, 1973 (ii)). Another overview (C.J. Surace, 1972) provided a good comparison of the systems and an excellent bibliography. Similar reviews (A.J. Evans et al, 1971 & S.W. Massil, 1970) gave the current position in serials mechanisation, but serials are not considered in detail in this thesis.

Criticisms of library computerisation

One of the advantages of computers is their versatility; they can be used for many different jobs, often at the same time. However, E. Mason (1971) in a well documented review of American library computerisation projects attacks the computer for its very versatility. All other equipment, he says is ordered to specifications to do a specific job. With the computer, the individual is expected to do his own research and development, and while it is very pleasant to experiment with the possibilities presented by the creative intellectual exercise of programming, this is not the most efficient means of providing a system. Some libraries have been pushed into unwanted computer systems for the wrong reasons. M. Sanderson (1973) described how the library of Simon Fraser University was pursuaded to introduce an on-line circulation system because the computer department wanted to try on-line working and the library was thought to be the most suitable guinea-pig. The dissatisfaction and frustration amongst users and a cost analysis of the system in operation convinced them of the need to change to a simpler batch processing system. A recent study of Retrospec I (E.C. Goodliffe & S.J. Hayler, 1974) showed that the manual system was ten times cheaper than the computerised one, took no longer to operate, and produced better results.

Frequent reasons for the failure are a wild euphoria about computers and poor planning. P.S. Davison (1972) said that we must divorce ourselves from the dogmas about the inevitability of computers and see if computerisation really is the best method. J.G. Fox (1972) tried to apply and ergonomic approach to the problem, urging that the human be treated as an integral part of the system and not as merely an appendage of the hardware. A.K. Kent, the Director of UKCIS (1973), warns strongly against the "obsession with mechanism", admitting that they may have been guilty of this themselves in the past. He urges the use of the computer as a tool and not the central feature of an information service, and condemns the attitude of some systems people that since batch processing has not worked the solution must lie with on-line computing. This view, he says, will militate against the proper use of the machine.

It is now beginning to be realised that computers will not necessarily solve all the problems of libraries. They have many valuable features which can be exploited usefully but only if incorporated carefully within the overall system. A.B. Veaner (1974) suggests three reasons why library applications are often poorly developed. Firstly the computer department is too independent; the library usually has little control over its own operations. Secondly there is often a lack of computer expertise in the library. He describes how a computer salesman tried to lease him a computer at only $1 a day. What the salesman did not mention was that this included no keyboard, cables, installation, control units, or computer software, etc. Thirdly, the manual system is not fully understood. Development of the computerised system at Taylor Woodrow has tried to overcome these problems. Little can be done about the physical remoteness of the machine, but with systems design and programming done in the library, the second difficulty has been overcome and the first minimised. In order to understand the manual system fully a detailed study of the library was undertaken, and summarised in a feasibility study (Appendix C).

There are three main arguments used to defend computerisation; firstly that labour is increasing in cost faster than computers, secondly that in the future the cost curves will cross in favour of the machine, and thirdly that even if it is not cheaper at present, the by-products make computerisation worthwhile. These three arguments dominate the literature, and have been used in this thesis. E. Mason (1971) has attacked all three of them. While the cost of the computer may be increasing substantially less fast than labour, the cost of the staff operating the machine is increasing faster than the cost of library staff, and they contribute 80% of the computer's running cost. Secondly, if the cost of the machine will become cheaper only in the future, surely that will be the time to computerise. This is not totally justified, because the library may be then have grown so much that the cost of retrospective conversion of records becomes impossible, but there is an element of truth in it. Finally, he finds most of the byproducts worthless, or able to be done more easily manually. The costs and byproducts of the system at Taylow Woodrow are discussed in Chapter 6.

Co-operation and national developments

An article in British Librarianship and Information Science 1966-70 (W.R. Maidment, 1972) gives a good history of early developments with computers in libraries. Until 1966 almost the only use of computers was catalogue production by about four public libraries, but by 1970 at least 30 libraries of all types had automated some part of their routine work, and many others were planning it. Maidment points out that during this time government action and OSTI policy both encouraged co-operation between libraries on projects, but two other factors also helped to stimulate both co-operation and computerisation: SBNs and MARC tapes.

The adoption of first Standard Book Numbers (SBNs) and then their expansion into International Standard Book Numbers (ISBNs) meant that any current book could be identified uniquely by one number. This provided a common code for the exchange of bibliographic information between libraries regardless of their local systems, and provided the

However, there are some problems with the present method of allocating SBNs, and F.H. Ayres (1974) suggested that a less random number based on the bibliographic details would eliminate some of the problems and provide for retrospective numbering, though there would be occasional chances of duplication.

With SBNs came the possibility of a central distribution of bibliographic information, entries of which could be uniquely identified. This began with the Library of Congress (LC) in the United States producing regular "Machine Readable Catalogue" (MARC) magnetic tapes of new books, and spread to the United Kingdom, where the British National Bibliography (BNB) took up the project and produced similar tapes. There are only minor variations in the format between LC MARC and BNB MARC. Then the French produced a manual for their version (MONOCLE) which has now gone into two editions (M. Chauveinc, 1972) and finally the Germans have followed suit with MAB 1 (E. Kohl, 1973). The Russians are thinking about introducing their own format (A.I. Batenko, 1970), so MARC is now international.

Early on F.H. Ayres (1969) summarised the opportunities presented by MARC, and advocated that although it is complex, local systems should try and use it. Three years later a survey of what had been achieved pointed out some complaints of inconsistency by BNB in cataloguing (J. Wainwright, 1972). By 1968 AWRE, Aldermaston had adopted MARC format for their local cataloguing, but BNB MARC tapes had to be reformatted for minor local differences (R. Sweeney, 1968). These were later abandoned (F.H. Ayres, 1969), but Irvine advocates that local variations at Southampton University are quite acceptable (R. Irvine, 1972 (i)). The principal problems encountered with MARC are the complexity of selection of records from the tapes, the lack of foreign material, which university libraries in particular need, and the delay in the appearance of items after publication (F.H. Ayres, 1971). These problems have not yet been fully overcome. MARC can also be used for selective dissemination of information, particularly in the non-science fields (L.H. Buhr, 1972). The use made by libraries of MARC format and tapes is discussed on page 2.24 ff.

Since the British Museum Library, the National Lending Library and the National Reference Library of Science & Invention have been brought together under the auspices of the British Library, this body has been pursuing and active program of research with an emphasis on computerisation and MARC. However, the problems of the enormous British Library with its deverse parts (see M. Line, 1973), is beyond the scope of this review.

In January 1969 the London Union Catalogue and the South East Regional Library System combined to form LASER (London and South Eastern Library Region). The main problems were a backlog of accessions of nearly half a million, and differences between the two cataloguing systems involved. The solution LASER adopted was a computerised index recording only the SBNs, or in some cases BNB numbers, and locations. The recording of this reduced data was simple and produced a very successful application of the computer quickly reducing the backlog (J. Plaister et al, 1971). The ISBNs were taken from MARC tapes, and it was found in practice that the delay in these entries appearing was inconvenient, and also that libraries which did not take MARC, did not have access to full records (R.A. Christophers, 1973).

However, the system works, and distribution of the location indexes on microfilm has permitted direct inter-library lending with a consequent saving of labour at LASER. The system may be introduced in other regional bureaux (R. Bourne 1973). LASER are also working on a MARC-compatible full union catalogue, and are retrospectively converting their records.

One of the larger projects in co-operation which OSTI supports is BLCMP (the Birmingham Libraries Co-operative Mechanisation Project). The aim of the project was to look at co-operation, notably in the area of acquisition, and with emphasis on MARC (C.F. Cayless et al, 1969). The three libraries involved are those of Birmingham and Aston Universities and the Birmingham Public Library, though it is probable that other libraries will join. The project set up subgroups to look at 5 different areas of mechanisation and co-operation (E.H.C. Driver et al, 1970 & 1972). Since 1973, catalogues and stock cards have been produced from MARC tapes and locally generated data, and the project is turning its attention towards a co-operative ordering and acquisitioning system for the libraries (D. Buckle 1974, et al, 1973). Similar things are now being done on the other side of the Atlantic, but communication seems to be poor, because V.M. Bowden (1974) who described MARCIVE in a recent paper as "a unique co-operative effort in library automation" does not appear to have heard of BLCMP's work in the fi d, despite th nationwide tour by Massil (S.W. Massil, 1974).

Another co-operative project sponsored by OSTI is SWULSCP (South-West University Libraries Systems Co-operation Project), which initially involved the libraries of Bath, Bristol & Exeter Universities, University College, South Wales, and the University of Wales Institute of Science and Technology (N. Higham, 1969). Studies were done and an in-depth analysis made of the procedures in one of the libraries (SWULSCP, 1972). The Institute of Science left the project in its early stages, and Bath decided to withdraw when the Univsersity obtained an administration computer on which the library intends to run its own on-line system. SWULSCP has now ordered a Rank Xerox 530 dedicated computer to work on and off-line, communicating with equipment ordered for each of the three participating libraries (R. Hudson, 1975).

A group in the United States are now looking at the possibility of producing standards for library automation (TELSA, 1974), and this may enable a greater exchange of systems and co-operation between libraries.

History of library computerisation

The following table (Table 2) shows the development of computerised systems in the United Kingdom. The entries have been restricted to ordering, cataloguing and loan (issue) systems, but these are interpreted fairly broadly. No entries have been made for serials automation, SDI, IR or indexes to UDC or other classification systems, since these are of less relevance to this research. The systems for which no date of impletmentation is known are listed at the end. The years have been divided up into Winter, Spring, Summer, and Autumn (W, S, Su, & A), but where only the year of implementation is known, the entry has been included between the spring and summer of that year. Some projects were implemented over a period of time, and in these cases the most significant date has been given. For example, the ordering system at Brunel University was partially operational from April 1972, but only became fully so in January 1973, so the latter date has been used.

The table largely speaks for itself, showing the ways in which computerisation has developed. It should be comprehensive up to April 1973, but the data after that date may not be complete, since there is no source of information comparable to the Directory of Computer Applications (C.W.J. Wilson, 1973)(i)), and libraries with new systems will not have published the results yet. Some of the entries in this period are based on projected rather than actual implementation dates.

Table 2

Type of library		Public			Accademic			Other		
	Library	O	C	L	O	C	L	O	C	L
1964	AWRE, Aldermaston (semi-automated)								x	
	Dorset		x							
1965S	Greenwich		x							
	Barnet		x							
	Camden		x							
	AWRE, Aldermaston (semi-automated)									x
	Unilever								x	
1966S	Newcastle Univ.				x					
	Southampton Univ.						x			
A	Essex Univ.					x				
	Southwark		x							
	Harrow		x							
1967W	West Sussex			x						
S	Unilever, Port Sunlight								x	
	ICI								x	
	Bradford Univ.				x					
	Cambridge Sci. Periods. Lib.					x				
	Taylor Woodrow								x	
A	IBM								x	
1968S	International Nickel								x	
	Hounslow		x							
	British Steel Corp. General								x	
	AWRE, Aldermaston							x	xx	
	Bexley		x							
	Flintshire		x							
1969W	Trinity College, Dublin					x				
	GKW								x	
S	Coventry		x							
	DOE								x	
	Durham Univ.				x	x				
	ICI								x	
	Shell Research									x
	Marconi Elliott Avionic								x	
	Medical Research Council								x	
A	Brighton			x						
1970W	Cornwall		x							
	Brit.Steel Corp.Strip Mills								x	
	Easams								x	
S	Westminster		x							
	P.O. Research Dept.								x	
	Newcastle Univ.					x				
	Fisons								x	
	Dundee Univ.				x					
	British Gas Corpn.								x	
	Brunel Univ.					x				
Su	Queens Univ., Belfast				x					
A	Brook Bond Leibig								x	
	Bromley			x						
	Merton			x						
	Shropshire		x							
	AERE, Harwell									x

O = ordering, C = cataloguing, L = loans.

Table 2 (continued)

Year	Library	Public O	Public C	Public L	Accademic O	Accademic C	Accademic L	Other O	Other C	Other L
1971W	Sussex University						x			
	Lancaster Univ.					x				
	Aircraft Research Assoc.								x	
	Worthing			x						
	East Anglia Univ.				x	x				
S	Southampton Univ.				x					
	Bournmouth		x	x						
	Kent	x								
	Camden			x						
	AWRE, Foulness									x
Su	Shell International Petroleum								x	
A	Warwick Univ.					x				
	Cheshire	x	x							
1972W	ICI								x	x
	Bedfordshire		x							
	Coventry		xx							
	Greenwich		xx							
	Grimsby		x							
	Brit.Hydromechanics R.A.								x	
S	Bradford Univ.						x			
	London Univ, Inst.Computer Sc					x				
	Surrey Univ.					x				
	Liverpool Univ.					x				
	Min.of Defence RPE, Westcott								x	
	Plant Protection Ltd								x	
	Southampton Univ.						xx			
	Stirling Univ.					x				
	West Sussex		x							
Su	Brighton		x							
	Loughborough Univ.						x			
	London Univ, Inst.Computer Sc						x			
	Brunel Univ.						x			
A	Surrey Univ.						x			
	Southampton Univ.					x				
	Berkshire	x	x							
	Staffordshire			x						
	Beecham Research Labs.								x	
	New Univ. of Ulster					x				
	Sutton			x						
1973W	Reading			x						
	Shropshire			x						
	Dorset			x						
	Flintshire		xx							
	Brunel Univ.				x					
	Loughborough Univ.					x				
	New University of Ulster				x					
	University of Wales					x				
	City University				x	x				
	Lancashire			x						
	West Sussex			xx						
	Luton		x							
S	Nat. Inst. Higher Ed.				x					
	J.Lyons								x	
	Luton			x						
	Barnet			x						
	Kingston upon Hull		x	x						

Year	Type of library / Library	Public O	Public C	Public L	Accademic O	Accademic C	Accademic L	Other O	Other C	Other L
1973Su	Salford Univ.					x				
	Sunderland Poly.					x				
	SRC								x	
	RAPRA								x	
	Leeds Univ.						x			
	Medical Research Council								xx	
A	West Sussex	x								
	Newcastle Univ.						x			
	Liverpool Univ.						x			
1974W	Kent		x							
S	Lancashire	x	x							
Su	Esams									x
A	Taylor Woodrow								xx	x
	Camden		xx							

Table 2 Implementation of library computer systems

(O represents a computerised ordering system.)
(C represents a computerised cataloguing system.)
(L represents a computerised loans system.)

xx indicates that the system supercedes an earlier computerised one.

Notes. An attempt has been made to keep the correct order even within seasons.

The following operations have been omitted from the table because their dates of implementation were not available:

Public libraries: Dorset - ordering
Huddersfield - ordering & cataloguing
Motherwell & Wishaw - loans
Oxford City - cataloguing and loans.

Accademic libs.: Bath Univ. - cataloguing
Imperial College, Rock Mechanics Section - cataloguing

Other libraries: IBM UK Laboratories - ordering, cataloguing & loans
Metal Box Co. - cataloguing
Nuclear Power Group Ltd - cataloguing

From Summer 1973 the list may not be complete, and in a few cases projected implementation dates have had to be used.

This table does not include the two consortia BLCMP & LASER.

From the table it can be seen that progress has continued gradually in the three areas of library automation included. In each case the public libraries have played an important part in developments, although for ordering, the universities have taken the most prominant role. One reason for the lack of early interest in computerised ordering in the public sector is probably that the ordering of books was done through the county treasurer's department, and that their procedures had already been put onto the computer. To adapt such systems to provide accessioning data would have been difficult. Ordering has been very slow to become established in the libraries. Many of the cataloguing systems used in special libraries are simple listing systems.

It has been suggested (R.H. Parker, 1967) that a university library should automate in the sequence; ordering, circulation and finally cataloguing. In fact, it seems from the table that neither university nor any other type of libraries universally accept an order for computerisation. Of the three universities which began to computerise in 1966, Newcastle started with ordering, Southampton with loans and Essex with cataloguing. However, since there are more libraries which have computerised their cataloguing systems first, this seems to be the most probable starting point. This is what was done at Taylor Woodrow, where an IBM program suite was used for cataloguing from 1967, and this was completely replaced with the integrated cataloguing and loans system described in this thesis. With twice as many libraries with computerised loan systems as with computerised ordering ones, this seems a reasonable second stage; though, as stated the sequence will not be universal, but must depend on local needs.

Computerised library systems

This section describes some of the developments and principles of computerised systems in various types of library. It is not an exhaustive list of operations, since that can be obtained in the Directory of Computer Applications in U.K. Libraries (C.W.J. Wilson, 1973). Where no other reference is cited, the directory is the source of much of the information in this section. Neither is this a comprehensive bibliography, as a good bibliography by library is given in a recent review (J. Wainwright, 1975). It is merely a consideration of some of the important developments and trends in the computerisation of library housekeeping, as described in the literature. However, in such a rapidly developing field, new systems and improvements to existing ones are appearing all the time and the literature is inevitably out of date. This review must therefore reflect the general position at the time the Taylor Woodrow system was being developed rather than the latest unpublished developments of the last few months.

The most important early computerised library systems were those developed to handle the cataloguing in public libraries around 1965. There is a rapid turnover of stock in the large lending libraries, which makes retrospective conversion of existing files simpler.

Dorset was the first public library to computerise in 1964, though only the non-fiction stock was included initially. With card systems it is impossible to distribute centrally produced union catalogues to branch libraries, and it was the possibility of using the computer to provide catalogues to the branches which stimulated the innovation at Dorset (K. Carter, 1968).

Government action provided the impetus for the next systems, with the reorganisation of London Boroughs in 1965. This meant that several groups of independent libraries were joined together, although they used different cataloguing rules and systems. For example, Bermondsey, Camberwell and Southwark were combined into a new Southwark, but they had kept different catalogues in different forms, and Bermondsey even catalogued by Browne rather than Dewey (G. Johnson, 1966). A very similar situation applied at Barnet (A.O. Meakin, 1965), Camden (W.R. Maidment, 1968) and Greenwich (R. Howard, 1967), and all four enlarged libraries decided on computerised systems; Camden obtaining some of their programs from Barnet. Camden included fiction and junior books in their catalogue, which divided opinions at the time, but is now done more generally. Greenwich and Southwark used computer printout, while Barnet and Camden xeroxed their catalogues. Otherwise the systems were largely similar.

Southampton University was the first library to computerise its loan system fully in 1966 (R.G. Woods, 1971) and as they wished to include microfiche in the system, they had to allocate new numbers to them. Renumbering is a problem which has been encountered by several libraries computerising their circulation systems though it has been experienced in different forms. Newcastle and Leeds Universities both lend periodicals. Leeds issues them separately form other material under a simplified manual system, while Newcastle has allocated them special identification numbers (R. Fern, 1973), Brunel University (C.B. Beale, et al, 1973) had to allocate numbers to all their books before they could automate the loans system, and Kingston upon Hull City Libraries decided to renumber with meaningful numbers for all stock for statistical purposes, instead of using the randon accession numbers (Kingston upon Hull, 1973). The University of East Anglia needed to do the same, because its computerised cataloguing system required unique book identification (C.J. Aslin, 1971), while Sussex University had to allocate new borrower numbers since the existing student registration numbers had gaps in them (R.C. Young et al, 1972).

Southampton's system was followed by West Sussex, which was the first public library to computerise its loans (N.J. Harris, 1971). This system was very advanced for its time, having a facility all day for on-line interrogation of the loans and borrower files, thereby obviating the need for printed loan lists (R.T. Kimber, 1968 (i)). In 1966, Elliott Automation and Camden library started to develop prototype data collection equipment for circulation systems, but due to delays it was installed in West Sussex (W.R. Maidment, 1972; & G.H.K. Bearman, 1968). The prototype remained in service there for two years until ALS (Automated Library Systems Ltd) took over the rights and produced an improved version. ALS equipment is now in service in 9 public and 6 university libraries: more than any other standard book-issuing equipment. Surrey managed to adapt the equipment to take the university's standard identity cards (L.M. Cowburn, 1971), and Sussex University installed the first trapping store in June 1971, to intercept reserved books or required users (R.C. Young, 1971; et al, 1972). The basic equipment had first been installed in January of that year to replace a punched card system without any parallel running of the two. The old system had been taking the whole of every morning to process the files, so no discharges could be done before lunch, which was exceedingly inconvenient. It was announced in January 1973 that ALS have developed a non-magnetic, non-metalic label for book numbers which can be read as a book is slid along the counter.

Queen Mary College, London University did a feasibility study of possible systems (D.G. Owen, 1971) and felt that for their library the ALS equipment was too inherently inflexible. They considered that only the

Friden Collectadata system used at the Universities of East Anglia and Southampton would be feasible, but that overall the benefits of computerisation did not outweigh the costs. However, Southampton is finding its system increasingly in need of replacement and is looking at alternatives (Computer Applications Group, 1974). Bradford University has a unique "Rontec" system, which is flexible, and in which data is safe, even in a power cut (P. Ford et al, 1972).

In some places ALS equipment is being superseded by Plessey light pens. Camden, for example, originally installed ALS equipment, but is now installing the pens in its other branches. One university and seven other public libraries were using the system in 1973, but an advertisement in Program in January 1974 claimed that "already some 25 authorities have ordered 75 systems to be installed during the next few months." The data from the pens is recorded on a magnetic tape cassette, which is much quieter than a paper tape punch, but requires special conversion to normal computer tape. Loughborough University installed the system because it hoped the electronic device would be more reliable than mechanical equipment, and the total cost was £12,000 of which 35% was the magnetic tape converter (K. Senior et al, 1974). Allred has reviewed the ALS and Plessey equipment and describes mini systems which could be introduced into smaller libraries (J. Allred, 1972). However, a simple single light pen system would cost £1,300, and a similar ALS arrangement would cost £1,250 - £1,500 plus £10.50 for cards for every 1000 books and £27.50 for each 1000 borrowers, so neither system would be likely to be acceptable in any but the very largest industrial libraries.

Another system which is popular in public libraries is the Olivetti RP50 data capture equipment used at Bournmouth, Staffordshire, Shropshire and Dorset. It is described most fully in a pamphlet put out jointly by Bournmouth and the manufacturer (Bournmouth Public Libraries, 1971). The main feature of the system is that it has to be integrated with a computerised catalogue, from which the circulation control draws data. In Shropshire the equipment is also being used to input changes of location for the book catalogue (A.J.Crowe et al, 1973).

The Olivetti equipment requires integration of the cataloguing and circulation control, but many other libraries are also moving towards integration. Oxford's central city library has integrated cataloguing with issuing based on Plessey data collection equipment, and the University of East Anglia using Collectadata for book issuing keeps the loans and cataloguing systems separate, while allowing them to draw on the same data (C.J. Aslin, 1971). A number of other libraries have integrated cataloguing with ordering systems. For example, Cheshire Public Library wants a "total library and information network" on the computer involving all books, museum objects, etc., and to this end they began with an on-line ordering and cataloguing system, into which they hope later to integrate a loans system (A.Wilson, 1973). Berkshire has an integrated ordering and cataloguing system for current material, as does the AWRE (L. Corbett et al, 1972), which is discussed in more detail later.

The West Sussex and Dorset (Dorset County Library, 1973) libraries appear to be the only ones so far to have completely integrated systems, but there are many other libraries moving towards this end. Cornwall (V. Burlton, 1973) is planning an integrated system for book ordering and circulation control during 1974. Lancashire introduced a pilot issuing system in its Morecambe Division as a first stage in an integrated ordering, cataloguing, issuing and retrieval system (County Councils Gazette, 1972). The British Steel Corporation General Steels

Division began its library computer acticities with SDI based on the UDC classification (R. Hindson, 1969; & W.H.McCash et al, 1970), but from this rather unusual beginning has developed a proposal for an integrated system whereby all the activities of the Library and Information Services will be computer based (C.W.J.Wilson, 1973 (i)). Hutton & Rostron have a very comprehensive computer system, and almost everything which happens in the office is punched on paper tape (G.H. Hutton, 1974; & P. Calderhead, 1972).

One decision which any library must make when considering computerisation is what to do with the existing stock. If the librarian wants a fully integrated system, all the old entries will have to be converted into machine-readable form. Some libraries like the one at Liverpool University (P.J.Hodgson et al, 1973) may just close the catalogues and start afresh, but this would prevent an integrated computerised loan system drawing on this information. This was a major reason why Cheshire decided to convert all its backlog of 80,000 non-fiction titles, but they estimated that it would take 18 months of hard work (S.G. Berriman et al, 1973). OSTI gave grants to two libraries to convert their catalogues completely; Newcastle University converted 320,000 entries (M.W. Grose, 1969) and the Bodleian Library, Oxford recatalogued $1\frac{1}{4}$ million items in the largest retrospective conversion to date (P. Brown, 1969). Most other libraries have converted their catalogues gradually. Shropshire has been converting its catalogue by class number (H.I.Hammond, 1972), Greenwich converted by author (G.Johnson, 1966), and Barnet decided to take advantage of the rapid replacement of stock in public libraries (5 - 7 years at Oxford - see L. White, 1973) and wait until the number of entries to be converted had dropped to reasonable proportions (A.O.Meakin, 1965).

To avoid the problems of full retrospective conversion of the catalogues, some libraries have produced catalogue files of abreviated entries. Bath University has developed a mini-catalogue (P.Bryant et al, 1971), which they defend strongly against fuller records, even if these are extracted from MARC tapes (P.Bryant et al, 1973). Loughborough, too have developed a minimal-input cataloguing system (MINICS), but entries can be created from MARC data, taking about a fifth of the information contained in a record (R.A. Wall, 1972; et al, 1973). The system is used for monographs, serials, and special information retrieval systems, and the simple record structure is claimed to be very flexible.

The New University of Ulster is building up a short catalogue from accession data which it has produced on paper tape since 1968; and intends to use this as a back-up file for its Plessey automated issuing system. Bournmouth Public Library uses a similar short title file for its loan system. Southampton University has MICROCAT, a catalogue of 130,000 entries from selected sections of the library giving only class-mark, author, a limited title and book number (B. Francis et al, 1974). Oxford City Library has a catalogue of reduced entries which is useful for overdue preparation, checks for duplicates, etc. (L. White, 1973). In addition to its full catalogue, Newcastle University is building up a stock file, and since this is to be kept on disc, the entries are kept down to an average of 70 characters and a maximum of 126 (A.D. Robins et al, 1973).

Kent was the first county to automate its library ordering system in 1971, encouraged by the County Supplies Department, and based it on MARC tapes (J.A.M.Dowsell et al, 1971). However, they had to reformat the entries on the tapes to fit their system, a problem also encountered by West Sussex when they planned their system in 1971, and not overcome until recently. As of April 1973, only eight libraries and

BLCMP were using MARC tapes, and five others were producing their catalogues in a format compatible with MARC. Of these, Glasgow already does its ordering with records from BNB, so the production of catalogues could be converted at any time from the manual system to a MARC based one (W.A.G. Alison, 1973). Flintshire, while interested in MARC, has the added difficulty of Welsh books (G. Davies, 1970). Manchester University (UMIST) had a fixed field record structure, but was considering converting to a MARC-compatible format (C.J. Hunt, 1971). Cornwall's catalogue is not compatible, but the library is involved with 4 other authorities in using MARC (V.Burlton, 1973).

When MARC tapes were first produced, the Bodleian Library in Oxford, one of the copyright libraries, was responsible for monitoring the currency and accuracy of the information (C.M. Overton, 1973). Of the other copyright libraries, Trinity College, Dublin checked the tapes for material not deposited (W. Dieneman, 1970), while Cambridge University found that the majority of its intake did not overlap with MARC (E. Stow, 1970). Southampton University has been responsible for the distribution of MARC tapes to users of ICL computers. Brighton Public Library has been engaged with BNB in a selected tape distribution service, BRIMARC (R.Hassel, 1973; & R.M.Duchesne et al, 1973), and find it very cost effective, while leaving the selection and ordering in their own hands. Other libraries are now also involved in the BRIMARC project. BNB also do the selection of entries for Liverpool University (P.J. Hodgson et al, 1973), which covers about 28% of the cataloguing workload. They do considerable checking of entries to ensure conformity with the existing records, which means that although professional staff time is reduced by 70%, very little clerical time is saved.

However, there is some resistance to the use of MARC. There are three university libraries which have their own computerised cataloguing systems, Loughborough, Newcastle and Bath, which consider their systems more flexible locally than MARC. Loughborough will convert data from MARC into its MINICS system, to supply about a fifth of its needs, but does not intend to convert records the other way (R.A.Wall et al, 1973). Newcastle has a very comprehensive NFHS system (Newcastle File Handling System), which is based on holding information on the computer in tree structures. All their catalogue entries and collections of old documents have now been converted into this format (M.Cooke et al, 1973; R.Fern et al, 1972; & A.Elliot et al, 1973). The library finds this system much more flexible than MARC, and although they could convert MARC records into NFHS, they had no plans in 1972 to do so. Bath, on the other hand has a system of short catalogue entries which they find easy to construct from their order records, and show no inclination to make any use of MARC. They feel that there are special local needs in classification, that a system should be designed for the local computer configuration, and they do not want to have to wait for items to appear in MARC or search old tapes (P. Bryant et al, 1973).

The main users of MARC in the UK are BRIMARC and BLCMP, and references for them have been given on pages 2.25 and 2.11. It is necessary here to review briefly the use made of some of the other eight libraries. Southampton University made a few small alterations to MARC format (R.Irvine, 1972 (i)) and converted the catalogue at the Wessex Medical Library to it (R,Irvine, 1973). The cataloguers learned to use it fairly quickly because they merely had to specify explicitly decisions which they previously took subconciously (R.Irvine, 1972 (ii)). AWRE, Aldermaston has also converted its catalogue to MARC format (J.J.Eyre, 1970).

Cheshire rejected MARC tapes even though they use MARC format for their catalogue, because records are too complex and too late (A. Wilson, 1973). Brunel University found that the currency of BNB cards was poorer than for cards from the American Catalogue Card Corporation (J.Worthy, 1973). West Sussex said that their system is being hampered by the continuing lack of currency of MARC tapes (Computer Applications Group, 1974). Delay is therefore the major problem of the BNB MARC system. F.H. Ayres (1971) agrees that the success of MARC at national level can not yet be repeated locally on a day to day basis.

Another important incentive to computerisation for libraries with dispersed branches is the possibility of computer output on microfilm (COM), whereby microfilms are produced directly from a computer magnetic tape, rather than having to print the information and copy it photographically. Many libraries have found themselves inundated with paper from the computer, and have had to start using COM so that the volume could be contained and the line printer released for other computer users. Having produced a master copy of the catalogue on microfilm, it is then very cheap to produce copies of it. A recent review of COM gives some costs for the Washington University School of Medicine (D, Bolef, 1974), and an earlier one (J. Woods, 1972) describes the various techniques and speeds of COM production, of which it says the "Charactron" is the best. Cornwall Public Library has done an experiment with COM (P. Marriott, 1972). Jane Wainwright (1974) considers that even for only 6 copies it may be cheaper to use COM rather than printout, and it becomes comparatively cheaper as more copies are produced.

BLCMP and Westminster both stimulated the use of COM. Westminster tested COM catalogues in a busy branch of the public library and found that the users' reaction was better than expected, so they introduced it in all their branches (G. Larkworthy et al, 1971 & 1972). They found that the microfilm catalogue cost half as much as the photocopies which had been used previously. BLCMP did a detailed study of possible computer catalogues and found 16 mm microfilm cassettes to be more suitable than hard copy or other microforms for a large university library, so these were adopted. AWRE, Aldermaston tested microfilm cassettes and microfiche, and found that the fiche were acceptable locally, while cassettes were not; so it adopted the former (Atomic Weapons Research Establishment, 1974). Twenty-two fiche hold all the 13,000 author entries, 10,750 UDC entries and 32,500 KWOC entries. Fiche would not be suitable at BLCMP due to the number which would be involved. Bath University has been carrying out the Bath University Computer Catalogue Project to look at the differences in use of card indexes, printout, rollfilm and fiche. The preliminary results suggested that the printed catalogues could be used most quickly, but not significantly so, and that the card index was definitely slower and slightly less accurate than the other methods (P. Bryant et al, 1974).

In discussing the current state of computerisation on page 2.3, it was suggested that the most significant trends in computerised systems are the move towards fully integrated ordering, cataloguing and circulation, replacing earlier computer operations where necessary, but with an economic situation which may cause the abandonment of some developments. The problem of cost is becoming increasingly important, but is not new. Since 1966 West Sussex had been producing monthly cumulated additions lists on the computer and they hoped to produce a union catalogue of all adult non-fiction in the county (G.H.K. Bearman, 1968). However, even with all the data in machine readable form, the cost of printing it was so large that they had to abandon this idea and only produce abreviated entries without locations, until a new system was introduced in 1972 (R.J. Huse, 1973).

Kent University too had expressed interest in a computerised circulation system early on, but at the end of 1970 it deferred any implementation, and still uses a manual system (W.R.Maidment, 1972). In 1968 Hertfordshire carried out an investigation into the use of the computer, and at that time came down strongly against it (J.H.Jones, 1968). They felt that computerised cataloguing might be feasible for adult then non-fiction, but that there would be no real gain because of the precision required and the great cost. Ordering would only be desirable if other computerisation depended on it, and issuing and reservation was not worthwhile, as no suitable equipment was available. Durham University, on the other hand, has the advantage that it is not charged for the use it makes of NUMAC (Northern Universities Multiple Access Computer). It produces author, title and classified catalogues (R.N.Oddy, 1971 & 1972). The most recent developing system which is likely to be axed is the University of Surrey Library's Interactive Circulation Experiment mentioned previously.

While Government action in the mid-60s stimulated the London libraries to automate, the entry for Torbay in the Directory of Computer Applications says that both its cataloguing and circulation developments were postponed on account of local government reorganisation in April 1974. However, these laws will probably have the same effect as the earlier ones. Changes in the organisation of the libraries will in many cases create the same problems as those faced by the London libraries ten years ago, and it is likely that some of them will adopt the same computerised solutions.

A number of libraries have been using the computer to do statistical analyses of their users. For example, Kingston upon Hull introduced new meaningful numbers for all its users and books (Kingston upon Hull Libraries, 1973). The philosophy behind the system was that they did not know exactly what would be wanted in the future, so it was best to include every conceivable entry point. Eventually they felt that some of the catagories would constitute an invasion of privacy, and excluded them. This was a good example to set, as too many computer personnel try to produce everything which is possible regardless of value. It is significant that in January 1975 a correspondent to the BBC objecting to the segregation of the elderly picked out library tickets as his example of unnecessary invasion of privacy. In the words of St Paul, "all things are lawful, but not all things are expedient."

<u>Some computerised applications in special libraries</u>

The Atomic Weapons Research Establishment (AWRE), which used to be a division of the United Kingdom Atomic Energy Authority, and is now part of the Ministry of Defence, has an integrated computer ordering and cataloguing system, and a separate computerised loans system. The latter, originally only semi-automated, was introduced in 1965 (F.H. Ayres et al, 1967), and revised and reprogrammed when the IBM 1460 programs, which were run on the IBM 360/40 with an emulator, could no longer be run on AWRE's IBM 360/50 (R.H. Searle et al, 1972). An integrated on-line loans and cataloguing system was wanted, but the staff were only given a few weeks to change, which was not sufficient to develop programs of this complexity. The new system is thus based on the old punched card arrangement, but is more sophisticated, as the card punch is programmable. Each borrower and book has a punched card, which together are used to produce 3 transaction cards. Approximately 120 loans are recorded a day, which take 1 hour to process and 45 minutes to check, and 1200 overdues are sent out every two weeks. The extimated cost is 6p per loan transaction, and the library says that there is a considerable saving of staff time. In 1968 the library introduced AMCOS (Aldermaston Mechanised

Cataloguing and Ordering System), and from 1969 used it with MARC tapes (L.C.Corbett et al, 1972). MARC has already been discussed in the last section, so it will not be repeated here; but three reports give details of the creation of MARC-compatible cards (R. Sweeney, 1968), the creation of tapes from the cards (J.J. Eyre, 1970), and the selection of MARC entries for the potential requirements file (P.D. Friend, 1972).

Another division of the UK Atomic Energy Authority, the Atomic Energy Research Establishment (AERE), has developed a comprehensive loans system, COBLOS (Computer-based loans system) (C.W.J. Wilson, 1971; et al, 1971). This was introduced operationally in December 1970, after being under development for three years. The programs are written in Fortran as it was the only language available. While the library only has 20% more loan transactions per year than AWRE, the stock is twice as large, and the users change very rapidly; so it was not thought feasible to have prepunched book or user cards. Input for the system is punched on paper tape and entered off-line. The system covers books, pamphlets, reports and microforms, and these catagories are kept separately; but it does not handle confidential reports, and inter-library, short or permanent loans. The system cost £13,000 a year in development, and £3,000 a year running cost, which gives a figure of just over 6p per loan; the same as for AWRE. Before computerisation, both libraries used the 4-slip method of recording loans described in the next chapter on page 3.13.

A branch of AWRE, AWRE Foulness, has an on-line loans control system (B.G. Eunson, 1974). This system is analysed in detail in the next chapter as library M, to give a point of comparison with the manual construction industry libraries of comparable size. The system handles 2000 loans per year, including external loans, which account for 50% of this. The books have book cards on which the users enter their details, and these are typed in batches at the terminal to record the loans on the computer.

The loans and cataloguing of the Wessex Medical Library have been computerised as part of the developments at Southampton University. The conversion of the catalogue to MARC format has already been discussed (page 2.26). The loan system is based on the one in the main library of the University, but does not involve the use of data collection terminals (C.M. Phillips et al, 1972). Borrowers have borrower cards, though these need not be punched, and all the books have book cards. When a book is borrowed, the borrower writes his name and number on the book card, which is filed and later sent for processing. The loan is recorded and the book card and a duplicate are filed in the library. On return, the new book card is placed in the book and the old one sent for processing to cancel the loan. Where no book card exists, the details are filled out on a slip and this is used to create the book cards for processing and future use. The system is simple, as there are only 10,000 books in the stock of the library.

The Group Central Library of English Electric used to use a faceted classification to index reports, from which the computer produced a permuted KWOC index (N.G. Dowell et al, 1962), but this was abandoned in 1969 because there was no money available to continue. However, a telephone call to the library elicited the fact that they have been using a punched card issue system for about six years. It is very simple; the borrower fills in a coding sheet at the time of loan, and the data are punched and used for lists and recalls. In a review of SDI, H.F.Dammers (1970) hinted that Shell Research had a similar simple system, but did not describe it. A discussion with the library revealed that they do have a program using punched cards for producing recalls, but that it was written largely as a

On-line and off-line systems

A review of on-line, off-line and hybrid circulation systems gave the costs as follows: off-line system \$13-22,000 ; on-line system \$70,000 and the hybrid system using a small on-line transaction file with an off-line master file \$35,000 (M.K.Buckland et al, 1972). They therefore felt that most attempts to progress from off-line to on-line working are ill-judged; and back the hybrid system. The argument against on-line working is supported by J.Buxton (1972), who argues that most of the information held on-line does not need to be kept in this very expensive way. As Professor of Computer Science at Warwick University he says that many computer systems are extremely inefficient and that data could often be more effectively be held on paper. On-line disc storage at that time cost 3p per day for 1000 60-bit words. With normal catalogue entries this means that 20 entries will cost over 15p per week just for storage, so for a catalogue of 20,000 items, the storage cost alone will be £150 a week. It is for this reason that some libraries are now developing the minimal entry catalogues described on page 2.24. The circulation system at AWRE was originally designed to be an on-line operation, but when introduced it had to be modified to work off-line (W.R. Maidment, 1972). The Northwestern University in the US ruled out a dedicated library computer on the basis of cost (J.S.Aagaard, 1972).

The University of Missouri Library obtained a dedicated IBM 1440 computer in the mid-60s, and a description of the system (R.H. Parker, 1967) argued strongly that a machine that was principally for other users would not provide a satisfactory system for the library. Recently a few libraries in this country have bought their own computers. Camden has bought a dedicated minicomputer, a NOVA 1220, for its ordering system

(Computer Applications Group, 1974), and Lancaster University is planning to obtain the same model (C.M. Overton, 1973). They will use it on-line to handle short-term loans, which constitute the bulk of the library's transactions. Long loans will be recorded on-line as well, but will update a file on the ICL 1905 off-line. The National Institute for Higher Education has a minicomputer, and SWULSCP has ordered a Rank Xerox computer to be shared between the participating libraries. The acquisition of dedicated machines will become an important trend in the future.

Costs in computerised systems

A review in 1972 set down guidelines when evaluating library systems (P.A. Thomas, 1972); and J. Wainwright (1974) has given two criteria for computer systems. Firstly, use of the computer becomes increasingly economic as the data are used for extra operations; and secondly, computerisation is extremely unlikely to reduce the number of staff employed. She only knows of one library where this has happened, and that is Trinity College, Dublin, where MARC tapes are exactly equivalent to the batches of accessions. However, this is not to say that staff cannot be saved for more profitable activities than running the system; it is merely the total number which will not be reduced, as they normally cannot be made redundant. However, in 1970 Southampton University found that with its computerised loans system the library staff had been kept constant since 1966, while the readership had increased 75% (I.J.Block, 1970). S.W.Massil (1974) found that in the United States the methodology of costing had not been deeply considered; and usually costs were not available.

There are a number of papers giving the cataloguing times at different libraries. A.C. Turner (1972) gives the times for the University of British Collumbia, M.E. Tesovnik et al (1970) give some earlier unpublished figures, and J.L.Dolby et al. (1969) have compared different lengths of catalogue entry. Their figures given in Table 3, show that long entries (about 425 characters) were at that time cheaper for the production of one copy of a catalogue in an automated system than a manual one, but that for short entries (about 250 characters) the manual system was cheaper. These figures were based on five studies, and they also found some suggestion that a cataloguer on a higher salary catalogued slightly faster than a lower grade one. M.B. Line (1969) has given some times for classifying and cataloguing books and suggests that centralised classification would save much more time than than centralised cataloguing. More use should be made of published indexes for books.

	Full entry	Short entry
Manual	$2.29	$0.78
Computerised	$1.31	$0.84

Table 3. Full and short entry catalogue costs.

Essex University has done a comparison of the cost of loans in University libraries with computerised circulation systems (J. Ross et al, 1972). They found that the cost of loans throughout the seven libraries studied was fairly constant at about 12p. The figures given for AWRE and AERE on pages 2.30 and 2.31 are also constant, but at only 6p. These figures were all published around 1971-2, which would suggest that it costs only half as much to run a computerised loans system in a research library as it does in an accademic one. However, accademic libraries are normally considerably larger than special ones, so it is possible that the more expensive systems are needed to handle the larger files. It is also possible that more factors were included in the university costs.

There is a popular misconception in computer circles that an increase in cost yielding a reduction in clerical time is beneficial. This is often implied, and the cost figures for Queen's University, Belfast are accompanied by a clear statement of it. "It is felt that a 14.6% cost increase yielding a 45% saving in staff time are a sufficient justification for proceeding with our work." (R.T.Kimber, 1968 (ii)). There is however, no intrinsic benefit in having transfered work from the staff to the machine, because the saving in cost of their time has already been included. It can be argued that their quality of life may have been improved because clerical work has been taken away from them, or that the computer and staff budgets are independent and that money saved on one could not be spent on the other, but in strictly economic terms there is no justification. If it costs more to use the machine, that money could be saved by employing staff to do the job; in this case ½p per loan. The only economic advantage of using the machine rather than staff is that its utilisation can be increased gradually, while staff normally have to be hired in units of one. At the end of Chapter 6, some industrial accounting anomalies are discussed which may make it advantageous to convert staff time into more expensive computer time, but these are not defensible on economic grounds. If a reduction in staff time is counted as a benefit to be set against a cost in which it has already been included, the reasons for this should be explicitely stated.

Conclusions

Half a million pounds is currently being spent on research in the library and information science field each year. Special libraries are involved in all aspects of this, but have been responsible for most of the work on SDI and IR. Public libraries were involved in the early stages of catalogue production by computer, while the universities were largely the pioneers of ordering systems. There are now some second generation housekeeping systems in existence, and libraries are just beginning to achieve fully integrated systems for ordering, cataloguing and circulation control. However, the economic situation may cause the demise of some of the experimental projects. Far more cataloguing systems have been produced than any other application.

Standard data collection equipment has been introduced, but not in special libraries, where the cost would be prohibitive. However, computerised loans in large special libraries appear to cost about half as much as in university libraries. A few companies have unrecorded simple computerised loan system for producing recall letters, but they may not be economic. The first dedicated library computers are being brought into service, but care must be taken before the very expensive on-line systems are introduced.

Taylor Woodrow has followed the trend towards integration of systems and economic use of bibliographic data by developing an integrated loans and cataloguing system. The remoteness of the computer has been reduced by programming in the library, and with the collaboration of the library staff. Data collection equipment is too expensive for a small industrial concern, so systems in an industrial library must be developed using the resources already available in the company, and this has been done at Taylor Woodrow.

CHAPTER 3

CONSTRUCTION INDUSTRY LIBRARIES

Engineers and information gathering

A survey of 25 firms in the building industry found that the sources of information used were: firstly an individual's boss (81%), then papers and circulars addressed to him (57%), then colleagues in other departments, in the same department, and finally meetings, etc. (P. Sills et al, 1973). Lower level and site staff found the papers and circulars more useful than did higher level and office staff, presumably because they were more isolated. Of those interviewed, 40% found no difficulty obtaining information, 53% found some, and 6% found a great deal of difficulty. The writers summarised the two main problems as being the difficulty of locating the people who possessed the required information and the growth of an organisation outstripping the updating of communication procedures.

Aslib performed an in-depth survey on the use made of technical libraries (M. Slater & P. Fisher, 1969). They found that a more integrated pattern exists for engineers than for other subject groups. They were the least frequent users of the library, preferring to use other sources, particularly the old boy network. They asked for information rather than documents, and needed librarian assistance more often, although their success rate (52%) was lowest. They made more use of books of technical data, specifications and handbooks, and less use of journals. Civil Engineers spent less time on each search than did Electrical or Mechanical Engineers.

Another study of information flow in technology found that engineers have too little contact with the literature, and went on to suggest that they choose sources of information for their accessibility rather than technical quality (T.J. Allen, 1968). H.B. Back (1972) agrees with these conclusions and says that engineers devote slightly less time to written sources than oral ones. This means that the library must make itself very accessible if it is to encourage engineers to make use of its services.

A recent survey of the use made of journals borrowed from the British Library's Lending Division at Boston Spa (BLL), showed that only 4.8% of all users are significantly held up in their work by delays in obtaining journals (B. Houghton et al, 1974). Amongst engineers only 1 in 75 was significantly held up, and 4 partially so, and these were involved in design and background research. Overall, the engineers found a higher percentage of articles of considerable interest than did any other subject group in the survey. Most of these delays were unimportant, but another survey found that while an engineer is waiting for information, his productivity falls by 25% (F.W. Lancaster et al, 1968). Despite the BLL survey, engineers always claim to need information by the day before they ask for it. A professional may be spending as much as 20% of his time on information handling (H.F. Dammers, 1971).

However, helping engineers to obtain reliable information is not the only problem faced by libraries in the construction industry. In common with all industrial service operations, they are subject to the vagaries of the economic situation. K.P. Jones (1972) describes the rise and fall of a library in the Research Unit of Rickers Laboratory, Welwyn. It was opened in 1965, grew rapidly, and a new building was opened which included an area for the library. In 1970 the library was closed. A number of other industrial libraries were also cut back or shut down at about the same time. The library of a company costs money and gives no apparent financial return, so when funds are tight, the library is always an obvious target for management economies.

Industrial libraries are also suffering from the rise in the cost of literature, and this has produced a shift in attitude from acquisition to an emphasis on availability and access, with greater use of external services. Between the last half of 1970 and the first half of 1971, the cost of periodicals rose 14% and books 33% (L. Corbett, 1972) and this trend has not diminished. Even before 1970, industrial libraries were borrowing externally up to 10% of the literature supplied to their users (B.C. Vickery, 1970) and this figure has increased. From Table 4, it is now over 35% in some cases in the construction industry.

Information needed in the construction industry

"At a rough estimate there are 1500 journal titles of interest to the construction industry, and 150 abstracting and indexing services" (A. Gilchrist, 1972). In addition there are about 1000 references produced by the British Standards Institution, and trade literature constitutes about 60% of the stock of most office libraries. Gilchrist is here considering the complete range of firms involved in the construction industry, and the inclusion of architects means that there is a much greater emphasis on trade literature. In another paper has has drawn the distinction between project information, product information and general documentation (A. Gilchrist et al, 1969). Project information is concerned with the individual projects carried out by a firm, product or commodity information is concerned with manufactured materials or products, and general documentation is the remaining literature in journals and books giving techniques, methods, etc. (See also A. Gilchrist, 1970). Most of the literature on information in the construction industry deals primarily with product information, then project information, and finally general documentation which is similar in the construction industry to other fields. This thesis is concerned with the last area, but it is necessary here to consider commodity information.

Manufacturer-produced data is the most common form of product information, but it is also very unreliable. A study showed that 40% of dimensions were missing in manufacturers' literature, 70-80% of performance data, 90% of cost data and 70% of adequate drawings (D. Bullivant, 1968), although the situation is improving slowly. Only 20-25% of these new products appear in the journals, and normally 4-6 months after they are produced. As a result there was a suggestion to set up a central commodity file for use by the construction industry. A. Gilchrist (1971) says that the only good systems would use microfilm and cost £5 million per annum, or a computer at £10 million per annum, but that these figures should be approached with a healthy degree of watchful scepticism. A detailed survey of supply and demand by W.S. Atkins & Partners (1971) suggested that it would cost the users of the information £23 - 33 million and the suppliers who entered their products £20 - 40 million. Large firms were overwhelmingly in favour of a commodity file, while small ones opposed it or were not enthusiastic. D. Bishop et al (1969) gave the figure of £50 per item as the cost of putting information into a central commodity file, so there was little agreement as to how much it would cost.

Nothing significant has yet been done about the matter, as there are a number of problems and a major conflict of need. The manufacturers who supply the information are interested in selling their product, while the user of the information wants the best and cheapest product available. On a public commodity file there would be no possibility of putting comments against an entry if the product did not perform in practice as would be expected from its details, and the cheaper, poorer product would do well. When keeping trade literature, it is worth including comments on the experience of the firm, so a local system is in many ways better than a central one. There is a discussion of trade literature and the commodity file in the Taylor Woodrow feasibility study (Appendix C, pages H1-H13), and the practice of construction firms is reviewed below (P 3.19).

Survey of libraries in the construction industry

Appendix A gives the results by library of a survey of 13 technical libraries in the construction industry, and for comparative purposes two small special libraries which have computerised part of their housekeeping systems. Also included is the data for a much larger library from a different field in which a detailed study of the loans procedure was carried out. The data from this was largely used to calculate costs in Appendix B, and is only dealt with briefly in this chapter.

The section at the beginning of Appendix A gives the basic arrangement of the 15 entries in the survey. The first two sections contain seven Civil Engineering and Building Contractors, and these fall into two groups of three, with one in between. T.W., libraries A and B belong to large companies which do design work and have research laboratories, and where the information departments are fairly active. Libraries D, E and F, on the other hand, are all in building firms, and consist of very small collections of literature run by part time staff. Library C falls between the two groups; it has a fairly large collection of material run by two full time experienced but unqualified staff. The building side of the company was reduced 2 years ago and the running of affairs was placed largely in the hands of Civil Engineers. The company does design work, but carries out no research. Thus in Contracting firms the size of the library is largely dependant on the amount of design and research being done.

The four libraries in the next group belong to firms of Consulting Engineers. J. Wainwright (1974) has defined a small library as one in which the staff does not exceed 3 qualified and 5 clerical members, and the only one found in the survey with a staff exceeding these figures is a library for Consulting Engineers. All the other libraries encountered in the construction industry were small by Wainwright's definition. This one exception, Library G, is in a very large practice with architects as well as Engineers, employing about 15,000 people worldwide. It has five offices in London alone, with 8 others in this country and still more overseas, so it is an unusually large group of consultants. It is worth noting that Library A has a large independent information department associated with it, while in the other Contractors, such work would be done by the library staff. However Consulting Engineering practices have a much greater need for good libraries than even the larger Contracting companies, so these are often very efficient, concentrating particularly on reports of completed projects.

A study of Freeman Fox and Partners (A.P. Shrimpton, 1972) gives similar impressions to those found in the survey. This firm of consulting engineers has a small library staffed by a senior engineer and a typist part time, and an information officer and a librarian full time. It takes 170 journals and has 1100 British Standards and 140 Codes of Pracitce. They find little need to use published abstracts, because items likely to be of interest are indexed as material is received.

The next library (K) belonged to a large firm of Quantity Surveyors, and it has about 7 subsidiary but almost autonomous libraries, none of which has full time or qualified staff. The most significant feature of the main library is its small size: 200 British Standards, 500 books, of which more than half are kept in the basement, 1000 reports, and 45 regular journals. The librarian, who only works from 10 a.m. - 4.30 p.m. spends most of her time on the extensive collection of trade literature, and the library is largely self-service. However, she believes it to be one of the largest in firms of Quantity Surveyors in the country, so it was decided not to include further libraries of this type in the survey.

Only one architectural library has been included in the survey, and it (Library L) is rather unusual in that it is almost entirely concerned with information, and does no design of buildings. The aim of the practice is to "improve building" generally, and to this end produces reports, bibliographies, indexes and information systems. It also provides a consultancy on information systems and services. However, this firm has been included because its complete operation is based round the computer, although the library itself is largely without procedures. All other information produced in the company is punched on paper tape and stored on a small computer. It was hoped to visit other architects' libraries, but approaches to them were not well received. One large firm when approached said that the librarian had left and had not been replaced, so the library was in disarry; another said that the practice was no longer doing the same work and that the library was too small to be of interest. An architect from the Scottish office of the first firm said that the northern library was of little use, because the material was always out on loan or not available when required. The general picture seemed to be one of small libraries in a disordered state which the firms would not like seen by outsiders.

A survey has been done on architects' libraries by P. Calderhead (1972), and the picture he gives seems to support the view expressed in the last paragraph. His book gives a very simple description of what an architectural practice could do towards setting up a library, and the fact that such a book was necessary is indicative of the level of libraries in this field. The size of the operation which he is recommending can be seen from the suggestion that an office library could be set up and run for 3 months for less than £1,000 . This includes purchasing the collection of books, which cost only £200, although these figures were produced several years ago. A Gilchrist (1972) says that office libraries are comparatively rare in such a fragmented industry, in which 85% of architects' practices are of 1 - 10 members, but employ 49% of all architects. Calderhead's survey suggests that for practices of this size a partner is responsible and his secretary spends some of her time running the library, possibly with visits form a qualified librarian to do some classification and checking. For practices between 10 and 20, a secretary still runs the library part time, but assistance is obtained by using official outside bodies, for example, Barbour Index. With a staff of greater than 20 a full time librarian runs his own library. The librarian of Library C described their architects' office which seemed to fit into this pattern.

Libraries M and N while not in the construction industry, are industrial libraries of a similar size and type, and have computerised parts of their operations. They have been included for comparison. Library P is a much larger library, and only its loan system has been studied. Details of all the libraries, except P, are given in the following table (Table 4).

	LARGE CONTRACTORS WITH RESEARCH LABORATORIES			OTHER BUILDERS AND CONTRACTORS				CONSULTING ENGINEERS				QUANTITY SURVEYORS	ARCHITECTS	SMALL COMPUTERISED INDUSTRIAL LIBRARIES	
LIBRARY	TW	A	B	C	D	E	F	G	H	I	J	K	L	M	N
NUMBER OF BRANCH LIBRARIES	NONE	1 BRANCH 13 OTHERS	NONE	NONE	NONE	NONE	NONE	1 BRANCH 13 OTHERS	5 AUTONOMOUS	1	NONE	7	NONE	NONE	NONE
STAFF — QUALIFIED	2	3	1	0	0	0	0	7	2	2	0	1	0	1	1
STAFF — EXPERIENCE	2	0	0	2	2 HRS/WEEK	0	AS REQUIRED	0	0	0	3	0	PART TIME	1	0
STAFF — CLERICAL	0	3	1	0	0	AS REQUIRED	0	8	1	3	0	0	0	PART TIME PROGRAMMER	2
STOCK — BOOKS	1720	1800	18 000 (?)	500	400	10	200	5000	2000	4500	5000	500	5000	500	10 500
STOCK — REPORTS	2900	7000		3000				12000							
STOCK — PAMPHLETS								10 000				1 000			
STOCK — SHELVED BY (R=REPORTS SEPARATELY)	UDC+R	UDC+R		UDC+R				UDC		UDC+R	UDC	UDC	C1/Sf B	UDC	UDC+R
STOCK — BRITISH STANDARDS	2450				0	150						200			0
STOCK — JOURNALS	100	350	180 (?)	120	0	1		250	275	100	80	45	25	200	200
USERS — POTENTIAL	3000	4000						15000	1000	300	1000	110	16	SECRET	380
USERS — ACTIVE	300		200	800	40		12	400	250	80	350	80	16		250
ACQUISITION — NUMBER ADDED TO CATALOGUE PER MONTH	130	460(?)	55 (BOOKS)	110		FEW	1	100	100	50	30	5	20		165
ACQUISITION — D=BOUGHT DIRECT, A=THROUGH AGENT, B=THROUGH BUYING DEPARTMENT	B				B		B		D	A, D	A	A, D	D		
DOES LIBRARY BUY ALL BOOKS FOR CO-NY RECORDED AS PERMANENT LOANS (P) OR ON CATALOGUE (C)	YES P	YES P		YES C		NO	NO		YES	YES FEW P	YES P			C/P	YES P
LOANS — NUMBER PER MONTH (EXCL B Ss)	120	450	150	65	FEW	FEW	FEW	580	380	850	100	15 BOOKS 500 TRADE	NO RECORDS	160	250
LOANS — LOAN PERIOD (WEEKS)	2	4	NONE	3	NONE	NONE		4	26	13	NONE	NONE	NONE		
LOANS — RECORDING METHOD (B=BOOK) 4-S=4 SLIP METHOD, (O=OTHER)	3-S	4-S	2-S	B+O(3)	B	B	B	2-S	3-S	2-S	3-S	1-S	NONE	ON-LINE COMPUTER	OFF-LINE COMPUTER
LOANS — NUMBER ON LOAN (EXCL B Ss)	700		1300	50					1500			400			400 (?)
IT IS POLICY TO GIVE PHOTOCOPIES WHENEVER POSSIBLE? (S=SOMETIMES)	S	S	S	YES	NO	NO	NO	S	NO	NO	S	NO	NO	YES	YES <20pp
RECALLS (NO=INTENDED BUT NOT DONE) — BY PHONE	YES		YES	VISIT				YES			YES	YES	ASK AROUND		YES OR VISIT
RECALLS — BY LETTER	NO	3							YES	YES				3	
INTER LIBRARY LOANS	70	75	55	25	0	40	SOME	40	225	45	10	3 (PHOTOCOPIES)	FEW	85	
INTER LIBRARY LOANS — RECORDED SEPARATELY (S) OR WITH OTHER LOANS (L)	S	S		S					S	S		L		L	L
TRADE LITERATURE — NUMBER OF ITEMS	FEW OLD	3500		600 COPIES	0	BARBOUR INDEX	KEPT ELSEWHERE	10 000	KEPT ELSEWHERE			2000 COPIES	DISCARDED	NONE	3000
TRADE LITERATURE — NEW ITEMS PER MONTH		100	20	25	0						WHAT COMES	1		0	
TRADE LITERATURE — FILED BY ALPHABETICALLY BY MANUFACTURER	C1/Sf B HEADINGS	ALPHA	UDC	ALPHA		C1/Sf B		ALPHA		C1/Sf B	With rest of stock (UDC)	C1/Sf B	Small data banks by subjects (X)		ALPHA
TRADE LITERATURE — INDEXES / MEDIUM	NONE	S1/Sf B CARD	NONE	SUBJECT LIST				Trade Name subject Card.					COMPUTER KEY WORDS.		NONE
TRADE LITERATURE — LOAN RECORDED SEPARATELY (S) WITH OTHERS (L) OR NOT LOANED (NO)	NO L	NO		S		L				L	L	L			
CATALOGUES — ACCESSION LIST (LIST), AUTHOR INDEX (AUTHOR), UDC INDEX (UDC), SUBJECT INDEX TO UDC (S), OPTICAL COINCIDENCE SYSTEM (OC), KWIC INDEX (KWIC)	LIST AUTHOR UDC KWIC	AUTHOR UDC S OC	AUTHOR UDC S	AUTHOR TITLE S (LIST)	LIST	NONE	LIST	UNION AUTHOR UDC S OC	AUTHOR UDC S	AUTHOR UDC S	AUTHOR (BOOKS) KEYWORDS	AUTHOR UDC		AUTHOR UDC KEYWORDS	LIST AUTHOR/ UDC/ KEYWORDS
CATALOGUES — SEPARATE CATALOGUES FOR PARTS OF THE STOCK?	NO	NO	3	YES				NO	NO		3	NO		2	
CATALOGUES — FORM OF CATALOGUES	COMPUTER LISTINGS	CARDS	CARDS	CARDS	LIST		LIST	CARDS	CARDS	CARDS	CARDS	CARDS		CARDS	COMPUTER LISTINGS
LIBRARY MANAGEMENT — STATISTICS REQUIRED: REGULARLY (RR), OCCASIONALLY (RO)	RO	NONE	RR	NONE	NONE	NONE		NONE	NONE	NONE	NONE	NONE	NONE	SOME	NONE
LIBRARY MANAGEMENT — STATISTICS PRODUCED: REGULARLY (PR), OCCASIONALLY (PO)	PO	PR	PR					FEW	ANNUAL	ANNUAL					
LIBRARY MANAGEMENT — BUDGET ALLOCATED?	YES			SELF-IMPOSED	NO	YES		YES		Considering charging for service.	SELF-IMPOSED	NO	NO		YES
COMPUTER (P=POSSIBLY) — AVAILABLE?	YES	YES	YES	YES		P	NO	P	P	YES	NO	P	YES	YES	YES
COMPUTER — LIBRARY WOULD CONSIDER USING IT?	USE	USE	P	NO		NO		YES	P	P KWIC or on-line	NO !	NO	USE	USE	USE

J.K.P.

(?) INDICATES THAT THE FIGURE IS DUBIOUS

Operations of the libraries

An example was given on page 3.2 of the rapid rise and fall of an industrial library, and it was stated that other libraries have undergone severe cutbacks. Of the 13 construction industry libraries in the survey, 3 have been considerably reduced in recent years (C, E and J), but have reacted in different ways. Library C used to have a staff of 6 who did in-depth indexing, but it was cut back and the staff recuced to 2 who see their role more as a "reference centre". They adjusted well, reduced the number of controls which pure librarianship demands, and provide the best information service they can with the reduced resources. There are still one or two strange anomalies in the system, which will be discussed later.

By comparison, Library E, has been cut back almost to extinction. It is not known whether this was company policy , or whether it just happened because the two ladies who ran the information system both left. Until a few years ago, there was a very comprehensive library in the company, offering many services, but today, there is merely a Barbour Index, some British Standards and a few books in the corner of an office, watched over by a secretary. She knows very little about libraries, but would be interested in trying to build up the collection again.

Library J, on the other hand, is still in a state of decline. The librarian says that it is trying to hold its own, but that really it is cutting back. The library originates from the founding of the firm, but a separate information unit was formed about 16 years ago, and subsequently took the library over. The head of the unit, who is not library or information trained, feels that their job is problem solving, and slightly resent s having to run the library. The current situation is compounded by the fact that one member of the staff with 25 years memory of the library and the firm has just retired, and this knowledge has gone with him. If the current librarian were to leave as well, the library would be ... too works largely by memory. The library entry points there are to his collection. He is also wary of any activity which might create a greater demand on the library services, and acquisition is regulated by inactivity rather than policy. Requests are never refused, they are just not attended to until the user has asked several times, thereby indicating that he really wants the item. The library staff were very friendly, but one fears for the future of this library; it is probable, though, that its demise is not company policy, since the only budget is self, not company imposed.

Only two of the libraries did any form of stock taking. Library G does this for all its stock about once in three years, and the librarian of Library C brings in temporary staff each year to check and update the collection of trade literature.

One problem during the survey was the obtaining of accurate figures. Some of those in the table may not be totally compatible, particularly,when work is done for or with branch libraries. When figures were provided by a library, it was not always possible to separate the constituent parts, and it was equally not possible always to evaluate all the figures for a library from its own records, so estimates by the librarian had to be used. The unreliability of this method was illustrated by Library B, in which the librarian estimated some values which were later checked. He estimated the number of items on loan to be 6000; a count of 40% of the slips gave a total figure of around 1300. He estimated 70-100 inter-library loans per month; a check of the records showed that the number had only been over 70 (74) once in the previous 10 months and that the actual average was 56. It seems that librarians are always optimistic about the activities of their libraries, and this may throw doubt on some of the other estimated figures in the survey. Whereever possible the original data have been checked.

(i) Loans

The majority (8 from 13) of the construction industry libraries in the survey used some form of the 4-slip recording method for loans. Several copies of a loan slip are completed by the librarian or the borrower and filed by author to show whether an item is on loan, by borrower so that books on loan to him may be identified, and two copies by the date due for return, one of which can be used as the first recall letter. This system was carefully described when it was first developed (J.A. Dearden, 1962). Only in Library A is it being used in full, all the others use an abbreviated form. Most of them (TW, H & J) have the three filed slips, but no recall slip, and two others (B & G) have just borrower and author slips.

In 1961 G. Fry and Associates produced a detailed study on circulation systems containing a manual for special libraries. The manual rejects the 3-slip method and suggests that a plain charge card system would be cheaper to run. Filing one slip by accession number or author would enable the loan record to be found for a specific item, but for loans to one borrower it would be necessary to look through the whole file. If recall letters are sent out at intervals, all the slips for overdue items could be found by one sort of the file. Fry considers that this would be less time consuming than filing and finding three slips for each loan. If the recalls were to be sent as often as weekly, the single slips could have tabs for each week. Only Library K operates this system exactly, though the one in Library I is very similar, merely involving an extra copy of the slip to be kept in the book to give a transaction number under which the original will be found.

Fry's manual recommends the abandonment of loan periods in special libraries, as he found that most such libraries had a 4-week loan period, but did little about it. In two of the libraries surveyed this is so (TW & G), while two with a short loan period recall books regularly (A,- C recalls by a tour round the offices). Libraries H & I follow Fry's suggested policy that libraries which wish to keep track of their stock should recall items only at long intervals. This should help prevent the situation at Library B, where, of a sample of 527 items on loan in the spring of 1974, 2 were out from 1962, 44 from before 1966, and 182 more between then and the beginning of this decade. This represents more than 50% of the loans, since 104 of the sample had no loan date. One user has 402 books out on loan, but none of the libraries in the survey have a maximum number of items which a user may borrow.

Most of the libraries recall items by telephone when required, and there are differences of opinion as to how effective written recalls are. The librarian of Library C says that "engineers take no notice of written request", but Library H finds that about half of the loans are returned when a recall slip is sent out, and Library M has found a computer produced recall letter to be more effective than the handwritten one from the 4-slip method which they used previously. At Library P, out of 459 items still on loan 95 had been recalled at least a month before the study, 46 of them once, 29 twice, 16 three times and 4 four times. It would seem that persistence of past recalls creates an atmosphere in which overdue items are returned quickly, and in this, the computer, with its reputation for persistence, fares better than occasional handwritten recalls. Fry suggests that if books are to be recalled occasionally, two slips should be filed together in the loans file and one used for the first recall. In the light of the previous observations, telephone calls would probably produce a more satisfactory result.

Only one other loans control system is considered viable by Fry: The Newark Signature System, and this is in fact the only additional system for text books found in the construction industry libraries, apart from the simple exercise book for names and titles used in the very small libraries. In the Newark system each book has a card in it which the borrower leaves in the library with his name on it. This is filed, like the slip, by author or accession number, and replaced in the book when it is returned. Library C uses this system for text books.

Library C also has a loan book for reports and an envelope system for British Standards. Each standard is in an envelope with the number in red on one side and in black on the other. When the borrower takes a standard, he writes his name on the envelope and turns it round so that the red number shows. TW has a card for each standard and moves it from an "in" box to an "out" box, both kept in number order.

Fry rejects the registration of borrowers on the grounds that it is not normally necessary in special libraries for identification, and none of the libraries in the survey had borrower cards. However, for the computerised system at Taylor Woodrow, this will be necessary, although there are problems. Users of an industrial library cannot be expected to carry cards with them, so this problem has been overcome by keeping the cards in a file in the library. However, it is difficult to keep track of the movements of staff, and this presents particular problems if there is no loan period. Two of the libraries for consulting engineers (H & I) found that even department numbers were of little use because staff changed projects and rooms so rapidly. Fortunately this situation is less acute in other branches of the construction industry.

Despite problems of rapid staff movement, almost all the librarians claimed that only small amounts of material were lost. This may, of course, be over-optimism, as Library G, the only one to do regular stock taking, does admit to some loss. It would certainly be surprising if material was not lost as in other fields, book losses cause great worry, although J. van Every (1962) found that few libraries really know how much they lose. Library M stopped its trade literature collection because no one ever returned anything, Sunderland Polytechnic introduced computerised circulation because of the problems in tracking down books (J.R. Haylock, 1974), and Camden Public Libraries has appointed two full time book recovery officers because the problem became so bad, (R.C. Dennis, 1971).

Six of the libraries surveyed acted as a buying agency for all literature purchased by members of the company, though TW had further to put the order through a Buying Department. The library must record these items, so four out of the six,and the two computerised systems (M & N) have a set of "permanent loans", which are often recorded separately from the other loans. Library C, for example, enters the borrower on the catalogue against the item. Library I tries to avoid this type of loan by recording it for the first three months as an ordinary loan, and only then making it permanent if still required. The librarian says that this is not often necessary. Library M records permanent loans manually, but would prefer to enter them with the other material on the computer. Library N finds that it needs to record these items carefully, because when they have been charged as part of a project to the Ministry of Defence, they must be returned on completion of that project.

Journals are still circulated in most of the firms, with varying degrees of success. At TW they are on uncontrolled circulation, which results in long delays and losses. Library G managed to terminate the practice by persuading management to allocate the salary of the person circulating the journals to buying extra copies and sending out lists of interesting articles. They will, however, lend journals which are not current, i.e. over a month old, while TW, with a policy of not lending them, frequently makes exceptions.

Two of the libraries have recently moved from central London to offices in the country (F & J), and the librarians of both mentioned the problems which this has created for inter-library loans. In the Westminster area they were able to borrow most books locally, while now they have to obtain them by post with consequent delays. Library I is near Westminster and obtains most external loans by telephoning round the local libraries and sending a messenger to collect and return the items. Library C is several miles away, but even they have adopted this method. They also enter some of the items in their index for future reference. At TW, which is outside London, nearly all inter-library loans are requested by telephone or telex, and received by post. About half of the libraries are known to record external loans by a different system from the one used for internal loans.

(ii) Cataloguing, indexing and library organisation

Five of the libraries in the survey have branch libraries or semi-autonomous associated libraries, and two of them have a centralised acquisition and cataloguing system. Library A produces cards for its own catalogue and also for one branch library, and these are all typed. This is encouraging them to consider the computer, as the typists do not like the job. Another alternative would be to use a mimeograph machine, as does Library G where catalogue cards are produced for all their libraries and a union catalogue. All the major libraries except those using the computer use card catalogues.

Three of the libraries (H, I and K) have abandoned the allocation of accession numbers completely, and it would be pointless for the smaller libraries (D, E and F) to have them at present. At the other libraries, little use is made of accession numbers. Library G does not use them at all, while Library C only checks them against the book cards before returning these to the books, and TW only requires them for the computer system. Libraries with only manual systems do not really need to spend time allocating accession numbers, although they can help in identifying loan slips. There has been a problem on some occasions at TW, where the loan slips are filed by author when a book is returned which has a corporate author or editor, it may not be clear which author or abbreviation has been used on the slips. Unique accession numbers alleviate this problem.

Most libraries in the construction industry use UDC for classification; though architects prefer CI/SfB, and this is used for ... other firms. TW and some other libraries use the abbreviated Construction Industry Version (DOE, 1971) while at least 6 of the firms keep their own card subject index to UDC with alterations to the official schedules. Most of the libraries use only 2 UDC numbers, but the librarian of Library G uses up to five, and says that a limit of two would be very restricting. This could be a problem as the new comperised system at Taylor Woodrow only takes two numbers. Libraries using the computer to produce UDC catalogues have had problems with the filing order. The library at AWRE, Aldermaston has had to convert the symbols used in UDC numbers to letters to maintain the correct sequence (L. Corbett, 1970).

The advantage of UDC is the possibility of browsing in the catalogue, but in most of the libraries few people use them for this. The use of UDC numbers in industry is more as keywords than a classification. Indeed, R. Hindson (1971) has described their aims at Motherwell as being to make "UDC notation and English language (keywords) interchangeable", though they do take advantage of ranges of numbers for their SDI system (W.H. McCash, 1970). Few people at TW use the UDC index, preferring the KWIC index, which will be discussed later. At Library C, the staff allocate one or more UDC numbers to text books and shelve them by the first, but as there is no UDC index to the collection the effort expended on second and subsequent numbers is completely wasted.

Most of the companies in the construction industry require trade literature, but this need is supplied in different ways. At Library F it is kept by the Buying Department, at Library H it is left to departments to supply their own. Library J makes no effort to collect trade literature, but any items which arrive in the post and look useful are included with the regular stock. Libraries M and TW both used to keep it, but have either stopped collecting or have let the collection run down. Library E consists very largely of a Barbour Index, but none of the other libraries have one, though the architects' departments at TW and C both do. Libraries A, B, C, G, I and K all maintain their own collections of trade literature and Library N keeps trade literature about complete systems but not components.

A collection of trade literature requires a great deal of maintenance, as new catalogues are being produced all the time and others replaced. To keep such a file up to date and well indexed requires considerable work. Library I has no indexes and the information is kept in boxes under broad CI/SfB headings with the names of manufacturers on the outside. All other entry points are found from trade directories, and the librarian claims that they have found no need for an index. Trade literature is the largest part of Library K, and is also kept by CI/SfB number, but there are a trade name and a manufacturer index on cards giving the CI/SfB numbers. This collection is checked regularly, and no manufacturer's catalogue should be over 18 months old. Library B files items by UDC, but they are not indexed.

Three of the biggest libraries (A, C and G) file their manufacturers' catalogues by manufacturer, which seems the most valuable system. Libraries A and C have only a card subject index to the collection based on CI/SfB headings, but Library G also had a trade name index and includes comments on the cards. This arrangement was the one recommended in the feasibility study if Taylor Woodrow wants to collect a library of manufacturers' catalogues. (See Appendix C pages H9 - H12). The system is simple to build up, comprehensive, will handle frequent revisions, and can accommodate changes in the use of terms by cross-referencing. Comments on the experience of the company in using the products can be included, as at Library G. However, Library A is now considering using a computer for its trade literature index.

Some of the libraries keep job reports, and complain of the difficulty of obtaining them from the engineers. Job reports are more important in the consulting practices, but Library C also endeavours to collect them. Project Managers do not push this aspect of the work sufficiently, and the current collection is spasmodic, with some of them of dubious value. The librarian tries to get all the literature back from sites just before they close down, otherwise any borrowed items, reports, British Standards, etc, are lost or buried in a basement store. Library G is much larger and has appointed one member of the staff to visit sites and make reports himself, which is resulting in a very well indexed, comprehensive collection. They have an optical coincidence system for features of jobs and card indexes by client, architect, contractor and sub-contractor, with comments on each. Of the other libraries in consulting firms, Library I has a smaller collection and a slightly simpler version of the system at Library G, while the librarian at Library J says that reports should be kept, but that there is too much difficulty in getting them written. One part of job reports is drawings, and Library I already keeps these on aperture cards while TW is in the process of converting all old drawings to this form. G.R. Cutts (1970) suggested that drawings should be on-line on the computer.

The libraries take different attitudes to the keeping of statistics. Libraries A and H produce some, but they are not really wanted by management, Library B calculates numbers of operations each month and submits them to the director, while in Library J and K no information is required and none produced. At Library M statistics are produced regularly, but only to support requests for staff or equipment, and at TW they are produced intermittently either for the same reason, or because they have been requested by senior management. Most of the libraries were not willing to disclose their expenditure and one librarian said that if it was known how much the library cost, there would be complaints from other departments.

Most of the libraries make no charge to their users, though this is a less definite rule in the firms of consulting engineers, where costs can be charged to projects. Other firms like the directors responsible for Library C, have decided to divide all library costs equally amongst the projects. This is the current policy at Library I but the librarian is considering whether to charge library services to individual projects rather than allowing them to be included as part of the overheads. This seems a rather unnecessary procedure, since it is difficult to find a fair system of charging, and if it were comprehensive it would be very expensive to operate. Library G occasionally charges for large photocopies of items sent overseas, and Library H does no photocopying since copies made in departments can be charged to projects.

(iii) Computer systems

A meeting of the Construction Industry Liaison Group (1969) suggested that everything concerned with information was possible if users are prepared to pay for it, but that in the construction industry they are not. This optimistic view of computers can be criticised, but it is worth considering what has been done. The computerised loans and cataloguing system at Taylor Woodrow will be described and costed in detail in Chapters 5 and 6. Library A uses a computer for the correspondence file which they keep for the company, but not for library activities, the Soils Research Group at B do computerised IR, and at Library K another department has a computer system for filing Bills of Quantities. Library L has a very comprehensive computer system, but it is largely disconnected with the library itself, so there is no known use of the computer for normal library processes in the construction industry, apart from at Taylor Woodrow.

Some comparisons between Libraries M and N and the construction libraries have already been made, but they have a certain amount in common between themselves. Both M and N are small and have similar numbers of staff; they both have defence contracts, and so must maintain close security; and both have computerised their issue systems. Library N has a slightly larger turnover, and has also computerised its catalogues. Library M still uses card catalogues but the cataloguing problem is slightly alleviated because the organisation's main library produces computer catalogues for all its stock, including half of that held by Library M.

The computerised cataloguing system at Library N has been in operation since 1970, while the loan system was only implemented at the end of 1974. Data for the catalogues is held under 28 broad COSATI subject accession number and title, then items of bibliographic data separated by commas, and finally keywords. At present one long index is produced with all the entries in the last two parts, but it is hoped to separate them later. The computer produces an accession list; and the general index containing authors, report numbers, keywords and UDC numbers refers to the accession list for full entries. The files on magnetic tape are updated with paper tape input and printed out every 3 weeks. Programs are written in ALGOL with NEAT segments, and the fields are all of variable lengths. It is also possible to select up to 450 items or search the files using Boolean logic. The data for the cataloguing and circulation systems are kept totally separate.

The loans system is an adaptation of EMPRENT, a network analysis PERT program. The details of a loan are written on a coding sheet, punched on paper tape and added to the loan file. Returns are entered in the same way on different coding sheets, and it is possible to make changes to records, or transfer a loan to a different borrower. The system will not produce recall letters or notify the librarian of reservations, though a note of these can be added to a record. This system has not yet been described anywhere in the literature, and the librarian says that the computer is used only because the data are so few (400 of 680 loans were still out after running the system for 11 weeks). The coding sheets are fairly complicated to use, but excluding punching the computer system takes slightly less time to operate than writing and filing slips. However, loans of confidential material cannot be done in this way, and the librarian admits that the system merely transfers work from the library staff to the punch operators. The library would not use the system if it had to do the punching.

The loan system at Library M is run on-line over a terminal to an IBM 370/165 at the organisation's main offices, but as this is shared with other departments, it can only be used at specified periods. If only one member of staff is present, the library must be closed for security reasons while this operation is in progress. Loans are recorded on transaction cards in the books and typed into the machine in batches from the terminal. Inter-library loans are given a transit card and included with the other items. The system produces up to three recall letters and will handle reservations. On return the computer automatically records a new loan of the item to the next person on the reservation list, and it is not possible to change this order. The information on items is not destroyed when the item is returned, but kept for a while in a current file and then transferred to a storage tape for possible future use. The current file enables the library to obtain the details of an item for a user who has forgotten what article he had read. The computer produces a loan list of all items currently on loan, but staff shortages have meant that recently the system has had to be run with a backlog of unrecorded loans.

General conclusions

1. Construction industry libraries were found to divide into the groups shown in Table 4 on page 3.10.

2. The level of activity in the contracting libraries is largely dependant on the amount of design and research done by the company. However, overall the most significant factor is the personality of the person running the library.

3. All the libraries except one are small, and could mostly be improved. Architects, with their small practices are particularly poorly served.

4. There is a shift in the libraries from acquisition to an emphasis on availability, and the proportion of items obtained on inter-library loan is as high as 40% in one case. Libraries in central London borrow items locally in person, and those moving away find it inconvenient to have to obtain them by post.

5. If the library is to serve the engineers well, it must make itself very accessible to overcome their preference for sometimes less reliable, local, oral information.

6. Keeping track of staff movements is a problem, particularly amongst consulting engineers.

7. The reactions of users to written recall letters is influenced by the persistence of past recalls.

8. The need for permanent loans has been reduced at Library I by recording purchased items as normal loans for three months. After that time, most borrowers are prepared to return the item to the library.

9. Library I has the most efficient, simple loans and cataloguing systems, and Library G has the most comprehensive systems for trade literature and project reports.

Computerisation in the construction industry

At present only Taylor Woodrow in the construction industry uses a computer for library housekeeping, but a few of the other companies might benefit from some computerisation. Library A would like a computerised system to provide multiple copies of the catalogues for its branch libraries and to relieve the pressure on the typists producing the catalogue cards. They are also considering it for trade literature, though the study at Taylor Woodrow suggests that this would not be a viable proposition (see Appendix C, section H). Libraries G and I would be interested in the possibility of KWIC (keyword in context) indexes and certainly the KWIC index at Taylor Woodrow is much more frequently used than the UDC index.

I. Buchinger (1974) suggests that UDC may be extinct in the next ten years and that KWIC indexes are better and even work well with several languages. T.N. Shaw et al (1968) agrees that KWIC indexes perform almost as well as more elaborate ones, and suggests that several simple indexes produce a better result than putting an equal amount of effort into one complex one. J.D. Black (1962) found that for a collection of 2000 documents a KWIC index had an efficiency of 76% compared with 82% for a UDC index. However, the cost of producing the KWIC index on an in-house computer was only 40% of the cost of the conventional UDC index and 70% using a bureau computer. The Bath University Computer Catalogue Project found that users preferred alphabetical subject indexes to classified catalogues, and that cards were significantly slower to use than microform or computer printout (P. Bryant et al, 1974). The project also suggested that a KWOC (keyword out of context) index is perhaps the most accurate for information. Adding keywords to the title can improve the performance of a KWIC or KWOC index (G. Thomas et al, 1971).

It would of course be possible to produce other forms of index using the computer, for example articulated subject indexes (M.F. Lynch et al, 1973), but the KWIC index is as simple as any and there are a number of programs available to produce it. This is perhaps the feature of a computerised system which would be most useful in the construction industry, and although it has not yet been included in the new suite at Taylor Woodrow, the head of the information department is writing a program to produce a KWIC index from the records held on disc for the system.

Many of the other problems found in construction industry libraries would also be alleviated with the system implemented at Taylor Woodrow. There will be no need to write and file slips in triplicate to record loans. Copies of the catalogues can be produced for branch libraries. There is a facility in the system for permanent loans. Abolishing the loan period eliminates the writing of recall letters, but a check can be kept on the loans by sending periodic computer produced renewal letters informing each borrower which items he has. The statistics held against each user would provide a simple means of recording charges if the library were to decide to charge for its services. All the details and costs of the new system are described in Chapters 5 and 6. Two establishments outside the construction industry have developed personal computerised filing systems (S.W. Bridle, et al, 1971; and C.E. Cook et al, 1971). In these the individual uses the computer like an information notebook.

It would thus seem that there would be benefits to be gained from computerisation in some libraries of the construction industry. The largest contractors and the consulting engineers are the two groups where this would be most useful. However, while TW, Library A and Library G are very happy to consider introducing computerised operations, the other librarians are more sceptical. Library B might use the computer, Library H was less enthusiastic and Libraries C and J said they would not use it on any account. It is significant that the librarians at these two libraries have been there for many years, have no formal library training, and are very wary of new ideas. The librarian at Library I has given some thought to the problem of computerisation, and was not interested in computerised cataloguing. To give a reasonable service he felt that the other activities would have to be done on-line, and this would be too expensive. He did however, feel that a KWIC index might be of value. The costs of programming and conversion of data provide a considerable disincentive to computerisation.

PART II

DEVELOPMENTS AT TAYLOR WOODROW

CHAPTER 4

THE LIBRARY AT SOUTHALL

Taylor Woodrow and its information system

Taylor Woodrow is a large international construction group with a turnover of £156 million. It employs 11,000 staff in the U.K. and has branches in 20 overseas countries. The group has diversified considerably from the original building firm, and now covers the whole range of design and construction, with its associated fields. In Britain, in addition to its main site at Southall, Middlesex, regional offices and innumerable sites; there are 46 subsidiary and 10 associated companies in the Taylor Woodrow group.

The Southall site houses the main offices of Taylor Woodrow Construction, and several of the subsidiary companies, and it is here that the library is situated. While the library is administratively part of Taylor Woodrow Construction, it in fact offers its services to the whole group. However, the majority of use is from Taylor Woodrow Construction, since the employees are in the surrounding offices. There are no branch libraries, so other companies in the group either use the establishment at Southall or satisfy their own information needs.

The Southall site also houses a Materials Laboratory and a Structures Laboratory. Since these laboratories are doing full time technical research, they have a need for technical information, and are thus major users of the library. They are now organised together, with a total of about 60 qualified staff, and employ a full time information researcher with a background in materials science. He has control of a small set of specialist papers and reports which are not catalogued in the library.

The library

The library at Taylor Woodrow is a fairly typical small industrial library. From visits to other libraries in the construction industry, it seems to have nothing unusual about it, except perhaps its interest in computerisation. It has grown up over nearly fourteen years until now there is a stock of about 2,000 books and 3,000 reports and pamphlets organised by a staff of 4, three of whom have some qualification or experience in librarianship or information science. In addition one person from another department spends some of her time receiving and circulating the 150 periodicals taken by the library. Until recently this job was done by the Publicity Department.

As in most of the construction industry libraries, books are catalogued by UDC, and the Construction Industry version is used. At Taylor Woodrow no more than two UDC numbers can be assigned. Before computerisation the lending of books was done by the three slip recording method. A slip in triplicate was filled in when an item was issued, and the copies were filed by date due, borrower and author. There was a three week loan period, which was largely ignored.

From the early days of the library the catalogues were produced using the computer. The bibliographic information of every item was held on punched cards, and the computer was used to sort these and produce printed catalogues. One major advantage was the provision of a KWIC index, which was found to be very useful in the library. The original programs had been written for the company's first computer, an IBM 1401, in SPS language. On the later IBM 360/30 they had to be run with an emulator, so by 1974 when the company installed a 370/135, they had become very inefficient.

The importance of the feasibility study

The project was begun with the intention of seeing how the information system could be improved, using the computer where appropriate. To this end the work began with the feasibility study included as Appendix C. This study was produced by preparing 7 short reports, covering the library's different activities, and bringing them together with a survey as appendixes of a general report.

The survey studied the use made of the library. Users were interviewed when they visited it to establish what they required and how well the library had been able to fulfill these requirements. The librarian kept a diary for a week, to show what his activities were. A.P. Wilkin et al (1972) claim that this is the most satisfactory method of library investigation. As a result it was felt necessary to survey the post coming into the library for a week, to see how far the library's functions were initiated by postal requests. This work showed the frequency and source of use of the library. (See page S11 of that report). The nature of enquiries was analysed and an assessment made of how far the library was able to satisfy these (pages S12 and S13).

The feasibility study in Appendix C may be unique, as most industrial libraries do not have the time to study their operations in this depth. It could therefore be of interest to other librarians both for comparative purposes, and also as a method of examining their own libraries in detail. Even from the limited survey of construction industry libraries in the last chapter, it would seem that several of them are in need of a reappraisal of their activities and intentions. Library J in particular would benefit from breaking down its activities as is done in the feasibility report, to see which of its old systems can be abandoned, and where the staff should direct their efforts. For example, their special collection on dams is becoming of decreasing value as it becomes increasingly out of date, but it was not clear during the survey whether the data are still required in the firm. Their move from London would provide a good opportunity to innitiate a feasibility study along the lines of the one at Taylor Woodrow.

The feasibility study resulted in 15 detailed proposals which are listed at the beginning of the report. Eight of these concerned the setting up of an integrated computerised loans and cataloguing system, and the changes required in the existing system to do this. Accession numbers should be increased from five to six characters, and all the books, reports, etc. held anywhere in the company should be included in the catalogues. The different sources could be designated by letters in the accession numbers. This should be simple to arrange, since anyone buying a book for the company must obtain it through the library. His department can then have the item on permanent loan. This means that it will be possible to ascertain if any copies of an item are held anywhere in the company. The computerised loans procedure would enable items to be recalled regularly, and reduce the amount of clerical work. The system eventually produced is described in the next chapter.

The last proposal in the list was that there should be a study of the informal information structures in the company; perhaps along the lines of the work of T.J. Allen (1968) in isolating "technological gatekeepers". At a later meeting with the company it was suggested that a computerised SDI system could be used for this purpose. Profiles would demonstrate the needs of the engineers, and perhaps, through feedback, enable some value to be attached to the information provided. The only action taken on this proposal has been the introduction of bi-monthly current awareness bulletins.

The most immediate other proposal was that a general library request form be introduced to replace the numerous different forms then in use. This has been done, but it and the other five minor changes concern areas of the library which are not involved in the computerised system.

Areas for further research

The feasibility report thus formed the basis of the rest of the research, indicating the two main areas for further study, as well as suggesting the minor organisational changes. Firstly it was suggested that the company should look at the informal information structures within itself, and the way in which individual engineers obtain their information. This would show how the formal library system already detailed in the feasibility report should be developed to best meet unsatisfied needs for information. The suggested project for this investigation is described in

"Proposals for further work" on page 7.10, but it was not carried out, because the library felt that the second area for study was of more immediate importance.

This second suggestion was a study of computerised housekeeping for the library. It was proposed to develop computer programs to handle loans and cataloguing, and use them to test a model to ascertain when it is worth computerising a small technical library. It has been shown that a large university or public library can benefit from using a computer for some of its activities, but work was needed to show how far an in-house computer could improve the service of a small company library. The project was thus directed towards seeing whether a computer could be profitably used in a construction industry library to assist with the housekeeping functions.

Library functions not chosen for computerisation

The only areas of the library included in the computerisation at Taylor Woodrow are the catalogues and the loans. However, the feasibility study identified eight areas of library activity in the company, and it is necessary to consider those which were not included in the system. The eight areas were loans, inter-library loans, ordering, cataloguing, special collections of certain types of material, journals, information retrieval (IR) & selective dissemination of information (SDI), and the library of manufactures' catalogues. Of these, loans and catalogues have been computerised, and it was recommended that the special collections should be included with the other material, but identified by letters at the beginning of the accession number. They could then be separated out for special listings, but would normally appear with all other items in the indexes and for circulation. This has been done. The other five areas will be considered separately.

(i) IR/SDI

IR and SDI were not being done when the feasibility study was written, but it was suggested that an in-house SDI system could be used to identify information needs and structures within the company. However, an SDI/IR system would be separate from the normal library catalogues and so has not been included in this project. Much of such a system would be concerned with journal articles, so the library's stock of reports would form a small part of the total, and text books would normally not be included. For an SDI system the material must be recent, and the small numbers of acquisitions alone would not provide anything like a satisfactory size of basic file. For these reasons SDI and IR are not included in this thesis.

(ii) Journals

The control of journals falls into a similar catagory to that of IR/SDI. The feasibility report recommended strongly that journal circulation in the company should be discontinued, as it was ineffective, and journals were being delayed for up to a year, damaged and lost. However, if journal circulation is required, a very simple semi-controlled manual system is proposed. (See Page F8 of the report). While this would not of itself speed up the flow significantly, it would identify the main offenders and the location of any copy at any time. If it is insisted that a computer be used, there are several systems available.

A simple mechanised punched card system was developed over 23 years ago (S-M Riggle, 1962). Pressed Steel Fisher claim the first fully computerised periodical circulation system in this country (D.J. Campbell et al, 1971), and this is based on an American card system (R.J. Booser, 1960). Taylor Woodrow has made modification to the American JURN program (M.W. Skelton et al, 1965), but this work will be taken further and brought into operation in due course. However, this will have no effect on the computerised loan and cataloguing system, so it will be considered no further. Library policy is that journals will not be loaned after circulation, so exceptions will have to be recorded in the manual system as before.

(iii) Library of manufacturer's catalogues

It would be normal practice to keep manufacturer's catalogues as a separate collection with a separate indexing system. Catalogues should not be taken from the library, so it is not necessary to include a facility for lending them. There are already cataloguing systems for catalogues, of which the most common is the Barbour Index, using CI/SfB and this is used in library E. In the feasibility report it was suggested that a large card index would provide the most flexible system (Page H9), as catalogues are amended or withdrawn far more frequently than other library material, and comments on the products can be added to the cards. The computer would be very inflexible in these respects, so the library of manufacturers' catalogues has been excluded from the system. The organisation of trade literature in the construction industry is discussed on Pages 3.3 & 3.19.

(iv) Inter-library loans

The main feature of loans from other libraries is the transient nature of the data required. The item will only be held in the library for about a month, and it is unlikely that anyone else will ask for the item again. If it is required by several people, it will be cheaper to purchase the item than repeatedly borrow it. (See cost of inter-library loans on Page B11 of the feasibility report). The supplying library will want items returned at the end of the loan period, so the borrowing library must recall all inter-library loans promptly. As mentioned previously, this is a time consuming occupation, and a computer could produce printed recall letters. However, at Taylor Woodrow most items are recalled by telephone, as this is a more reliable method than sending a written request, which the borrower will frequently ignore, or not even read. The proportion of inter-library loans overdue is less than that for other material, as borrowers know they have to return books to other libraries promptly, and usually send them back as soon as they have finished with them.

A manual inter-library loan system requires the data for the book to be written out only once. This may be in a book or on a form which can be moved from a pending to an "on loan" file. It is not possible to better this with a computerised system of any type, as all the information will have to be written out on coding sheets or a terminal once. In addition programs have to be run to input the data, and cards may have to be punched. Instructions would be required to control the input, and further data would be needed for returns. The operator would also have to initiate regular computer searches of the files to find overdue items; so a computerised inter-library loan system would almost certainly create more manual work than it saved by producing recall letters.

(v) Ordering/Purchasing

Computerising the ordering or purchasing side of large libraries was discussed in Chapter 2, and the move towards integrating it with catalogue production. The following is a comparison of the simplest manual and computerised systems showing the work involved in each at a library like the one at Taylor Woodrow.

Simple Ordering/Purchasing Systems

Manual System	Computerised System
Details of the item to be ordered are entered on a form; either by the library staff or a user in his own department. With the latter it may be necessary for the librarian to revise the details and fill out a new form.	However the request originated the librarian must either write out the details on a coding sheet to be punched on cards, or input the data via a terminal.
	Cards may have to be punched from the coding sheets.
Form is photocopied and sent to Director for approval if necessary.	Data is input to the computer, which produces two copies of an order. One may be sent to the Director for approval if necessary.

Order is to the Buying Department who dispatch it. Second copy is filed in the library.

Manual System	Computerised System
The librarian must check the orders to see if any have not been received.	Out standing items must be identified by one of the following (i) checking the orders manually (ii) running a computer check program (iii) producing computer listings and checking them.

The item is received and the order removed from the file.

Manual System	Computerised System
Details of the item are entered in the catalogues.	The details on the order are checked with the item, corrected, and the information transferred from the computer "on order" to the accession file.

From this it can be seen that very little manual work is saved by the computerised system. In addition programs have to be set up and run. A large proportion of requests for items turn out to have incorrect data when the item finally arrives, and such corrections would have to be made to the order record before the information was transferred to the catalogues. Detailed amendments would not be difficult on an on-line system, but for batch processing the control statements would be quite complex, as was found when a facility for amending entries was incorporated in the new cataloguing programs. Cataloguing from the book itself in the manual system involves writing the data twice, but obviates the need for corrections.

A second problem which may arise in some companies will be the form of order sent out. At T.W. the order submitted to the Buying Department is transcribed in the appropriate manner for the supplier. If however, it was intended to produce the final order on the computer, it might be necessary to use a special preprinted paper with carbon copies. This is acceptable only if large numbers of orders are being produced together. In most industrial libraries there are few orders, so this would be very wasteful of both paper and the computer operator's time, as it takes time to change paper on the printer, and several blank sheets are left at the beginning and thus wasted. To change for just a few orders would not be economic.

In certain circumstances it may be feasible to computerise the ordering and purchasing of a small technical library, but in many cases the resultant system will not only cost more, but will take up more of the librarian's time than the manual one. Where it is economical in time to computerise this aspect of the housekeeping of the library, it should be as the third stage after the catalogues and loans. For this reason it has not yet been done at Taylor Woodrow.

CHAPTER 5

THE COMPUTERISED SYSTEM

Constraints on the system

The company was concerned that the prime objective of the new system should be to reduce the clerical effort required by the library staff. The programs were therefore written to transfer as much of the work as possible from humans to the machine. Management also wanted the disruption from the implementation kept to a minimum. With the catalogues the changeover was un-noticeable, because catalogues in the new format were merely introduced along side the old ones. However, the change in the loan procedure necessitated parallel running of the two systems, during which time the old loans were entered on the new files. Anomalies discovered in the backlog of existing loans took a considerable time to clear.

Other constraints upon the system were imposed by the equipment at Taylor Woodrow. The company's computer was an IBM 360/30 with 64K of main storage, and this was exchanged during the writing of the programs for an IBM 370/135 with 144K. This meant that the basic design of the system had to fit on the smaller machine, though it would eventually be run on the larger one. In fact one program could not easily be compressed into 64K, so it was left until the new machine was installed before the constituent parts could be tested together. Three disc drives and four tape units were installed with the new machine so that either tape or disc files were possible, and it was decided to store the data on disc. Only batch processing has been available. The in-house machine provides only certain programming languages.

The final constraint on the system was also an advantage; the bibliographic details of most of the holdings of the library were already held on cards for the existing cataloguing programs. Some examples of the card formats are given on Page CD9 of the feasibility study. The first sixty columns contained the information, while the last 20 columns giving the accession number and Luhn codes, are virtually identical for each card, and largely repeat information given elsewhere. The existence of all this data in a form acceptable to the computer was advantageous in reducing the amount of information which had to be coded, but it did dictate certain conventions. For example, the length of each author was kept as 20 characters, as it would have been difficult to reduce and pointless to increase it. The records were completely reformatted for the disc files, but the only major change in the rules used on the cards was to increase the accession numbers from five to six characters. The reasons for this are discussed on Pages A11 - A12 of the feasibility report (Appendix C).

Programming languages

It was decided that it would be beneficial if the programs were machine independent, so that it would be possible to offer them commercially to other firms. This meant that a high level language was required, and the obvious one was COBOL. Unfortunately no one in the company had COBOL experience, and there was no compiler available. The old programs were written in SPS, which was only available on the 360 with an emulator. All programming in the company was then done in Assembler, PL/1 or Fortran. To help with debugging, it was important to use a language in which there was expertise within the company, so these three languages were the only possible ones. Assembler was obviously in no way machine independent, and so was ruled out. At that time a review of computer languages (J.L. Dolby,

1971) suggested that PL/1 would become the standard high level language for documentation purposes. This does not appear to have happened in the U.K. (See C.W.J. Wilson, 1973), and as the only compilers available were on IBM machines, PL/1 too would have denied the system machine independence. Fortran was therefore chosen, which had the additional advantage of being known in the library.

Fortran is a scientifically orientated language, but there are compilers for it on most computers. Programs in Fortran can therefore be transferred to machines of other manufacturers with fewer changes than for other languages. However, the choice of Fortran made the programming more difficult, as it has poorer file-handling facilities than Cobel or PL/1. Each character of a record has to be moved or compared individually. As the computer would have to make a similar comparison after breaking down an overall instruction from another language into machine code, this does not affect the running time as much as might be expected, but it does make the program writing more difficult. When writing Fortran records to tape, IBM machines divide them into "spanned records" of a maximum of 260 bytes, which does slow down transmission, but makes no difference to the programming. A difficulty only arises when using a standard IBM utility program, such as a sort or merge as there is no facility for such records. Special programs therefore had to be written to handle longer records for these operations. However, this makes the resulting system even more machine independent.

Fortran will only take records of fixed overall length. Although the constituent parts, for example the authors, title and publisher of a book, may vary within the record, the total number of characters to be read or written must be constant. The type of file required for library applications is an "indexed-sequential" file, in which it is possible to take each record of the complete file in sequence, or to pick out an individual record. Fortran does not support indexed-sequential files, so a simplified indexed-sequential file system had to be developed in Fortran, with indexes and search routines.

Operation of the system - the human involvement

Throughout development of the system simplicity of operation for the library staff has been the prime consideration. Though the company intends to introduce terminals to its computer, all work at present is batch processed. As no money was available for a badge reader or other identification system, the simplest medium for all input to the computer was punched cards. They can be filed, read by the librarian, individually corrected and take up little room. As there is no card punch in the library it is not possible for the librarian to punch cards at the time of loan. They must therefore be prepared beforehand, and the computer can do this for all the stock and users on file.

With the decision to use cards for all input there had to be a card to identify each copy of each item which might be borrowed, and another to identify each user, and these were termed book cards and user cards. Book cards contain the name of the author, the first part of the title, the accession number and the copy letter. User cards contain the user's name, department and user number. To record a loan, the librarian simply has to submit the two cards together to the computer.

The number of cards involved in the loan system is fairly large; there are around 300 users and nearly 10,000 loanable items, as there are an average of two copies of each title at Taylor Woodrow. Storage of these cards is a problem. The best solution would be if each book contained its book card and each user kept his user card, but this is difficult. Users will not carry around 80 column punched cards, and with a batch processing system, cards could not be returned at the time of loan. In addition the cards would very quickly become unusable. The 300 user cards must therefore be kept in a file in the library. Neither has it been practical at Taylor Woodrow to put the book cards in the books, because pockets would have to be stuck in about 10,000 volumes and the cards put into them. This would be expensive as well as time consuming, even if done gradually, so both book and user cards are kept in a file in the library.

To lend an item the librarian simply finds the appropriate book and user cards and puts them together in one section of a box to be recorded on the computer later. One difficulty arises when either the book or the user is not yet recorded on the file. The simplest way of handling this is to make use of the coding sheet on which the book or user details will be written for punching. When a new user comes in, the librarian writes his name, department, address and telephone number on a coding sheet in the appropriate format for adding to the computer file, and adds in the margin the accession numbers of any items he may have. When the name is added to the file the loans can be recorded.

When an item comes into the library it is frequently catalogued and sent straight out to the person who requested it, so new books can be borrowed before they have been added to the accession file. Exactly the same procedure is adopted for these items; the borrower's user number is written in the margin against the entry on the coding sheet, to be recorded in due course. Using the coding sheets in this way prevents unnecessary copying of the bibliographical information, and means that a new user can borrow an item which has just come in.

New entries to be added to the files are also input on cards, and are grouped together in batches. The normal procedure is for the items to come in singly and for the cataloguer to allocate accession and UDC numbers. These are written in the book and entered with the full details on coding sheets. When there are sufficient entries coded the cards are punched, and the entries added to the disc files. Corrections to existing entries can be included with the new data. These may merely be past mistakes, or they may be due, for example, to a user changing his department. The computer produces a list of all the cards put in and indicates any problems which have occurred, so that the librarian can check what has been done. An accession list of the new additions can be produced at the same time, and the computer punches book and user cards for them.

Production of new indexes and listings is the easiest part of the system as far as the library staff are concerned. The appropriate set of control cards are merely put into the standard printout programs and submitted to the computer. No new cards need to be punched unless an unusual form of the data is required. At Taylor Woodrow sets of control cards have been prepared for the following listings:- accession list, UDC index, author index, lists of users in user name and user number order, a list of loans, and renewal letters. Any other form of printout can be obtained by preparing a suitable set of control cards.

The manual parts of the system which the library staff have to carry out are therefore very simple, as follows.

(i) Loans

When an item is borrowed the librarian takes the appropriate book and user cards and puts them in a box. For returns only the book card is required, since some borrowers return items without identifying themselves. Each day (or loan period) the cards are inserted into the standard deck of cards for the loans program and presented to the computer. Action should be taken on any messages returned by the computer, and the cards refiled.

(ii) New additions

When new items arrive in the library the librarian catalogues them as before, and writes the details onto coding sheets. New users are similarly coded when they first borrow books. Changes to be made to the files are also coded. Cards are punched, inserted into the appropriate parts of standard program decks and submitted to the computer. Action is taken on any messages returned.

(iii) Printout

When new lists are required the librarian take the appropriate control cards and inserts them into the standard program deck. The program is submitted to the computer and the output collected. For unusual printouts a special deck of control cards is to be punched.

Departures from normal library practice

As discussed on Page 3.14 , borrowers in an industrial library do not respond well to recall notices, and most of the libraries recall items by telephone as they are needed. In their report G. Fry & Associates (1961) recommend the abandonment of loan periods, but suggest that a reminder could be sent to borrowers 3 - 6 months after the issue. He did not have the benefit of the computer to do this.

In conventional librarianship the emphasis is on the individual item from the library's holdings. In the system at Taylor Woodrow the prime consideration is the company, so the system concentrates on the user rather than the book. It is thus possible to reduce still further the frequency with which the user has to be disturbed. In Fry's system the user receives a letter every three to six months for each item which he has on loan. With computer sorting a letter can be sent for every item at one time, asking if the borrower still wishes to keep all the items. He merely has to sign and return one slip for those loans he wants to renew. This will reduce substantially the number of letters to be answered by an active user. It is felt that this change of emphasis from recall to renewal, and from book to user will reduce the clerical work required to maintain accurate loan records, and will be appreciated by the users of the library.

Machine requirements

At TW the programs are run under DOS on an IBM 370/135 with 144K of main storage. The largest program (ASORT) currently requires 122K of storage, but this could be reduced by decreasing the number of records (5000) which can be sorted. The next largest (LISTING) needs 96.5K, and the others are all less than 64K. Storage requirements for the data are 900 bytes/ book + 550 bytes/user for the main files. The indexes take up 546/bytes 39 books, + 550 bytes/55 users. A book for this purpose is taken as any item which is to be included in the library catalogues, and a user is any person or organisation which borrows books. The system could be operated with only 2 tape drives, but for efficient running it is necessary to have 4. Data are input on cards via a card reader. If a card punch is available, the computer can produce the book and user cards used for input to the Loans program. For card punches which do not interpret the cards automatically, this must be done afterwards.

There are 11 independent programs in the system, which can be grouped together as file maintenance, loans, the production of listings, and the miscellaneous task of producing new book and user cards. The formats for input to the system are fairly rigid, but the programs have been written to give the greatest possible flexibility of use and output. With Fortran, the overall length of records is fixed, but many of the elements of the records are also of fixed length, with the exceptions of the title and the publisher. This makes the coding of entries simpler in some ways, but has imposed a discipline in that authors' names, for example, may not be more than 20 characters in length. However, this problem was inherent in the old system, and there have been inconsistencies in abbreviations by the different cataloguers over the years.

The detailed formats for the files are given with explanations in the chapter, "Details of the Files" in the user manual. The accession records hold the accession number, up to two UDC numbers, publication date, authors, title, publisher,and the number of copies in stock, as in a standard card catalogue. The record also holds the loan details of each copy of the item. These include the copy letter, the user number of the borrower, the date of the loan, a permanent loan indicator and the user numbers of any one who has reserved the item. There is one reservation space for each copy of the item held in the library, though this number will be reduced if copies are on permanent loan. However, reservations do not refer to the specific copy against which they are recorded, since the borrower is not concerned which copy of an item he receives; but are ranked as a waiting list by the time for which the user has been waiting. When an item is returned the computer informs the librarian of the first reservation (if any). When an item is borrowed the computer checks the reservations and deletes the borrower's number if he had reserved the item.

There are two other parts of the accession record which would not appear in a card catalogue, the classification star and the statistics. The former arose out of the old system for distinguishing internal reports which were classified (confidential); an asterisk was used to indicate the unclassified reports. This convention was maintained in the new system but the use of the classification star was widened, so that any item could have an asterisk to indicate different things for different types of material. For example, every item in each special file has been catalogued separately, but it was necessary to include an entry for the whole file as a unit. This entry is designated by an asterisk which can be used to show where files begin and end in the catalogue. The printing programs can also select the starred special file entries from the complete accession list to produce a list of only file headings.

The computerised system does not require any written records, so any management information required by the librarian must be collected by the computer, and the statistics are a device for doing this. Four statistics were allocated for each user and each item, and these can be varied at will by the librarian, using the STATS program. Consultation at Taylor Woodrow resulted in five of the eight statistics being allocated values by the programs. The first accession statistic is automatically set to the date of acquisition when the item is catalogued, and the next two are incremented by one every time it is borrowed. For the users the first two are incremented by one for every loan. The other three statistics have not been allocated, so the librarian may use them to record any number he wishes against the book or user. At Taylor Woodrow the third user statistic may be used to record the number of times the user borrows items on inter-library loan.

As discussed in Chapter 3, if a company wished to charge departments for their use of the services of the library, the statistics could be used for the purpose. The number of loans is already being recorded, and extra units of cost could be recorded against users as one of the other statistics. At the end of a period, the department could be charged for all the loans and units recorded against its members.

Besides the four statistics the user records contain the user number, the user's name, department, phone number and details of the loans. It holds the accession number, copy letter and permanent loan indicator of any item on loan to that user. All elements of the user records are of fixed length.

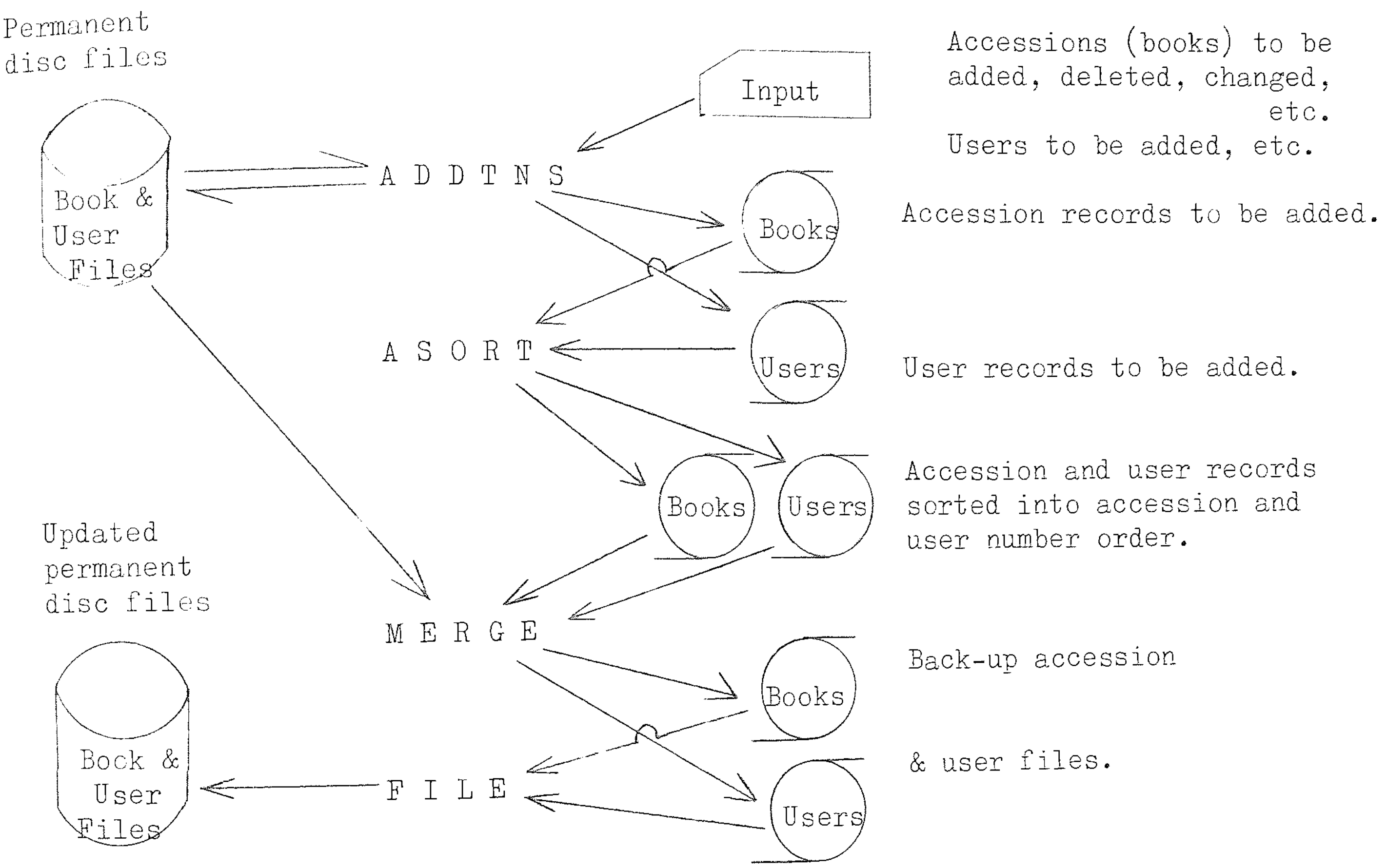
The programs in the system and their functions

PROGRAM	FUNCTION
ADDTNS	The additions program sets up tapes of new accession records and user records. It can also mark records to be deleted from the files, change existing records and substitute new entries for them.
ASORT	The sort program takes either a tape of accession records, or a tape of user records, or both, and sorts them into accession or user number order.
FILE	The filing program sets up new accession or user disc files with their indexes from sorted magnetic tapes. It can also be used to copy the accession or user files to tape.
LISTING	The listing program writes out accession or user records according to a format specified on control cards. It can take as input, a list of individual numbers, one complete file, selected records on tape, or sort keys from the PRESORT program. It can only print one type of record at a time, but may refer to the other file for certain details. Headings and notes can be included in the printing of each record. This program is used to produce the catalogues, loan list, renewal letters, etc.
LOANS	The loans program records loan details, cancels loans and informs the librarian of any user who is waiting for an item. reserves items and cancels the reservation when the item is loaned to that user or when requested to do so.

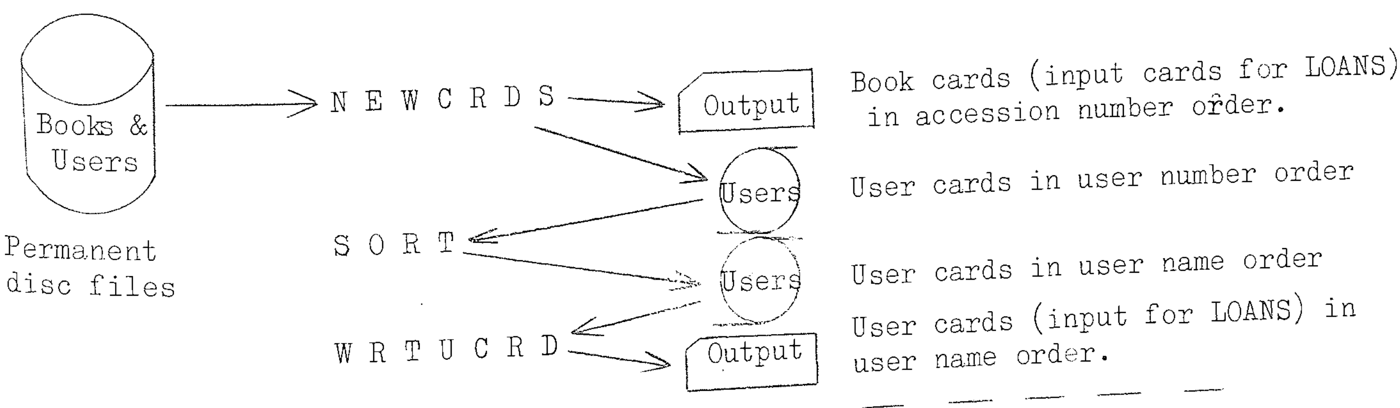
LSORT	This is a system utility program to sort the output tape from PRESORT.
MERGE	This program is used to merge a tape of sorted additional entries with the permanent disc files and produce a new back-up tape.
NEWCRDS	The new cards program produces book and user cards for input to the LOANS program. The book cards are punched, and the user cards passed to the WRTUCRD program for punching.
PRESORT	The presorting program produces either a tape of selected records, or of selected sort keys. A tape of complete records is passed directly to the LISTING program to be written out, while the sort keys are sorted by LSORT first. Selection may be of a particular kind of material designated by a letter at the beginning of the accession number, or only permanent loans, etc; sort keys may be the authors, UDC numbers, loan date, etc.
STATS	The statistics program allows all or some of the statistic values to be changed on one of the files.
WRTUCRD	New user cards produced by the NEWCRDS program may be sorted into name rather than user number order by a utility sort and then punched.

<u>FLOW DIAGRAM OF THE SYSTEM</u>

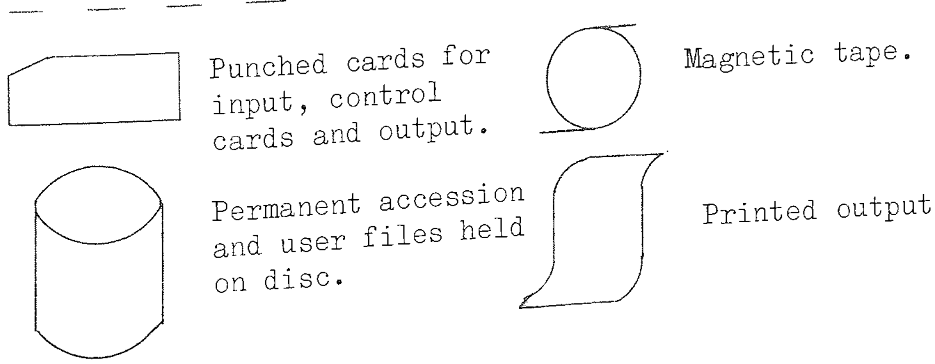
1. Adding New Records To The Files



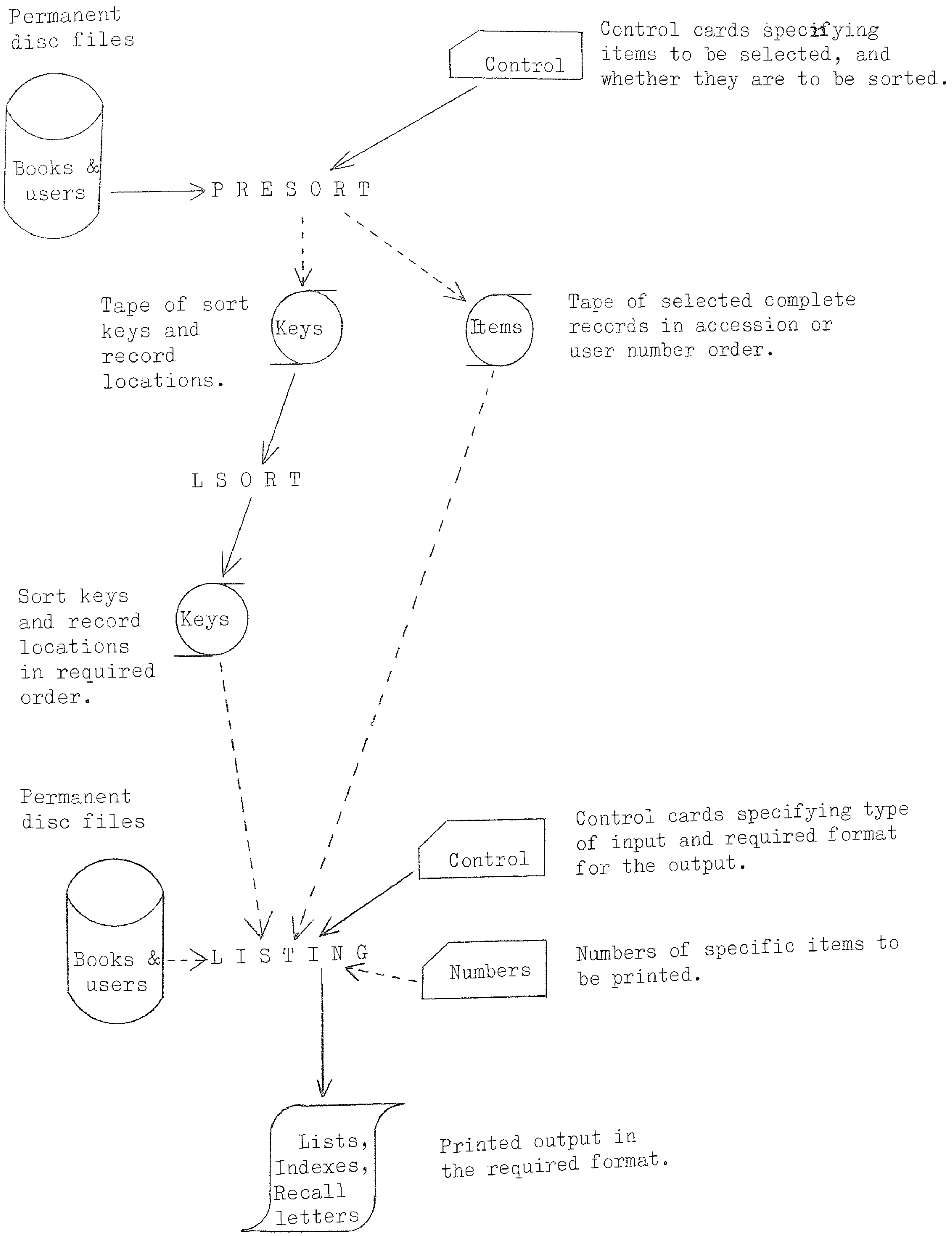
2. Production of New Input Cards For LOANS Program



<u>Key To Symbols</u>

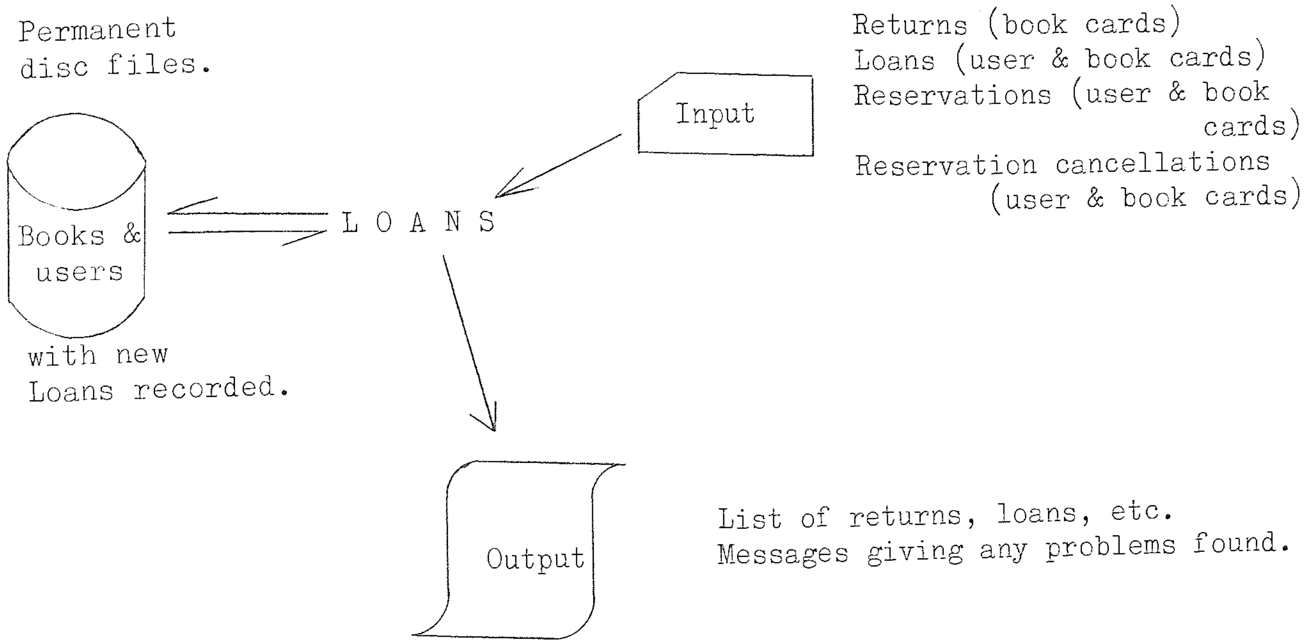


5. Written Output from the Files

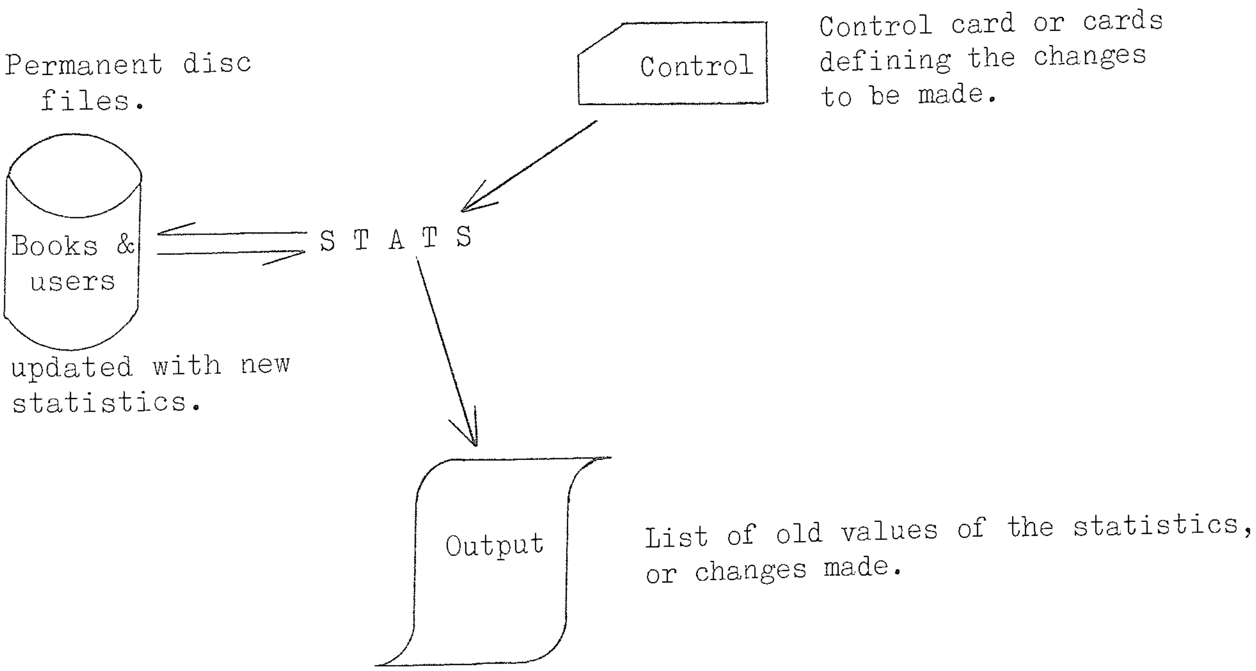


- - - - - - - - -> alternative output from PRESORT & alternative input to LISTING.

3. Loans



4. Changing the Values of the Statistics.



(i) Maintenance of the Files

There are five programs in the file maintenance set, ADDTNS, ASORT, MERGE, FILE, and STATS, the last being completely independent of the other four. FILE also may be run independently, but normally the first four programs are run in the order given, and pass data from one to the next, as indicated in the flow diagram.

The ADDTNS program is used to produce tapes of new accession and user entries to be added to the files, and to amend or delete existing entries. The initial data is coded in the library, punched on cards and then submitted to the computer for the ADDTNS program to arrange the information on magnetic tape in records suitable to be added to the accession and user files. The records are sorted into accession and user number order by ASORT, merged with the existing files by the MERGE program to produce new back-up tapes, from which the files can be recreated by the FILE program.

There are five types of accession data which the ADDTNS program can handle. New entries are input on cards and reformatted for addition to the file, with the statistics and loan data set to zero. Extra copies of items can be added to existing records, and records can be marked for deletion (The entry will be deleted by MERGE or FILE). Minor changes can be made to records but for a major change a new entry is substituted for the old one but keeping the statistics and loan records the same. In the same way, new users may be added, and existing ones substituted or deleted. Book and user cards are produced for new entries and extra copies of books.

The user data must be kept separate from the accession data, but within each type the new additions, deletions, and substitutions may be in any order. This means that the tapes of new accession and user records will also be in any order, so they are sorted using the ASORT program. This program has been written because the standard IBM sort will not handle Fortran records of this size (See Page 5.3). Either an accession tape or a user tape or both can be handled by ASORT, as specified on an ASORT control card. The sorted data are written back to the tape on which they were originally supplied from ADDTNS.

The MERGE program then takes the sorted tapes and merges the entries with those on the disc files, which are already in the correct order. This program again has been written because standard IBM merges could not handle these records. A MERGE control card specifies whether one, or both of the files are to be merged, as for the ASORT program. The merged records are written to a new magnetic tape, which leaves the tapes of new additions untouched, so that a listing of them can be produced. However, it means that four tape drives are in use when both files are being merged. The MERGE program will list and then delete any items marked for deletion.

The FILE program sets up new disc files from tapes or copies the existing files onto tape. It can be used on its own to produce a copy of the files or to recreate them from back-up tapes, but normally it will be used as part of the process for adding new additions. When setting up the disc files it will delete any items previously marked for deletion and notify the librarian that they have been deleted. When FILE is used as part of the new additions set two options will normally be specified, as back-up tapes should be of the same date for both files. The result is two up to date disc files with their indexes, and two up to date back-up tapes.

The STATS program is used to make amendments to the statistics of some or all of the accession or user entries. It can either set statistics to a given value, or it can increment them by a given amount. It can operate on one statistic in every record of one file, or it can be used to change the values of individual entries in both files. It will list either the amounts incremented or the original value if a new one is to be substituted. If every record in a file is being changed, this printing can be suppressed. Thus, the statistics of an individual book or user can be varied at will by the librarian (for example increasing a value each time the user borrows a book from another library), or a statistic throughout the whole file could be initialised to some value.

(ii) Loans

The LOANS program will process four types of information concerned with the borrowing of items. It will record the loan of an item, its return, its reservation by another user and the cancellation of that reservation if the user decides he can wait no longer. Since items are often returned and then go straight out on loan, the computer considers the returns first and then the loans. For returns only the book card of the item is required, as the number of the borrower will be recorded against the book, and some items are returned anonymously. If the item has been reserved, the computer prints a message to the librarian informing him of the reservation. If there are any items returned which are not recorded as being on loan, the computer waits until it has checked the loans before printing an error message, in case the item has been borrowed and returned in the same batch.

For loans the borrower's user card is required, with the book cards of all the items to be borrowed. A facility has been included whereby an item can be issued on "permanent loan". This is to overcome the difficulty that as the library is the official channel for purchasing books, it has to record those bought for other departments, even though they will not normally be recalled. To do this a card with a "P" is inserted before the relevant book card. Permanent and normal loans can be distinguished by the programs for printing lists or letters. After recording the loan of an item, the computer checks whether the borrower had reserved it and if so, the reservation is cancelled.

British Standards, Codes of Practice and Ordnance Survey maps are held in the library but not included in the catalogues. To handle the loan of these items a facility has been included in the programs (See Page 27 of the user manual). As discussed in the feasibility report (See Pages E10 and E14 - E16, of Appendix C), these items can be individually indentified by creating an accession number made up from the letters, "BS", "CP", or "OS" followed by their own four figure numbers.

(iii) The production of listings

There are three programs involved in the production of printed listings: PRESORT, LSORT & LISTING (See the flow diagram on Page 5.16) PRESORT selects records to be printed, and LSORT sorts the selected records if necessary. LISTING arranges the data supplied, and then prints the record out. LISTING may be run on its own if a complete file is to be printed in its original order, or if only specific individual records are required. PRESORT will be run with LISTING if any other form of selection is wanted, or if the records are to be sorted. LSORT will be run with the other two programs when the records selected by PRESORT are to be sorted before LISTING prints them.

The LISTING program arranges elements from each record in turn and prints them out. It can be used to print any form of list, index or the renewal letters (See Page 5.8). A set of "ARRAA control cards" controls the format of the listing; setting up the information in a block of up to 20 lines, each 130 characters long. Another control card indicates the type of data which is to be printed and specifies the arrangement of the blocks and the creation of pages. The detail of this is given on pages 58ff and 70ff in the user manual. While printing out the information on one file, it is possible to call data from the other. For example, a list of users from the user file would not be restricted to giving only the accession numbers of the books which they have on loan, the computer could find all the details of the books from the accession file. This is particularly important with the renewal or recall letters, as the user would not know what the numbers were and must have the author and title. There is also a facility for producing an additional list of the entries in the main listing. For example, when sending renewal letters to all the users, the librarian might want a list of them so that he could check replies.

The PRESORT program provides for a selection of records on tape for the LISTING program to print. It will also arrange keys from the record so that the entries can be sorted before printing. For example, one entry would be set up for each author of a book, giving the location of the complete record in the disc file. When sorted, this would give an author index with all the authors. PRESORT may select a special collection with a particular letter as the first character of the accession or user number. For example it would be possible to obtain the special files by requesting accession numbers with an "F" as the first character. In addition to this selection it is also possible to ask for accession records with or without a classification star, or in certain circumstances items which either are or are not on permanent loan.

The LSORT program is a set of job control cards to sort a tape of the sort keys from PRESORT using an IBM utility program. The sorted keys are written back on the tape on which the keys were presented, so only one tape is needed to link PRESORT with LISTING. The LSORT deck of cards is the only part of the system which is not in Fortran, but its sole function is to sort the tape of keys produced by PRESORT.

(iv) Production of new book and user cards

Book and user cards used for input to the loans program are kept in boxes in the library. After a time it is inevitable that cards will get lost or damaged. A few individual cards can be punched to replace those lost, but the time will come when it is more efficient to renew the complete collection of book or user cards. This is done using the NEWCRDS (new cards) and WRTUCRD (write user card) programs. NEWCRDS punches book cards directly from the accession file in accession order, as they will be found later by accession number. The librarian will have the book with its accession number in his hands at the time he is recording the loan or return. However, users will never remember what their numbers are, so the librarian will have to find the user card from the user's name. NEWCRDS therefore writes the user information to a magnetic tape, which is then sorted into user name order and punched on cards by the WRTUCRD program. NEWCRDS also produces some permanent loan and delimeter cards. The punching of the book cards can be suppressed so that only user cards are produced.

Problems encountered in setting up the system

The major advantage of already having most of the accession data for the library on punched cards also caused the principal difficulties in setting up the system at Taylor Woodrow. The original data were not in a form suitable for the new system, as discussed above (See Page 5.2), so a program was written to reformat them for the disc files. This program is not described in detail, as it was used only to convert the data held on cards when the disc files were first set up. However, even with the checks it performed, and the use of a validation program on the old data, a number of errors still crept in which had not been noticeable in the old system. For example, the inconsistent abbreviations used for corporate authors were unimportant in the old catalogues, since sorting was done by the Luhn code, but it is a problem in the new, in which the actual authors are sorted.

Another problem was that duplicate copies had different accession numbers in the old system, with a number to say they were duplicates. As discussed in the feasibility report (see Pages A11 - A12), it is preferable to give all the copies of one item the same accession number and differentiate between them by copy letters. This meant that some items had to be deleted and added as duplicate copies of other entries. This was relatively obvious for items that were appropriately marked in the original, but a large number of items were found which were duplicate copies, but had not been marked as such. These caused problems, but would have caused more if left, as a user is not interested in which copy of an item he reads, and may not know that there is another copy under a different number. UDC numbers were not always consistent for duplicate copies.

There were a few problems with the system itself, but the major part of the implementation was in teaching the library staff to use it. The documentation included the user manual and notes on the running of the programs at Taylor Woodrow included as Appendix D. In addition the operations were explained to the people who were to be responsible for them. The members of the staff showed different degrees of interest and ability in operating the new system. They had most difficulty in learning to run the programs, as none of them had had to assemble a deck of control cards before. In the past programs were completely under the control of the computer department, and the library merely requested what was to be done. With the need to have cards in the library because of the number of alternatives for what can be done, the staff have to operate the system themselves. The head of the information group is experienced with the computers, so problems can be referred to him. In his absence the computer department and computer applications group can advise on the IBM system and the Fortran programming respectively.

Another important difficulty was the recording of the backlog of loans under the new system. Recall letters were not being sent, so loan records had built up and some of the borrowers and items had not been heard of for three or four years. The old manual method was more flexible than the computerised one, in that anything could be lent whether it was catalogued or not. The change to the computer imposed a discipline on the system. When old loans were recalled, borrowers often produced several items in addition to those they were known to have, and this caused extra work which further delayed the clearing of the backlog. In addition some slips had not been removed when items were returned, and this could cause ill will.

Comments of those using the system

The staff who use the new system were asked for their reactions to it. The library assistant who does all the coding of entries learned the new formats fairly quickly, and said he found them easier to use. The repetitious data included to identify cards in the old system has all been eliminated, and he does not have to produce a Luhn code. The new rules are simple to follow.

The librarian said he had some fears about the operation of the system, but that he felt that it is valuable. His main worry is that control is being taken out of his hands, and he is dependant on the punch operators and the staff running the computer. He is also concerned that there will be too much delay after an action has taken place before it appears in the lists, and that if old listings are not thrown away quickly they may become confused with the newer ones. He initially found himself having to refer to too many lists. He feels that the flexibility of output is good, and that the renewal letters will be a useful reminder for those who borrow items and forget that they have them. The new loans system will be better than filing slips once he is used to it and it has become routine.

The head of the information group and a temporary member of staff spent considerable time clearing the backlog of loans. The new member found the system easy to follow. They have been discovering the anomalies as they progressed, and there are a few modifications to the programs which they would like introduced. However, the programs have usually indicated clearly when there is a problem. It has been easy to omit small details like the fact that a loan date must be included in the loans program, even if there are no new loans, only returns, to be recorded. They feel that the flexible printout programs provide a useful range of listings.

Non-financial benefits of computerisation

The principal advantage of the new system is its flexibility to growth. The catalogue of the complete stock of the library and its users is held on considerably less than half of an exchangeable magnetic disc. There would be no problem of storage until the files exceeded one disc. This will not occur until the library has increased to about five times its present size (approx 25,000 items and 1500 users). Appendix A gives a figure of about 1600 new items a year added to the files. At this rate of increase it would take about 13 years for the library's stock to exceed the amount which could be held on a single disc, and by that time the company will probably have changed its computer more than once and the programs will be more out of date than the ones which they now supersede. The system will therefore handle the growth over the next few years.

When new staff are appointed to deal with increases in library activity they have to be trained. They normally also have to be added in units of one person at a time. The computer should lessen the number of new staff needed to handle a given expansion, as it reduces the clerical effort required for a given usage. The computer will give a system which can be expanded continuously, rather than one which builds up to breaking point until a new member is added to the staff, and is then under-utilised.

The reduction in the clerical work done by the librarian will not only save money, it will free him to do work which is beneficial to the company and of more interest to him; predominantly the answering of technical queries. This will increase his job satisfaction. Journals and uncatalogued reference material should not be borrowed from the library. However, in a company library, senior management who require something will have it even if it contravenes local rules. These items will now be the only ones for which the librarian has the tedious task of writing loan slips, and will be kept to a minimum. The majority of loans on the computer will be kept much more efficiently than is possible manually. Slips of paper get lost, misfiled and are sometimes unreadable as carbon copies. The computer will not misfile or lose records, and they will always be readable. It will not now be possible to record the loan of a book twice, as has been done in some cases in the manual system. Before a new loan can be recorded for an item the previous loan must be cancelled. Renewal letters can be produced regularly and this must result in more accurate and up to date records. Unwanted items should return to the library sooner, and the librarian can still remind defaulters by telephone.

The possibility of reserving an item is new to the library. Under the manual system it would have been possible to introduce reservations by writing the name of the person who wanted the item on the slip recording the loan. The librarian would then have seen it as he removed the slips when the item was returned. The major problem would have been that any of several copies might be returned first. The new system surmounts this problem by having all copies of an item recorded under one accession number with just different copy letters.

The head of the information group will write the KWIC index to go with the system, and this is needed; but already the flexiable printing programs give a very wide range of choices of lists, indexes and formats. The librarian should be able to obtain any arrangement of information which he might want, and this should create a better service. The old author, UDC and KWIC indexes were idfficult to use because they were based on fixed card formats, but the continuous information recorded on the disc files produces a clearer arrangement. Carbon copies of lists and indexes can be produced at almost no extra cost, for circulation to other departments or branch libraries. At Taylor Woodrow the information scientist in the research laboratories receives copies. If the company were to take part in the production of a union catalogue for the region, the fact that the data is held in machine readable form would simplify the work.

The final benefit of computerisation is that management information will be available for the librarian. In the past it has been possible to collect the information by going through the loan slips, but this has not normally been done to any great extent as it is very time consuming. However, with the computer collecting the data, much more use can be made of them. The listing programs will select for certain statistics, so it would be possible to produce a list, for example, of all text books which had ever been out more than 5 times, in order by the number of times they had been out in the last few months. It should be possible to assess more quickly the overall and specific use being made of the library, and this in turn could be used to improve the service.

PART III

COSTS

Chapter 6 THE COST OF COMPUTERISATION

Development of a general cost equation

This chapter considers the formulation of a general model to compare the costs of the computerised library housekeeping operation with a fully manual equivalent. This does not necessitate an evaluation of all the costs of both systems, as the most important consideration is the difference in cost between them. For example, there is no need to evaluate the cost of classifying a book, if the two procedures are identical. The cost of this would have to be considered as a step on its own, to decide whether the time spent was justified by the use made of the classification later. That is outside the scope of this thesis.

The comparison of the manual and computerised systems can be reduced to cost terms alone, provided that the two are comparable. Where there are no differences in the resulting service, the only variables are the costs and operating times. Questions of comparability are discussed later, but the next section considers the logical basis of the model.

Logical basis of the equation

To compare a computerised and manual loans and cataloguing system, the costs can be considered separately for four areas: the manual and computerised loans systems, and manual and computerised cataloguing.

(i) Manual loans system

The costs for a manual loans system can be reduced to a function of library staff time and user's time.

For a given period, $\text{Cost} = A_1 c + B_1 u$

where A & B are parameters dependant on the size and use of the library, c & u are the cost/unit time of the library clerical staff and library users respectively, which will all be constants for a particular library at a particular time.

In this expression it would be expected that $u > c$ & $A_1 > B_1$

(ii) Computerised loans system

The costs for the computerised loans system will be similar, except that there will be an element for the use of the computer.

For the same period, $\text{Cost} = A_2 c + B_2 u + D_2 C$

where A, B, c & u are the same variables as before, D_2 is a parameter reflecting complexity of the programs and computer use, and C is the computer cost/unit time.

Expected relationships in this expression are $C > c > u$

and $A_1 > A_2 > B_1 > B_2 > D_2$

The savings made on the computerised loan system against a manual one in the period is given by:

$$\text{Savings } 1 = (A_1 - A_2)\, c + (B_1 - B_2)\, u - D_2\, C$$

(iii) Cataloguing systems

The expression for the cataloguing systems would be similar, but with no element for the user's time, and the punch operators time included with computer time in the computerised system.

For the same period as for the loans

$$\text{Savings}_2 = (A_3 - A_4)\, c - Es - D_4 C$$

where A, D & E are variables depending on the size and use of the library, and c, C & s are the cost/unit time of the library clerical staff, the computer and punch operators respectively. Subscript 3 refers to the manual system and 4 to the computerised one.

In this expression it would be expected that $C > s$, $E > D_4$

& $A_3 > A_4 > D_4$

(iv) Overall costs

To obtain the overall difference in costs in the period, the two savings are added together (Savings_1 + Savings_2)

$$\text{Total cost difference in period} = (A_1 - A_2 + A_3 - A_4)\, c + (B_1 - B_2)\, u - Es - (D_2 + D_4)\, C$$

$$\text{Overall saving} = Ac + Bu - Es - DC$$

In any library the values of c,u,s & C (the costs per unit time of staff and machine) are known, and the next sections endeavour to give expressions for A, B, D, & E in any small library. For example, it was found that the expression for Taylor Woodrow was

$$\text{Cost difference/year (£)} = 15700\,c + 1092\,u - 1800\,s - 1740\,C$$

With local cost figures this gave an annual saving of - £537 (see page 6.22).

Comparability of systems

It is thus possible to develop an equation to show the net difference in cost between operating a manual and a comparable computerised system. However, the systems must be "comparable". As soon as a difference in service is included in the equation, the comparison becomes a cost benefit analysis. As will be discussed later, certain benefits result as a byproduct of the computerisation at Taylor Woodrow, but it would not be justified to include them in the equation. After evaluating the difference in cost between the two comparable systems, any benefits should be listed for consideration with the net gain or loss from computerisation.

The computerised system set up at Taylor Woodrow has a feature which is different from the manual operation; one renewal letter is sent to each user at regular intervals, instead of recall letters being sent for every item at the end of the loan period. This may be considered to be a benefit, but cannot be included in the equation as such. For this it is assumed that the final result of both systems is the same: users returning or renewing books regularly. Recall letters were not previously being sent at

Taylor Woodrow because of lack of staff, but this does not mean that the procedure can be omitted from the equation, as the systems would not then be comparable. As it was in fact library policy to send recalls, the failure to do so must be regarded as a breakdown of the service, and they should be included.

The next sections develop the general cost equation for the loans and cataloguing of a basic technical library. The way this has been done is to detail the individual costs for operations in the manual and computerised systems, and to increment them for the number of times the operation is performed in a given period. For the loans this is the period before there are sufficient loans to file in one batch, and for the cataloguing, it is a year. Adjustments for this are made when the two parts are brought together.

The manual procedures taken are the 3-slip issue system, with author and UDC catalogues on cards, as these seem the most common in this type of library (see chapter 3). Most of them also have a subject index to the UDC number, but this has been omitted as it will be equally necessary in the computerised system. The computer programs and procedures used in the equation are those described in the last chapter. If it is decided to produce different programs to perform the same functions, these could be substituted for the ones in the equation.

Key to the main symbols used in the cost equation

Constants in a library

S = number of different items in stock.

A = number of additions per year.

L = number of items on loan at any one time (assumed constant).

U = number of users of the library.

R = proportion of recalled items requiring renewal.

Periods selected by the library

1 period = the time before it becomes necessary to update the manual or computer files. This will be between one day and one week depending on the number of loans. The file should be updated before the number of unfiled records becomes unmanageable.

p = loan period (in periods), or the time between renewal letters.

P = number of periods in a year (working year).

D = life of catalogue cards in years (before being lost or damaged).

B = life of computer punched cards in years (before being lost or becoming unreadable by the computer).

t = number of sets of loans before a new complete loan list is printed.

K = number of sets of additions to the catalogues before a complete new set of catalogues is printed.

Library data (The library can select these by a suitable choice of frequency of operation).

n = number of loans/period. (This is assumed to be equal to the number of returns, or the library stock would be increasing or decreasing).

r = number of recalls/period.

a = number of new additions added to the files in one batch.

$1/k$ = proportion of computer cards which can be accepted as missing before a complete set of new cards is produced (e.g. for 1 in 40 not found $k = 40$).

Costs

C = cost of computer/unit time.

c = cost of library staff/unit time.

u = cost of users' time/unit time.

s = cost of clerical staff outside the library/unit time.

Other codes used in the cost equation

In the equation the programs used in the computerised system are referred to by their names written in block capitals. Since the equation only considers times and then converts them into costs, the time to perform one operation on the computer is given as the name of the program and the type of operation it is performing. For example, (LOANS/return) would be the time which the computer takes to record the return of one item to the library. The term (LISTING, etc/renewal) would be the time to produce one renewal letter using the LISTING, PRESORT and LSORT programs. The time units must be the same as those for 'C', the cost of the computer/unit time, in this thesis: minutes.

Library data (The library can select these by a suitable choice of frequency of operation).

n = number of loans/period. (This is assumed to be equal to the number of returns, or the library stock would be increasing or decreasing).

r = number of recalls/period.

a = number of new additions added to the files in one batch.

$1/k$ = proportion of computer cards which can be accepted as missing before a complete set of new cards is produced (e.g. for 1 in 40 not found $k = 40$).

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The time taken to set up the programs on the computer is considered separately from the time for each item processed, because, once set up, a program will handle any number of entries. For the loans program, for example, this is referred to as (set up LOANS).

It is assumed that all the runs are taken to the computer with the regular loans run. The time for this operation is given as (take/collect). Words in brackets indicate the time to perform an operation.

Finding cards in a card file, and refiling them are referred to as FindC and FileC respectively. For the loan slips the terms would be FindS or FileS. These codes are followed by the size of the file. (See "Constants in a library" on page 6.6 for the values.)

FindCS = the time to find a card in a file of the complete library stock.

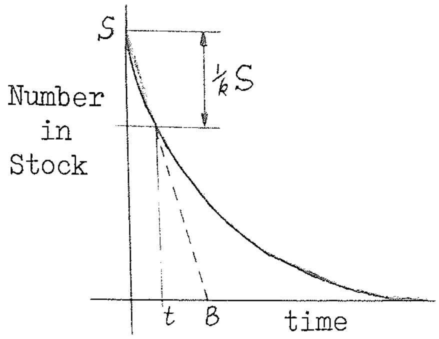
FileSU = the time taken to file a slip in a file of all the users.

It is assumed that filing and finding take the same time in identical files. It is assumed from collection at T.W. that there are 2 UDC numbers and 2 authors for each item.

Derived values

Catalogue cards needing replacement per year $= 4S/D$

The rate of loss of cards will be an exponential decay. However, after time t, $\frac{1}{k}$ S will have been lost, so all the cards will be replaced. Assuming k is large, the gradient of the curve may be considered as constant, with an average life of the cards of B. Thus $t = B/k$.



Number of years before a complete new set of cards must be produced $= \frac{B}{k}$

Average number of cards not found for loans per run $= \frac{3n}{2k}$

Allowing for duplicate copies, the number of book cards kept $= 2S$.

General cost equation

(i) Loans procedure - manual system

For each loan, the librarian completes a 3-part loan slip while the borrower is present. The copies are divided up and filed; one by author or UDC number, one by borrower, and one by date due for return. (There are modifications of this, but they will take about the same time to operate.) When the item is returned, the librarian removes the three slips from their files and discards them, or puts them aside for later processing to produce statistics. After expiry of the loan period, the item is recalled by sending a recall note. (To be comparable with the computerised system, second and subsequent recall notices are not included in the cost equation. Unanswered renewal letters will equally have to be followed up manually.) A proportion of the recalls will have to be renewed (R), which will involve finding the three slips, amending and then refiling them. Renewals are extra loans, and are treated separately.

To be done:- For each loan: write out loan slip and file 3 copies.
For each return: find the 3 slips, and discard or keep.
For each recall: write out recall notice.
For renewals: find the 3 slips, amend and file them.

Cost of these procedures in 1 period =

$$\begin{aligned} & n(\text{write slip})\ (c + u) + n(3\text{FileSL})c \\ + \ & n\left[(3\text{FindSL}) + (\text{discard})\right] c \\ + \ & r(\text{write/address recall})c \\ + \ & Rr\left[(3\text{FindSL}) + 3(\text{date slip}) + (3\text{FileSL})\right] c \end{aligned}$$

Cost of manual loans system for one period (assuming File = Find) =

$$\begin{aligned} & n(c+u)\ (\text{write slip}) + nc\left[6(\text{FindSL}) + (\text{discard slips})\right] \\ + \ & rc\left\{(\text{address recall}) + 3R\left[2(\text{FindSL}) + (\text{date slip})\right]\right\} \end{aligned}$$

(ii) Loans procedure - computerised system

For each loan, the librarian finds the appropriate book and user cards, and places them in a box for loans. After a day's run, these cards must be refiled in sequence. When the book is returned, the book card is put in a box for returns, and after processing it must be refiled. The data for the loans program must be put together, taken to the computer, and collected with the output after running. Reservations are not included in the equation, as there is no comparable facility in the manual system. The loans program must be set up on the machine and run. On the (t)th run, a loan list of all loans must be printed. (A list of new loans is automatically produced every time the loans program is run.) At regular intervals the renewal letters must be printed. When it becomes uneconomic to replace lost cards individually, the complete sets must be renewed using the NEWCRDS program.

To be done:- For each loan: find book and user cards, and later refile them.
For each return: find book card and later refile it.
For each batch: the data must be taken to the computer.
the LOANS program must be set up and run.
At intervals: production of a loan list using LISTING,etc.
printing of renewal letters.
replacement of individual book or user card.
replacement of all book and user cards.

Cost of these procedures in one period =

n(FindCS + FindCU) (c + u) + n(FileCS + FileCU)c

\+ n(FindCS)c + n(FileCS)c
\+ (take/collect)c
\+ (set up LOANS)C + n(LOANS/loan + LOANS/return) C
\+ (set up LISTING,etc) (C/t) + (LISTING/loan list entry)LC/t
\+ (set up LISTING,etc) (C/p) + (LISTING/renewal letter)UC/p
\+ 3nc/2k (punch card)
\+ kC/BP [(set up NEWCRDS) + (NEWCRDS/new card) (2S + U)]

Cost of the computerised loans system for one period (assuming File = Find) =

$$
\begin{aligned}
& n(4c+u)(\mathrm{FindCS}) + n(2c+u)(\mathrm{FindCU}) + c(\mathrm{take/collect}) \\
+ & \big[(\text{set up LOANS}) + (\text{set up LISTING,etc})(1/t + 1/p) \\
& \qquad + (\text{set up NEWCRDS})k/BP\big]\, C \\
+ & \big[n(\text{LOANS/loan \& return}) + (\text{LISTING/loan list entry})L/t \\
& + (\text{LISTING/renewal letter})U/p + (\text{NEWCRDS/new card})k(2S+U)/PB\big]\, C \\
+ & (\text{punch card})3nc/2k
\end{aligned}
$$

(iii) Comparison of loans procedures

To obtain a figure for the saving which will be made by using the computerised loan system rather than the manual one, the cost of the computerised system given should be subtracted from the manual cost.

Saving to be made by using the computerised system per year =

P (cost of manual system for one period - cost of the computerised system for one period)

(iv) Catalogues - manual system

The assigning of UDC and accession numbers to new items is identical for both the manual and computerised systems, so this can be ignored in both. The cataloguer will continue to the writing out of the information on sheets for the typist; equivalent to coding it for punched cards. An average of 2 UDC and 2 author cards must be produced for each entry and then filed in the catalogues. Old, damaged or missing cards will have to be replaced when found.

To be done:- For each item: 2UDC & 2 author cards must be prepared.
the four cards must be filed.
As required: damaged or missing cards must be retyped and refiled.

It is assumed that A is small compared to S, so that S remains constant over a year.

Cost of these procedures in one year =

$$A(\text{type 1 card})c \;+\; 3A(\text{duplicate card with alterations})c$$
$$+\; A\left[2(\text{FileC2S}) \;+\; 2(\text{FileC2S})\right]c$$
$$+\; 4S/D\left[(\text{type card}) \;+\; (\text{FileC2S})\right]c$$

Cost of manual cataloguing for 1 year =

$$(A \;+\; 4S/D)c(\text{type card}) \;+\; 3Ac(\text{duplicate card})$$
$$+\; (4A \;+\; 4S/D)c(\text{FileC2S})$$

(v) Catalogues - computerised system

As described for the manual system, the classifying and coding of the new items can be omitted as it is identical for both systems. The data for each new entry must be punched on cards, and these added to the files by running ADDTNS, ASORT, MERGE & FILE programs. Every time a new batch of items is added to the files an accession list of them must be printed, and after every Kth batch it will be necessary to produce a complete up to date set of the catalogues. The computerised catalogues include an accession list giving full bibliographic details of the items, but this does not count as an extra benefit, because it is needed to run the system.

To be done: - For each new item: bibliographical details must be punched onto cards.
For each new batch: ADDTNS, ASORT, MERGE & FILE must be set up and run.
Accession list of items to be printed.
Every K sets: new accession list, author index and UDC index to be printed.

Assumptions: Number of sets of entries per year = A/a
New catalogues will be required $(1/K \times A/a)$ times $= A/Ka$ times per year.

The number of listings produced each year will be
$(A/a - A/Ka)$ accession lists of "a" items
$+$ A/Ka accession lists of S items, UDC indexes of 2S items and author indexes of 2S items.

Cost of these procedures in one year =

$$
\begin{aligned}
& A(\text{punch cards})s \\
+ \; & A/a\ (\text{set up ADDTNS, ASORT, MERGE, \& FILE})C \\
+ \; & A/a\ [a(\text{ADDTNS \& ASORT/item}) + S(\text{MERGE \& FILE/item})]\ C \\
+ \; & a(A/a - A/Ka)\ (\text{LISTING/accession})C \\
+ \; & SA/Ka(\text{LISTING/accession})C + A/Ka\ [2S(\text{LISTING/author}) \\
& \qquad + 2S(\text{LISTING/UDC})]\ C \\
+ \; & A/a\ (\text{set up LISTING})C + 2A/Ka\ (\text{set up LISTING})C
\end{aligned}
$$

Cost of the computerised system for one year =

As(punch cards)
+ CA/a [(set up ADDTNS,ASORT,MERGE & FILE)
+ (set up LISTING) + 2/K(set up LISTING,etc)]
+ AC(ADDTNS & ASORT/item) + SC(MERGE & FILE/item) A/a
+ AC(1 - 1/K + S/Ka)(LISTING/accession)
+ 2ACS/Ka [(LISTING/author) + (LISTING/UDC)]

(vi) Comparison of the catalogue procedures

To obtain a figure for the saving which will be made by using the computerised cataloguing system rather than the manual one, the cost of the computerised system should be subtracted from the manual cost.

Savings to be made using the computerised system per year
= cost of the manual system for one year
- cost of the computerised system for one year.

(vii) Total savings from the computerised system

To obtain the figure for the saving to be made in one year by using the computerised system, the savings made in the two parts of the system (sections iii & vi) should be added together. If the result is negative, the value gives the extra expenditure which will be incurred by running the computerised system.

Discussion of the general cost equation

The cost equation given in the last section is completely general for the systems specified. One or two minor assumptions have been made, but the equation could be applied to any library. In the next sections it is simplified and applied to Taylor Woodrow. For normal use in the libraries of the construction industry this simplification should suffice, but in a library with different circumstances the librarian might wish to use the general form or the intermediate version in Appendix B. The times for local programs could then be inserted.

The cost equation gives a complete comparison of the running of a computerised and a manual library housekeeping system, excluding ordering. It does not give the total cost of either, but the difference in cost of running the two systems. The cost of setting up the system has been excluded, though this may be considerable if a large catalogue has to be converted into machine readable form. However, it is impossible to include the cost of this as it will depend completely on what has to be done, and what facilities are available locally. The setting up cost must be compared with the benefits of computerisation, including the possibility of producing a KWIC index.

There is no element of equipment cost in the equation, as no special equipment is needed for either system. The capital cost of the computer will be included in the charge for its use (C), whether for a bureau or an in-house machine. The cost of punched cards will be covered by the cost of the punch operator's time (s). The system required no terminals or other equipment.

If it is felt that the cost of catalogue cards is significant, the cost of the time of the clerical staff in the library should be increased to cover this. If the computerised system were modified to make use of other equipment, or discs and tapes were charged separately, the cost of rental could be subtracted from the final figure for the annual savings.

The only assumptions in the equation are that it takes the same time to find a card in a file as it does to file one, that the loss of cards may be averaged according to their life, and that everything is done regularly on time. It is not possible to consider the two parts of the equation, the loans and the cataloguing in isolation, as some of the items for one part may be integral to the operation of the other. For example, the taking of the programs to the computer and collection of the results (take/collect) for the cataloguing system will be done with the loans. Thus to consider the cataloguing as a separate entity, an element of cost would have to be added to the computerised system to cover this. The equation must therefore be considered as a whole, and only as a means of comparing the running costs of the computerised and manual systems.

Simplification of the equation

In Appendix B, the equation has been simplified in two stages. The first stage has been to put in standard times for filing, the life of cards, and running times for the programs. The second stage involved assumptions about likely relationships between the variables in a normal library. For example it was assumed that about 45% of the loaned items would have to be recalled, and that of these about a half would require renewal.

It has been difficult to obtain figures for the running times of the programs, as the computer will not record the Central Processor Unit (CPU) time for a run. At the end of each printout, the computer prints out the time for which the program was on the computer, and charges for it. However, this is not a totally satisfactory method of charging from the user's point of view, since it can vary considerably. The times given for the processing of a given amount of data were far from uniform and this has made the calculation of standard running times very difficult. The main reason for this is the time taken by the operator to perform operations. For example, if the card reader jams, it may be several minutes before he attends to it, depending on what else he is doing. A more uniform method is to record the CPU time, the length of time for which the computer is actually calculating. This would give a uniform time for a given job, but would not be as satisfactory from the costing point of view, since large amounts on input and output would be under-charged. However, it would only be by recording the CPU time, that consistent running times would be obtained. As the computer at Taylor Woodrow will not give this, the values used in the equation are the best average overall running times.

It has also been difficult to obtain times for standard operations such as the filing of cards. J.L. Schofield (1974) says that times vary considerably even for the same people. It is possible to obtain reasonable data for one library, but it could not be applied to another. N. Metcalf (1974) agrees with this, but both suggest that a time of $\frac{1}{2}$ minute for filing one card in a large file is reasonable. Schofield suggests that this should be tested in the library. A test run was done, and as a result the time used in the equation was reduced to 20 seconds. This may be due to the small size of the file at Taylow Woodrow. Aslib is looking into the problem of standard costs, beginning with a formula for the time to abstract and index articles (B.C. Vickery, 1972).

Standard times are therefore not really precise for library operations, but the figures used in the equation are an attempt at the most likely values. This is a major problem in basing an equation on the unit costs for operations.

The simplified equation

The two stage simplification of the equation gives the following result.

Total savings in pounds per year with the computerised system =

$$c\,[11.2A + 0.86S + 4.95nP - (\text{take/collect})\,P - 0.375nP(\text{punch card})]$$
$$+\ 0.75nPu - 1.5As$$
$$-\ C(1.9 + 0.017n + 0.0046L)P$$
$$-\ C[54 + 0.9U + 0.012S + 0.014A + A/a\,(7.5 + 0.004S) + A/K\,(-0.01 + 9/a + 0.04S/a)]$$

where c = library staff cost/minute

u = borrower's cost/minute

s = staff (outside the library) cost/minute

C = Computer cost/minute

S = number of items in stock

A = number of acquisitions/year, added in batches of "a"

n = number of loans/period, P = number of periods/year

L = number of items on loan

K = number of sets of additions between each set of new catalogues.

(take/collect) = time in minutes to submit program for running and collect the output

(punch card) = time in minutes to punch, or have punched, one replacement card when required.

In this simplification, the resulting equation could be reasonably applied to any normal, small, industrial library. The variables, for which values have to be substituted, are cost variables, the statistics of the library, and three decisions. These three are the size of batches in which the acquisitions will be added to the files, the number of loans which will be entered at a time, and the permissible number of updates before a complete new set of catalogues is needed. It was thought initially that the library would normally want new catalogues after about every fifth update, as for the loans; but it was found that this figure produces large changes in the equation, so it has been given an assumed value in the simplification. Librarians may select a value in specific cases after determining the costs. Various examples are now considered using the equation.

Results from the equation

The library data for Taylor Woodrow given in Appendix A are inserted in the simplified equation, leaving the staff and computer costs as variables. It is assumed that K = 5. The resulting equation is as follows:-

The savings from the computerised system in a year (in pounds) =

$$15700c + 1092u - 1800s - 1740C$$

in which c = cost of library clerical staff/minute
u = cost of library users' time/minute
s = cost of punch operator's time/minute
C = computer cost/minute.

At Taylor Woodrow, these values are currently: c = £0.040/minute
u = £0.055/minute
s = £0.0333/minute
C = £0.667/minute

The net loss per year is therefore - (£628 + £60 - £60 - £1165)
= £537 per year.

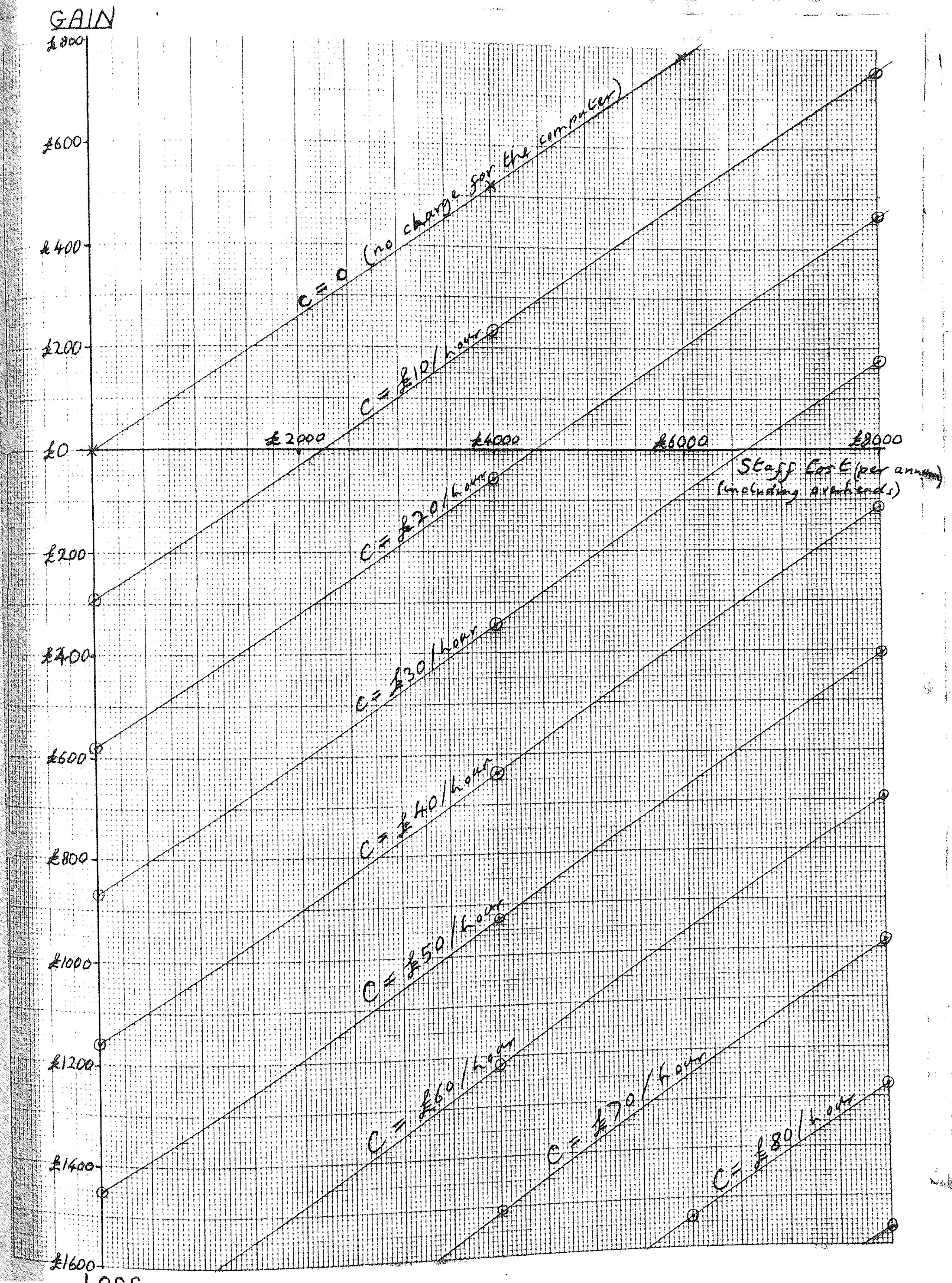
It can be seen from this that the two costs which at Taylor Woodrow are not charged to the library, the users' time and the punch operator's time, are not only small, but cancel each other out. If the are omitted, the saving per year is reduced to

$$£(15700c - 1740C) \text{ per year.}$$

The next page gives a graph of this expression for different values of c and C. The computer charges are given in pounds per hour, and the staff cost as an annual cost including overheads, which may be double the salary actually paid. A. Armstrong (1972) suggests even trebling it for library staff.

The cost of the computer is obviously very important when considering whether it is worth computerising. At some firms the company makes little charge to the library for its use of the computer. In such cases the library must make a saving by computerising, though the company as a whole may not. At Taylor Woodrow, the current internal charge to the library is £40/hour, and it can be seen from the graph that the library staff would have to be costing nearly £9,000 p.a., before the computerised system is cheaper to run than the manual one. Even with the present high rate of inflation, this is not likely to happen for quite some time. It therefore seems that the operation of the computer system at Taylor Woodrow will cost more than a manual one. Before considering the benefits which may be derived for this cost, it is necessary to consider other significant variables.

Graph showing gains or losses from using the computerised system per year at Taylor Woodrow for different staff and computer costs.



Appendix B also gives the results of the equation for the probable size of the library in a few years. The resultant annual saving is

$$25800c + 1560u - 1800s - 2350C$$

For the same values as before there is a loss per year of

$$- £\ (1030 + 86 - 60 - 1566) = £\ 510/\text{year}.$$

The resulting loss is therefore slightly smaller than the current one, though only by £27. If one assumes that there is a 50% increase in staff cost and only a 25% increase in computer costs over the next 2½ years, the loss is only reduced by a further £135 to £375 per annum. Thus if the stock increases, even if the increase in staff costs continues to outstrip the rise in the cost of the computer, then the loss on using the computer will only fall £50/year. H.F. Dammers (1971) suggests an increase in the cost of labour over the computer of 20-30% per year, which would give a result more to the advantage of the machine system.

However, the changes produced by most of the variables is small. As mentioned previously, the frequency of production of the catalogues (K) is one of the most significant variables in the equation. From the figures in Appendix B, it takes 52 minutes to produce a complete new accession list of all the stock currently held by Taylor Woodrow, 74½ minutes for an author list and 84½ minutes for a UDC list. With the computer costing £40/hour, a complete new set of catalogues costs £141. Thus, any time it is possible to save a run, there is a saving of nearly £150.

From the figures for the current situation new items are added to the files every three weeks, so for (K = 5) new catalogues are produced every 3 - 4 months. Even if the catalogues are never renewed, the computerised system would still cost £116 a year more than its manual counterpart. After the proposed growth of the library, running the computer system without new catalogues would save £146, and if the rising staff and computer costs are taken into account, there is a saving of £375 p.a. If K is chosen as 7, the computer system would only cost £22 more to run than the manual one. This would occur if the catalogues were only renewed every 6 months, by which time entries of about 560 items will have been available only in the 6 supplements. These figures show that for a greater turnover the greater expense of the computerised system is slightly reduced, but that the difference in cost between the manual and computerised systems could be completely offset by increases in staff costs, if the catalogues are renewed only after 6 months (K = 7). The internal costing of computer time at Taylor Woodrow is discussed below.

The equation applied to library G

In order to see how effective the equation would be for larger libraries, it has been applied to the largest of the libraries studied in Chapter 3, Library G. Both its stock and its number of loans are five times as great as at Taylor Woodrow, though the number of new acquisitions is comparable. The T.W. cost figures were used to calculate the saving or loss from computerisation. The results are that if (K = 5), there will be a loss of £1,678 per year, but that this would be eliminated if no catalogues were produced. This result is similar to the findings in the last section for Taylor Woodrow.

The cost figures used in the equation

The figures used in the equation for the cost of staff are taken as double the salary. For Taylor Woodrow the cost used for the library staff is £4,800 per annum, whereas for Library G a figure of £4,000 has been used. The reason for the difference is that all the staff at Taylor Woodrow are either qualified or experienced, and are therefore on a higher salary than those at Library G, where younger inexperienced staff are used for the routine clerical work. This difference in the level of staff must be taken into account when considering the amount of staff time saved by the computerised system.

At Taylor Woodrow, there is a charge for the use of the computer of £40 per hour, and the same value has been used for computer time in Library G as well. This figure is presumably based on the running costs of the computer department plus some element for depreciation of the machine. However, the head of the technical information group feels that this is not the true cost of use, because if a specific job was not run on the machine, the company would not save £40 per hour. The figure is a mechanism for internal accounting, and the company would still have to pay for the cost of the computer and its staff, even if it were not used. At the present there is spare time on the computer, and he feels that any saving in staff is therefore a net gain if it only uses this spare time. However, for accounting purposes it is necessary to include some figure for the cost of the computer, and the internal charge of £40 per hour is the most appropriate. If it is known how much extra expenditure actually is incurred by the company for a one hour run on the computer, the graph on page 6.24 could be used to show the true savings from using the system.

Validity of the equation

It can be unwise to build up overall costs from specific activities because minor changes in individual values may make a considerable difference to the overall result when the operations are repeated many times. This is a particular problem with library activities, which as discussed on page 6.18, may take very varied lengths of time, how long it takes to file one card will depend on the size of the card, the number of other cards in the file, the thickness and age of the cards, the number in a drawer, the clarity of the entries, the person doing the filing, and even the time of day. It has thus been extremely difficult to obtain standard times for manual operations, and, as discussed previously, for program run times too. This may cast doubt on the validity of the approach.

With operations taking such different times, it is equally likely, however, that minor errors will in fact average out over the repetitions rather than compound. This will be particularly so provided no one variable dwarfs the rest. In the equation, for the size of library considered, the variables contribute fairly evenly. Domination would only occur for a library with a very large book stock, for which the catalogues would become all important. However, even for Library G, which was the largest of the industrial libraries surveyed, this has not happened significantly. While the basis of the equation cannot be fully justified, the results show it to be reasonable, and there is no method of obtaining a general expression other than by considering unit costs. Without a general expression, application to libraries of very different size and use becomes impossible, and the construction industry libraries reviewed in Chapter 3 vary considerably.

It therefore seems reasonable to accept this type of equation as the best available tool for general application, even though it has its faults. While other analyses have concentrated on the cost of running a system in a given establishment, the cost equation gives a formula for application to any small library.

The cost of the library

The equation only gives a figure for the extra expenditure which will be incurred by using the computerised system rather than the manual one; it does not give the total cost of the operation. However, the additional cost must be compared with the total cost of running the library, to see how significant it is. Alan Armstrong (1972) has given a formula for working out the cost of the time of a member of the library staff based on his salary, but taking into account all the library's costs. It applies to industrial libraries in companies with more than 100 employees, which includes all the construction companies.

$$\text{Selling price per person per hour} = \frac{(\text{Annual salary} + 26\%)}{1950} + (175\% \text{ to } 225\%)$$

The figure of 26% includes all the company's contribution to National Insurance, pension, absence or sickness, luncheon vouchers, etc. The figure in the second bracket covers the cost of running the library in terms of equipment, postage, telephone, heating and lighting, subscriptions to Aslib and similar bodies, books, journals and accommodation. It is the accommodation which produces the difference between 175% and 225%. If the library is outside London, the figure should be around 175%, while libraries in Central London should allow at least 225%.

To obtain the total cost of the library per hour, the salaries of all the staff should be included. To convert this to a cost per year, the result must be multiplied by the number of working hours in a year (approximately 1800). The formula can then be re-written as:-

Cost of the library per year = 3.49 (Total salary bill) $\mp$ 8.3%
where the 8.3% would be added for libraries in Central London
ignored for most libraries on the edge of London
subtracted outside London.

Using a salary of £2,000 p.a. for clerical staff £2,500 for experienced staff, and £3,000 average for qualified staff, the total cost of the library at T.W. is £38,500 per annum. For library E, which is in Central London, the figure would be £140,000 per annum. Thus the £540 and £1,700 losses from computerisation are only of the order of 1 - 2% of the total costs of the libraries. One and a half per cent is a small proportion of the total bill for the library, but it is necessary to consider the benefits received in return.

Benefits of the computerised system

Non-financial benefits of computerisation were considered in Chapter 5 on page 5.26. It is, however, worth reviewing some of them for consideration with the cost increase derived from the equation.

There are one or two features of the computerised system, which are not included in the equation, because they have no counterpart in the manual system. Prior to computerisation reservations of book has had to be remembered or recorded on paper; but with the new system, the computer can notify the librarian when a book is returned which is wanted by someone else. Each user has a card and a black listing could be noted on it. When the librarian tries to lend him a book he would find the note on the card. Provided there is sufficient time to analyse them. The statistics available from the system should enable the librarian to improve the service, and indicate the subject areas in which the greatest amounts of effort should be concentrated.

The computerised system also provides the possibility of producing lists other than those specified. For example, if all members of a company were registered with the library, the programs could produce a telephone directory. It was mentioned that the accession list by itself is not a benefit, but it can be made to serve additional purposes. With all the data kept in machine-readable form it would be possible to produce a KWIC index to the stock of the library, and this would only need to list the accession number, for the user to obtain the full bibliographical details for the entry from the already existing accession list. As discussed in Chapter 3, this is perhaps the most useful computer application for an industrial technical library. For stock taking, the librarian can have a printed shelf list of all the books in first UDC number order. It would be difficult to use the classified section of a card catalogue as a shelf list.

With computerised systems, extra copies of the catalogues can be produced very cheaply, whereas producing duplicates of a card catalogue is expensive. Appendix B (page B10) gives the costs of different methods of reproducing a card catalogue of the size which would be required at Taylor Woodrow. With the computerised system, up to 4 carbon copies could be produced with the normal runs for only the extra cost of the interleaved carbon paper, while a special run to print author and UDC indexes would cost £106. This must be compared with £2,000 for a typed copy of a comparable card index, £350 for a xeroxed copy, and £260 for microfilm. These costs could be reduced for second and subsequent copies, but microfilm would require appropriate readers and is not well received by library staff or users. It would therefore be expensive to supply copies of a card catalogue regularly to branch libraries or offices.

One advantage of the computerised system lies in its ability to handle increases in the size of stock. The equation indicated that for the projected increases over the next couple of years, the extra cost of the computerised system over the manual one will fall by only £27, but will be further reduced by £135 for the greater increases in the cost of staff. However, with a growing stock the frequency with which the catalogues are updated becomes increasingly significant. Renewing them after every fifth update makes the computerised cost £375 higher than the manual one, but if more supplements were accepted, the computerised system would become cheaper for the increased stock. This would be normal, as one would expect to renew a larger catalogue less frequently.

However, the main advantage of the computer as the stock increases is that its use can be increased gradually without further work. A little more computer time can be allocated to process a few more records, but a new member of staff is taken on only when the labour situation has become most accute, and he then requires the time of others as well as himself to learn how to operate the procedures. A large backlog can build up in the manual system before the new member of staff settles in.

These benefits must be balanced by the disadvantage of being at the mercy of the machine. The computer may breakdown when needed most desperately. Tape and disc files may be damaged and require recreation. The geology department of a large university reported (personal communication) that someone inadvertantly "cut 11 feet out of the middle of a data tape" completely destroying a large amount of work. If the company buys a new computer, the programs may have to be adapted for it. Perhaps worst of all, the data is not available to hand. There will always be a built-in delay, in that the new data will be batched and output will probably be even less frequent. A card catalogue is a continuously updated on-line file dependant on no machinery. Only the individual librarian can balance these benefits, disadvantages and costs for his library. A general rule can not be set, but it is possible to consider the value of the system generally.

Discussion of the value of the system

The system was described in Chapter 5, and the cost differences, benefits, and disadvantages have been given in this chapter. It now remains to see how far the system meets the requirements of small libraries, although it was suggested in Chapter 3 that the construction industry libraries surveyed would mostly not benefit from computerisation. The few which might do so are the libraries of the firms of consulting engineers and those of the larger contractors involved with design and research. The principle advantages for them would be the possibility of duplicate copies of the catalogue for distribution to offices and branches, and the possibility of KWIC indexes, Libraries which insist on the recall of overdue material would benefit from computer-produced recall letters, but they might find it better to change their policy. The possibility of having loan records in a form where they could not get lost or misfiled, linked with regular checks in the form of the renewal letters, would certainly be attractive in some libraries.

The system fulfills these needs and others, but it costs more to run than a manual equivalent. However, computer cost may not be so important to the library as staff costs. In the present economic climate staff time is at a premium, and the nature of industrial work means that it is better spent assisting a visitor to the library with his problem rather than running a system. In this, of course, the computer helps, and as discussed on page 6.27, Taylor Woodrow considers any reduction in staff time is worth while. The company will save £628 of staff time (about 100 hours) per year, but at the internal cost of £1,165 (29 hours) of computer time.

The final criterion is whether the library is saving the company more money by its existence than it costs to run. If so, and there is a need for more staff, then the company is being very short-sighted not to provide them. If the library then manages to save staff time by persuading the company to provide it with some computer time, even at greater cost, then this may in fact be beneficial to the company in the long run. The cost considerations are also based on the assumption of full utilisation of the computer and the staff, while in many companies there is in fact spare capacity on the machine. These considerations are discussed for Taylor Woodrow on page 6.27.

T.K. Burgess (1973) at the Washington State University has adopted the same approach of considering comparable manual and computer systems. He gives a graph which he claims is general for circulation systems, in which the computerised and manual costs only become equal for a monthly circulation figure of about 25,000 loans. It is therefore suprising that the system at Taylor Woodrow is so nearly equal in cost for such a small circulation though his operation is of a completely different scale. A recent set of tables produced this year (C.J. Tucker, 1974) gives costs for different forms of catalogue production. His data are not directly comparable, but would give a figure of about £26 for the production of a catalogue of comparable size to the accession list at Taylor Woodrow, which at present costs nearly £35. The difference in cost may be due to the flexibility of the printout program.

Potential improvements to the system

If starting the programs again, there are two improvements which could be made to the system. Firstly it would have been simpler to write them in another high-level language, as discussed on page 5.2 . This might also have provided facilities for variable length records, which would have been more economic than the fixed length ones dictated by Fortran, even though the programs permitted the authors, titles and publishers to vary in length with the fixed overall length. The number of active characters in each bibliographic record varies considerably; some originally even exceeding the allocated 450 characters. Since many are very short, much wasted space could have been eliminated and hence the time for processing reduced.

Secondly, up to half the number of bytes used to store the characters could have been saved. The smallest adressable unit in Fortran is the 2-byte half word, and this was thus used to store single characters, although they use only one byte of the two. By rearranging the format of the records, it should have been possible to store most of the information as pairs of characters in the half words. This would have saved storage and since input and output consumes most time on the computer, the reduction of data would have saved processing time and should therefore have been done.

The only other thing which could have been done to cut the running time concerns the production of catalogues. This is a time consuming part of the system (see page 6.25), and a reason for the high cost is that a general printing program has been used. If the formats of the output had been specified exactly, processing for the listings would have been much cheaper. However, the system would have lost its flexibility. Were these changes to be made to the system it would become cheaper, and might show significant savings against the manual system. However, this cannot be shown quantitatively, and must remain speculative.

CHAPTER 7

C O N C L U S I O N S

Computer use in libraries

Libraries of all types are spending over half a million pounds a year conducting research into possible applications of the computer in their work. By March 1973, this expanding field had produced at least 425 operational systems; and new and improved ones continue to appear. Many of them have been written up in the literature, but there are insufficient accurate cost figures.

The computer becomes increasingly economic when the data held are used for different operations, so integration of ordering, cataloguing and issue systems is desirable. In the last two years first Dorset and then West Sussex Public Libraries have announced the completion of fully integrated systems to cover these areas of library housekeeping. Other libraries are also working towards this end, some integrating cataloguing with circulation control, and others with ordering. One or two dedicated computers have now been brought into service.

At Taylor Woodrow an integrated loans and cataloguing system has been developed. Detailed costs are established and expressed in a general form for any small technical library. For this purpose a small library may be taken to mean one with no more than 3 qualified and 5 clerical staff.

The construction industry

The principal contribution of special libraries to the development of computerised library systems, has been in the areas of Selective Dissemination of Information and Information Retrieval. However, in the construction industry, company libraries have been largely uninvolved. The activities of construction industry libraries vary considerably and depend very much on the personality of the person in charge. One or two of the larger firms of consulting engineers are considering using the computer for information work, but have not so far computerised any parts of their housekeeping systems.

Most of the companies in the industry have an in-house computer which would be available to the library, but the librarians differ in opinion as to whether it would be worthwhile using it. Most of them are deterred by the prospect of converting their files, and the experience at Taylor Woodrow shows this fear not to be unjustified. Some would be prepared to computerise, but as yet see little gain, while others are totally opposed to the machine on any account.

Most company libraries in the construction industry are small, and the most useful contribution which the computer could make to them would be the provision of KWIC indexes. Some of the libraries would like a system for keeping loan records and sending recall letters regularly. Those with branch libraries would benefit from being able to distribute copies of the catalogues and reduce the duplication of coding by centralised production. One library is considering making a charge for its services to the projects which use them, and this might be more easily done on the computer than manually.

Computerisation of a company library in the construction industry

An initial feasibility study of all the functions of the library at Taylor Woodrow (Appendix C) proposed some improvements to the existing manual procedures, and suggested that an integrated computerised loans and cataloguing system could be beneficial to the library. It would not be efficient to computerise general ordering or the cataloguing of a collection of trade literature. The study also suggested an investigation of the ways engineers gather information and make use of it. This suggestion is discussed later in the proposals for further work.

The integrated system was programmed and implemented in the library at Taylor Woodrow. It handles the cataloguing of all the library stock, with provision for separate collections, and maintains loan records, including permanent loans. British Standards, Codes of Practice and maps have their own indexes, and so are not included in the catalogues; but they may still be loaned using the computer system. It will also handle reservations of items, and a flexible printing program can provide many possible lists.

The data for the book stock were already held on punched cards, but there were still considerable problems in implementing the new system. The old format had to be completely revised with new identifying numbers, and a considerable backlog of old loans had to be recorded. As some had been out for several years they were difficult to trace. This check also uncovered material which had never been catalogued and which then had to be entered. Conversion to the new system was difficult, not so much because it was computerised, as because the new procedures brought to light problems in the manual arrangement which had previously remained undetected, and these all had to be cleared.

Computer considerations

The system is written as a general one to handle the housekeeping of any but the smallest libraries in the construction industry. It is designed to be run on an in-house computer, such as is found in most construction companies. However, this can cause problems, as an in-house machine is often bought to do design calculations, and may not be suited for library operations. A bureau service, however, would be considerably more expensive. Mathematical work requires extensive manipulation of small amounts of data, while information involves large amounts of data and very little processing.

It was therefore the intention in the library system to make the programs as machine independent as possible so they could be operated elsewhere, by writing them in a high level language. The obvious choice was Cobol, but this was not available on Taylor Woodrow's in-house machine. Instead, Fortran, which is a scientifically orientated language had to be used. This had a number of draw-backs, and some sorts and other standard file handling programs had to be specially written because the utilities available could not handle the necessary operations with Fortran records. However, it has been shown that a reasonable system can be produced in Fortran, and it should be possible to transfer it to other computers with little difficulty.

In-house computers have a number of other problems. When the company decides to change to a newer model it can cause great disruption, and may require reprogramming; and delays also occur when the machine is out of service. Camden's circulation system recently suffered a crisis situation when, due to NALGO action, the computer staff were on strike, but the library staff were not. Finally, there is little check on local programming. It is very difficult to check whether programs operate as efficiently as possible, and an overall comparison of costs with other libraries may not reveal inconsistencies, particularly when there are different accounting procedures involved.

Cost of computerisation

The costs were evaluated by development of a general equation for the difference in cost per annum between the computerised system and a comparable manual one. This equation was progressively simplified by replacing variables with data from the system at Taylor Woodrow, and then including probable relationships between variables, as found in industrial libraries in the larger construction companies. The simplified form of the equation is as follows:-

Savings in pounds per annum from using the computerised system rather than a manual one =

$$
\begin{aligned}
& c\ 11.2A + 0.86S + 4.95nP - (\text{take/collect})P \\
& \qquad\qquad\qquad\qquad - 0.375nP\ (\text{punch card}) \\
& + \ 0.75nPu \ - \ 1.5\ As \\
& - \ C(1.9 + 0.017n + 0.0046L)P \\
& - \ C\ 54 + 0.9U + 0.012S + 0.014A + A/a\ (7.5 + 0.004S) \\
& \qquad\qquad\qquad\qquad + A/K\ (-0.01 + 9/a + 0.04S/a)
\end{aligned}
$$

where c = library staff cost/minute
u = borrower's cost/minute
s = staff (outside library) cost/minute
C = computer cost/minute

S = number of items in stock
A = number of acquisitions/year, added in batches of "a"
L = number of items on loan
n = number of loans/period, P = number of periods/year
K = number of sets of additions between each new set of catalogues.

(take/collect) = time in minutes taken to submit programs for running and collect the output.

(punch card) = time in minutes taken to punch or have punched one replacement card when required.

This equation can be applied to any library, but a librarian wanting a more basic version into which he could insert his own data, could use the general form given on Pages 6.10 - 6.15, or the intermediate form in Appendix B. Application of the equation will give a librarian figures for the savings or extra expenditure which would result from using the computerised system in his library, rather than a comparable manual one.

Results of the equation

At Taylor Woodrow, it was found from the equation that the computerised system saves about 100 hours of staff time a year, at the cost of about 29 hours of computer time. With the values assigned to these by the company's accounting procedure, this means that the computer system costs about £540 a year more to run than a comparable manual system, but a projection of likely size and cost increases over the next few years suggests that it will fall slightly. When applied to the largest library in the survey of the construction industry, the equation suggested that there would be an extra expenditure of about £1700 per annum from using the computerised system, based on similar charges. Both of these increases are about 1½% of the total running cost of the libraries as calculated by Armstrong's formula. This is a small increase in cost, but it must be weighed against the benefits of a computerised system. It represents an increase in internal computer cost against a saving in staff time in an overworked library.

Benefits of computerisation

The most important advantage of a computerised system is that its use can be gradually increased to meet a growing demand on the library services, whereas new staff normally have to be employed one at a time. At libraries with several branches, copies of the catalogues can be produced for distribution at very little extra cost. Some offices may also want copies. The disadvantage of this form of catalogue is that it is always slightly out of date in that it records the state of the computer files only at the last time of printing. A card catalogue can be as up to date as the acquisition system, but the cost of reproducing it would be prohibitive. Other benefits were set out on Pages 5.26 and 6.30, so it is only necessary here to say that they exist. Whether these benefits are deemed to offset the 1½% increase in running costs and the problems and capital costs of conversion are a matter for the individual librarian.

The costs from the equation are expressed in terms of cost savings for the library staff, punch operators, engineers, and the computer. In some of the literature it has been argued that an increase in overall cost yielding a saving in staff time is beneficial. This view is rejected on purely financial grounds, but there may be anomalies in the structure of companies which make this arrangement advantageous to the library. Many computers are under-utilised, so that saving processing time would not necessarily save money; and some libraries find it easier to obtain extra computer time rather than new staff. It may be beneficial for the library to automate, without being so far for the company as a whole. The computer charges made to departments may be irrelevant, as the machine has to be paid for whether it is used or not. The charge does not then represent the extra cost to the company of its use in a specific case.

The effect of different library variables

The most important variables when comparing the costs of a manual made for computer time. If no charge is made for the computer, the computerised system must save the library money. Similarly, at one of the libraries reviewed, the computerised system is cheaper for the library only because the cost of the punch operators' time falls not on them, but on the computer department. The other significant variable is the frequency with which the catalogues are replaced. With a net cost of nearly £150 for this, the total annual loss of £500 represents only about 3 new sets of catalogues. A library must therefore play off the currency of its catalogues against the cost of replacement.

Summary of conclusions

1. Libraries in companies in the construction industry are almost all small and have access to in-house computers.

2. Some of the librarians of these libraries are interested in using the computer in their libraries, but some are totally opposed to the idea.

3. The level of library activity in construction libraries is very dependant on the personality of the head of the unit.

4. The most useful application of the computer would be to produce KWIC indexes, but it could also be used for general cataloguing and issue systems in some companies.

5. An integrated cataloguing and loans system has been written in Fortran and implemented in Taylor Woodrow's library; and the costs are evaluated in a general form. The system too is general and could be applied elsewhere.

6. At Taylor Woodrow the new system saves 100 hours of staff time for 29 hours of computer time a year.

7. From charges in the internal accounting system in the company this represents an increased cost of about £500 per annum, and it should fall slightly over the next few years.

8. The computerised system currently increases the overall running cost of a library by about $1\frac{1}{2}\%$.

9. The advantages of the computerised system are:-

A greater flexibility to growth

The provision of copies of the catalogues

More accurate records and less misfiling

More information on the use of the library stock, and greater control of its circulation.

10. The general cost equation may be applied to any library to give comparison of the costs of the computerised system with a fully manual equivalent.

PROPOSALS FOR FURTHER WORK

There is little further work which can be done on the computer system itself, except that the head of the technical library and information group at Taylor Woodrow is writing a program to produce the KWIC index. As already discussed, a KWIC index is one of the major advantages of computerisation, and will form a very valuable addition to the system. The main areas for further work are in the first field of research suggested from the feasibility report (see Page 4.5). Having completed a detailed study of the library and the formal information channels in the company, it should be possible to use this knowledge in examining the informal information structures using an SDI system.

Before the formation of the Royal Society, there was an informal group of scientists known as the 'invisible college'. Today there are still informal 'new invisible colleges' of all the really active workers in a field (D.J. de S. Price, 1965). There are usually about 100 scientists in each, who communicate results to each other long before publication. The members of such a group in sleep research have been identified (S. Crawford, 1971 & R.R. Korfhage, 1974), and it would be interesting to see whether new invisible colleges exist in the branches of a technological subject like engineering. It would seem reasonable to expect that there would be one consisting of those working, for example, on the properties of concrete.

A.W. Pearson (1973) looked at the benefits of information systems and concluded that innovation is sparked off by surprise contacts, not formal systems. T.J. Allen (1968) examined this question, and found that communications from within a company are much more effective than those from outside. He looked at the communication of information in several firms and identified what he called "technological gatekeepers": people who act as informal channels for information. R. Jungk (1972) has carried this further, identifying 5 types of people involved in information transfer. At Pilkingtons, an attempt has been made to identify and support the work of the natural technological gatekeepers, whatever group or department they are in (B. Yates, 1970).

Recently the Wessex Regional Health Authority has appointed an "information broker" to a planning unit (M. Valdex, 1974). She was a full member of the unit for two years and her work was to facilitate internal and external communications for the group. Gatekeepers have a similar role, but a major difference is that they have acquired their knowledge and position naturally as part of a more specific job (A. Wilkin, 1974). However, it is very clear that the informal information workers contribute considerably to the flow of information within a company, and in 1972 it was suggested that an investigation should be carried out to consider the informal information structures at Taylor Woodrow, and identify the technological gatekeepers. It might then have been possible to set up a system something like that at Pilkington, but designed for engineers.

As the system was proposed it was hoped also to evaluate SDI based on weighted terms. A proposal was put forward for a simple system of photocopied abstracts indexed in-house to provide individual profiles for the staff. The computer would select a specified number of the most relevant abstracts determined from weighted keywords. The output would be followed up to see what items had already been found by the users and their sources. At the same time the users would be asked to say what they had found which the system had missed, and what use they had made of all the information. From this data it was hoped to be able to evaluate the performance of the system, identify the informal sources of information in the company and provide some measure for the value to the users of information which they received.

This research project was not adopted, at the time, because it was felt that the computerisation of the library housekeeping system was of more immediate importance. However, it would still be possible for a company to carry out this work; as it gives a number of returns from one project, in addition to providing a service. It would, however, require considerable co-operation from the engineers concerned. The Company accepted the need for such information dissemination and started a series of current awareness bulletins.

Several information workers have pointed out that a user does not usually want all the literature on a subject, just a few of the most relevant references (e.g., W. Ashworth, 1974 & A.G.A. Pickford, 1971) B.C. Vickery takes this further (1971), pointing out that every user is different and that each one will therefore want different precision from a system. The only way this can be done is to allow the user to state how many references he wishes to see and find the most relevant. The proposed SDI system would have achieved this by using weighted terms, and supplying only the specified number of abstracts per month.

K. Sparck Jones (1972) says that weighted terms give improved results. S.E. Robertson (1974) has reviewed the subject, and he and M. Dillon (1974) say that further study should be carried out.

A recent review of cost-benefit techniques accepted that methods of quantifying the ultimate benefit of information have still to be developed, and suggested using the concept of the "hit": an item of information which the user would otherwise have obtained for himself (M.S. Magson, 1973). However, it was hoped to obtain a better measure of the financial value of information than that. Obviously general knowledge cannot be expressed in cash terms, but by following up the information supplied to each user, it should be possible to identify direct uses and evaluate them.

This project would make good field for research, which could yield benefits in all three areas. The use of weighted terms could be developed in a simple system, the informal sources of information and technological gatekeepers could be identified and encouraged, and it might be possible to evaluate the financial benefits of the information supplied from the system. At the same time the company would receive the benefits of an individual SDI service. While a knowledge of the library and the formal information channels in the company would be needed, this might have to be on a more company-wide base, rather than the limited area of the feasibility study at Taylor Woodrow.

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APPENDIX A

DATA FROM OTHER LIBRARIES

A sample of libraries in the construction industry was selected and studied in detail. With the exception of some libraries in architectural practices, all those contacted were willing to co-operate and were very helpful, allowing me to look at their systems and discuss their local situation. Some of the librarians were unwilling to admit that they had any difficulties until they were given examples of worse cases elsewhere, and then they were glad of a sympathetic ear for their troubles. More contact between construction industry libraries would help to show them that most of the problems are common and enable them to try the solutions adopted elsewhere. Someof the estimates by the librarians are exagerated.

The libraries divide into 5 types of parent company in the construction industry. In addition two computerised libraries outside the industry are reviewed, and the loans system of a large steel company is examined in detail. The types of library are as follows.

Large Civil Engineering Contractors (with research laboratories)	TW, A, B
Other Builders and Contractors	C, D, E, F
Consulting Engineers	G, H, I, J
Quantity Surveyors	K
Architects	L
Miscellaneous	M, N, P

The figures given in each case are those collected, and are not directly comparable. For direct comparisons see Table 4.

LIBRARY TW

This large Civil Engineering Group consists of 56 companies employing 11,000 staff in the UK and overseas offices. The library was set up about 14 years ago under the Design & Research Department, and there are no branch libraries. Technical construction problems are usually referred directly to the Research Laboratories, so normally only requests for specific items come to the library from sites. The laboratories have an autonomous collection of specialist literature run by an information scientist, but they make considerable use of the library.

Users - 300 people locally use the library, mostly from the company. 60% of use is from the Design & Research Department, 27½% from the rest of the company, 10% from other companies in the group and 2½% from sites.

Staff - 2 qualified library or information workers and 2 experienced, but unqualified staff.

Stock - About 5000 items catalogued (an average of 2 copies of each).
About 100 journals are taken, most of them circulated. They are kept for different lengths of time, but so far only weekly publications have been discarded.
The stock is as follows: 1720 text books, 450 BRS publications, 250 C&CA publications, 50 Highways Research Board Papers, 60 HMSO reports, 140 CIRIA publications, 25 BSCA and 110 RRL publications, 570 internal reports, 220 technical notes (internal), 1050 items in files by subject.
In addition there are 2450 copies of British Standards, Codes of Practice, etc. + maps + old drawings held on aperture cards filed by job.
Text books are filed by UDC, and British Standards and reports by type and number.

Acquisitions - The library adds about 50 text books, 42 reports and 40 entries in files to the catalogue per month on average.
The library acts as a buying agency approving all book purchases for the company, but it puts them through the company's Buying Department.

Loans - About 1420 loans recorded per year, 700 items on loan at a time.
Items bought for other departments loaned as 'permanent loans'.
Reference material and journals not officially loaned, but exceptions are quite common. Lose a few items. Photocopies often given.

(i) Old system

Loans recorded by the 3-slip method. 2-week loan period.
Items recalled by telephone when wanted, otherwise by letter when time permitted (very rarely).
British Standards, etc., are recorded by a card for each copy. When borrowed, the users name and department are written on the card and transfered from an "in" box to an "out" one. Over half of the British Standards are out on loan. This work has not yet been transfered to the computerised system.

(ii) New system

Loans recorded on the computer by presenting the book and user cards together. Exceptions are lent manually.
Recall letters replaced by renewal letters.

Inter-library loans - About 860 items a year recorded in an inter-library loan book and on special slips.
61% from the BLL, 16% BSI, 10% local public libraries, 1% other public libraries, 2% university and college libraries, 4% research associations, 3% DOE, 2% THE, 1% other companies.

Trade literature - The collection of trade literature is very small and rarely used. Items are filed by CI/SfB broad subject headings.
The collection has no index. There is a Barbour Index in the Architects Department. The old catalogues are sometimes referred to, but other queries are answered from such publications as "Specification".

Catalogues - Computer produced accession list, author index, UDC index and KWIC index. The construction industry version of the UDC schedules is used, and provides the only subject index to UDC.

Library management - No information required regularly, but the librarian keeps some statistics for his own use, and these are sometimes collated when management wants information on the library.
The library has an annual budget for literature, but still needs ... items costing over £5.

Computer - The company has an in-house IBM 370/135 with three disc and four tape drives. This is used to produce catalogues, and to record loans and reservations in the new system. The library plans to introduce a journal control system on the computer.

LIBRARY A

Library A is the main library for the whole of a large civil engineering contracting group. It is suituated on the outskirts of London in the Research and Development company and has one satelite library in the head offices. There is a collection in Manchester run by one girl full time, 12 libraries with part time staff and several unattended collections on sites. None of the part time staff are qualified. The main library services all the others, and individuals all over the country.

The information department is divided into 4 facets: the libraries, a central computerised index of all the correspondence passing through the firm, publications (a technical house magazine, technical publications, films, slides, exhibitions, etc.), and specification vetting.

Users - potentially 2-4000, but the actual number is not known, since they use the individual libraries and are scattered. There are about 100 at the main library and 1000 at the head offices.

Staff - The library comes under the head of the information department.
At the main library there are the group librarian, 2 assistant librarians, and 3 clerical staff.
At the head office there are 1 librarian and 2 clerical staff.

Stock - About 1800 books, 7,000 pamphlets, reports, cuttings, etc.
About 350 journals. No maps are kept.
Collections of internal R & D reports and British Standards.

Acquisitions - The library adds about 5,600 items a year of all types of material for both libraries. Have occasionally discarded old pamphlets.
Buy books, journals, etc., for other departments.

Loans - About 40 loans recorded per day from both libraries (45% of them from the branch library).
3-400 items on loan at one time, 200 pamphlets.
Items bought for other departments loaned as 'permanent loans'.
Loans recorded by 4-part slips (1 filed by author, 3 by date due)
Loan period 1 month. Two of the slips sent as recall letters, then a letter asking the borrower to pay for the lost item.

(Loans continued)

Few overdues reach the letter stage, but they do lose some items when users leave.

Quite a lot of photocopies are given away, but as they are not charged to the library, no record is kept.

Inter-library loans - About 900 per year, recorded separately from normal loans.

Trade literature - Trade literature kept in Barbour Index type folders by manufacturer. Keep about 3,500 items, but continual turnover.

Card index of subject headings based on CI/SfB.

1200-1800 new items per quarter, 1/3 rd for the libraries.

Would like to use the computer for trade name, manufacturer and CI/SfB indexes, but feel it may be too difficult.

Catalogues - Card author and UDC indexes + subject index to UDC.

Author index also contains some names and titles, eg Acts, Bills.

Separate abstracts index using optical coincidence system and locally produced thesaurus. Entries being reduced because of overlap with commercial services. British Standards and internal reports not included in the index.

Catalogue cards are centrally produced at the main library.

About 4 cards are required per item for the main library and it produces copies for the branch library.

Library management - no information is required outside the library, but the librarian produces quarterly figures.

Computer - The library has access to an in-house IBM 370, which they use for the correspondence index. Data is punched off-line, checked through a PDP8, and recorded on the IBM machine. Few corrections are entered later, and the files are printed quarterly and annually, after which the tapes are cleaned. The programs were developed locally.

The library would be prepared to consider any computerised operation, but is interested in trade literature indexes and cataloguing. The typists object to the current repetative typing of cards, and the librarian would like to eliminate this.

L I B R A R Y   B

Library B is attached to the research laboratories of a large Civil Engineering Contractors, and serves the staff of these laboratories almost exclusively. There are at least 3 other collections with engineers looking after them full time. Staff are difficult to keep owing to the location. Since the laboratory staff are specialists the librarian allows them to keep items for long periods, as they are unlikely to be required by others.

Users - The laboratory staff are about 200 in number, and mostly use the library.

Staff - 1 qualified librarian and 1 clerical assistant.

Stock - 18,000 books and reports (his estimate)
180 journals, all circulated (his estimate)
From comparison of the shelving with other libraries, these figures must be too high.

Collections of photographs, slides British Standards, etc.

Acquisitions - About 650 books a year (16 - 149 per month)
about 100 slides a year (0 - 21 per month)
about 170 photos a year (0 - 40 per month)

Loans - 15-20 loans/day (his estimate), average over 4 days = 7 (my estimate)
6000 items on loan (his estimate),1300 (my figure).
No loan period - 50% returned within days (his estimate).
Recalls done over the telephone - librarian claims he can obtain 90% of the material within 10 minutes, but admits that sometimes there are problems.
Loans recorded on two slips filed by borrower and author.
Reference material borrowed, and arbitrary due date given.
About 36 photocopies a month produced.

Inter-library loans - About 670 per year (43% BLL, 26.5 CICRIS, 30.5 others.)
Inter-library loans recorded separately from other loans.

Trade literature - kept by UDC order, but not indexed. A fairly constant 21 items are received a month.

Catalogues - Author and UDC indexes held on cards, and a subject index incorporating local variations. Items by company staff are given a special UDC number. Up to 4 UDC numbers may be allocated to one item.

There is a separate card index for slides, based on keywords from a modified form of the Construction Industry Thesaurus.

Photographs are indexed from the same thesaurus in an optical coincidence system.

There is an index to tests on products giving UDC numbers.

Entries in the main file are in black for books, etc., and red for journal articles.

Library management - Monthly figures given to the director showing acquisitions, inter-library loans, number of photocopies, etc.

Computer - Library has access, but does not use it.

Soils Research Section have a computerised IR system for soils reports (internal job reports).

LIBRARY C

Library C belongs to a civil engineering and building contractor with divisions in civil engineering, building, mining, foundations, property, dredging, etc. The building side was reduced about 2 years ago, and civil engineers were put in charge of everything. The library was originally set up to serve the civil engineering side, and is still concerned predominantly with this type of work. The company has about 7000 staff, and 50% of its operations are overseas, so the library deals with a lot of foreign material, such as colonial building notes. Literature from the sites is stored in the basement, largely uncatalogued.

Users - The librarian estimates about 500 regular users, mainly local engineers doing civil engineering design work, with some queries from overseas and sites.

Staff - The library used to have a staff of 6 who did in depth indexing, but this number was reduced when it became the "reference centre", and the current staff is 2 experienced, but unqualified staff.

Stock - 5-600 text books + reports, pamphlets, Encyclopedia Britanica.
About 120 journals taken and most circulated. (There is a sheet for each copy giving the circulation list, and a card index of journals seen by each user. Circulation slips are typed for each issue when necessary. A check is made annually.)
Text books are shelved by UDC, with separate collections of British Standards, and publications by CIRIA, DOE, CIRIA, etc.
The library has collected some files of information on special topics.
Withdrawn standards have to be kept since jobs are done to the standards of one specified year.
Feedback from sites is very poor. The library would like to build up its collection of job histories, but at present present this is spasmodic. The librarian is encouraging project managers to make sure that jobs are written up.

Acquisitions - About 65 items added a month, of which 40 cost over £2.
Material is bought when wanted, and the librarian tries to salvage documents when sites close down. Only buy about a dozen new text books a year, excluding duplicate copies.
Receive more than 500 reports a year.

(Aquisitions continued)

Purchases costing more than £2 require a written order, and before decimalisation is was calculated that such an order cost 15/- to process. Books are also purchased for other departments.

Loans - There are 3 loans systems in operation.

(i) For text books, users write their name on a card in the book and leave it in the library. There are 24 books on loan.

(ii) Reports are loaned by the borrower writing his name in a loan book. 2 items are borrowed a day, and 24 are on loan.

(iii) British Standards are kept in envelopes in numerical order. A borrower writes his name and department on the front and replaces the envelope the other way round. When 'in' the number shows in black, when on loan it is in red.

There is a 3-week loan period, but items are not recalled until after a month.

Purchases for other departments are entered in the catalogue giving their location (the name of the borrower and department.

Some material is lost, but departments are charged for any item which is not returned.

Originals are only lent to local offices; otherwise photocopies are made.

Inter-library loans - About 1 a day, recorded in a book.

The library makes use of BLL, ICE, BSI, etc., and collects and returns items by messenger whenever possible, to save time.

Trade literature - The library is on the mailing list of 600 companies regarded as essential, but the data are checked annually.

Catalogues are kept in folders by company in boxes filed alphabetically. Only complete folders may be borrowed.

The library receives about 1 new item a day.

There is a subject headings list.

The Buying Department also keeps trade catalogues, and the Architects Department has a comprehensive collection.

Catalogues - The text books have author and alphabetical title indexes.

There is a simplified subject index to the UDC, but no UDC index.

The BSI Yearbook is underlined to show which standards are held.

Accession numbers allocated to books are only used to check the book card when an item is returned, but gives order of purchase.

(Catalogues continued)

The library keeps a large subject index of articles, selected reports, books, old inter-library loans, etc. A locally produced thesaurus is used. Interesting articles in the journals are marked by those on the circulation lists, for inclusion in this index.

Library management - The library used to keep a record of staff time spent and what was done, but this was found not to serve any useful purpose, so it was stopped. The library has a budget, but does not make charges for its services. Although this was discussed, the directors decided to "split all charges down the middle."

Computer - An in-house computer is available, but the library has not considered using it. The librarian would not be keen on the idea.

L I B R A R Y D

Library D is in part of a firm of builders and contractors in the Midlands. There is a separate civil engineering branch in the company. The firm has grown rapidly over the last few years. Library D is the only library, and is run by the security officer part time. It is open only 2 hours a week, except by appointment.

Users - About 40 people use the library, some of them students, and some staff from sites.

Staff - 1 part time unqualified staff.

Stock - 400 text books.
British Standards are bought by the Buying Department, and specifications are held by the Estimating Division.

Loans - There are not many loans, and they are recorded in a book while the librarian is present.

Catalogues - Have a list of library books and own catalogue system. For example, there is a section for books for students and one for calculating tables, etc.

L I B R A R Y   E

The company is a large building firm with about 4000 employees. but no research department. Until a few years ago it had a large library and information department, but this has faded away; possible merely because the two women running it left. At present the library is housed in the office of one of the secretaries who has no library knowledge or experience. She is hoping to expand it, particularly the trade literature. The library is open at any time.

Users - There are four companies in the group, and staff come from all of them.

Staff - 1 part time unqualified secretary

Stock - About half a dozen text books,"all the relevant British Standards"(probable about 150), a Barbour Index and a complete collection of telephone directories.
Journals are sent direct to departments, butthe library does keep a copy of Architects Journal.

Acquisitions - There are not many new items, as most departments buy their own. Some material is charged to the library budget.

Loans - Borrowers enter their names and the titles in a book themselves. The library does no photocopying.

Inter-library loans - none.

Trade literature - At present there is just a Barbour Index, but this is not satisfactory, so the secretary is hoping to expand the collection. She intends to develop a card index using the CI/SfB classification for relevant literature. The cards will be by manufacturer with subjects covered.

Catalogues - no list of library stock.

Library management - The library has a small budget.

Computer - There is a large computer installation in the company.

L I B R A R Y   F

Library F belongs to a building and civil engineering contractor with one subsidiary. The company employs about 1500 people, and has sites around the country. It has recently moved its offices, including the library, out of London.

Users - About 12 people locally and some on sites.

Staff - 1 person a minimum of the time.

Stock - About 200 text books, and collections of C&CA, CIRIA, DOE Publications, Building Regulations, etc.
Maps are kept in another department.

Acquisitions - All items are bought through the Buying Department, so the library only orders for itself. About 10 text books purchased a year.

Loans - Borrowers fill in the details in a loan book.

Inter-library loans - A number of items are obtained from BLL, ICE, etc. When the library was in London, they made considerable use of the surrounding libraries in the Victoria Street area, but now things are more difficult.

Trade literature - The company gave up its Barbour Index a few years ago. Trade literature is now kept in the Buying Department.

Catalogues - There is only a list of books with numbers.

Library management - Times are hard financially, so there is little growth of the library.

Computer - The company's computer would not be available for library use.

LIBRARY G

The company is a large firm of consulting engineers and architects, with five offices in London, 8 other major ones in this country, sites and overseas offices. It has wide interests and several thousand jobs to its credit. There is a main library in the centre of London, with a branch library nearby. There are two independant libraries with qualified staff in Edinburgh and London, a small collection in Cardiff, and 12 office libraries throughout the country. The main library also has connections with several libraries overseas, two of which have full time staff. The Geotechnics Division set up its own library about 2 years ago. The main library handles about 21,000 enquiries a year.

Users - There are potentially 15,000 users worldwide, but the use is predominantly from about 400 users at the main library and about 200 at the branch one.

Staff - 7 qualified and 8 clerical staff at the main library, and 2 qualified librarians at the branch library.

Stock - 5,000 text books, 12,000 reports & 10,000 pamphlets.
250 journals are taken, 100 kept indefinitely, others discarded after 6 months for weekly issues, and 1 year for monthlies.
Drawings are kept on 35 mm film, and maps are kept by the Geotechnics Division.
The library has an important collection of job reports.
Items in the library are shelved by UDC.

Acquisitions - 3-400 text books per annum, with 500-750 pamphlets.
Bibliographies from literature surveys are also kept.

Loans - About 7000 loans a year recorded at the main library and about 6000 at the branch library.
Loans are recorded by two slips filed by borrower and author, and the data on them are restricted to author, title, borrower and copy. Accession numbers are allocated to books but not used.
There is officially a 1 month loan period, but items are not recalled unless required.
Items are recalled by phone, because "engineers take little notice of written requests."
The library is notified when staff are leaving and recalls all outstanding items.

(Loans continued)

Journals may be borrowed by the surrounding offices if they are no longer current (3-4 issues old).

Articles from recent journals and requests from overseas are usually photocopied in the library rather than loaned.

Journal circulation has been discontinued, and the library distributes lists of interesting articles instead.

Inter-library loans - About 500 per year, perhaps 70% of them from BLL.

The company has a subscription to Lewis's.

Trade literature - About 10,000 manufacturers' catalogues are kept, filed by manufacturer.

There are card indexes to the collection. The cards have the manufacturer's name, the types of products, and trade names, and are filed under each entry.

Comments are included on the cards, giving the experience of the company in using the products.

Catalogues - The librarian does stock taking every 3 years, and has found that some items do go missing.

The main library produces catalogues for all the libraries and maintains a union catalogue. It has author and UDC indexes; and has a card subject index to UDC, though there are few alterations to the regular schedules.

Five cards are required for the main library for each item, and 12 copies are mimeographed for the other libraries.

Up to 4 UDC numbers may be allocated to one item, and the librarian says he would find a limit of two restricting.

Job reports - One member of the staff has been appointed to collect information on jobs. This is filed by job number, and indexed with a local thesaurus for an optical coincidence system.

There are four card indexes to the job number: by client, architect, contractor and subcontractor, with comments of experience in the past.

Jobs reports are a major area of the library, and it is being considered whether the data could be indexed on the computer.

Library management - Statistics are kept on loans, enquiries and literature surveys.

The library has an annual budget.

The services of the library are not normally charged to projects, except that in some cases expensive work may be; for example, large photocopies to be sent abroad.

Computer - The company has a computer, but the librarian feels that the present economic situation might make it difficult for the library to obtain time on it.

The librarian has considered the use of KWIC, but has not pursued the idea.

The library tried to use the computer for project information, but the computer department were busy. Nothing will be done on this in the near future.

LIBRARY H

Library H is a small one serving a large group of computer and civil engineering consultants. There are about 5 autonomous branch libraries which make calls upon the services of the main library. The library acts as a buying agent for the surrounding offices, some of which keep their own collections. The library is very cramped and most of the journals are kept in offices.

Users - About 1000 in offices in the area, 250 of them actually have items out on loan.

Staff - 2 qualified librarians and 1 clerical assistant.

Stock - 2000 text books, separate collections of British Standards and some 1" OS maps.

About 275 journals are taken, but only about 30 are kept in the library and another 20 in offices.

Acquisitions - About 45 orders are sent out per month to many different suppliers. (In March 1974 there were 46 orders to 30 suppliers)

About 120 British Standards are ordered a month, with 3 OS maps and about 225 other items.

Probably 70% of the items ordered are in response to requests.

Loans - About 4500 items are borrowed a year, and the figure is increasing about 600 each year. 50 of these loans are to the branches and 10 to sites.

There are 1500 items on loan to 250 borrowers, and 13% of these have more than 10 items on loan. One user has 64 loans.

Loans are recorded by 3 slips filed by borrower, author and due date. The loan period is 6 months.

Recall slips are typed every two weeks.

About a half of the material is returned when recalled.

The library loses some items.

Maps may be borrowed, but have no accession numbers.

Literature bought for other departments is not recorded as loaned.

If photocopies are required, they are done in departments, as they can be charged to a project.

Inter-library loans - About 225 a month, fairly constant over 3 years.

Inter-library loan request forms are filed by author until they arrive and then by date due for return.

Trade literature - The departments keep their own trade literature.

Catalogues - Accession numbers have been discontinued, but copy numbers are still given.

There are an author index, a UDC index, and a subject index to the UDC all held on cards. There have been some modifications to UDC, such as putting Building and Civil Engineering together.

The author index has coloured cards for the branch libraries.

The catalogues contain a few old permanent loans.

British and foreign standards are indexed separately on cards, but only by number and country. Accession numbers are written on the copies, but not marked on the cards.

Library management - Old orders are kept filed with stationary requests.

Annual statistics of loans and inter-library loans are prepared for internal use.

Computer - have access to the company's computer service, but no use is made of it. The librarian considered a computerised journal circulation system, but found that the staff moved around too fast for it to be practical. As computer time is sold on a bureau basis, the company might be unwilling for the library to take up time on the machine.

LIBRARY I

The company is a partnership of consultant civil and sturctural engineers (4 partners, 2 consultants and 15 associates). The library serves the main offices and acts as a backup service to an autonomous library in the Belfast branch with 1 part time member of staff. The library is short of space, but is just about to move from the centre of the offices to a larger area in the basement. The library is situated in the centre of London.

Users - 300 potential local users, of whom 60-100 actively use it, with occasional requests from sites and cutside offices.

The Bradford office has an IR system set up with assistance from the central library.

Staff - 2 qualified and 3 clerical staff.

Stock - 4-5000 text bocks, pamphlets and reports.

The library takes about 100 journals, but is having to change to an agent who delivers, because there have been considerable delays with the post, particularly being in London W.C.1.

The stock is shelved by UDC, but some sets of reports are filed separately.

The library keeps a collection of 1000-1500 job reports.

Acquisitions - 2-3000 items are purchased a year, but series are not indexed, and other material is disposed of. About 5-600 items are added to the catalogues a year.

The library acts as a buying agent for all literature for the company. It has an account with an agent, but makes purchases from the simplest source.

Loans - About 10,000 loans are recorded each year.

A borrower writes his name, room number , and the book's author, title and the date on a cash register-type slip in triplicate. The top copy is kept in the book, and the others filed by the first letter of the author and the transaction number. Telephone and room number are not useful, because the engineers move around too much.

The loan system is used for all items, including journals and British Standards.

The third slip is unused. The librarian used to file it by borrower, but found that the time spent outweighed the gains.

(loans continued)

There is no loan period, but the librarian recalls items by letter when they have been out for 3 months.

If an item is wanted, it is recalled by telephone.

Items purchased for departments are not entered as permanent loans until after the first 3 months. By this time most of the borrowers are prepared to allow the library to keep the item; so there are very few permanent loans.

If users want photocopies, they arrange this for themselves.

Inter-library loans - About 500 inter-library loans are recorded each year in a diary by date of return.

25% are from the BLL, 25% from ICE & 25% from the DOE.

The company has no Telex, but expects to use the BLL more when it gets one. Requests by letter are slow, so the library borrows most of the items from local libraries, sending a messenger to collect and return them in batches.

Trade literature - A collection is kept in boxes by CI/SfB.

There are no indexes, but the names of manufacturers are written on the outside of the boxes.

The librarian says they use trade directories and have found no need for their own index.

Catalogues sometimes have to be split for classification.

Catalogues may be borrowed.

Catalogues - The library has card author, UDC and subject indexes.

They use the full UDC schedules, but have one major transposition and a few modifications. Only 3 numbers after the decimal point are used. One or two UDC numbers are given.

The catalogues include the holdings of the Belfast library.

British Standards are indexed on cards (1 card per standard), giving the locations (permanent loans). Ammendments are sent to these copies as they appear.

No accession numbers are allocated.

Job Reports - Details of 4000 jobs are kept in the library, and for the last 1000 much fuller details and reports have been collected.

The data held are: - a data sheet on the job, drawings on aperture cards, correspondence on microfilm.

The jobs are indexed by architect, client, contractors, etc.

Library management - The librarian does not specifically keep figures, but he has to submit a brief report to the partners each year.

The transaction numbers automatically give a figure for the number of loans in the year.

The librarian estimates from Alan Armstrong's formula that the library costs about £26,000 per annum, and is considering charging the library's services to projects. However, costing by items is not fair, and by time spent is very time consuming. He has not yet decided what to do.

Computer - The firm has an IBM 370/135 which would be available to the library. The librarian would not want cataloguing done on the computer, though he might consider a KWIC index. Other activities would have to be done on-line to be of value to him, and this would be expensive.

L I B R A R Y   J

Library J is part of a broad partnership of consulting engineers. The firm has moved out of London to five offices in Berkshire, though there are still a few departments left temporarily in Victoria. There are also about 8 established offices worldwide. The library is temporarily housed on a farm in the country, but should be moving into the town soon. It serves the whole firm, except North America.

The library goes back to the beginning of the firm, but a separate Technical Intelligence Unit was formed about 16 years ago, and subsequently took over the running of the library. The head of the unit considers its work to be probelm solving rather than providing a library service. A member of the library staff who has been with the company for years has just retired, and this is a considerable loss, as his memory provided much of the information. The librarian says that the library is trying to hold its own, but is really cutting back. The library has a good base of indexes, etc, but these are now being neglected, and the librarian, while very friendly, did notreally seem to know quite what was there.

Users - 1000 potential users. The librarian estimates that 3-400 people used the library before the move, but that less do so now.

Staff - 3 experienced, but unqualified staff. There used to be 5, including a qualified librarian.

Stock - No estimate available, but probably about 15,000 items.

80 journals are taken, and all of them circulated.

There are no official retention periods, but holdings are weeded occasionally.

Uninteresting material received is kept in a pile and discarded eventually.

British Standards, Annual Reports and Conference Proceedings are filed separately from the remaining material which is shelved by UDC.

The library has an old collection of data on dams, but this has not been kept up to date over the past few years.

Acquisitions - About 30 items a month are purchased, all through one supplier, and the library is trying to obtain all the journals from one source too.

(Acquisitions continued)

The library is supposed to buy all the literature for the firm.

Items to purchase are selected not by policy, but by inactivity. The library never refuses any request, but nothing is done until the person has requested it several times, thereby indicating that it is really wanted.

An acquisitions list is circulated every month, but the librarian does not like doing this, because it creates more work when people ask for the items.

Loans - Before the move into temporary accomodation there were about 200 loans per month, but it has now fallen to 100.

Loans are recorded by the 3-slip method, and as the date is stamped in the book, the slips can be found from this.

There is no loan period, so permanent loans are the same as normal ones.

Standards are loaned by the borrower writing his name on the catalogue card of that standard. Ammendments are sent round.

Photocopies are frequent since the temporary accomodation separates the library from most of the offices.

Inter-library loans - About 10 per month. In London there were libraries all round the area, but now things are more difficult, and the library is beginning to make use of the BLL.

Trade literature - No effort is made to collect trade literature, but whatever comes in is included with the stock shelved by UDC.

Catalogues - The main catalogue is a card keyword index based on locally developed headings. There are one or more cards per heading,each giving half a dozen entries. The index includes articles.

There is also an old keyword index from the 40s and 50s.

Textbooks have additional keyword, and author indexes.

1 UDC number is allocated to each item for shelving, but there is no UDC index.

Standards are only recorded by a set of cards (1 per standard).

The collection on dams is indexed by type and country, but this is now out of date.

Job reports - The librarian says that they should be kept, but it is difficult to get them written. An independant archivist attached to the library will keep them.

Library Management - No information required by the partnership, and no statistics kept. The cost of the library is not known. There is no official budget, but the librarian has imposed one on himself.

Computer - The company's computer would not be available at the moment, as there is only one terminal in the temporary accomodation, and it is fully used.

The librarian would never possibly consider the use of the computer for his library.

L I B R A R Y   K

Library K is a small one serving the needs of a group of Quantity Surveyors. There are about 7 subsidiary, but almost autonomous libraries, none of which has a full-time or qualified member of staff looking after it. The principal function of the library is the collection and indexing of trade literature. A Barbour Index is not used in any of the libraries, and the librarian runs her own system, which is better and more suited to the needs of the company. She sends copies of everything to four branch libraries. Loans are done independantly, but occasionally a branch library will ask for a book to be ordered centrally. The librarian estimates that her library is one of the largest for quantity surveyors.

Users - There are 110 staff in the offices, of which probably 80 use the library, and there are occasional queries from outside.

Staff - 1 qualified librarian, who works from 10 am - 4.30 pm daily.

Stock - About 500 text books, of which over half are in the basement.
About 1000 reports, pamphlets, etc. There are no maps.
45 journals are taken, and all circulated on free circulation.
There is a set of folders on cost analyses.
Items are shelved by UDC.

Acquisitions - About 1 item a week is bought from the most suitable source.

Loans - 2-3 books and 2-3 cost analyses folders are loaned each week, together with 20-30 items of trade literature a day.
The system is very self service, and users must take photocopies themselves if required. The librarian finds quantity surveyors very self-sufficient.
There is no loan period, and all items are recorded together. The borrower fills in a single slip, which is filed by author.
Items are recalled by phone only when required by another user.
Few books are lost, though some catalogues are.
There are about 400 items on loan.

Inter-library loans - Only borrow about 6 items a year, but obtain 2-3 photocopies a month; usually from RICS or RIBA.

Trade literature - About 2000 firms covered, and all catalogues should be less than a year old.

(Trade literature continued)

The manufacturers' catalogues are indexed and recorded by CI/SfB, with a trade name and a manufacturer index to the CI/SfB numbers.

Catalogues - There is an author index with titles included when they are better known. Items are allocated one or occasionally two UDC numbers from a card subject index to a slightly modified version of the construction industry UDC schedules. There is a UDC index, also on cards.

No accession numbers are allocated.

Library management - No figures are required and none prepared.

Computer - There would possibly be access to an overworked computer, but the librarian can see no value in using it for her library. Another department holds Bills of Quantities on the computer.

L I B R A R Y   L

This architectural practice is a research practice, and does not design buildings. Their stated aim is "to improve building", and to this end they produce reports, bibliographies, codes of practice, indexes, etc. The complete operation revolves round the library, information and the computer. The partnership is divided into 3 groups; one for research, one editorial handling the publications, and one concerned with the data processing. The practice is at present in south London, but is soon moving away, so the library has been largely packed up in readiness.

Users - The practice has a staff of 16 of varied backgrounds; only three of them being architects.

The firm also provides information and information systems to clients.

Staff - The library used to be run by a qualified librarian, but he was not sufficiently flexible, so now one of the staff has responsibility for the library.

Stock - About 5000 text books, reports and pamphlets.

The practice takes 20-30 journals, of which 2 are indexed in depth.

Items are shelved under CI/SfB broad subject headings, but only as a brousing aid.

They build up temporary data banks on special topics, such as bricks or windows.

Acquisitions - About 20 per week.

Loans - No loan records of any kind are kept; items can usually be found with one of the staff. If not, a new copy is bought.

Trade literature - The practice has just discarded its product library, but has access to Barbour's master index.

If the practice is producing a data bank on some subject, it is necessary to collect 100% of the current data, so old information is of no value.

Catalogues - Because of the move of the library, the staff are checking all the catalogue entries and converting any outstanding SfB numbers to CI/SfB.

(Catalogues continued)

CI/SfB is used for browsing and cross-referencing only, not for retrieval. For that the practice has developed its own keyword system based on semantic factoring, using 350 codes. It is now available in French and English. The system can be operated manually on on the computer.

For special data banks, extra keywords are used.

Computer - The computer is a very central part of the organisation, and everything produced in the office is punched on paper tape.The systems were developed in Algol as required; eg, a typesetting program was developed before retrieval was totally satisfactory, because it was needed. The computer produces all types of COM, typesetting tapes, optical coincidence cards, etc. In addition to an in-house PDP8, the practice spends £4-5000 a year on a bureau. Co-crdinate indexing has been done on the machine since 1965.

LIBRARY M

This library serves a part of a government research establishment with very tight security, and acts as a branch of the main library of the establishment.It shares a terminal to the establishment's large computer with other departments. This creates delays, as for security reasons the library cannot be left unattended, so if the librarian is on her own, she must close the library while entering loans, etc. If any of the small staff are away, finding time to run the computerised system can be very difficult.

Users - not known (this is classified information).

Staff - 1 qualified, 1 clerical and 1 part time member, + programming support. The librarian says she could not operate the library without the computer.

Stock - About 5000 text books, a small collection of pamphlets & reports.
There are collections of British Standards, specifications, defence standards, etc.
About 200 journals are taken, but only a few specialised ones are circulated or loaned.
Text books are shelved by UDC.

Acquisitions - All literature for the local part of the establishment is bought through the library as a check.
Five-figure numbers are allocated to all items including inter-library loans.

Loans - Until 1972 the library used the 4-slip recording method.
Now loans are recorded on the computer on-line (but not at the time of loan).
Loans have been reduced to about 2000 per year.
Journals may not be borrowed, but exceptions are recorded by using the journal title.
Literature bought for other departments is issued on permanent loan, and these are recorded manually in the catalogue, but it is intended to include them in the computer system.
Ephemeral material is not recorded at all.
The library gives away photocopies and microfiche whenever possible, rather than lending items.

Computerised loan system

Users complete atranaaction card in the book when they borrow it, giving name, location and phone number. The loans are then entered on the computer in batches.

Inter-library loans are included - they are allocated transaction cards and numbers.

The computer produces a loan list, up to three recall letters, and then a telephone list for items still not returned.

Items can be reserved, and the computer automatically lends the item to the next person on the list after it has been returned by the current borrower. It is not possible to alter this order, except by recording a loan and return to the earlier reservers. This is not often a problem.

Old loans are kept in a file, from which it is hoped to build up a catalogue file. This file may be referred to for recent loans so that the data does not need to be reentered. It is now full, so older data are dumped to tape.

The system was programmed by a local member of staff in a local programming language based on Fortran. It was written as there was underused access to the establishment's central computer via terminals. It was first run on an IBM 360/40 and is now operated on a 370/165. The system can operate with a backlog. The loans system has no connection with the catalogues as currently held.

Inter-library loans - are recorded on the computer system with special transaction cards and numbers.

Half of the loans are from outside (about 1000/year).

The library has a subscription to Lewis's, and some loans from there are kept for considerable lengths of time, and should really be purchased.

The library prefers microfiche to give away, rather than borrowing hard copy.

Trade literature - None kept. The library used to keep it, but no one ever returned it, so abandoned the collection. The scientists now obtain their own.

Catalogues - 50% of the items in Library M are covered by the catalogue of the main library. This is computer produced on microfiche, so it is not possible to annotate the entries. The library therefore also has UDC and author card indexes of local stock. (Entries which appear in the main library's catalogue are abreviated slightly.).

There is a keyword index of all reports (local thesaurus used). The dead loans file will answer such questions as "6 months ago I borrowed a book by Smith on inter-library loan; - what was it?"

Library management - Keep statistics of numbers of loans. Some data are produced by the computer. These are kept and used to support application for more staff.

Computer - The library shares a terminal giving access to the computer at the establishment's main centre. The branch library uses it for recording loans, reservations, recalls, etc. These programs are not used at the main library, and the cataloguing programs at the main library are not used by the branch library. The two libraries are of a totally different scale of operation.

LIBRARY N

The company is a firm of systems designers and electronics engineers. It has 5 offices round the world, but the smallest has a staff of only 2 people. The company was formed in 1962 by a company which was later taken over. It does not manufacture anything, but provides advice on everything from guided missile systems to agricultural work. Sixty per cent of the work is concerned with defence. The company employs about 500 staff, 380 of them professionals. The library is therefore broad and shallow, but with one or two specialities. It is very short of space and some material is very confidential.

Users - About 250 people locally use the library and there are occasional requests from abroad. The library circulates a news sheet to everyone in the company daily.

Staff - 1 qualified and 2 clerical staff.

Stock - 10-11,000 items of all types indexed, including offprints. Standards and specifications are dealt with elsewhere. Job reports are included with the other material.

The library also keeps a collection of company proposals for work. There are 3-400 of them which are pruned regularly.

Books are shelved by UDC, and the remainder are kept by a sequential computer number. Much of the stock is confidential or on restricted access.

About 200 journals taken of which a few specialised ones are circulated.

Acquisitions - About 2-3000 new items are taken every year, but about 2000 are weeded every other year.

The library purchases items for the other departments, and the items are either recorded as permanent loans or become the property of the project and are returned to the client on completion. The Ministry of Defence insist on the latter.

Loans - The library previously used the 3-slip issue method, but have changed to a computer system using a modification of EMPRENT (a network analysis PERT program). The 3-slip method is

(loans continued)

now only used for secret material.

The computer system will not record reservations (these are recorded on paper) and it will not produce recalls (items are recalled by telephone when required, or by a visit). Notes of users waiting for an item on loan can be entered on the loan record, but will not be printed as a message.

The computer system for loans

The librarian fills in the loan details of the book and user on coding sheets which are not kept after entry to the machine. Coding is complex, and could not easily be done by the user. The information coded is the number, author, title, date, date due, borrower and any comments (eg notes of reservations). Similar sheets are used for returns.

The data is kept on a magnetic master tape, and it is possible to sort this to get a list of items on loan to each user.

The librarian says that the library only uses the computer because the data are so few and there is unused punch operators' time in the company. Excluding the punching it takes slightly less time to use the computer system than writing and filing loan slips.

The program is run once per week (about 60 loans) and costs about £15 a run. After 11 weeks (680 loans) there were 400 items still out.

The library prefers to copy items of up to 20 pages and give the photocopy away rather than lend the item; but tries to get the borrower to do this himself.

Inter-library loans - Items are obtained from the BLL, SASLIC, HATRICS & the Defence Research Information Centre. The last named do not recall items, so the company may have 4-5000 items from them out on loan.

Trade literature - The library keeps several thousand catalogues of large systems (not components). They are filed alphabetically by manufacturer, but with no other indexes.

Catalogues - The computer allocates numbers under 28 broad subject headings and two or three current project numbers.

The computer produces an accession list and one index for all authors, report numbers, keywords, UDC numbers, etc.

(catalogues continued)

The data input for each item are the number (allocated by the computer), title, bibliographic data in a square bracket, each entry separated by commas (eg author, report number, date,), and keywords in a curved bracket separated by commas (UDC numbers are included here). The index includes entries for all the data in the two brackets, though it is hoped to produce indexes later for the data in each bracket separately.

It is also possible to search the file by up to 24 keywords (usually 5 or less) linked by AND, OR and NOT. However, the computer will only list 450 items, so a complete list of say reports is not possible.

The programs are written in ALGOL with NEAT segments. Input is on paper tape, and the files are stored on magnetic tape. A disc is used only for sorting the output. All the fields are of variable length.

The files are updated every 3 weeks block by block. Three generations of tapes are kept, and a master copy is made every other run. A complete list is produced every time, because on one occasion the data were nearly destroyed.

Library management - No information is kept because the librarian does not have the time to collect statistics.

The library has a budget and theoretically there is a library committee, but it has not met for some time.

Job reports - These are included in the main index.

The library keeps a manual index to jobs, and holds job sheets giving client, cost, a description of the work, etc.

Other data could be obtained from the contracts department.

Computer - The library currently runs its programs on an Elliot 6130 with 98K of main storage. However, company policy is that machines of a different manufacturer are to be used, and this may pose problems with the NEAT segments in the cataloguing program.

The library currently runs loans and cataloguing programs, but the data for each of them are independant.

LIBRARY P

Library P is totally different from the other libraries studied, and is included because its loan system was examined in great detail. The figures obtained were used in the simplification of the equation in Appendix B. The library and information department serves a large metals company, and has a branch library and close connections with two autonomous "site libraries" serving laboratories. For comparison, the branch library may be nearly as large as the library at Taylor Woodrow. A third of the budget is supplied by charges made for services.

The department is run by a full time assistant director, and consists of a patents section monitoring UK,US, German, Russian and other patents, the administration, and the library and information service. The total staff of the department is equivalent to 27 full time people, of whom six are qualified library or information workers, four are qualified translators, and two are patent officers.

There are about 250,000 entries in the author catalogue and the library takes about 450 journals. The catalogues are currently being pruned to save space. The library provides current awareness literature, undertakes searches, lends books, etc, and does translations. About 90% of the searches can be satisfied from within the library stock.

Loans procedure

When a request for an item comes in, two duplicate slips are written out, one of which is filed and the other is used to send out the item. The slips are given a number (sequential by request), and the file is kept in order by this number. The filed copy is ticked when the item is dispatched, and the other silp is either clipped to it, destroyed, or filed. Most requests can be satisfied by sending a photocopy, in which case the second slip is not required, but for the loan of a book, the slip is filed in a 'live file' of items on loan. The normal loan period is two weeks, but the recall postcards are not written until the staff have time to go through the file: once every month or two. Loans involve the full time of about one and a half people. There is no limit to the number of items one borrower may have. Journals are not "circulated", but about one in 8 goes out to people on "regular loan". Other data are given in the following figures.

Loans procedure at Library P

Average number of transactions per month in total	= 1157		
Average number of transactions from main library	= 713	= 61.2%	
Average number of transactions from branch library	= 445	= 39.2%	

Percentage of requests requiring external loans

at the main library	=	9.2%
at the branch library	=	9.7%

Percentage of transactions which are loans = 26.0%
Number of items on loan at one time = 459
50% of items are returned within $2\frac{1}{2}$ weeks (loan period = 2 weeks).

Number of books on loan which users are waiting for = 127

Number of books waited for by

1 user	= 20
2 users	= 99
3 users	= 5
4 users	= 3

(The last batch of recalls had been sent out more than one month before these figures were collected.)

Number of items which have been recalled but not yet returned = 95

Number of recalls which have been sent for these items = 168

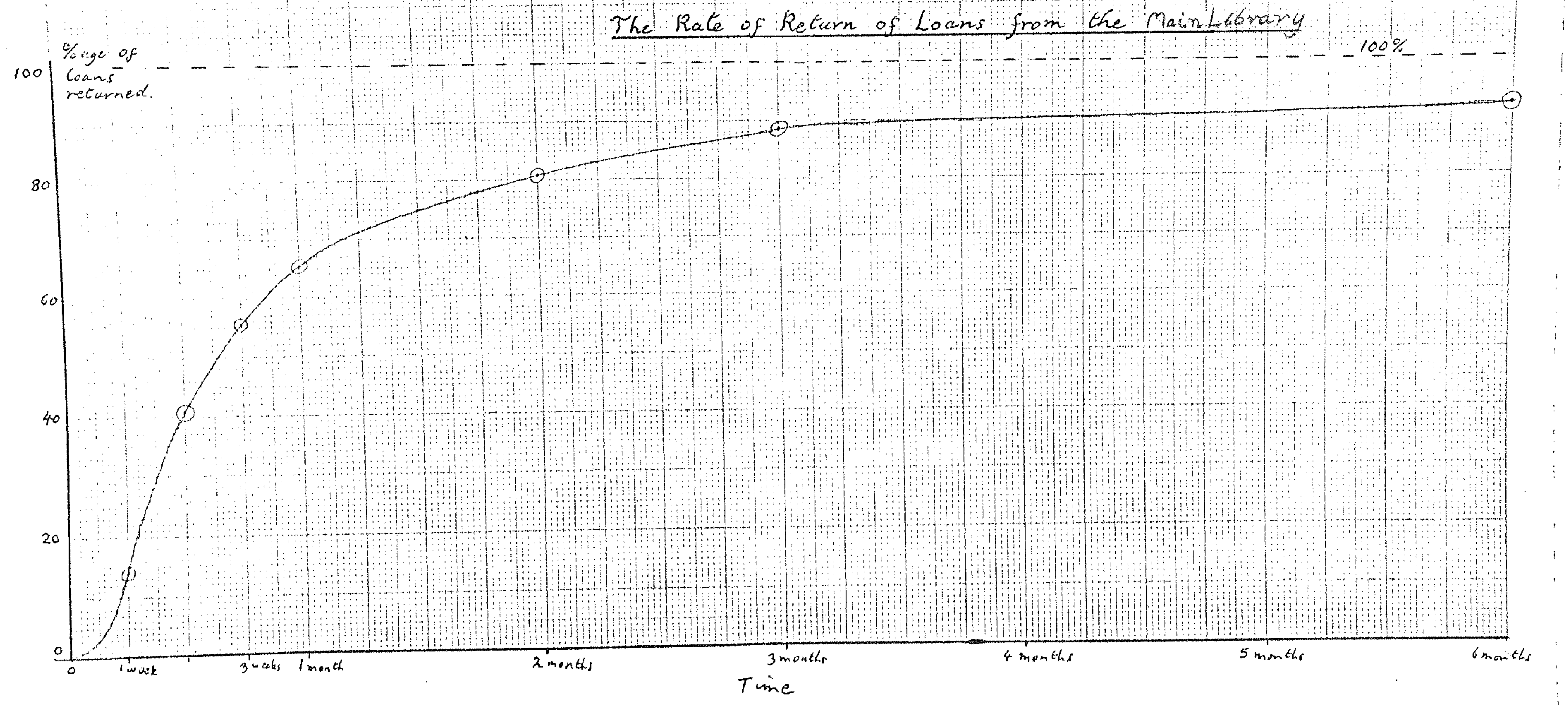
Number of books which have been recalled

once	= 46
twice	= 29
3 times	= 16
4 times	= 4

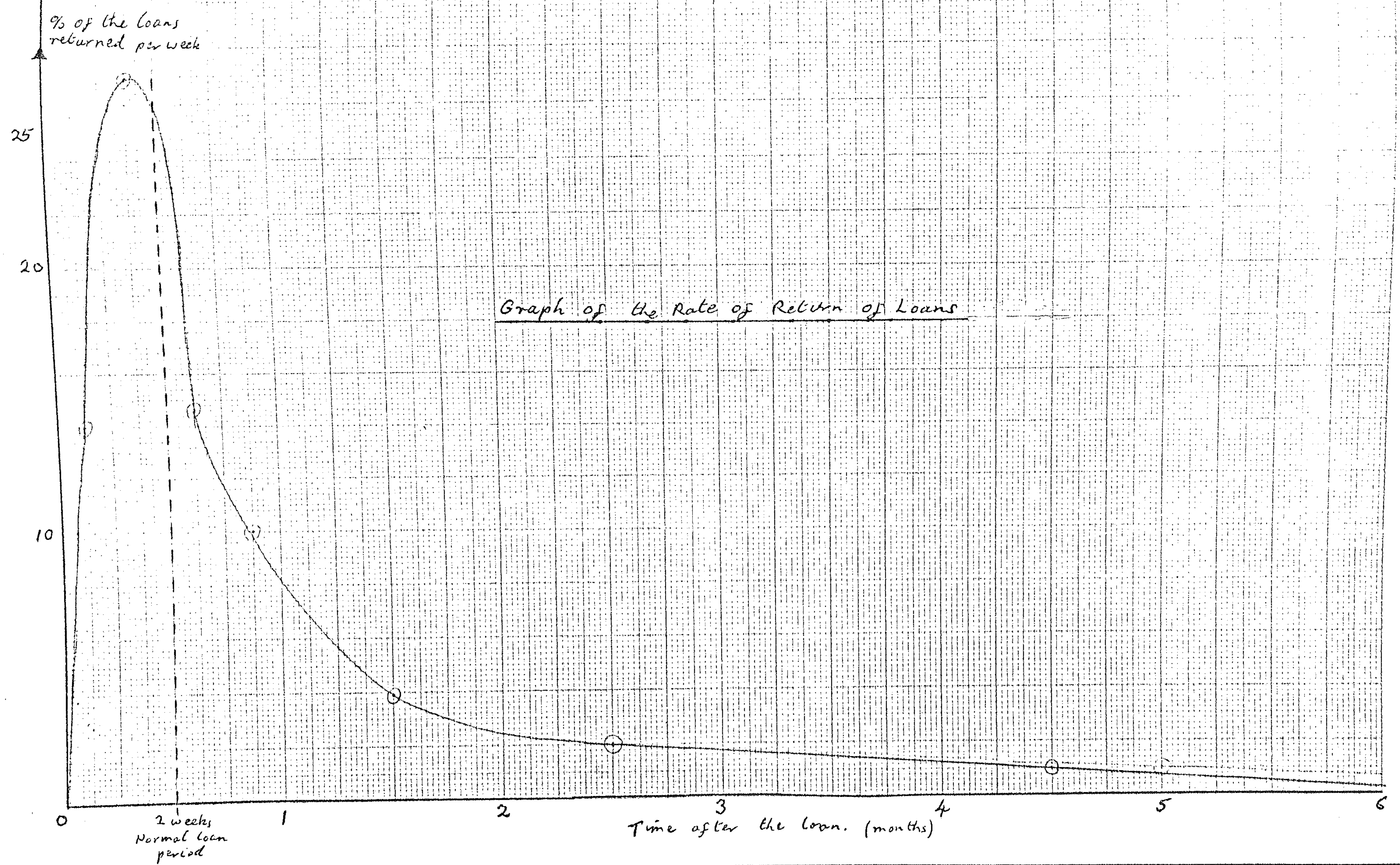
Percentage of loans returned after

	1 week	= 13.9%
	2 weeks	= 40.8%
	3 weeks	= 55.4%
(1 mth)	4 weeks	= 65.4%
	2 months	= 80.8%
	3 months	= 88.9%
	6 months	= 92.0%

These figures are for a sample of 1000 records in two months.



The Rate of Return of Loans from the Main Library
100%
%age of
Loans
returned.
100
80
60
40
20
0
0
1 week
3 weeks
1 month
2 months
3 months
4 months
5 months
6 months
Time



Graph of the Rate of Return of Loans
% of the loans returned per week
25
20
10
0
1
2
3
4
5
6
2 weeks
Normal loan period
Time after the loan. (months)

APPENDIX B

S I M P L I F I C A T I O N O F T H E C O S T E Q U A T I O N

Standard figures (The first simplification)

In the first simplification of the cost equation, the times for standard operations such as filing cards have been substituted for the variables. The run times for the programs have also been introduced, but any other variables which can be chosen, or which are different for different libraries are left.

The following values have been substituted for variables in the equation. The origin of them is also given.

B (life of computer cards) = 20 years. This figure is based on observation at Taylor Woodrow, and is not a strict average life (see page 6.9).

D (life of catalogue cards) = 20 years. This is based on discussion.

The times to file cards and slips are very variable. The size of file seems to be relatively unimportant. T.K.Burgrss (1973) gives the filing time for cards as 40 seconds. After communication with J.L.Schofield at Cambridge, a study of the figures for operations at Aston University, discussion with N.Metcalf of BLCMP, and short tests at Taylor Woodrow, it was decided to take the filing time for cards (FindC & FileC) as 0.3 minutes whatever the size of file, and 0.6 minutes for the filing time for slips (FindS & FileS).

The time to punch the details of a book on cards (punch cards) = 1.5 mins.

The time to type out the same details on catalogue cards (type card) (type card) = 4 minutes. This figure is based on unpublished data at Aston University, Library P, BLCMP and A.C.Turner (1972).

Time to type an index card or duplicate a catalogue card (duplicate card) = 2 minutes. This is based on the same sources as (type card).

Time to write a loan slip (write slip) = 1.35 minutes (A.E.Jeffries, 1969)

Time to dispose of the cancelled loan slips (discard slips) = 0.4 minutes. The slips are normally kept for later statistical analysis.

Time to change the date on loan slip for renewed item (date slip) = 0.2 mins.

Time to prepare recall letter (address recall) = 1.0 minutes.

The time to punch a replacement book or user card will depend on the location of the card punch, so no value is substituted for this here.

Times adopted: - B = 20, D = 20, FindC = 0.3, FindS = 0.6,
(punch cards) = 1.5, (type card) = 4,
(duplicate card) = 2, (write slip) = 1.35
(discard slips) = 0.4, (date slip) = 0.2
(address recall) = 1.0

Setting up times for the programs at Taylor Woodrow in munutes were: -

LOANS	1.5
LISTING	2.0
LISTING, etc	4.5
NEWCRDS	1.0
ADDTNS, ASORT, MERGE & FILE	5.5

Running times for the programs were difficult to obtain, as explained on page 6.18. CPU times were not available on the machine at TW, so all costs are charged on the basis of overall running times, and these can vary considerably. The following figures were the best which could be obtained.

Running times for the programs were: -

(LOANS/loan & return)	=	0.017	minutes
(LISTING/loan list entry)	=	0.023	"
(LISTING/renewal letter)	=	0.075	"
(LISTING/accession)	=	0.010	"
(LISTING/author)	=	0.007	"
(LISTING/UDC)	=	0.008	"
(NEWCRDS/new card)	=	0.003	"
(ADDTNS & ASORT/item)	=	0.004	"
(MERGE & FILE/item)	=	0.004	"

The printout times (those using LISTING) are for the length of entries at Taylor Woodrow, and would be increased if more information were required.

Results of the first simplification

The formulae and codes for the general form are given in Chapter 6 on pages 6.6 to 6.15.

(i) Cost of manual system in one period =

$$n(c+u)1.35 \; + \; nc(6 \times 0.6 \times 0.4) \; + \; rc\left[1 + 3R(2 \times 0.6 + 0.20)\right]$$

$$= 5.35nc \; + \; 1.35nu \; + \; (4.2R + 1)rc$$

(ii) Cost of computerised loans system in one period =

$$n(4c+u)0.3 \; + \; n(2c+u)0.3 \; + \; c(\text{take/collect})$$
$$+ \left[1.5 \; + \; 4.5(1/t + 1/P) \; + \; k/20p\right]C$$
$$+ (0.017n \; + \; 0.023L/t \; + \; 0.075U/p \; + \; 0.006kS/20P)C$$
$$+ (\text{punch card}) \; 1.5 \; nc/k$$

$$= 1.8nc \; + \; 0.6nu \; + \; c(\text{take/collect}) \; + \; 1.5nc(\text{punch card})/k$$
$$+ \left[1.5 + 0.017n + (4.5 + 0.023L)/t \; + \; 4.5/p + k(1 + 0.006S)/20P + 0.075U/p\right]C$$

(iii) Saving on loans procedure in one period =

$$3.55nc + 0.75nu + (4.2R + 1)rc - c(\text{take/collect})$$
$$- [1.5 + 0.017n + (4.5 + 0.023L)/t + 4.5/p$$
$$+ k(1 + 0.006S)/20P + 0.075U/p]C$$
$$- 1.5nc(\text{punch card})/k$$

(iv) Cost of manual cataloguing system in a year =

$$4(A + 4S/20)c + 3Ac \times 2 + c(4A + 4S/20)0.3$$

$$= 11.2Ac + 0.86Sc$$

(v) Cost of computerised cataloguing system in one year =

$$1.5As + CA/a\,(5.5 + 2 + 4.5 \times 2/K) + 0.004AC + 0.004ACS/a$$
$$+ AC(1 - 1/K + S/Ka)0.010 + 2ACS/Ka\,(0.007 + 0.008)$$
$$= 1.5As + 0.014AC + CA/a\,(7.5 + 0.004S)$$
$$+ AC/K\,(-0.01 + 9/a + 0.040S/a)$$

(vi) Total savings on the complete system in one year =

$$P\{3.55nc + 0.75nu + (4.2R + 1)rc - c(\text{take/collect})$$
$$- [1.5 + 0.017n + (4.5 + 0.023L/t + 4.5/p + k(1 + 0.006S)/20P$$
$$+ 0.075U/p]C$$
$$- 1.5nc(\text{punch card})/k\}$$

$$+ 11.2Ac + 0.86Sc - 1.5As - 0.014AC - CA/a\,(7.5 + 0.004S)$$
$$- AC/K(-0.01 + 9/a + 0.04S/a)$$

Assumed relationships (The second simplification)

The results above give the equation after data for the programs and the standard operations has been substituted for the variables. The second simplification is to insert data for the probable relationships in the library and likely choices; for example, the proportion of recalls requiring renewal.

The following are the values substituted for variables in the equation for the second simplification.

It is assumed that four supplements to the loan list will be acceptible before a new complete loan list is required. Thus $t = 5$.

In the survey of libraries in the construction industry (Chapter 3 and Appendix A), it was found that there was no general pattern as to how long books were allowed out on loan. It is thus difficult to know how long to allow for the loan period, but 1 month seems a reasonable length of time. This means that $p = 1/12$ years, so $p = P/12$ periods.

Eunson (1974) estimates that 80% of loans at AWRE, Foulness require a recall letter, but she does not give the loan period, and the figure included inter-library loans. Library P has a loan period of 2 weeks, but only recalls items after a month; and from their records 40% of loans are returned by the end of the 2 week period, and 65% by the end of the month. It would thus seem reasonable to take a figure of 45% as the proportion of loans which would require recall at least once. As explained on page 6.10, second and subsequent recalls are ignored. The number of recalls (r) may therefore be expressed in terms of the number of loans (n) by the function $r = 0.45n$.

Eunson also gives a figure for the number of items which need to be renewed. Out of 100 loans, including inter-library loans, 80 have to be recalled, of which 60 require 1 extension of loan, 40 two extensions, and 20 have three or more. This means that 75% of first recalls require renewal. This figure seems high for the situation at Taylor Woodrow, so a figure of 50% has been taken. Thus $R = 0.5$.

It has been assumed that up to one card in 40 can be lost before it is necessary to renew all the book and user cards. When applied to Taylor Woodrow, this figure coupled with the value of B used in the first simplification gives a value of the right order for the frequency of renewal expected.

The figures assumed for the second simplification are therefore: -

$$t = 5, \quad p = P/12, \quad r = 0.45n, \quad R = 0.5, \quad k = 40$$

Results of the second simplification

Total savings in one year =

$$P\{3.55nc + 0.75nu + (4.2/2 + 1)0.45nc - c(\text{take/collect})$$
$$- [1.5 + 0.017n + (4.5 + 0.023L)/5 + 4.5 \times 12/P$$
$$+ 40/20P\ (1 + 0.006S) + 0.075U \times 12/P]C$$
$$- 1.5nc(\text{punch card})/40\}$$
$$+ 11.2Ac + 0.86Sc - 1.5As - 0.014AC$$
$$- CA/a\ (7.5 + 0.004S) - AC/K\ (-0.01 + 9/a + 0.04S/a)$$

$$= c[11.2A + 0.86S + 4.95nP - (\text{take/collect})P - 0.375nP(\text{punch card})]$$
$$+ 0.75nPu - 1.5As$$
$$- C(2.1 + 0.017n + 0.0046L)P$$
$$- C[54 + 0.9U + 0.012S + 0.014A + A/a\ (7.5 + 0.004S)$$
$$+ A/K\ (-0.01 + 9/a + 0.04S/a)]$$

Application of the equation to Taylor Woodrow

Data for Taylor Woodrow from Appendix A

Stock (S) = 5000 items, Additions (A) = 1200 per year
Number of items on loan (L) = 700, to U = 300 users
Number of loans = 1420 per year
Programs will be run once a week, so P = 52
Thus number of loans in a period (n) = 28
New acquisitions added once in 3 weeks,
so number of entries in a run (a) = 80.
(take/collect) = 10 minutes, (punch card) = 5 minutes, since card punch is not in library.

Savings per year at Taylor Woodrow =

$$c[11.2 \times 1200 + 0.865 \times 5000 + 4.95 \times 28 \times 52 - 10 \times 52 - 0.375 \times 28 \times 52 \times 5]$$

$$+ u(0.75 \times 28 \times 52) - s(1.5 \times 1200)$$

$$- C(2.1 + 0.017 \times 28 + 0.0046 \times 700)52$$

$$- C[54 + 0.9 \times 300 + 0.012 \times 5000 + 0.014 \times 1200 + 1200/80\,(7.5 + 0.004 \times 5000) + 1200/K\,(-0.01 + 9/80 + 0.04 \times 5000/80)]$$

$$= 15700\,c + 1092\,u - 1800\,s - 1115\,C - 3123\,C/K$$

The costs at Taylor Woodrow, including overheads are as follows: -

Computer cost (C) = £40/hour = £0.667/minute.
Library staff cost (c) = £4,800/annum = £0.040 per minute.
Punch operators cost (s) = £4,000/annum = £0.033 per minute.
Staff cost of users (u) = £6,600/annum = £0.055 per minute.

Using these costs, the saving from the system in a year =

£628 library staff + £60 library users - £60 punch operators

- (£744 + £2080/K) computer time.

It was assumed that the catalogues, like the loans, would be completely renewed after 4 supplements (ie when K=5). If so, there is an annual loss from running the system of £537. By cutting down the number of new sets of catalogues, this figure could be progressively reduced to a minimum loss of £116 for no new catalogues.

The future at Taylor Woodrow

In about $2\frac{1}{2}$ years the situation at Taylor Woodrow may have changed as follows. The figure for the number of additions does not increase because the current figure is high due to the building up of the collection of special files. With rapidly rising cost of literature and the economic situation discouraging increases in book purchasing budgets, it is unlikely that the number of books bought each year will rise significantly over the next few years. The number of users will probably not rise, though their use of the library is likely to increase. The following projected values have thus been used: -

S = 8000 items, A = 1200 items/year, L = 800 items
U = 300 users, Number of loans per year = 2040
P = 52 (weekly loan runs), so n = 40 loans/period.
a = 80, (take/collect) = 10, (punch card) = 5

Saving per year =

$$c(11.2 \times 1200 + 0.865 \times 8000 + 4.95 \times 40 \times 52 - 10 \times 52 - 0.375 \times 40 \times 52 \times 5)$$

$$+ 0.75 \times 40 \times 52\ u - 1.5 \times 1200\ s$$

$$- C(2.1 + 0.017 \times 40 + 0.0046 \times 800)52$$

$$- C[54 + 0.9 \times 300 + 0.012 \times 8000 + 0.014 \times 1200 + 1200/80\ (7.5 + 0.004 \times 8000) + 1200(-0.01 + 9/80 + 0.04 \times 8000/80)/K]$$

Saving per year =

$$25830\ c \quad + \quad 1560\ u \quad + \quad 1800\ s \quad + \quad 1365\ C \quad + \quad 4923\ C/K$$

At the same rates as before (see page B7), the saving is: -

£1030 library staff + £86 library users - £60 punch operators

- £(910 + £3280/K) computer time.

For K = 5, Loss per year = £510 (or a possible saving of £146 for no new catalogues.)

Over the next $2\frac{1}{2}$ years it is probable that with present trends salaries will have risen 50% and that computer costs will have risen only 25%.

If these figures are taken the loss per year = £375

However, if K is increased to 7, the loss per year is reduced to £22. This would mean that the catalogues were only renewed every 6 months, by which time 560 items would have been added in 6 supplements.

Application of the equation to Library G

For the entry in Appendix A, the data for library G are as follows:-

S = 27,000 items, A = 1200 new items a year, U = 400 users

L = 1500 (estimated from the numbers of items on loan in other libraries compared to their total stock.)

loans per year = 7000. If the loans program is run twice a week (P=100), n = 70. Running the additions program every month would give a = 100.

(take/collect) = 10, (punch card) = 5 (as for Taylor Woodrow)

Library staff cost (c) = £0.033/minute, which is less than at TW.

Saving per year, using the TW costs for other staff and the computer, =

£1910 library staff + £290 library users

- £60 punch operators - £(2106 + 8560/K) computer time.

For K=5, as before, the extra cost of the computerised system will be £1678 per annum. Without the catalogues it would save £39.

Cost of conversion of a card catalogue

For comparison with the computerised production of copies of the catalogues, it is necessary to calculate the costs of reproducing a card catalogue. At Birmingham University, the card catalogue was replaced by a computerised one, so a study was made to compare costs for converting it into other forms (T.French, 1971). The figures from this have been used in the following calculation of the cost of converting a catalogue of the size required at Taylor Woodrow.

Size of stock at Taylor Woodrow = 5000

It was assumed in the equation that there are an average of 2 authors and 2 UDC numbers per item.

Therefore, number of cards in the catalogue = 20,000

Cost of typing one entry = 10p

Therefore cost of reproducing the catalogue by typing = £2000 (excluding binding)

To xerox four 5"x2" cards per page (A4) would require 5000 pages.

Cost of xeroxing 5000 pages at 2p/page = £100

Time to sort cards, arrange on the machine, expose, etc. would take 1 minute/page. Time to photocopy 5000 pages = 80 hours.

Cost of clerical staff to xerox catalogue (£2.50 per hour) = £200

Binding 12 volumes (400 pages/volume) at £4/copy = £50

Total cost of xeroxed copy of the catalogue = £350

To microfilm the catalogue cards would cost only 1p/page, and cassettes would probably cost only £10.

Total cost of microfilming catalogue = £220 (excluding readers).

To reproduce a card catalogue of the size required for Taylor Woodrow would cost about £2000 typed, £350 xeroxed, and £260 on microfilm.

APPENDIX C

FEASIBILITY REPORT

TAYLOR WOODROW CONSTRUCTION LIMITED

REPORT OF THE I.H.D. PROJECT BEING UNDERTAKEN BY J. JOHNSON ON

THE LIBRARY AT SOUTHALL

A feasibility study of the library shows which procedures need changing to improve the library's service. Certain aspects are covered which require management decisions. The possible expansions of the library service are described and discussed.

September, 1972.

THE LIBRARY AT SOUTHALL

CONTENTS

C&D Cataloguing and Ordering of Monographs

Introduction, Present ordering system, Flow chart of ordering and cataloguing procedure, Present cataloguing system, Example of the KWIC index package, Example of card formats, Modifications to the cataloguing system, Modifications to the ordering system, Proposed manual ordering system, Possible format for library request form, Proposed ordering system incorporating computerised cataloguing, Flow chart of alternative manual ordering system, Flow chart of alternative ordering system incorporating computerised cataloguing, Proposals.

E Special Collections

Introduction, Reference material & conference proceedings, Reports, Translations, Photocopies, The special concrete collection, British Standards, Trend of loans of British standards, Technical drawings, Maps, Accession numbers, Proposals.

F Reception and Circulation of Periodicals

Introduction, Ordering, Circulation, Points for consideration for a computerised system, Proposals.

G Information Retrieval & Selective Dissemination of Information

Introduction, The value of IR/SDI, Problems of IR/SDI, Possibilities for Taylor Woodrow, Comparison of Costs, Proposals, Bibliography. Appendix - Running costs of IR/SDI.

H Catalogue Library

Introduction, The use of a catalogue library, Commodity file (National). Possible systems a) Faceted classification, b) The Barbour Index, c) Card index, d) Computerised systems, Proposals, Bibliography.

S General Discussion of Survey Results

Introduction, The surveys, Nature of users, Length of visits, Nature of enquiries, Reasons for user failure, Librarian's time, Discussion, Proposal. Results of survey of users - Frequency of use, Users, Success, Time taken for visits, Nature of enquiries, Catalogue, Complaints. Results of librarian's diary. Results of analysis of the post received by the library.

SUMMARY OF PROPOSALS

1. A new form (as shown on page CD18, flowchart p.18) should be introduced for users to send in requests for loans, inter-library loans and purchases. They should be distributed round the Company and will replace letters for requests, inter-library loan forms, the inter-library loans book, purchase requisitions or memos, order record cards and possibly the TW Telex forms.

2. The loans procedure should be computerised.

3. The cataloguing computer programs should be rewritten to form part of the loans procedure in a language suitable for modern computers. An accession list, UDC list, author index and KWIC index should be produced in the most acceptable layout.

4. The second authors and UDC numbers should be included in the author and UDC indexes respectively.

5. Accession numbers should be increased to six characters with a seventh letter to distinguish multiple copies of the same item.

6. Book loans should be renewed by letter monthly. Users who do not return the letters will be blacklisted appropriately.

7. Maps and British Standards should be included in the computerised loans procedure under their own official numbers.

8. Material from the special collections should be included in the main catalogues and loan system where possible. Letters in the accession numbers can be used to distinguish them.

9. Material held in other departments of the Company should be indexed in the library, particularly that held by the information scientist in the Materials Laboratory.

10. Catalogues will not in future be circulated to departments.

11. When photocopies are made of items borrowed on inter-library loan, they should be kept in regularly updated files by subject.

12. Simple instructions beside the catalogues and more obvious shelf marks would help those who feel they are displaying ignorance by asking for assistance in the library.

13. Management should cease the circulation of journals.

14. The journals holdings list needs updating.

15. A further study should be made of the informal information structures in the Company to see if a catalogue library or SDI/IR service would be a worthwhile addition to the library.

Introduction

In October of 1971, Taylor Woodrow took on a post-graduate student from the University of Aston in Birmingham under the Interdisciplinary Higher Degrees Scheme. Under this scheme the student does interdisciplinary research for a Ph.D on a problem provided by an industrial company. In this case the problem was to look at the library of Taylor Woodrow and see what could be done to improve the service, using the computer where appropriate. The title given to the project was "Development of a modular, mechanized library and information system in the construction industry".

The initial months were spent in trying to learn the way the company operates and the procedures used in the library at present. At the end of this period, the library functions were divided into eight areas and these were looked at in detail: loans, inter-library loans, ordering, cataloguing, special collections, periodicals, the catalogue library, and information storage and retrieval. The results of these studies are given in the appendix to this report in sections A - H. During this time a survey was carried out on the use and users of the library, and this is given in section S of the appendix. This report gives a summary of the recommendations of these several studies, in some cases modified by subsequent discussion.

From the beginning the four supervisors have been closely involved in the project and have helped with comments and suggestions. They are: Mr. E.H.C. Driver, Librarian of the University of Aston; Mr. D. Buckle, Head of Library Automation of the Birmingham Libraries Mechanisation Project; Dr. R.D. Browne, Head of the Materials Research Laboratory; and Mr. A.A. Keren, Head of the Technical Library and Information Group, the last two being from Taylor Woodrow. Following a meeting in June, it was decided that, in view of the shortage of staff, the first areas which should be dealt with are the ones concerned with library housekeeping routines, and that the last three areas, which require further investigation, will have to be left until the librarian's work on the clerical side can be reduced by making the system more efficient. This report therefore concentrates on these aspects, since the proposal is for immediate implementation of the recommendations. A flow chart of the complete library procedure is given at the end, page 17.

<u>Loans</u> a) Present system.

At the moment a loan slip in triplicate is used to record loans For each book which is to be loaned the borrower or the librarian fills out the loan slip with its carbon copies, giving his name and department, etc., and the details of the book. One slip is then filed under the name so that it can be seen which items he has out at any one time, one is filed by author, so that the book can be located and one is filed by the date, so that it can be seen how many books are overdue for return. The official loan period is three weeks, although insufficient staff for recall means that most of the users do not know this or act upon it. Company policy demands that all books are purchased through the library, so books which a department buys have to be classified as permanent loans, and the appropriate loan slips are filed as before, but with a note to this effect. The borrower index is only used when the library is notified that a user is leaving the company and that therefore all the books he has on loan must be recalled.

b) Problems with the system.

The principal problem is that there is insufficient staff to recall the books when they have been out for a long time. Some have not been seen in the library for five years, and although it is known who officially has each book, it is unlikely that it will ever be seen in the library again. Once someone has had the book for more than a couple of months, they very rarely remember having borrowed it or know where it is now. In many cases it does turn up in a pile of literature on their desk, but by that time a certain amount of ill-will has been engendered. Apart from the delay and annoyance to the user who wants the book and the one who has it, a number of books are in fact lost in this way. It is therefore most important to introduce some form of system whereby the books are checked at regular intervals.

c) Proposed system.

The main aim of the proposed system is to reduce the number of forms which have to be filled in, and provide for renewal of the loans at regular intervals. This can be done by using the computer. Each user would be given a number and the computer would produce lists giving the name, user number and company address (phone number, etc.). By using these lists and the accession lists of book numbers, which are already being produced by the computer, all the information for a loan can be condensed into a four character and a seven character number. This reduces the amount of information required on the form.

Since the user and accession lists will be stored in the computer, it is reasonable that the loans should be too. To do this the librarian will just have to enter the appropriate numbers directly onto coding sheets which will then be sent to be punched ready for input to the computer. From this data the computer will print lists of who has which books out on loan, and will write renewal letters to each borrower when required.

It was recommended and agreed that it is unnecessary to have the books physically returned to the library every month, and that it would be sufficient merely to have the borrowers sign that they have the books recorded as being on loan to them and want to keep them. The computer would thus write letters to each borrower telling him which books were out in his name, asking him to return those not wanted and sign at the bottom to say that he wished to renew the others. These letters would be addressed by the computer and sent out through the internal mail about once a month, but the permanent loans need only be included once every six months. The computer would also produce a check sheet of who it had writen to and the librarian could tick off and file the letters as they were returned. Those who did not return them could be "blacklisted" by marking the list of user numbers, so that the librarian could see and take the appropriate action when the user tried to borrow another item. A waiting list could be incorporated so that when a book was wanted the computer could recall it and notify the librarian that someone else was waiting to see it.

Inter-Library Loans

a) Present Procedure

When a user wants a book or article on inter-library loan, an inter-library loan form is filled in giving the user's name, etc., details of the required item, and a space for notes on the sources tried. Three quarters of the loans are from the National Lending Library (NLL), in which case a telex message has to be sent requesting the item. This necessitates obtaining the next number from an NLL Telex Form Book, and writing out the details of the loan on a Taylor Woodrow (TW) telex form, to be sent to the NLL. If it can not be obtained from the NLL, the librarian rings round to other libraries until he finds one which will lend the item.

When the book comes in it is sent to the user and the details entered in the inter-library loans book. If the item has not been returned to the library before the date it is due to be returned to the library of origin, it has to be recalled. It is then packaged and sent back and the forms and entries cancelled. The periods of loan vary from one library of origin to another. Sometimes the librarian photocopies short items as soon as they come in, gives the copy to the person who wanted it and sends the original straight back. On occasions the library of origin only sends a photocopy in the first place, in which case it is usually not necessary to return it.

b) Problems with the present procedure.

The main problem is that at the moment the procedure for obtaining inter-library loans is very time consuming: it takes up a quarter of the librarian's time. However it is not feasible to computerise the system, because the items borrowed do not have recorded accession numbers, so the same amount of information would still have to be written out even if the computer were used, and it would then have to be punched and entered into the machine, thus increasing the amount of work. The librarian must also have the inter-library loan forms to hand so that at any time he can take up the search where he left off. With an on-line computer terminal it might be possible to computerise this area of the library, but at the moment it is not feasible.

c) Proposals

The best way to cut down the amount of work in this area is to reduce the number of forms needed. In the study on ordering it is proposed that one standard form be distributed round the company on which people could send in requests for internal loans, inter-library loans and purchases. A flow chart of how this form would be used is given at the end on page 18. A byproduct of this would be that the library should receive more complete references as there would be spaces for all the different bits of information required (see possible format of form, page CD16). By using this one form in different ways, it should be possible to do away with all other documentation of inter-library loans. As journals do not have accession numbers either, they could not be treated in the same way as internal loans, so they would have to be included in the inter-library loan procedure.

Ordering a) Present system.

The existing procedure is that the user sends in his request for a purchase to the library. It then has to be entered onto standard forms, and if it is to be paid for by some department other than the library it is sent to that department to be signed by the appropriate director. If it is to be paid for by the library and it costs more than £2, R.S. Taylor's signature must be obtained on a requisition form which is then sent to the Buying Department who write out five copies of an order and send one each to the supplier, the library, the stationary and Invoice Departments. When the book arrives the invoice is checked in the Invoice Department who then send it up to the library to be signed that the item has been received.

b) Problems.

The principal problem in the procedure is that all the information is copied out several times. This is very time-consuming, so anything which can be done to improve the situation would be useful. The two pound limit also raises questions, but these are discussed later in the section "Proposals Requiring Management Decisions".

c) Proposals.

In the study on ordering, two systems were proposed, a manual and a computerised one. However, in the subsequent discussion it was agreed that the manual system would be much better, particularly as there is no on-line facility available to the library at the moment. The idea for this is that the standard form described in the last section would be distributed round the company and that people would use it to make their requests. After all the necessary stages the form could be photocopied and sent to the Buying Department, who would then order the book as before. The invoice could go straight to the library for signing to save it being passed back and forth to the Invoice Department. The system is simpler in that the number of records is reduced and standardised, so the librarian does not have to continually recopy the same information. Also the initial form is filled in by the user, so the librarian will not even have to do that. The forms should be bound in book form, perhaps with carbon copies to alleviate the need for photocopying later and to give the user a copy of his request.

<u>Cataloguing</u> a) Existing system.

When a book arrives in the library the assistant librarian gives it an accession number, and, if it does not have one already, a UDC (Universal Decimal Classification) number. He then writes all the bibliographic details out onto coding sheets and they are sent to be punched onto cards for input to the computer. About once every six months up-dated sets of library catalogues are produced. These consist of an accession list, author list and UDC list, and a set produced by a KWIC package consisting of bibliographic list, author list and KWIC index. A KWIC index is a method of finding a book from the important words in its title. Copies of the KWIC set are distributed round the company to the different departments.

b) Problems

There are several problems to do with the existing programs themselves, as they are writen in SPS language which is very out of date, but was used when TW had the old IBM 1401 machine. This means that they have to be sorted several times on the mechanical sorter, which is extremely time consuming. A magnetic tape sort was tried, but did not work properly. Also the indexes are not arranged in a very attractive way, so they are little used, and there is duplication between the KWIC set of programs and the ones used for the UDC and accession lists. Since the catalogues which are circulated to departments are normally left in the head of department's office they are not used at all.

c) Proposals

The main recommendation for the cataloguing is that the prgrams at present being used should be rewritten to provide the four listings in a simpler and more useful format. The lists required are: an accession list, an author index, a UDC list, and a KWIC index. It was also proposed that the technical notes, which at present have no UDC number, should be given one, and that the printed format of the accession file should be modified. The Luhn code, which was included for the benefit of the old, small machine when sorting, should be abandoned, the accession numbers increased to six characters (see Study E, Special Collections, Accession Numbers), and only one number given for duplicate copies of the same work (see Appendix to Study A, Accession Numbering). The indexes should each cover all the material in the library and not be divided into the different types of literature (books, reports, etc.) as at present. It has been agreed that in future no catalogues will be circulated to departments, since they are neither wanted nor used.

Special Collections

a) General

At present the various categories of literature in the library are kept and catalogued separately; The Materials Laboratory Technical Notes even have their own card index and loan system. This makes things difficult, as one has to look in several indexes unless you know what the document you seek is like. The basic suggestion therefore, is to include as much of the literature as possible in the one arrangement, but with codes in the catalogue which show which set any item actually comes from. There are many small collections of information around the company which are not recorded in the library, for example, the Materials Laboratory's data bank on concrete. These enclaves of private literature should also be indexed centrally, so that others can make use of them without the tedious and expensive inter-library loans procedure. An identifying letter can be included at the beginning of each accession number signifying the various special collections, as is already being done by the library for some sets like the CIRIA reports and TW internal reports.

b) Maps and British Standards.

Maps at present have no index, and British Standards (BS) have their own special card loan system. However, with the six figure accession code suggested, the maps and BSs could be included in the computerised loan system, since their numbers will identify them uniquely, and are all six characters or less. A card index record of which standards were held would still be necessary as a stock list. Similarly the maps could be listed by area, so that it could easily be seen what was the largest scale map of a given district available in the library.

c) Photocopies.

Sometimes the librarian copies useful articles which are borrowed from the NLL, and keeps them in the library. Up to now they have just been piled up at the back, but after long discussions it was felt that the best way to deal with them would be to group them in files on specific subjects, and catalogue them merely by file, and not as separate items. It was felt that much of the material is obscure and that as well as being more selective in deciding what to photocopy, the files will need to be regularly pruned of out-of-date and irrelevant information.

Journals, Drawings, the Catalogue Library & SDI/IR

It was decided that these four areas of the library should be left until the housekeeping routines have been implemented.

a) Journals.

From the results of the survey (Study S), at least one person leaves the library dissatisfied every day because the journals have been circulated, and are therefore not available to anybody except the one person who has kept them. One user recently returned an eighteen inch pile of journals to the library, which he had accumulated over the previous years. In some cases he was the first person on the circulation list, so no one else in the company had been able to see them! Since the whole policy of circulation is thus not working, it should be reviewed by management, and hopefully ended. Nothing can be done in the area of journals until a decision on this is taken.

b) Drawings.

The library is slowly building up an archival collection of microfilmed drawings of completed jobs. As this has not nearly reached completion and no decisions have been taken about the collection of active drawings held in the drawing office, no complete recommendations can yet be made about this section of the library.

c) Expansion of the Library Service.

At present there are barely enough staff to provide the present library service, so it would not be possible at the moment to operate a Catalogue Library and Selective Disseminatio of Information/Information Retrieval system. However, proposals for SDI/IR have been made in Study G, in the hope that in the future more staff may be available for this useful addition to what the library already provides. With regard to the catalogue library, it was felt that in the light of the survey, a further study should be made of the informal information structures in the company to see if such a project is worthwhile. There already appear to be several departments which have limited manufacturer's catalogue collections of their own; the materials laboratory has its commodity file, Mr. C. Cross keeps catalogues for his department, and there are probably other sources of this sort of information. A knowledge of the informal structures would also enable a more useful assessment to be made of the value to the company of an IR/SDI system. These two areas should therefore wait until further study of the existing sources of information in the company has been carried out.

Proposals Requiring Management Decisions

a) Journal Circulation.

Since one third of the failures in the library are due to this one feature, and money is being lost because missing copies have to be either borrowed from the NLL at a cost of over 50p a time, or bought again, it is strongly recommended that circulation of journals in Taylor Woodrow should cease, or that duplicate copies should be purchased and sent directly to the library for copies should be purchased and sent directly to the library for reference by others in the company. There are virtually no circulated journals for which the library has a complete run of back numbers for any one year. The introduction of an SDI service would obviate the need for circulation anyway.

b) Book Purchases.

At the moment any book to be purchased by the library, whether for itself or some other department, which will cost more than £2, has to have the signature of a director. Under the centralised ordering system now in operation, the library has been made responsible for deciding which books are worth buying, but then the director is required to decide the same thing again. Surely the library should be made completely responsible for this decision where the books are to be part of its own stock. However, if it is necessary to have the director signing the requisition form, £2 is an unrealistically low figure, since very few text books cost less than double this, and the cost of the director's time must far outweigh the saving made on the books he refuses.

c) Internal Reports.

At the moment internal reports remain classified for ever, once they have been designated in this way. However, much of the information does not remain secret for long, and would be of use to others within the company. There should therefore be some mechanism for declassifying reports after a certain length of time.

General Suggestions

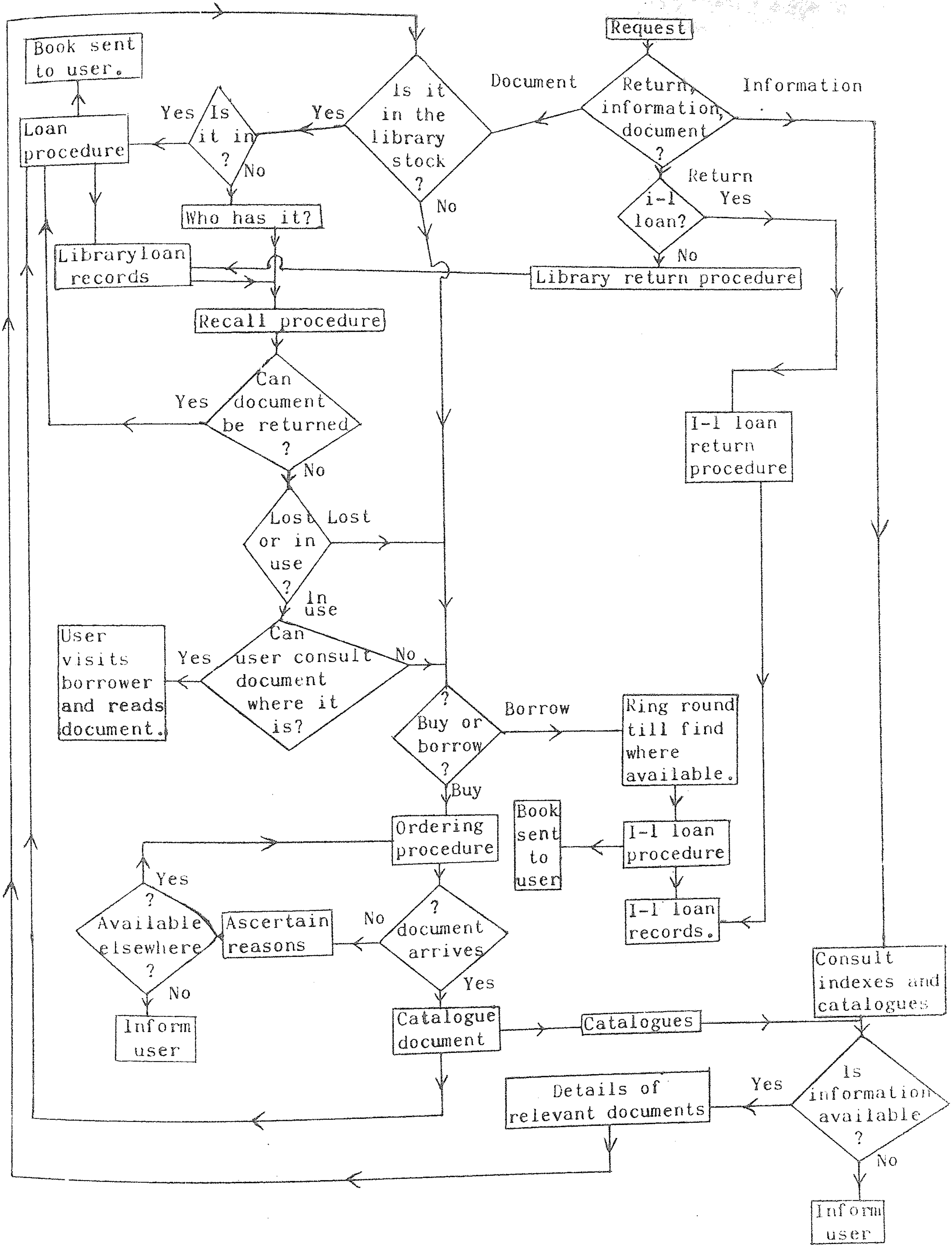
Some points of a general nature need to be mentioned. More people would probably use the library if its services were advertised round the company. Although the survey reflected a fairly wide range of departments using it, it is probable that many people do not do so because they do not know what is available to them. However, at the moment the library staff would not be able to cope with an increase in enquiries, as they are already over-worked. If more staff are taken on in the library as suggested in Mr. G. Forde's recent report (014J/71/1509), it would be possible for the library to give a fuller information service rather than acting in its role of a centralised book loan agency; and some form of advertising of the expansion might be valuable, possibly user meetings. The optimum state is when all those who need the library are using it.

Some people do not find what they want in the library because they feel they would be displaying ignorance by asking for help. To ease this sort of situation, it would be worth the providing simple instructions beside the catalogue on how the various indexes should be used, and where the books are on the shelves. There is a shelf key by the door, but the shelf marks and divisions of the shelves themselves are not clear, and these could be labelled.

Conclusions

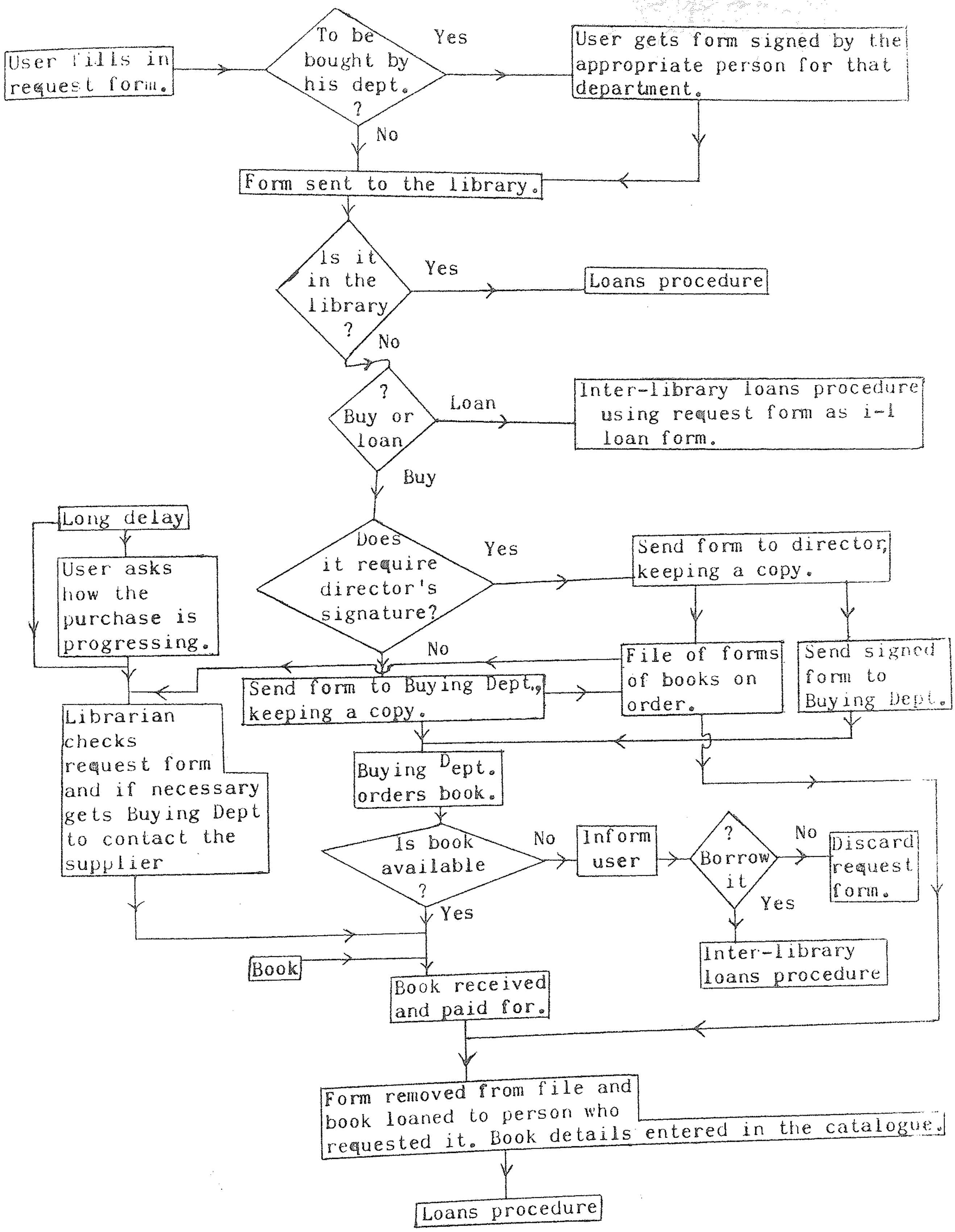
At the moment it is proposed to implement the recommendations for improving the housekeeping routines. Suggestions have been put forward in the studies for areas in which the library service could usefully be expanded, particularly the SDI service. However, further study of the informal information structures in the company is required first. Management decisions are required in the areas of journal circulation, book purchases and internal reports. Detailed proposals in each area are given at the end of the appropriate section of the appendix.

OVERALL LIBRARY PROCEDURE



I-l = Inter-library

NEW REQUEST FORM



APPENDIX

INDIVIDUAL STUDIES OF THE LIBRARY

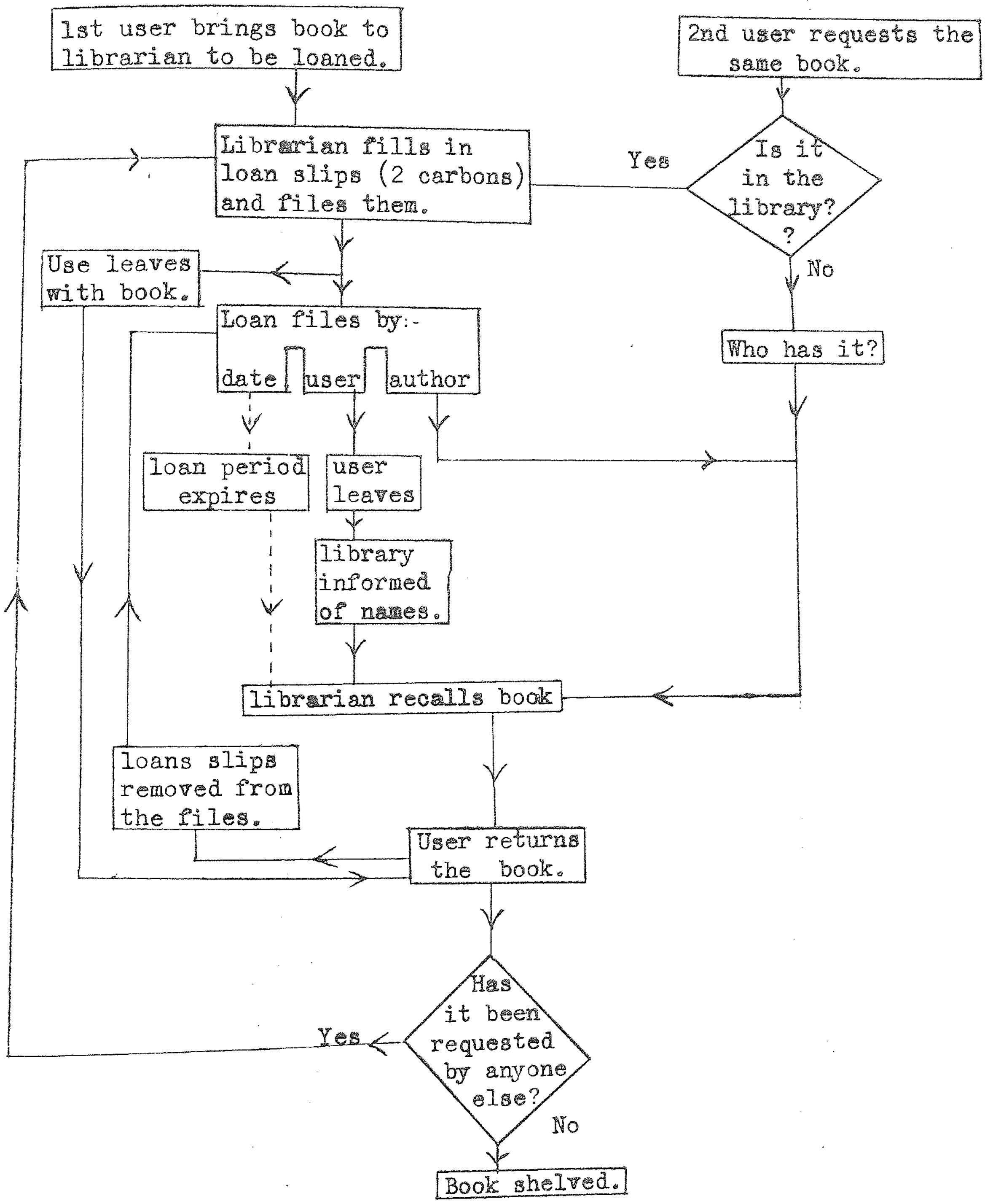
A. LOANS PROCEDURE

Introduction

The main problem of the library with regard to the loans procedure can be seen from the following remark which the librarian was overheard making recently, "I'm afraid all our copies are out on loan at the moment - one to yourself in 1967". The users are not returning the books, and although the library knows where they are, a shortage of staff prevents them being recalled.

At present the loans of textbooks are recorded by the librarian (or borrower) filling in a loan slip with two carbon copies. These are filed under the borrower's name, author's name and the date. This means that all the books on loan to a borrower can be found by looking up his name in the first file, a book can be located from its author, and all those books borrowed prior to a given date (i.e. all those overdue) will be found at the front of the date file. This is a very good manual system, but it is not functioning to its full advantage because there are insufficient staff to write out recall notices after the three week loan period, and to chase up those who still do not send back their books. The procedure when the book is returned is to remove the slips from the various files. At present there are no sheets of paper stuck in the books on which the due date can be stamped. A flow diagram of the procedure is given on the next page (A2).

LOANS PROCEDURE



- - - - - -➤- - - - = possible path which is not actually used.

Any new system must therefore achieve the same ends as this manual one without increase in working time, and must cater for the return/renewal of books. After discussion with Mr. Keren it was decided that 3 weeks to a month was a reasonable loan period, since this given enough time for use to be made of the book, and yet borrowers will not have forgotton that they had it. It was also decided that it was not necessary to actually have the books brought back to the library as long as they were renewed.

Present System

According to the recent report on the library the number of loans of "textbooks, proceedings & magazines" in a six week period was 419, which would mean 3,640 loans per year. (The recent user survey, Study S, gives a substantially lower figure). Since few journals are loaned, this means that the vast majority of these are textbook loans. (Journal loans will be considered later). The number of loans is increasing, as can be seen from the graph on page A10.

The loans were checked on a typical day in January, and the results were as follows:-

The number of books on loan at the time was 410,

to 135 different people

of which 29 were permanent loans

to 17 people,

and 70 were pamphlet type.

Following a new ruling a few months ago, the individual departments have not been allowed to buy their own books; this has to be done by the library. As a result the books had to be recorded in some way, so they were lent out on permanent loan to the individual who made the request in the department which paid for them. Since the system has not been in existence very long there are not many books on permanent loan at the moment.

At one time the company required each member who was leaving to collect signatures that they had no stock outstanding from various departments including the library. Although this had ceased, so that there was no check whether people leaving the company had any books still on loan, a list of those leaving is now sent to the library so that the loans can be checked. The only difficulty, which might arise is that contract staff can leave with one week's notice, and some people take paid holidays for their last month if they have time owed to them, but in most cases books can be satisfactory recalled. The numbers of people moving are small; for example between October 70 and October 71 there were the following changes:-

Number of people leaving the Group	= 110
Number of people joining the Group	= 220
Number changing company within the Group	= 360

Proposed System

Since the new system has to cater primarily for the writing of renewal slips, and ease of recording loans, these two ideas have been made the central part of the arrangement. Since it is not necessary to have the books back after the loan period, it has been decided to send out a letter every three or four weeks instead of recall notices. This would say something to this effect: "you have the following books on loan .... please either return them or sign below to say that you have them and wish to keep them for a further three weeks". When the forms were returned, they could be kept as a signed statement that the person has all the books which are recorded as being on loan to him. A note could be added to the letter saying that if there were any queries, these should be taken up with the library immediately. The exact frequency of the letters could be determined by the turnover of loans. By this means each borrower is automatically reminded which books he has on loan, every few weeks, and the library has regular signed statements that he has them. Permanent loans could be included as items in this letter at longer intervals, twice a year perhaps. Every volume in the library is identified by a five figure accession number, and this is marked on the volume and given in the accession file (see Study C, Cataloguing). This number will be used for all computer processing when the volume is considered. The cataloguing data can be printed out as an accession list, giving the bibliographic details for any accession number. In addition it will be necessary to give each user a number, and this will be recorded in the user file. The user file will be stored sequentially by number, with the following type of layout.

```
0220
0221    BLOGGS A.J.+++++++++CIV. ENG. DESIGN (014K)++EXT 295++++++++++++
0222
```

(+ = unused space)

The first characters would be the user number followed by the name and sufficient information for the internal mail service to find the user; including the department or contract number. Additional information which was useful to the library, such as the telephone extension number, could be held at the end of each record.

From this file it would be necessary to produce an alphabetical user list, a user number list, and to address the renewal letters. The user list would contain the information exactly as given in the file, and would enable the librarian to contact a user from documents giving only the user number, e.g. the loan list (see later). The user number list would give the user numbers from an alphabetical list of user names, e.g.

```
BI
BLOGGS A.J.  0221
BO
```

The computer could automatically address the letter for the internal mail with the name followed by the address, and it should be folded so that the name and address appear on the outside.

```
BLOGGS A. J.
CIV. ENG. DESIGN (014K)
```

In addition to the accession and user files, the system also needs a loan file. The input to the system when a book is borrowed would be the user number, the accession number and the date, and these would be recorded on the loan file in user number order, so that the computer could print out the list of books on loan to each user in the renewal letter. This would be about 20 characters, per record.

```
0220
0221  R0665A  72.3.21
0222
```

Return of a book can be recorded merely by inputing the accession number. This is necessary since sometimes a copy is returned with no indication of who has returned it and to whom it was on loan.

Six digits have been allowed for the accession number so that multiple copies of the same volume can be entered separately. At the moment every copy has a separate number, but it is proposed (see Appendix to this Study) that multiple copies have only one accession number and are distinguished for loan purposes by the addition of a letter in the loan file.

The information on the loan file would mostly be used in the computer, but it would be necessary to have a printout of a loan list. This would be the same information as the loan file, but in accession number order, since the librarian will want to be able to check to whom a certain book is on loan.

```
R0623
R0665A 0221 72.3.21
R0665C
```

The situation is slightly confused by the fact that some of the special collections have a letter for the first accession number character to denote that collection, but this can be handled.

Proposals

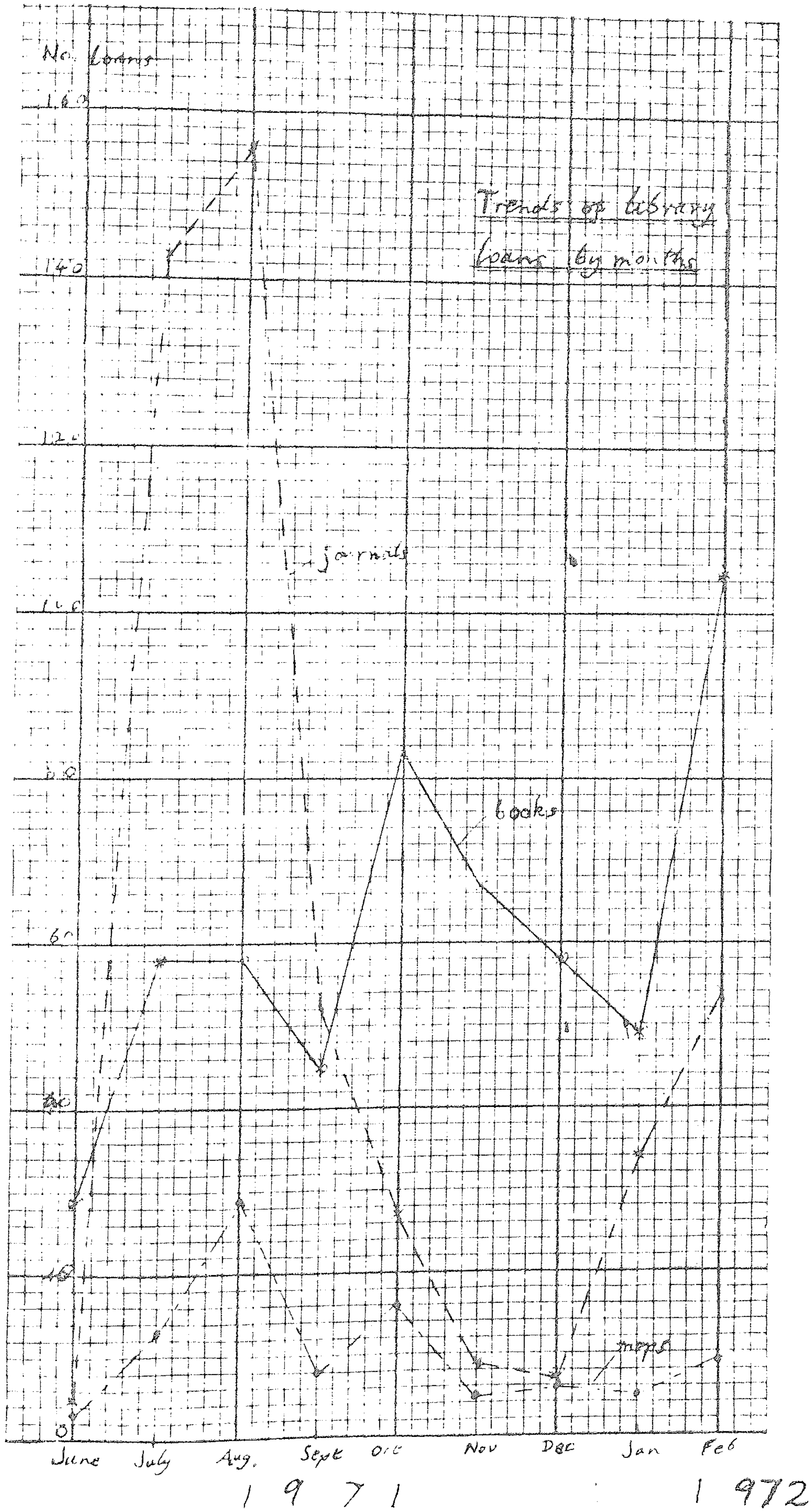
It is proposed that the loans procedure should be computerised, thus reducing the amount of work required for recording each loan, and providing renewal letters periodically asking borrowers to sign that they have items, and suggesting that they return those that are no longer being used. Chasing those who do not return the form will still have to be done manually, but where the items are not actually wanted, the user can be blacklisted by marking the current user list, so that the librarian sees it when the user tries to take out further volumes. The computer can keep and provide a list of those who have books out on loan and this can be ticked when the renewal letter is returned.

The filling in of forms is reduced by this system, as the librarian can enter the brief loan information directly onto coding sheets which he can send straight to the computer department for punching, keeping a carbon copy for reference. The same applies to returns and entries for the user file when a new borrower is added to the list. The only time spent on the renewal is the filing of the letters when they are returned, since the computer can list the details of the books from the accession list and address the letters from the user list.

Thus the system requires three files: an accession file (covered under catologuing), a user file, and a loan file.

The input of these would be user number, accession number and date for loans; accession number only for returns; and the user number, name, address and additional information (telephone number) for new users. From these files it would be possible to produce four lists; a user list giving the user's details from the user number, a user number list giving the user number from the user's name, a loan list giving details of all items on loan, and a list of all those to whom renewal letters had been sent. If the system were to be used on line, it would be necessary to modify some of the programs. Journals being loaned will have to be treated in a similar way to inter-library loans as they have no accession numbers.

TRENDS OF LIBRARY LOANS



APPENDIX TO STUDY A

ACCESSION NUMBERING

At present most items entering the library are given a five character accession number, except periodicals. In the case of books it is simply five digits, but special collections have an alphabetic character followed by four digits. Taylor Woodrow internal reports, for example, are "T, 4 figs", CIRIA "R, 4 figs", and files of photocopies and pamphlets on a particular topic are "F, 4 figs". There will be about a dozen codes.

By the time a new system is able to be introduced, all these records will have been put onto computer cards, so it is obviously best if the accession number is not changed unless absolutely necessary. However, without changing the data on the catalogue cards; it is possible to make a slight modification for the loan procedure.

Up to now every item has been given an accession number when it arrives in the library, regardless of whether there is another copy, either a different volume, edition or a duplicate. With different volumes and editions this is reasonable, though it would obviously be best if the numbers could be together. However, for duplicate copies of the same work, it would be better to have one accession number for the work and mark each copy with a letter so that it could be absolutely identified if returned to the library without the borrower's name, as often happens. The loan file would then have to keep the "copy letter" as an addition to the accession number, though it would not appear in the catalogue. The number of copies held by the library could be recorded by adding, for example, ("3 copies") as a note in the catalogue after the title, (the library has agreed to do this anyway) from which it would be known that in the loan record they would appear as say 00254, 00254A & 00254B.

When the computer is printing out the renewal letter it would get the bibliographical details of 00254B from the accession list under 00254.

This procedure has two advantages; firstly it reduces the number of cards to be written and processed, since only one set is required for each set of duplicate copies instead of one set per copy, and secondly it makes it much easier to search for items. A user requesting an item does not want to have to look for it under several accession numbers, which may be quite different if the copies were brought at different times; it is more than sufficient for him to know that there are x copies. This is not so bad under the manual system, but when computerised it is much better for a list to be consulted merely by looking under one number with its letter additions, rather than several different numbers, to find whether the different copies of a work are out. It is therefore proposed that multiple copies have on accession number, and are differentiated for loan by the addition of letters after the first copy. This will not increase the sort time as an alphabetical sort is already necessary with the letter code at the beginning of the accession number. (It is later suggested that the accession numbers be increased to six characters apart from the letter; - see Study E, Accession Numbers).

B. INTER-LIBRARY LOANS

Introduction

According to the survey (Study S), inter-library loans take up a quarter of the librarian's time but they are not easily analysed into catagories, and hence are not easily computerised. The principal problem is that the bibliographic data of each book involved is not held anywhere in the library in machine readable form. This means that for every loan it would be necessary to enter all the details of the book into the computer each time, including the library of origin, since a quarter of the loans are not from the National Lending Library. Notice of arrival of books could be done by computer, but there is usually a need for speed, and the telephone provides a much quicker way of informing the user that his book is ready for collection. Recall slips could be done by the computer, but the loan periods of the different libraries vary, the British Standards Institute Library only allowing their documents out for a strict 6 days. This would prevent the inter-library loans being incorporated into the regular loans procedure.

Present System

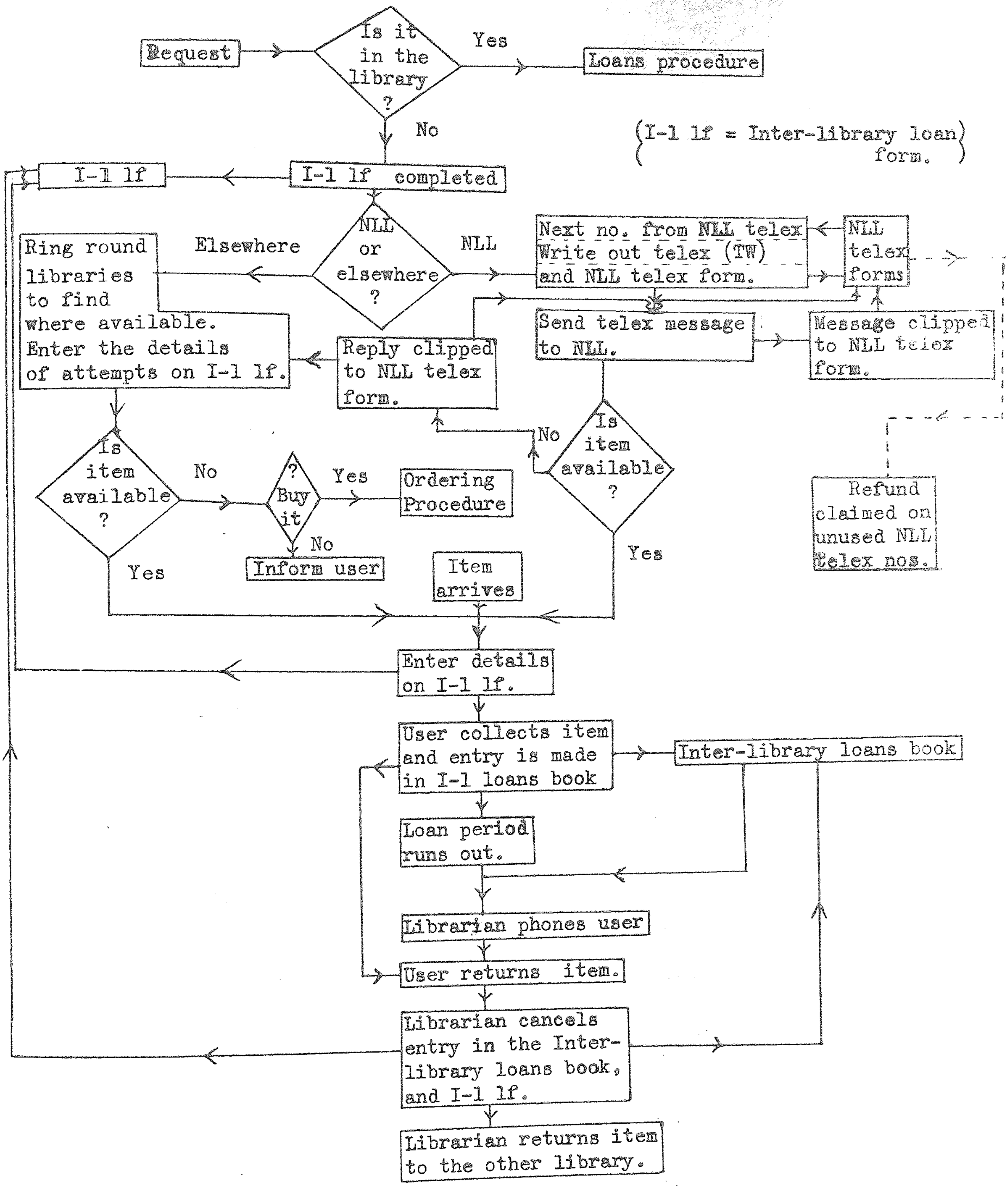
When a user comes in and requests a book which is not in the library, an inter-library loan form is filled in by the librarian giving the details of the book (or article), the name and department, etc., of the user, and the date of the request. There are additional spaces for the dates the book arrives, is due back, and returned, the sources tried, the means of communication used, and the result, and these are filled in as the loan proceeds. These forms are kept by the librarian who tries to deal with them when he has time, depending on the urgency of the request. When the item has been ordered from the library they are filed in library order or NLL order number order.

To obtain an item from the NLL, it is necessary to fill in two Telex Forms. The next order number must be found from the NLL Telex order book, and it must be marked so that the number is not used again. At the moment the librarian enters the author and title, etc. with the date requested, but he has agreed to just put a line through the page and clip on the copy of the telex message when it comes back from the Telex Room, since this information is duplicated from the inter-library loan form, and is given in a much fuller form on the telex message. If the item is unobtainable, the telex from the NLL saying so is clipped to the form as well, and a refund can be obtained on numbers which are unused; though at the moment this is not being done. The NLL holds a block of lables addressed to the library, for sending the items.

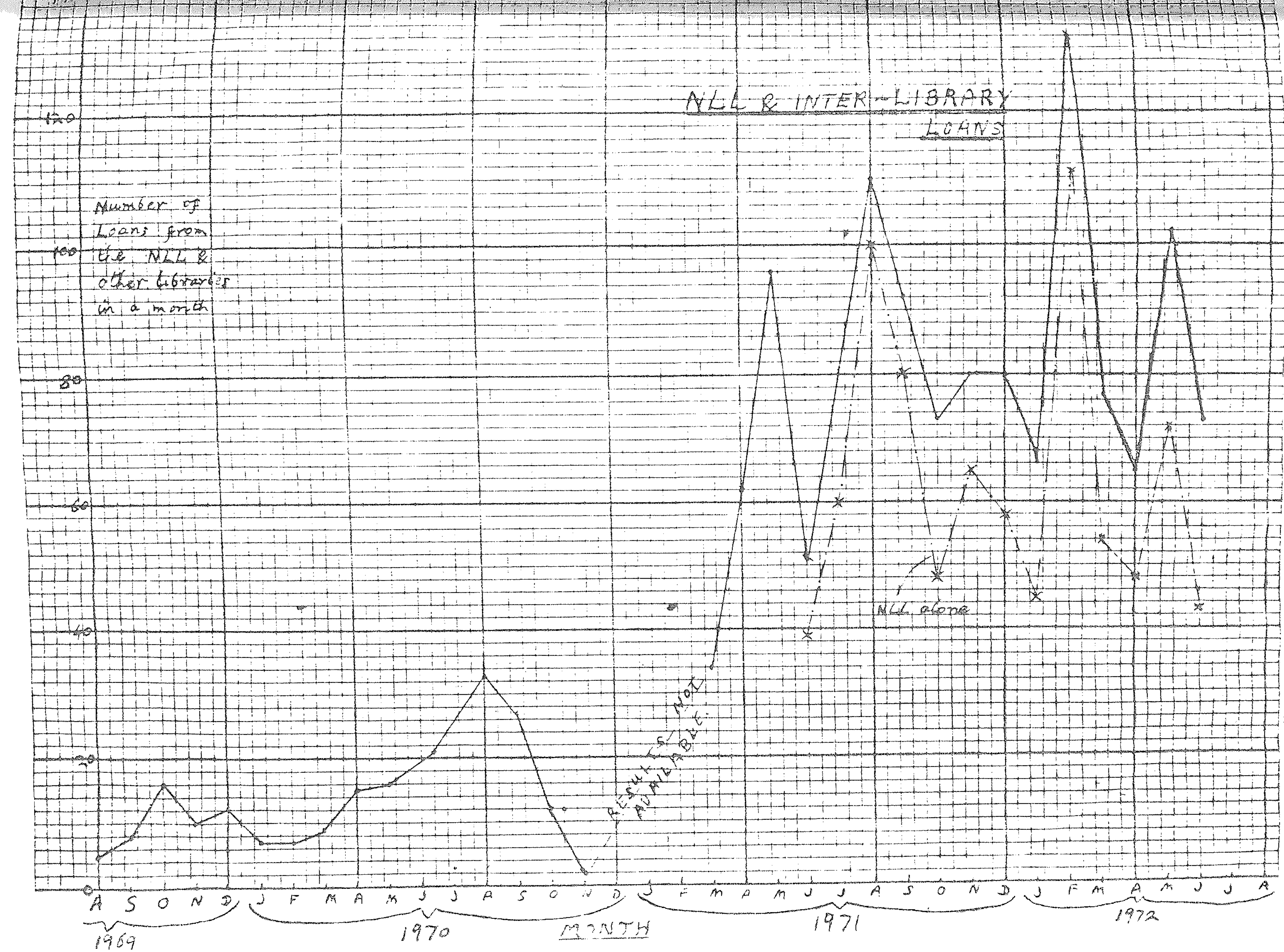
A Taylor Woodrow Telex form must also be filled in giving the message to be sent to the NLL requesting the items. Each item must be separated by large spaces, as the NLL cuts the message up when searching for the various documents. Two copies of the message come back from the Telex room, and at present are kept in a folder in case there are any problems later. In future one will be clipped to the NLL telex form. The TW telex pad provides for a carbon copy to be taken when the form is filled in, and this is also kept to check against the message actually sent.

When the loaned document is finally received from whichever library is appropriate, it is entered in an inter-library loans book. The following details are recorded: date, NLL number or other source, bibliographic details, borrower, department, description of copy (book, photocopy, film, etc.), date due back, date returned, method of return (certificate of posting number, etc.). From blanks in the last two columns it can easily be seen which items still outstanding and the details. A flow diagram of the procedure is given on the next page (B4).

The number of inter-library loans over the past two and a half years is shown in the graph on the next page, together with the figures for the NLL alone over the past eight months. From this it can be seen that the number of loans has been generally increasing, though fluctuating from month to month. Over the last year 76.9% of loans have been made through the NLL. The breakdown of the other loans by library is given below, "others" being those libraries from which only 1 or 2 items were borrowed during approximately the last 6 months. A costing of NLL loans is given as an appendix at the end of this study.



- - - -> - - - - = possible path which is not actually used.


NLL & INTER-LIBRARY LOANS
Number of Loans from the NLL & other libraries in a month
120
100
80
60
40
20
0
A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1969
1970
1971
1972
MONTH
RESULTS NOT AVAILABLE
NLL alone

Library	No. Loans	%
Acton Commercial & Tech. Lib.	20	8.4
BSRA	6	2.5
BSI	17	7.1
Brunel	3	1.3
Cement & Concrete Association	11	4.6
Dept. of Environment	4	1.7
Gas Council	3	1.3
Hydraulics Research Station	3	1.3
Institution of Civil Engineers	27	11.3
Royal Inst. Naval Architects	6	2.5
Institute Of Petroleum	3	1.3
Inst. Structural Engineers	3	1.3
Institute of Welding	3	1.3
Nat. Inst. Oceanography	5	2.1
Mintech.	3	1.3
Southall District Library	75	31.5
Others	46	19.3
Total	238	100.2

In addition the following items are on loan at the moment:-

Acton Commercial & Tech. Lib.	4
Southall	11
Wimpey	1
Cement & Concrete Association	1
(NLL	29)
Total	46

The large number of items from the Southall District Library is because they have a good collection of British Standards and Codes of Practice, so these are borrowed from there if required in a hurry. Virtually all the Southall loans are of these two types.

In many cases, if the item received is a fairly short article or pamphlet, the librarian makes two photocopies and sends the original straight back, which saves the trouble of recall later. One photocopy is then sent to the user who can keep it, and the other is filed in the library, as it is quite likely that if it is to do with a new contract, someone else will want it in the near future (see Study E - Special Collections, Photocopies).

Most of the telephone calls made by the library are concerned with inter-library loans. Between 5th July and 12th August 1971, 285 out-going calls were made from the library, and of these 205 were to do with inter-library loans: 85 requesting items from other libraries, 58 recalls (20 for the NLL) of which at least 3 were for the second time and 62 were to say that the book or information requested was now ready for collection or that the item was unobtainable.

Frequently top management ask for detailed searches in a very short time, sometimes the same day, which necessitates the library borrowing books and journals extremely quickly, so the librarian has to ring round to other London libraries (names can often be obtained from the Aslib locations file), and then possibly go and fetch them in person. This is very disruptive to the service to other users, whereas if he were given more notice, as is often possible, he could obtain the information in the course of his other work.

Proposed System

It would seem that it is not worth computerising the inter-library loans procedure, as all the details of each loan would have to be input to the system in machine readable form. A certain amount of the present manual system could be simplified if the librarian has the user list from the loans procedure, as it would not then be necessary to list all the user's details on each form, a name or number would do. The inter-library loan form is used mostly to remind the librarian of what is required so that when he has time he can contact the other libraries to see if he can borrow it. The list of sources already tried prevents repetition. This form must therefore be always ready to hand, and it would not be possible to computerise this with a batch process.

Of the other forms, the NLL form now has no hand written information, and is needed if a refund is claimed. It would be possible to have the computer writing out the TW telex form, but this would save no staff time as it would take just as long to write all the details out on a computer coding sheet as it does on the telex form, and the letter saves two stages (punching & computing) and hence time. The computer could keep the loans book records, but again all the information would have to be input in detail. Both loans book and inter-library loan forms are necessary, even though there is some duplication of information, as the forms are filed in library or NLL order number order, needed if the library writes about the item, while the loans book is in date of receipt order, which shows when the items are due for return. It would thus seem that the present system is the best, and that the computer can not provide any saving in this area.

The only way in which a computerised inter-library loans procedure would become feasible would be if the computer were on-line. It would then be necessary to have a "memo" file in which all the details of the item required were entered, and on which the sources tried could be included. Some order of preference would have to be incorporated so that the librarian continued with the most urgent request next. These records would then have to be transferred to another file when the item was ordered, in which the date of receipt and the date due back could be entered when it arrived. The computer could be interrogated each day for loans which were falling due and and produce an addressed recall notice using the user file from the loans procedure. The date and method of dispatch could then be added to the record and the whole transferred to a new file of previous loans which could be cleared onto some form of hard copy for archival records, or processed to give statistics such as a list of books that were borrowed more than a certain number of times in a given period.

Journals

The problem with journal loans is rather similar to that of inter-library loans, as the journal is required back in the library after a short time, and the bibliographic data is not held in machine readable form. It would thus seem reasonable to treat such loans in the same way. Obviously the telex forms and inter-library loan form are not required, but it would be possible to record loans of periodicals in a book under the following headings: date, journal, volume, number, user number. The entry could have a line put through it when the item was returned, hence making it easy to see which journal had been held by the borrower for a long time.

Proposals

The manual system being operated at present should continue to be used for inter-library loans, until there is a possibility of an on-line computer system, when it would be necessary to do another feasibility study of the system suggested on page C8. However, by having the user information on the user list from the loans procedure, it is possible to cut down the amount of information on the forms. A book should be introduced for recording the loan of periodicals.

APPENDIX TO SUPPLY B

THE COST OF NLL LOANS

			£
Charge made by NLL for each request			0.17
Librarian's time:- (approx £1/hr)	writing Telex form, etc.,	- 3 mins.	0.05
	packing for return	- $5\frac{1}{2}$ mins.	0.09
Telex:-	Operator's time	- 2 mins.	0.03
	the call to the NLL at 4p/minute	- $1\frac{1}{2}$ mins.	0.06
Return by post:-	Bookroom time, - weighing, stamping, etc.	- 3 mins.	0.05

Stamp and Certificate of Posting if under

1 lb = $12\frac{1}{2}$p
" " " 1-4 lbs = 25p

Several may be returned together but the average weight of a journal is 1 lb, so the average postal cost is 0.10

Total cost of an NLL loan £0.55

C. CATALOGUING &

D. ORDERING OF MONOGRAPHS

Introduction

It was decided to consider the cataloguing and ordering procedures together, as there is a certain amount of overlap between them. Most items that are ordered have eventually to be catalogued when they arrive in the library at the end of the ordering routine.

Cataloguing is the only library function which is already done with the help of the computer, but the programs used have certain defects, such as the fact that an item cannot be found from its second author. Also the programs were written for the 1401 computer which TW had before the 360/30, so they are not so efficient on the larger machine; and as they are writen in SPS language, they will not fit in with the stated criterion of machine independence. There are therefore good reasons for rewriting the programs, even if the procedures are not substantially changed.

However, since much of the library stock is already on cards in machine readable form, it will considerably ease the implementation problems if the format does not have to be drastically altered. This means that it would be best to keep the method of coding the same, i.e. fixed fields, 20 characters per author, etc. As there is a lack of consistency in some of the formats, it will be necessary to run a check program to achieve uniformity in some areas. This will be discussed more fully later.

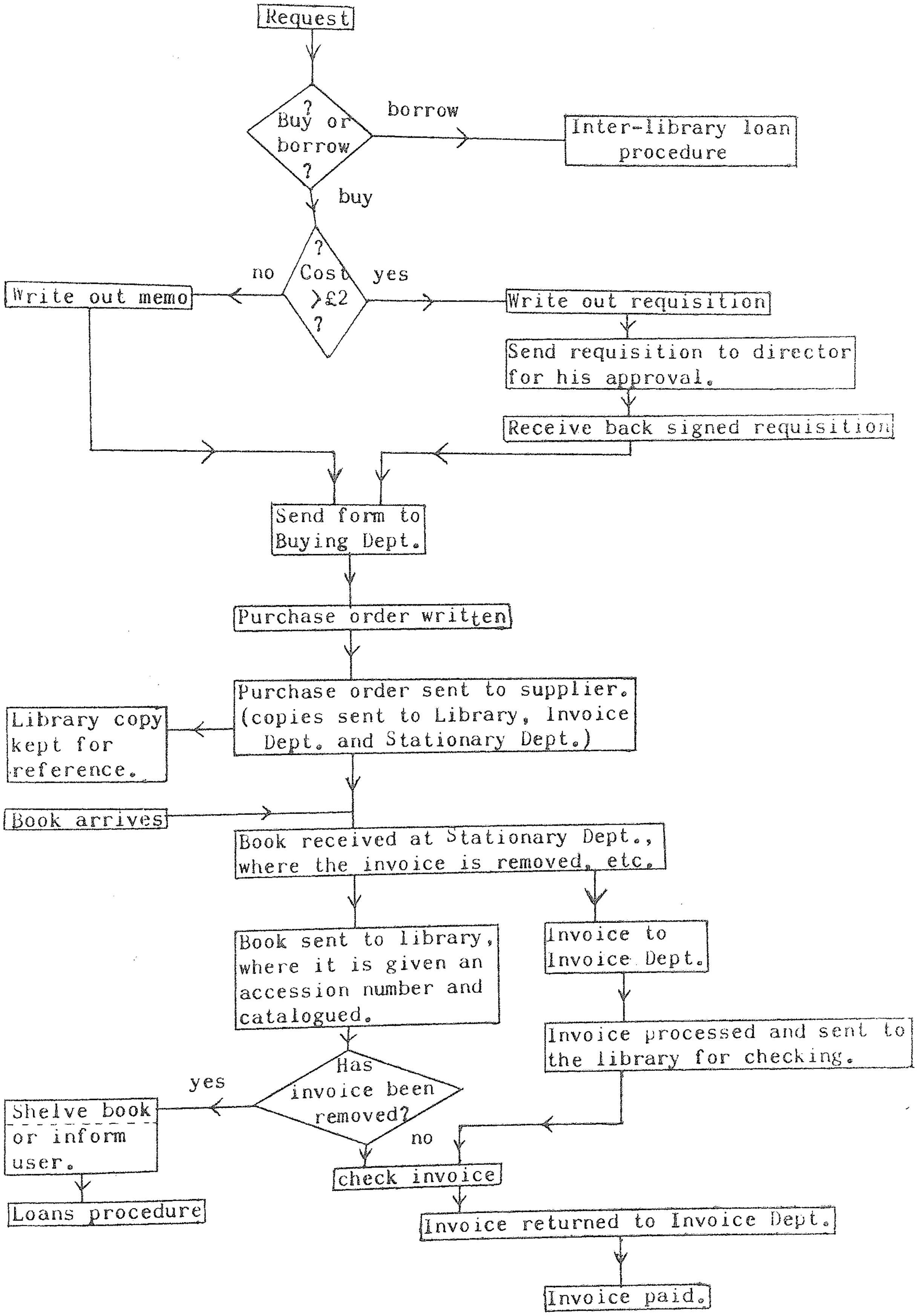
The main problems for the ordering system arise through two recent policies handed down from management. They felt that there was liable to be duplication of written material purchased, so all orders for books, etc., should go through the library for approval. However, as a further check, any item costing more than £2 has to have the approval of the director responsible for the department paying for it. This has meant a vast increase in the amount of paper work being passed round the firm.

Present Ordering System

A flow diagram for the existing procedure is given on the next page. The request for a purhcase comes in from anywhere in the company, in any form, and with any amount of bibliographic detail. If the item will cost over £2 a requisition is sent to the director for signing, giving all the necessary details. If the library is to pay for the book Mr. R.S. Taylor signs the form, but if it is being brought by one of the other departments or a site, it must be signed by the appropriate director for that department. If the book costs less than £2 or will be ordered from the BSI or HMSO, a memo is writen out instead of a requisition form, and signed only by the library.

The completed form is then sent to the Buying Department, who write out a purchase in quintriplicate, one copy being

ORDERING & CATALOGUING PROCEDURE



filed, one sent to the supplier, and one each to the library, stationery department, and invoice department. The book eventually arrives at the company and is received at the stationery department, where any invoice or delivery note is removed and sent to the invoice department. The invoice is then passed through the invoicing procedure and is sent to the library for signing and checking. It is then returned to the invoice department, and paid. The invoice is kept in hard copy for five years (invoices from sites are kept on microfilm for ever).

However, sometimes the stationery department misses an invoice or delivery note, and it arrives in the book in the library. A delivery note is kept until the invoice arrives for checking and is clipped to it, but if the invoice itself is received it is checked and signed as being correct and sent to the invoice department. The invoice department agree that to do this for all the invoices would save shunting the form backwards and forwards, but feel that they would rather check it in first, as they have had cases of invoices being kept by the purchaser, and never being sent down for payment. However the library is an exception because its main function is the control of books. Since all written material is ordered through it, any invoice which went astray could be immediately traced back to the library.

Once the book has arrived in the library it is entered into the system and catalogued. One other form is written out which is not on the flow diagram: an order record card. This is a 3" x 5" library card, which is completed when the request for a purchase first comes in. It gives the supplier, bibliographic and ordering details, who it is to be sent to on arrival, and the dates ordered and received. These are filed in supplier order, grouped as those "on order" and those "received". (If the supplier is not known the author of the document is used.) This is a rather arbitrary system which has been developed to give quick access if there is a query about the order later, since the memo number may not be given. It would seem that considering the volume of material ordered, this is not really necessary, and that if there is any form which is already being kept, like the purchase order, this could be filed in supplier order instead, thus cutting out one form.

There is one exception to this ordering procedure which cuts out the whole system. If an order which does not require a director's signature is required very urgently, the library occasionally orders the publication by phone, provided prior payment is not necessary. The librarian then writes out a note saying what he has done and sends it to the buying, invoice and stationery departments.

The number of items ordered is fairly small, as the following figures show. The period concerned was the six months ending on 22nd February, since this all occurs since the centralised ordering was officially begun.

70 memos were filled in for 400 items (at least 155 were duplicate copies.)

(6 of these were for 176 copies of BSs, (at least 77 duplicates.)

20 requisition forms for 46 items (at least 7 being duplicates.)

Averages:- requisition forms - 2.3 items/form (0.35 duplicates)

memos	-	3.5 items/form (1.22 duplicates)
BS orders	-	29.3 items/form (12.83 duplicates)

Totals:- number of orders in 6 months = 70 + 20 = 90

number items ordered (6 mths)= 400 + 46 = 446 (162 duplicates)

Present Cataloguing System

When a new book arrives in the library the librarian checks it with the order record card and stamps it. It is then passed to the assistant librarian to be given an accession and UDC number, both of which are written in the book. The details are then filled out onto a coding sheet, and the book is returned to the librarian who sends it out to whoever wanted it. The coding sheets are then kept until the next updating of the catalogues which happens about once every six months.

Six lists are produced by the computer: an accession list, an author list and a UDC list as one set, and a bibliographic list, an author list and a KWIC index as another. The print-out of the KWIC package is given on the next page. The main entry

THE KWIC INDEX PACKAGE

MAIN ENTRY

MCALSR-35-TMS 624.191.7
MCALPINE SIR R
THE MCALPINE SYSTEM OF REINFORCED CONCRETE TUNNEL LINING.
LONDON.*MCALPINE,1935 35

MCCRDD-61-AGT 681.3,06
MCCRACKEN D D
A GUIDE TO IBM 1401 PROGRAMMING.
NEW YORK.*WILEY,1961 61

MCCRDD-62-AGT 681.3,06
MCCRACKEN D D
A GUIDE TO ALGOL PROGRAMMING.
NEW YORK.*WILEY,1962 62

MCCRDD-63-AGT 681.3,06
MCCRACKEN D D
A GUIDE TO COBOL PROGRAMMING.
LONDON.*WILEY,1963 63

AUTHOR INDEX

MARGEN P H	MARGPH-60-NRD
MATHESON J A L	MATHJA-59-HSA
MATHESON J A	MATHJA-60-HSA
FRANCIS	MATHJA-60-HSA
MCALPINE SIR R	MCALSR-35-TMS
MCCRACKEN D D	MCCRDD-61-AGT
	MCCRDD-62-AGT
	MCCRDD-63-AGT
	MCCRDD-64-NMA
DORN W S	MCCRDD-64-NMA

KWIC INDEX

```
                                                                         GARTCH-69-MH3
   METRIC HANDBOOK FOR REINFORCED CONCRETE. #                            GARTCH-69-MH2
   METRIC HANDBOOK FOR REINFORCED CONCRETE. #                            GARTCH-69-MHF
   METRIC HANDBOOK FOR REINFORCED CONCRETE#                              LARGGE-57-BRC
     AND CREEP. # BASIC REINFORCED CONCRETE DESIGN.*ELASTIC              LEGAAW-40-DAC
IGN AND CONSTRUCTION OF REINFORCED CONCRETE BRIDGES. # DES               MANNGP-67-PCR
                   NKS. # REINFORCED CONCRETE RESERVOIR AND TA           MCALSR-35-TMS
THE MCALPINE SYSTEM OF REINFORCED CONCRETE TUNNEL LINING. #              MCCRNG-71-ARO
OF THE SCIENCE OF FIBRE REINFORCED PLASTICS. # A REVIEW                  MORCE -50-RCD
G IM EISENBETONBAU/. # REINFORCED CONCRETE DESIGN-TABLES/DI              MORSE -58-TLA
IGN AND CONSTRUCTION OF REINFORCED AND PRESTRESSED CONCRETE
```

is given in alphabetical order by the Luhn code. It can be seen from the photocopy that there can be cases where there is only a minute difference in this code, and this can make for difficulties for example the three books by McCracken only differ in the central figures (date of publication) though their contents are very different. The author list only gives access to the code and not the bibliographic details, and as the code is based very largely on the author's name, it could be worked out without having to go to the author list. In addition the second author is listed under the first author of a paper and not in his own alphabetical sequence, for example "Francis" appearing after "Matheson" means that he was a co-author with Matheson, and his name will not appear under "F". Apart from breaking up the alphabetical order which makes searching difficult in some cases, it means that it is impossible to retrieve a book if one only has the second author. It is claimed that by changing of some of the computer cards, it is possible to have a second sort to get all the authors into alphabetical order but this has never been done. The KWIC index also only refers to the Luhn code.

The formats of the cards for two of the series in the library are shown in the next page (CD9). The first card for books records the UDC number and codes. The UDC number starts in column 21 and any number after the colon should begin ".*" in columns 36-7 followed by the number. However, about half of the records

CARD FORMATS

BOOKS

517.
PERRY M F
THE CALCULUS FOR ENGINEERS.=
LONDON EDWARD ARNOLD 1897
R440. .*413.164
KETTERIDGE J O
FRENCH-ENGLISH AND ENGLISH-FRENCH DICTIONARY OF TECHNICAL
TERMS. VOL.1 FRENCH-ENGLISH.=
LONDON.ROUTLEDGE,1963
526.9
REDMOND F.A.
TACHEOMETRIC TABLES.=
LONDON TECHNICAL PRESS LTD. 1931
624.
624.014.2
GRAY C S KENT L E MITCHELL W A
STEEL DESIGNERS MANUAL.=
LONDON.*CROSBY LOCKWOOD.1955

97
43
31
55

PERRME97TCF	010	00004
PERRME97TCF	011	00004
PERRME97TCF	012	00004
PERRME97TCF	013	00004
KETTJO63FE1	010	00005
KETTJO63FE1	011	00005
KETTJO63FE1	012	00005
KETTJO63FE1	022	00005
KETTJO63FE1	013	00005
REDMFA31TT	010	00006
REDMFA31TT	011	00006
REDMFA31TT	012	00006
REDMFA31TT	013	00006
ANDRES20TSE	010	00007
GRAYCS55SDM	010	00013
GRAYCS55SDM	011	00013
GRAYCS55SDM	012	00013
GRAYCS55SDM	013	00013

MATERIALS LABORATORY TECHNICAL NOTES

LANGRIDGE D G HACKER S
EVALUATION OF THE COST EFFECTIVENESS OF CERTITE POLYESTER
JOINTING COMPOUND IN COMPARISON WITH ALTERNATIVE RESIN
COMPOSITIONS.=
TWC TECH. NOTE JTN/ 69/ 0048 MAY 1969 /TWCJTN0048/ 69
MATERIALS LABORATORY REF. TECH. NOTE NO 226695
HACKER S LANGRIDGE D G
DETERMINATION OF THE COST EFFECTIVENESS OF THE ADDITION OF
SAND FILLERS TO AN EPOXY MORTAR.=
TWC TECH. NOTE JTN/ 69/ 0049 MAY 1969 /TWCJTN0049/ 69
MATERIALS LABORATORY REF. TECH. NOTE NO 227695
GWADERI A H
FIDDLERS- FERRY POWER STATION CRACKING OF CONCRETE
RETAINING WALL.=
TWC TECH. NOTE JTN/ 69/ 0050 MAY 1969 /TWCJTN0050/ 69
MATERIALS LABORATORY REF. TECH. NOTE NO 611695
MCCURRICH L H
ROOTES WHITLEY.* SURFACE PREPARATIONS FOR RESIN FLOORING.
TOTAL AREA APPROX. 1100 SQ YDS.=
TWC TECH. NOTE JTN/ 69/ 0051 JUNE 1969 /TWCJTN0051/ 69
MATERIALS LABORATORY REF. TECH. NOTE NO 415696

LANGDG69EOT	001	N0048
LANGDG69EOT	012	N0048
LANGDG69EOT	022	N0048
LANGDG69EOT	032	N0048
LANGDG69EOT	043	N0048
LANGDG69EOT	059	N0048
HACKS 69DOT	001	N0049
HACKS 69DOT	012	N0049
HACKS 69DOT	022	N0049
HACKS 69DOT	033	N0049
HACKS 69DOT	049	N0049
GWADAH69FFP	001	N0050
GWADAH69FFP	012	N0050
GWADAH69FFP	022	N0050
GWADAH69FFP	033	N0050
GWADAH69FFP	049	N0050
MCCULH69RWS	001	N0051
MCCULH69RWS	012	N0051
MCCULH69RWS	022	N0051
MCCULH69RWS	033	N0051
MCCULH69RWS	049	N0051

have been coded with the number beginning in column 36, so the ".*" begins in column 34. This will have to be checked if it is intended to have the index listing second UDC numbers: at the moment it only gives the first one in order, so the difference in coding does not make any difference. The classification is done by only using the one volume version of the UDC, so only two numbers are included, and no auxilliary schedules. An "R" before the UDC number indicates that the volume is in the reference collection, and an "S" means that the volume is part of a special collection, most notably proceedings of conferences.

There is no shelf list made, giving the order of books on the shelves for checking the stock in the library, but the UDC list could be used very easily for this, as all the books are shelved in UDC order. With those in the reference and other collections marked "R" & "S" respectively, it would be very simple to go round seeing which volumes were missing. If the programs were rewritten so that the second UDC number was brought to the front as well, it would still be possible to do this, as the colon (.*) could be brought with the number, thus indicating that it did not mark the positions on the shelf.

The second card has the authors, each allocated twenty columns. Three authors can thus be fitted onto one card with the Luhn code and accession number, and more than one card is permissible. However, the problem which will arise will be what to do with a corporate author whose name takes up more than the twenty columns allocated. To prevent the computer starting in the middle of a corporate name when sorting for the second author it would be necessary to include some sort of code to detect it. At the moment the computer sorts by the Luhn code so this difficulty does not arise. Also the names are not listed in an absolutely standard format. For example, Redmond F.A. on page CD8 has fullstops between his initials whereas, the others do not. In the data for the IR test R.L. Peck was listed differently for each of his papers:

	Author Card	Index Term
1.	PECK RL	PECK R
2.	PECK R L	PECK R L
3	PECK RL	PECK R L

It would appear that the author card should have been RL, and the index term R L, but this is not certain. While this sort of lack of uniformity is unimportant for merely listing the items alphabetically by author, it means that a match will not be obtained if the computer is asked to find a different format from the one used. In a listing one would find PECK R L appearing before PECK RA.

The title cards have the title of the work, its volume number, language, etc. Second and subsequent title cards are indented by two characters. The number of copies should also be included as suggested in the appendix to Study A. The final card gives the publisher and date of publication, and in addition the last two digits of the publication date are repeated in columns 59-60. This is unnecessary unless one wants the publication date to stand out.

The last three columns of figures in the Luhn codes are in fact closed up on the card, the program has spread them to make them easier to distinguish. The characters are the first four characters of the authors name, then two initials, the date of publication, and finally the first letters of the first three words of the title. This Luhn code is not automatically added by the computer, but is written in by the indexer, and hence there are one or two exceptions. For example, the 1 instead of the last first letter for the dictionary indicates that it is volume 1. Next follows three digits which describe what sort of a card each one is. The third of these numbers gives the kind of card; 0 is a UDC, 1 an author card, 2 the title, and 3 the publisher. The first two numbers are the number of the card within each type; hence when the title of the dictionary exceeds one line the next one is 02. The last five digits are the accession number.

Thus, when the author index is prepared by sorting alphabetically by the Luhn code, it sorts by the first four letters of the author's name, his initials, the publication date and three arbitrary letters from the title. On the surface this sounds reasonable, but it does allow DAVISON A J to be listed before DAVIES D P, DAVIDS I, and DAVIS L, while it will come after DAVITT A B, (all fictitious names). For the KWIC program it seems unnecessary to generate a new unique code, when that is exactly what the accession number is, and the five accession digits are much simpler than the 11 mixed character Luhn code. If the authors were to be sorted directly, this would render the Luhn code totally superflous. In addition the first subsequent number could also be omitted in normal cataloguing, since this is only zero unless there are more then ten cards of a particular kind for an item, this would only happen if there were text cards included and hence not in cataloguing.

Some of the other documents have slightly different layouts, but this is the basic form. Some of the sets of reports have Luhn codes based on their organisation of origin rather than the rules stated above, but they are not fundamentally different. Different collections also have a letter at the beginning of the accession number; for example, on the page of card formats, the Materials Laboratory Technical Notes have an "N" followed by four digits. These technical notes are also the only items which do not have a UDC number allocated to them, as can be seen from the same page. While one could easily code titles like "Painting of lime gypsum plaster" (667.66:666.81), it would still be possible to do "SE. Electricity Board Offices, - Lews, Sussex, Breakdown of concrete columns", or "Newham paint failure", using even the Abridged English Edition of the UDC, since what would be looked for would be "breakdown of concrete columns" or "paint failure". The UDC number for the books breaks up the listing into items, owing to it being indented, though one tends to attach the number to the item above rather than below. With no UDC number, it is very difficult to read the list of the technical notes, so this at least needs laying out again.

Modifications to the Cataloguing System

It is questionable how much of the catalogue is really worth having, considering the use that is made of it. The survey revealed that during two weeks no one except the library staff used the catalogue and they only did six times. Most people on being asked expressed ignorance that there even was a catalogue in the library; yet, twelve copies of each part are sent round to the heads of departments so that the members of each department can find out what is in the library without having to go there. This means that little or no use is being made of this facility outside the library, and little enough inside.

However, it is obviously necessary to keep a record of the stock of the library, so the accession list is necessary, (also it will be needed for the loans procedure proposed). It is necessary to be able to find the books on the shelf, so the UDC list must be continued. It is probably worth having an author list since this is the most common way of finding if a particular book is in the library.

The need for a KWIC index is questionable, but it would seem to be reasonable to have some means of finding a book on a given subject, apart from the UDC list. Any further listings would seem to be unnecessary so only these four programs will need to be written. At the moment 6 listings are provided to give these four indexes, so in a new system two could obviously be dispensed with.

One does not want to change the existing formats more than necessary, but in new programs, sorting by the author's and second author's names, the Luhn code could be omitted without loss, the additional space being used for more data, or the entries compressed. This would be better anyway if the data were kept on magnetic tape rather than cards. The initial preparation of the entries will probably still be on cards, though this will depend slightly on the ordering procedure adopted.

Thus it seems that the cataloguing should remain as it is at present, except that the prgrams will be rewritten to do the jobs more thoroughly. In addition it will be necessary to run programs to check the formats which have not been strictly adhered to, for example the position of the second UDC number on the card. These details have not effected the data as it is manipulated at present, but will become all important in the new programs.

Modifications to the Ordering System

The problems with the ordering system are that there are too many forms, too much duplication of the same bibliographical information by different people, and that forms travel repeatedly round the company. To improve the system one must reduce one or more of these factors. Unfortunately much of the movement of forms around the company is necessary; the enquirer must send in a request before the library can act, the director must have the form before he can sign it and it can only then go to the buying department to be sent out to the supplier. However, a certain amount can be done in this area.

To computerise the ordering procedure sounds very nice in theory, but is more difficult in practice. Of 62 purchase orders received in the last six months by the library, 34 different suppliers were involved in providing the material, of which the most frequent were 12 orders to HMSO and 8 to the Cement and Concrete Association. To have the computer write purchase orders to all these different suppliers would be very time-consuming. The books are supposed to be purchased from an agent who gives a 10% discount, but he is very slow, so in practice is very rarely used. Also the company has an account with HMSO, and it is easier to get an organisation's literature from that organisation direct (e.g., C & CA). The other problem is that some suppliers require payment in advance, and some are sent official orders, while others merely receive a letter. The procedure is not standard enough to computerise en bloc.

However, the same bibliographical data which ends up in the computerised catalogue is passed from the user to the library to the director back to the library, to the buying department and finally to the supplier: and it is possible to make use of the computer. The way to do this is set out as the Proposed

Ordering System Incorporating Computerised Cataloguing. The other approach is to reduce the number of forms to a minimum manually, forgetting about the cataloguing which must be done later. This is set out in the Proposed Manual Ordering System.

Proposed Manual Ordering System

At present the user who wants a book purchased must send a letter to the library, who then fill out an order record card and a requisition or memo. If it is a requisition form it must be sent to a director, who then sends it back to the librarian, who then sends it to the buying department. All this could be done using one form and could be included with the loans requests. A suggested format for the form is given on the next page.

These forms would be distributed round the company, and anyone wishing to borrow or purchase a book or article would fill one in. One by-product is that by asking for specific information like volume number, the users will be encouraged to give complete references. At present many users have the whole reference in front of them when they write to the library asking for an item, but they do not realise that all the information is useful, particularly for NLL loans. The distribution of loan request forms could be advantageous even if the ordering system is not adopted, and people ringing up the library with requests would be asked to send in a form. To make things simpler, the library's address could be written on the back when the form is printed, so that it can be simply folded in half and

POSSIBLE FORMAT FOR LIBRARY REQUEST FORM

(Library's address on the back for return)

TAYLOR WOODROW CONSTRUCTION LTD

LIBRARY REQUEST FORM

NAME .... DATE ....

DEPARTMENT .... PHONE ....

Please supply/purchase the following item:-

TITLE ....

AUTHOR (if applicable) ....

Title and Editor of
Conference Proceedings (if applicable) ....

JOURNAL (or PUBLISHER) ....

VOLUME .... PAGES .... DATE PUBLISHED ....

Any additional information:-

For purchases: - Price (exact if known, otherwise approx.) £ .....

Please charge this item to .... Department (No......)

Signed (Director) ....

For Library Use Date ordered .... Date received ....

Due Back .... Returned ....

SOURCES TRIED

Source	Date: Telex	Date: Phone	Date: Letter	Result

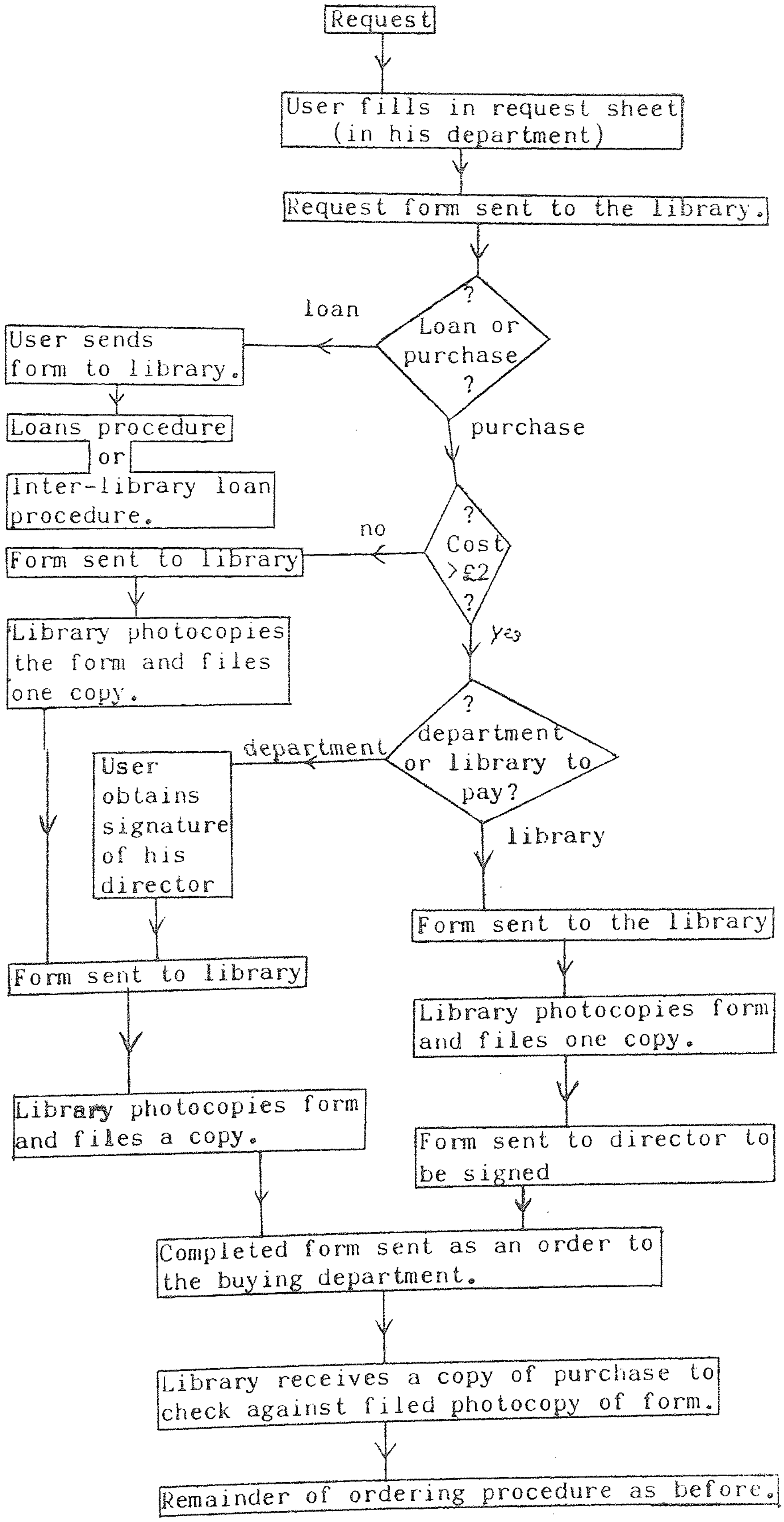
put straight into the internal mail.

If the item is to be purchased then there is a space for the director's (or head of department's) signature and this can be obtained before the form ever goes to the library. This should act as a deterrent to those who feel that if it is just the same form to obtain either a loan or purchase, that they might as well buy the book. When the form arrives in the library it would be photocopied after any additional information had been entered and one copy sent to Mr. R.S. Taylor for signing if necessary. The second copy could be filed under the supplier as the order record cards are at present, since the librarian seems to find this the most satisfactory method. The original form is then sent to the buying department, from the library if it did not have to be signed, or direct from the director if it did. Presumably, if he turned it down, the form would be returned to the library, and if for some other reason it did not reach the buying department, the library would find out because no copy of the purchase order would arrive from there. I ascertained from the buying department that they did not mind what form the request to purchase an item reached them in. A flow diagram for this procedure is given on the next page.

Proposed Ordering System Incorporating Computerised Cataloguing

The approach here is to get the bibliographic information into machine readable form as soon as possible, so that it can be used for filling in the forms. Obviously it is not possible to get the original user to send his purchase request in on a coding sheet, so his request will continue to arrive in any manner, or the previous

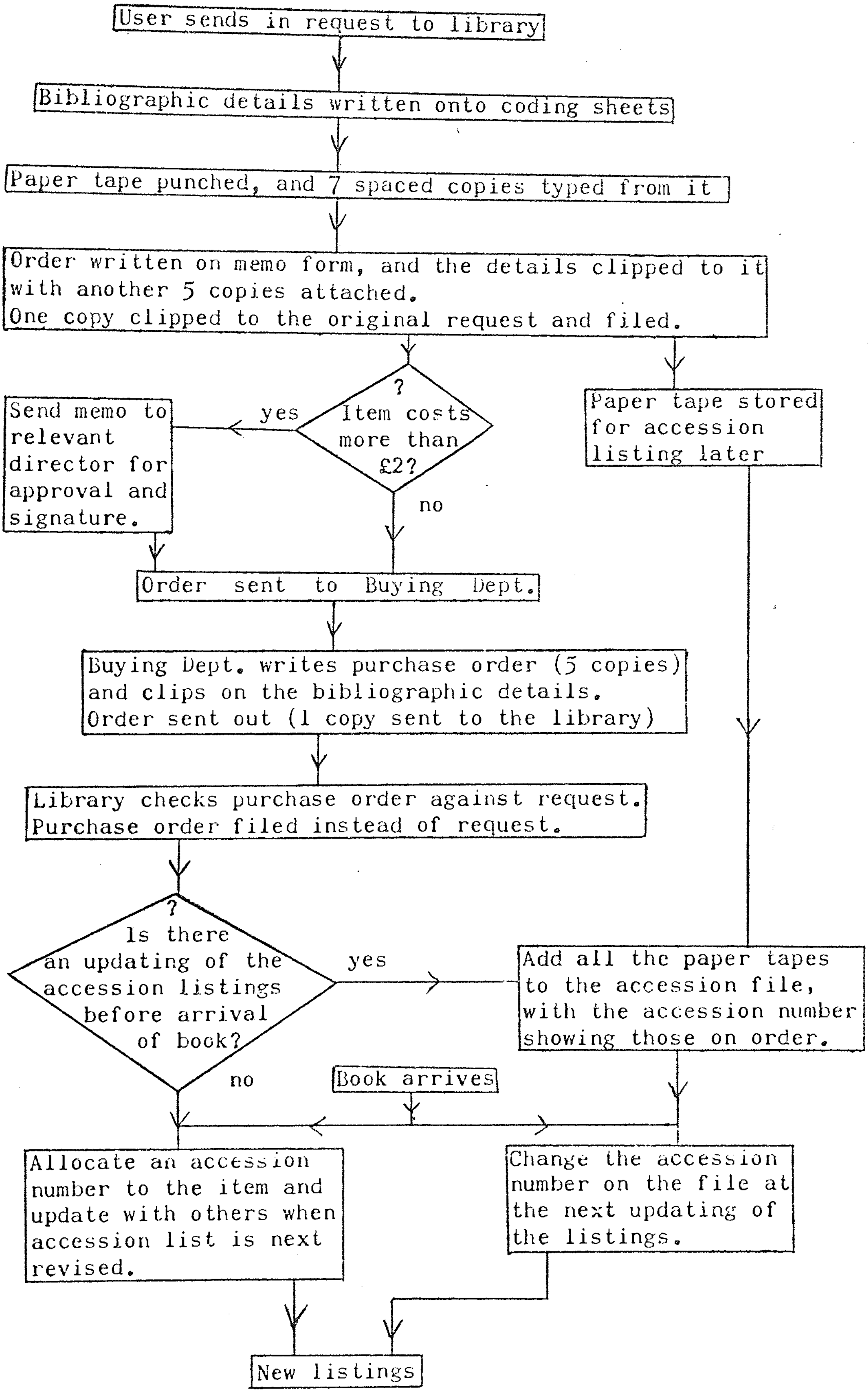
ALTERNATIVE MANUAL ORDERING SYSTEM



standard form could be used. However, as soon as it arrives in the library, the details are written out on a coding sheet in catalogue form. The sheets would then be punched onto paper tape, and this used to make seven records. One copy would be clipped onto the request and filed (this would be the advantage of standard sized form),and one copy would be clipped to a memo and the extra details written on by hand. The other five copies would be attached to the back with a paper clip and the whole sent to the director, or direct to the buying department, where the five copies would be clipped onto the five copies of the letter saying "please supply as attached".

Since the updating of the catalogue is so infrequent, it would probably be worth entering items, which had been ordered but not yet received, with a special accession number (possibly letters for clarity) indicating that they were on order at the time of going to press. If this is not done, it means that some items will not be listed until six months after they have been received. At the next updating the proper accession number could be inserted for the "on order" one. Alternatively the tapes of all the items received during the last period would be edited and made into one tape to be input to the system and updated. Obviously, unless the tapes can be put straight onto the computer into a current file, there will be problems of storage for shortish lengths of paper tape which must have some explanation written on them. Cards would be very much preferable, but there does not seem to be a facility in TW for printing them out onto paper without going through the

ALTERNATIVE ORDERING SYSTEM INCORPORATING COMPUTERISED CATALOGUING



computer. Unless, therefore, an up-to-date file of library holdings is kept on the computer, it will almost certainly be better to use the manual system. However, since the loans procedure will need an up-to-date list, not one that is updated only once in six months, it would seem that the former is necessary anyway. In this case it would be possible to have a file of items on order. A flow diagram is given on the previous page.

Proposals

The programs for the various catalogue listings should be rewritten to remove the weak points, and make them compatible with the new machine independent system. The computer should keep up-to-date lists of the library holdings, even if the printed listings are only produced once in six months. The ordering system should have the number of forms involved reduced, by one of the two systems suggested; and in any case request forms should be distributed round the company.

E. SPECIAL COLLECTIONS

Introduction

Their are eight areas of the library which must be considered under the general headings of special collections: Reference Material and Conference Proceedings, Reports, Translations, Photocopies, British Standards, the Materials Laboratory's Concrete Collection, Technical Drawings, and Maps. Some of these groups do not need much description, but must be mentioned for the sake of completeness.

Each of these special collections has its own problems, and some, like the drawing collection which is being put onto aperture cards, are undergoing change at the moment. It is therefore necessary to consider each collection in turn.

Reference Material & Conference Proceedings

This section includes all the items in the library which are given the letter R (Reference) or S (Special Collection) in the catalogue. These letters before the UDC number merely act as a kind of shelf mark. These sections are kept together separately from the rest of the collection, and since the UDC number is used to locate the position of an item on the shelves, it is necessary to have some means of recognising that these items will not be found with others of the same number. The R and S are not sorted separately from the rest in the UDC and other lists.

While it is obviously worth keeping the reference material separate, there seems to be little point in doing so with the conference proceedings unless one is going to produce a separate list of conference proceedings, and this is not being done at the moment. The only way to obtain a list of proceedings held by the library is to look in the KWIC index. Since they can be called "Conf." "Conference" or "Symposium", these words are not the best to use. The word "Proceedings" yields 79 items, while "held" provides 63.

Recently the Materials Laboratory bought for itself a copy of a conference proceedings which was in the library, but which they had not been able to find. Since these are usually expensive items, it is important to prevent this sort of duplication as much as possible; so all the conference proceedings, including those in the Materials Laboratory and any others which may be aroundin departments of the company, should be included in the catalogue. If a list of all conference proceedings was wanted, it would be better to change the first zero of the accession number to a letter signifying conference proceedings, rather than having to sort separtely for an "S" before the UDC number. The reference material should remain as it is.

Reports

The main principle to be applied to reports is that they should each have a unique accession number which can be used for loans in the proposed loans procedure. These should also show which sort of report this is, so they can be separated into groups merely by sorting the accession numbers. This is achieved by making the first of the five characters a letter which will designate the group, e.g. CIRIA reports or TW Materials Laboratory Technical Notes.

The reports divide themselves into two sorts: external and internal. The internal reports are of three kinds: classified and unclassified TW internal reports and the Material Laboratory Technical Notes. The Technical Notes have the letter N as the first of the characters of the accession number, but as they are never loaned they provide little difficulty. Most people who are interested in the Technical Notes are from the Materials Laboratory and consult the complete collection which is kept there; but if someome wants a copy from the library a photocopy is produced for him.

The TW internal reports are slightly different. When a report is commissioned, the writer applies to the library for a number. The library allocates the next number in a scale beginning from 1000, and sets aside an accession number in a sequence which started from 1. These numbers should be made one. When and if the report is finally submitted, the original and two copies are supposed to be sent to the library. On receipt of these, the librarian fills out the details on a computer coding sheet for punching, and writes out three cards (one per copy). These cards are kept together, and when a copy is borrowed, the appropriate card is moved from one half of the box (the "in" section) to the other half (the "out" section), with the borrower's details entered. Initially, the reports are only made available to those on the circulation list on the copy, and to those with permission from the director of research. Every three months, the reports which have been received are sent to the director of research, who marks them as classified (available only to the same people as before) or general (available to any member of the TW staff). He can later declassify reports if asked to do so. A star is entered on the computer cards of general reports when they cease to be classified, and lists are produced by the computer of the two types.

There are many different types of externally produced reports. For example, all the CIRIA reports are received by the company by virtue of membership, though in the past some have not always reached the library; and some reports are bought from the Building Research Station, DOE, Cement and Concrete Association, the Road Research Laboratory, HMSO and others. In particular, the HMSO publications are especially varied in content, ranging from Acts of Parliament to reports on the construction industry. The government publications have their own indexes, as do some of the other organisations, and these provide a useful entry to the system. All these reports have been or are being given a unique accession number, which will be entered in each copy, though it has not been yet. Unlike the books however, the reports only have one number for several copies of the same item. This is what was suggested for books in the appendix to Study B, so it will fit the loan system well.

Proposals for this section are few; things have already been changed so that a copy of CIRIA and similar reports does come straight to the library. The best system seems to be to include reports in with the other material for loans procedure, using their unique accession number. Since the different sets have a letter at the beginning of this number, they will be sorted by the computer when it produces the accession list. For other lists, they should appear in their normal place, by author, title and UDC number. Classified reports can be included in this except that they will not be available without permission of the director of research. It would probably be worth having a regular updating and declassifying of the classified reports.

Translations

The library only holds a few translations and these are the ones produced by Cement & Concrete Association, with a few of the CIRIA translations. In neither case is the collection complete; they are just bought on request. (The librarian does not remember one CIRIA one being asked for in the year he has been with the company.) The lists of other translations available are given in the copies held, so there is no real need for an index at present. Unless they increase, it would seem to be best to leave the translations as they are, and if they do they could be treated like the reports.

Photocopies

The librarian has been making a point of photocopying short NLL loans when they come in. One copy is sent to the person who requested the item, one is filed in the library, and the original is sent straight back to the NLL. This procedure prevents difficulties of recall later, and provides a permanent copy in the library for other users, since a particular project may mean that several people ask to see the same paper. At present these copies, and duplicates returned by borrowers, are kept in unsorted piles at the back of the library, and retrieval depends on the librarian remembering that he ordered the particular articles.

This backlog of uncatalogued material is obviously evidence that more library staff are needed. The photocopies need to be allocated accession numbers and indexed. There are two ways in which this can be done; either the papers, as individual items, are given a code for photocopies, (a letter at the beginning of the accession number) and treated like the reports, or they can be grouped together by subjects, and each subject made the base for one of the special files on specific topics, which the library is intending to build up. In the latter case, the files themselves would be treated as reports for indexing and retrieval. As mentioned in the appendix to Study B, the files have been allocated the letter F, and one such file is already in existence. In either case the papers certainly need cataloguing as soon as possible. (Since writing the library has already started sorting the photocopies into files by subject).

The Special Concrete Collection

The information scientist in the Materials Laboratory has built up a special collection of papers on concrete, known in the laboratory as their "data bank". This collection has about 1700 items which have been indexed and put on cards and an optical coincidence index. It is obviously worth-while for the library to have details of this, since others in the company may require some of the information, and at present the library would have to go outside the company for it. This will equally apply to the other material held by the laboratory, which will be discussed later.

To provide the data for the library would be very simple, as one of the cards kept in the Materials Laboratory lists the accession number, title, author, source, and keywords allocated from their own work list and the CIRIA Thesaurus. This information could be punched straight from the cards in the appropriate format, and input to the computer. Since the accession numbers only go up to four digits, they could easily be given a letter and treated in the same way as all the other special collections as far as the library was concerned. The IR system would also include the papers, though the Materials Laboratory wishes to continue to use its own optical coincidence index for interrogating the system in the laboratory. It is not suggested that the collection itself is moved to the library since the main use comes from the research staff in the laboratory, and there is a full time information officer looking after it. The possibility was discussed with him of having his card indexes done on 80 column punched cards and having these produced as required, when the library input the information to its own system, thus reducing the copying work he is required to do. This seems a reasonable possibility.

The Materials Laboratory also has some conference proceedings in its collection, and the list of these should be included with the library ones as suggested in the section on conference proceedings. There are also about 20 files on special topics, and these could be included in the files lists made in the library (see last section on photocopies). The topics covered include such subjects as "crack widths".

British Standards

There are a large number of British Standards and Codes of Practice in the library, and up to six or seven copies of some of the more popular ones. About half the collection is out on loan at any one time, some items for very long periods. The library tries to keep one copy of the most important ones on the shelves for reference. At the moment the system of loan is the same as that for the TW internal reports. Each copy is marked with a small letter to distinguish it from duplicates, and a card is made out for it and filed by BS number. When the standard is borrowed, the date and borrower's name are entered on the card and it is moved to another box of standards on loan. At the same time an entry is made in a book of British Standard loans giving date, number, BS number, borrower and a space for date returned. The "number" referred to is an old one which is no longer operative, but which is still included.

The number of loans is steadily increasing, as can be seen from the graph on the next page, so a quicker loans procedure would be useful. While the card system works well, there is no reason why the standards should not be included in the previously

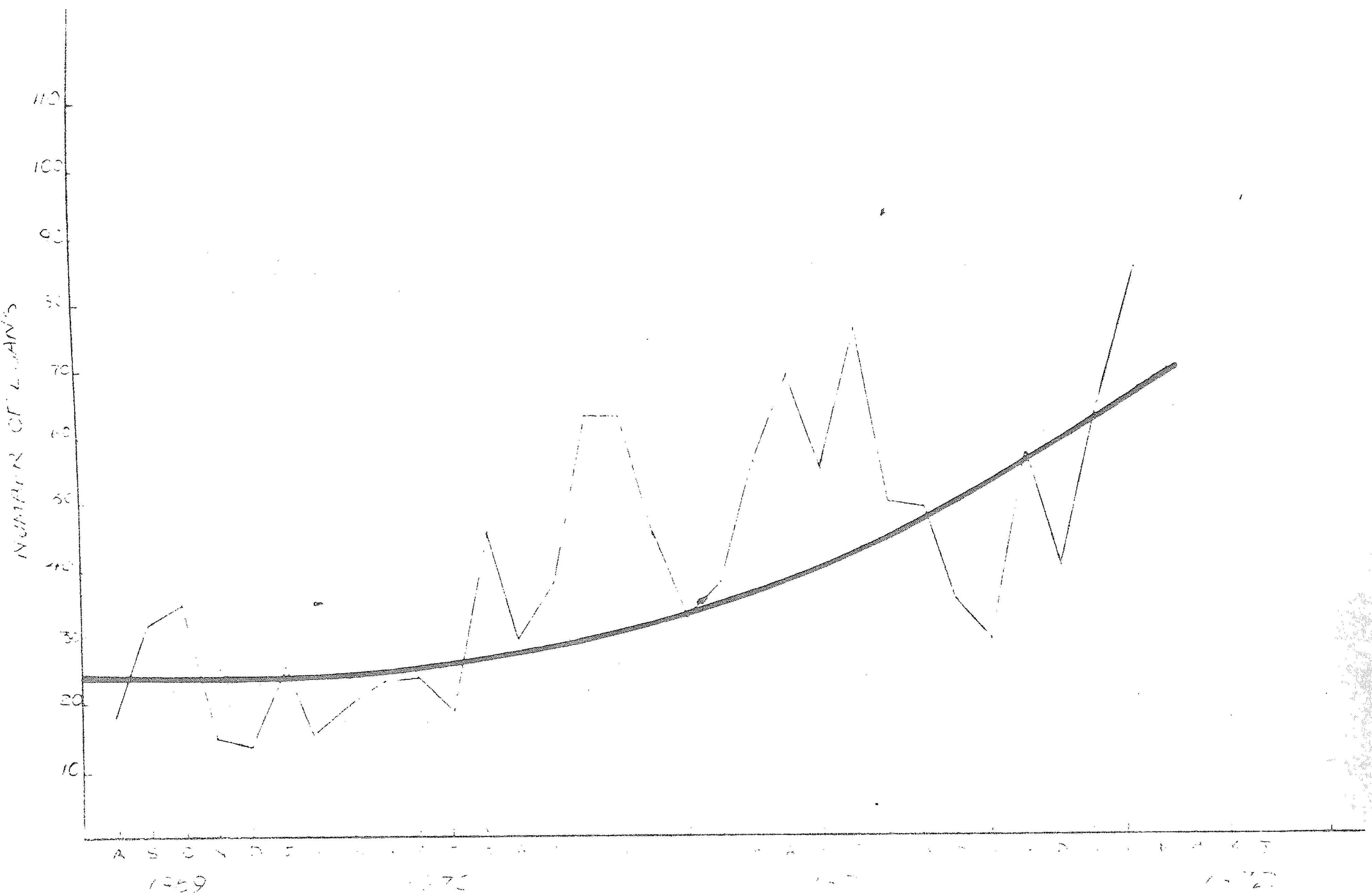


FIG 2 – TREN OF LOANS

suggested computerised system (see Study A). The BSI publishes its own index to its publications in the BSI yearbook, which is received in the library through membership of the Institution, so there seems little value in trying to produce another one in the library. It is therefore not worth including the BS holdings in the computerised accession lists. Since however, it would be necessary to keep a record of which ones are held in the library, the simplest way would be to continue to keep a "list" on cards, though these would not be divided between "in" and "out". However, the BSs should be included on the renewal lists of books sent to the borrowers to tell them which are on loan to them and need renewing. This can be done by treating the BS number as an accession number for purposes of loan, and this number can be written straight out on the renewal letter.

All the BSI publications have six character (or less) identification codes, ie. the standards go up to BS4662, with some in the BS9000s, while the codes of practice only go up to CP3009. With a letter to indicate the copy number, this would mean that the accession number allocation for the loans procedure would have to be increased from 6 to 7 characters, (including one for the copy number) but this would create no problems, since the programs for this have not been written yet.

(See also the final section in this study on "Accession Numbers".)

Technical Drawings

The company has about 250,000 drawings of past projects which have up to now been kept in plan chests in the drawing offices. The company has decided that all these are in future to be kept on aperture cards. There is therefore one person working full-time on converting the drawings, though at the moment only the archival ones. One master copy will be kept in the strong room, and another will be housed in the library for reference. A special viewer with a wide screen is being purchased, so that the whole drawing can be seen at once, and not only by sections.

It is therefore necessary to work out a system of retrieval, so that these drawings can be referenced quickly and easily. At the moment they are coded by a job number given by the company concerned, and this is extremely complicated, for example 3W 21920A 2272B. For ease of access it might be better to give the drawings a frame number, which need only be six figures long. As most enquiries come in the form of a request for a particular job, it would be necessary to have a computer listing of the frame numbers from the drawing numbers given for the job, however there may be some way of using the job numbers as a form of classification and this needs looking at.

There is little to be gained from putting all the drawing information into the general data bank, since people are unlikely to ask for all papers and drawings on a particular subject, however, many of the same programs can be used. With a quarter of a million drawings, this data base will be quite big enough on its own. A problem then arises with the coding of the aperture cards. At the moment all the documents in the library have a five figure accession number, and all the programs will cope with this, but to code ¼ million items will require six figures. This means that either the accession numbers will have to be increased to six characters (see section on Accession Numbers Later), or at least two letters will have to be included in the number, thus giving about 675,000 codes. It has been proposed to store the cards in trays on rotating drums, and the exact arrangement of the numbers will depend on the nature of such storage, for example if there were 24 trays along the drum and 9 round it, it would be best to begin with a letter for each tray along and a number for each one around.

Study is needed as to how the requests for drawings will come in to the library. It would be possible to allocate keywords to the drawings and use an IR program to retrive them, but if requests are not as general as this, it might be between simply to have a KWIC index of the titles. To run frequent searches on 250,000 items will be expensive, as will be the allocation and coding of keywords for such a collection.

In addition to the archival collection of drawings, the company has proposed that the file of 60,000 active drawings should also be put onto aperture cards. No final decision has yet been made, as consultation with the draughtsmen who use the drawings is still taking place. If, however, this does happen, these ones too will come under the control of the library, though they may be situated in the drawings registry. At the moment a draughtsman wanting a copy must send, or if he is in a hurry take, the tracing to be reproduced, and the same would happen with the microfilm system. There are a couple of hundred draughtsmen in several drawing offices in different parts of the building, and with the Company's policy of centralisation, there are no longer dyeline copiers in these various offices, all are concentrated with the large machines in a central printing room.

Under the new system, there would be collections of the active drawings for consultation in the main drawing office with a microfilm reader or readers. If the draughtsman actually wanted a 18" x 24" hard copy of the drawing, he would have to apply to, or visit the library and have one made up. There would be a reader/printer for this purpose housed with the active collection in the library. To obtain the original size would be more difficult. The main central installation will continue to produce drawings for sites from the new tracings.

This system will require one new full-time member of the library staff. It has been estimated by the company that each draughtsman requires about three old drawings for each new one, and that each one takes about three weeks to produce. Thus each draughtsman will require one drawing to be copie each week. If there are 210 draughtsman in the company, this means 210 copies per week. It will probably take about 10 minutes to receive acquisition forms (or answer the telephone), find the drawing, copy it, return it to its tray and send the copy to the draughtsman. This means a total of 2100 minutes (35 hours) of library time each week, which is almost a full man-week. One new library staff member would therefore be needed for this alone, apart from making and cataloguing the aperture cards.

Maps

There are two sorts of maps in the library, Admiralty charts and ordinance survey (OS) maps. In the past, there were few of either, so they could easily be leafed through to find a relevant one, but the collection has been growing and now some form of list or index is needed. At the moment there is no key to the Admiralty charts at all. They are nearly all of costal waters, except those concerned with oil drilling in the North Sea, and they are located by comparing the adjacent coast with ordinance survey maps. This is an unreliable method, and the library has agreed to try and purchase some form of key from the Admiralty. (This has now been done.) The OS maps have already got their own keys.

Both sorts of maps are sometimes loaned, though the flat OS maps only in an emergency. There have been an average of 11 maps loans a month over the past year: one every other working day. However both sorts can be entered into the proposed computerised loans procedure, as all their code numbers have six characters or less. The computer could be programmed to recognise these codes and prints out "OS map" or "Admiralty Chart" before the number. This means that like the British Standards, it would not be necessary to enter all the maps onto the accession file on the computer. However, like them it would be useful to have a list of all the library's map holdings.

The library has a complete collection of ¼" OS maps and it is trying to get a complete collection of the 1" ones. These scales have an overlap, so it is not possible to have a unique number for one area, but for larger scales all the maps cover sub-divisions of the same areas. This means that it would be possible to produce a "once for always" list of all the more detailed maps covering the areas of the 1:25,000 maps. On this list could be ticked off the maps which are held in the library and others as they are added. This means that it would be easy to see at a glance the most detailed map held of any area found on the 1:25,000 maps key. The users normally seem to want the most detailed map available of their area. Admiralty charts would be included for each area.

Accession Numbers

There would seem to be quite a good argument for increasing the number of accession number characters from five to six. It would be worth dividing the reports, for example, into much more detail, so that the accession number would be able to distinguish between CIRIA technical notes and CIRIA research reports. This could be done by inserting a second letter after the R for CIRIA. Other items such as books would just have room for extra expansion. There could be a second letter difference between special files kept in the library and those kept in the Materials Laboratory.

When the data at present being used is reformatted to run under the new programs, it would be easy to have the computer put in the extra characters, since all the necessary data is already on the cards in one form or another, in many cases in the Luhn codes. Such a change would mean that an all figure drawings accession number would be possible if desired, and that maps and British Standard could be included in the system without renumbering them.

Proposals

a) Reference Material and Conference Proceedings: Reference Material should continue as at present. A list of all the conference proceedings in the company should be prepared, and they should have a distinguishing letter in the accession code.

b) Reports:- TW internal reports should be included in the loans procedure, and each set of reports should have its own distinguishing accession code. There should be checks on the necessity of classified TW reports remaining classified.

c) Translations:- No change should be made in the keeping of translations.

d) NLL Photocopies:- Should be catalogued, and listed either as individual items, with a unique accession code, or collected together in files.

e) The Special Concrete Collection:- records of the materials laboratory's "data bank" and other items should be included in the library's data base. It may be possible to help produce the index cards on the computer.

f) British Standards:- The BSs should be included in the loans procedure, using their BS numbers and a copy letter, but should not be included in the computerised cataloguing, as they have their own index in the BSI year book. An accession record of them should continue to be kept on cards.

g) Technical Drawings:- further study is needed to find what form the requests are made in, so that the coding and retrieval may be designed to suit this; it may only be necessary to run a KWIC index of titles. Decisions concerning the active file must wait until the company has decided exactly what course to take. However at least one full-time member of the library staff will be required to man the suggested system.

h) Maps:- A list of maps and charts broken down by area should be compiled showing those which are held in the library. Loans can be done like the BS loans by using their official numbers.

i) Accession Numbers:- it might be best to increase the accession numbers to six characters, while the whole system is being computerised, as this will relieve pressure on codes and allow for expansion.

F. RECEPTION & CIRCULATION OF PERIODICALS

Introduction

There are four parts to the control of periodicals in Taylor Woodrow. Firstly, they must be ordered, checked in, etc. Secondly, since senior staff in the company demand to see them before they are ensconced in the library, either the magazines themselves, or photocopies of the contents page and abstracts are circulated to certain people. When eventually in the library, the journals must be available for consultation, and lastly it may on occasions be necessary to let out on loan.

The first two of these areas will be discussed in detail in this study, but the other two have already been dealt with (see study B, Inter - Library Loans, Journals). It is assumed that the magazines will continue to remain on open access as at present, but there is a question of how long they should be kept. At present the policy is to keep all the journals for a time specified in the list of periodicals, and then to convert them to microfilm. None have been converted yet, as a few have reached the proposed ages. The present list of periodicals, officially revised once a year, is well out of date, and it would probably be worth reconsidering the retention periods and updating the list in the light of recent cancellations and orders. It is probably not worth keeping all the back numbers for ever, even on microfilm.

If microfilming were being carried out, it would be much better if this could be done when the issues first came in, but there are serious problems. Only one issue of a journal would be filmed at a time; hence the lengths of film would be very short, and unless they could be stuck together, this would cause storage problems. However, there would be great advantages since it would mean that there was always a reference copy of every issue of every journal available in the library for consultation, and at the moment large numbers of issues are lost. Hardcopy of articles could easily be made on a reader/printer if they were wanted. When the microfilming equipment moves into the same area as the library, the delay would only be of the order of a day.

Ordering

At present there is a problem in obtaining figures on the number of periodicals taken by the company, because the list in the library is out of date, but the following gives some idea of them.

Approx. number of periodicals reaching the library.	= 150
Approx. number of periodicals passing through the Publicity Department for the library	= 100
∴ Approx. number from other sources	= 50

It can be seen that the majority of the magazines are received in the Publicity Department and passed down to the library via those on the circulation list. The Publicity Department has a total of 134 subscriptions with Tratsart, and external agent, of which 27 are duplicate copies of 11 magazines. Of the remaining 107, some never reach the library; for example

Punch goes to Reception, Nursing Times to the industrial nurse, and Mr. Munrow keeps one journal in his department because he says he is the only worker in the field in TW, and it is more useful there.

In addition, the Publicity Department orders 11 copies of Construction News and 13 copies of Contract Journal direct from the local newsagent, because he is more reliable. All the Publicity Department purchases are well documented, and arrivals are noted on a form, with the date. Non-arrival of an issue can be seen from the blank space in the appropriate place, and a letter can be sent to the agent to query it. The only problem is that the form is a standard one, with a space for each month and several lines underneath for weekly entries, but there is no provision for quarterlies (ie there will be blanks anyway) or for irregular publications. For the latter the volume and number have been entered recently, but it is still not possible to tell if the last number of the volume published came in unless there is a standard number per volume, which is not always the case.

The magazines which pass through the Publicity Department are thus fairly simple to check up on, and it should really be considered for this purpose as an extension to the library, but the situation is different for the other third of the periodicals, which appear to come from a variety of sources. Some are ordered direct by the library, for example the ASCE and C&CA publications; but there seems to be little reason for this except that originally the Cement and Concrete Association used to send an order form at the end of the year for the coming one, and this was filled in by the librarian. One or two publications come to the library as a result of the membership of either the library or the company in certain organisations, for example the BRS News and the BSI News, though sometimes these too arrive through the Publicity Department.

Other free issues come direct to the library, and the Indian Concrete Journal still comes in although the subscription expired 6 years ago. BRS Current Papers just arrive, though this may be due to membership. Civil Engineering (ASCE) is sent down by a member of the company who receives it, though it is his own copy and he does not always remember. The British Computer Society Journal is on subscription by the Computer Department, and they send it to the library when they have finished it. FIP goes to Mr. R.S. Taylor as Director and is sent down. There may be other sources which have not yet been discovered.

It can thus be seen that the origins of publications arriving in the library are many and varied. This poses great problems, since the present librarian, who has only been with the company since March 1971 does not know exactly which periodicals he is meant to order, and there is no record in the library of issues not received. (The librarian has left and been replaced since this was written.) It is therefore essential that there should be a central record of all the publications held by the library and a check on when issues are received.

It would also be useful to have the ordering centralised, and this would seem to be an area in which the computer might be useful. A system on the computer could perform four useful tasks two of which are not at present being done, and two of which at the moment are rather haphazard. It could keep an up to date list of all the journals being received and where they are obtained from, print out the list at regular intervals, give notice of reordering dates (most would occur at one time, since one order covers all Tratsart periodicals), and keep a record of the issues as they come in, giving notice of ommissions. There is a program in Fortran II already in existance called JURN, which prints distribution slips, reorder dates, listings of circulation and reference journals and a list of library holdings.

Since about 2750 issues are received in a year, the computer could be prohibitively more expensive than the manual system currently in operation, as it would require more than fifty entries to be input each week. However, if the manual method is to be continued, it is essential that it should include all the journals received, whatever their source.

Circulation

At present most of the journals are sent to people in the company on free circulation. Duplicated lists of names are attached to each issue when it is received by the Publicity Department and it is sent to the first name on the list which may or may not be the library. It is then passed from person to person down the list until eventually it is hoped that it turns up in the library. This does not always occur, and sometimes on trying to trace it back up the list, the people all deny any knowledge of it. At present, since there is no record of arrivals in the library, it is only discovered that an issue has not completed its tour if someone asks for it, or if there is a noticable space on a shelf; so there is no knowledge of how many copies in total are lost in this way but obviously the system does not work. An improved, centralised receiving system would at least make it possible to find out.

The other problems associated with circulation are that if it is not in the library and on one knows where it is. Also the time taken for the journal to circulate is quite considerable, sometimes a year ! Civil Engineering and Public Works Review starts in the library with Mr. Keren, goes to Mr. Mickler at T.W. (Northern), is passed on to Mr. Llewellyn who is at present in Brighton, and returns to the library via two other people in T.W. Construction. This is obviously ridiculous.

It would be possible to put all this onto a computer, but the volume of input would be unrealistic, as shown by the following figures.

Approx number of periodicals received	= 150
Approx number not circulated	= 17
Approx number for which only the contents page and abstracts are circulated (photocopies)	= 33
Approx number of journals circulated	= 100
Approx number of issues received per year	= 2750
Approx number of issues requiring photocopying of contents & abstracts per year (each sent to several people)	= 275
Approx number of copies of contents page/abstracts (each more than 1 page)	= 1580

The best solution would be to cease magazine circulation together, or receive duplicate copies to be sent straight to the library for reference; particularly as a current awareness service would achieve the same distribution of new information in a simpler fashion. However, if the company requires that certain people see the only copy of the journal itself regularly, the simplest step which could be taken without trouble would be to introduce a recorded circulation which had no time limit.

By having the periodical returned to the library after each person had seen it, it would be possible at least to know where the copy was if anyone came in to see it. This could be done by the library filing (by journal name) duplicates of the circulation tag stuck on each journal. These would have to be of a standard size, but this could easily be arranged with Multilith who print the tags. By merely entering the date that the journal was returned from each person in the space provided for their signature on the duplicate tag, the circulation could be recorded for very little extra work. The system would also show where the hold-ups occurred, and appropriate action could be taken.

For the journals which are circulated this would also provide a check on whether each issue had arrived, and it could be tied in with the centralised reception. There would probably still be a large time lag before the last people on the list received each copy, but the work involved in regularly chasing up those who slow the system would be tremendous, since the volume is about 2000 items going to three or four people.

At present 1580 copies of contents pages and abstracts are circulated round the company. Each of these is usually more than one page, so assuming an average of two pages per copy, at 2p a page, is about £64 a year. This is fairly cheap; however, the librarian has to spend a considerable time filling in the requisition forms and arranging the pages for distribution when they are duplicated. It might therefore be worth considering the purchase of Current Contents (Engineering & Technology Section), which can be purchased from ISI for $110 (£44) per year. These weekly booklets give the contents pages of 675 engineering journals, the subscription being reduced with the number of copies ordered. By ordering a certain number of copies to be distributed round the company, it might be possible to eliminate the photocopying of contents pages and abstracts, widen the coverage of journals which could be scanned and reduce the number which had to be circulated.

Points for Consideration for a Computer System

Any computerised system devised must be able to take into account the following points:-

a) erratic arrival of periodicals (eg ASCE publications and delay due to postal holdups/strikes)

b) name changes and variations (eg New Technology incorporated into Trade & Industry)

c) cancellations and new orders (eg when a new project is started)

d) additional supplements published (eg BTI sends a bound volume once a year)

e) human error (eg forgetting to enter an arrival)

Proposals

1. The list of current journals should be updated, giving holdings, source and revised retention period.
2. Reception of journals should be centralised either in the library or in the publicity department.
3. A computerised system, though technically feasible, would be prohibitatively expensive to run, so a manual system for receiving and controlling journals should be used.
4. Journal circulation should cease. Duplicate copies could be sent round the company if necessary.
5. A circulation system, if needed immediately until a current awareness service can be introduc d, should require the journal to be returned to the lib ary after each person has seen it. A duplicate circulation tag would be filed for each

issue, with the date of return entered each time it came back. The cause of delays could thereby be detected, and the library would always know who had it.

6. Journals should only be allowed out on loan in special circumstances and would be treated as inter-library loans (see study B - Inter-Library Loans).

7. Journals which will be kept on microfilm should be filmed early so that there is always a reference copy in the library.

8. The purchase and circulation of "Current Contents" should be considered as an alternative to circulating photocopies of title pages.

G. INFORMATION RETRIEVAL AND SELECTIVE DISSEMINATION OF INFORMATION

Introduction

Information retrieval (IR) and selective dissemination of information (SDI) are just two sides of the same coin. From indexed literature, information on a specific topic or subject area is supplied, either on request, or when it comes into the library, before it is asked for. At present this is not being done on a systematic basis in the library, so this is the first area to be looked at where the service to be considered is new to the company. Since the only previous experience we have is a small pilot test of the old programs, the recommendations in this report will be largely based on the writings of others.

The Value of IR/SDI

Lancaster & Climenson in discussing document retrieval systems (1) said "In the final analysis, the question to be answered is not "Is the system operating efficiently ?", but, "Is the system worth-while?" There have been many examples given of how one small piece of information given at the right time, when it became available, would have saved the company concerned a vast amount of money, so there is little point in repeating them here. Lancaster in the same paper says that productivity drops by 25% for engineers waiting for information, but asks, "how does one place a value on the stimulation of creative thought, an important function of any current awareness service?"

In every library there is some form of IR, this does not mean that each has an IR system. A user visiting the library and asking for information on a certain topic will be pointed in the direction of a suitable book, or something similar, but this is a very haphazard method, since it relies totally on the librarian's knowledge of the library and the subject in question. At Taylor Woodrow we now have some printed catalogues, which include a KWIC index. However the majority of new information takes a very long time to get into the books and other material which is catalogued; it is mostly in the journals, and at the moment little is done to retrieve it, apart from people just browsing or those who have references from other sources. An IR system is therefore designed to find the relevant papers in response to a question from the user.

The only difference between this and SDI is that the user of an SDI service tells the library what his interests are and they inform him of any papers which they received as soon as they arrive. There is a slight confusion of terms here, in that some people call this "current awareness". The term normally implies a more general coverage, but definitions have never been agreed on. There is also the possibility of producing a current awareness journal, giving general information round a topic, which would be circulated to those interested. I feel that there is little value in this, as there are general journals which can be scanned if one wants a wide coverage, and such current awareness always involves a large amount of literature, which is expensive, or considerable condensation which is even more expensive.

The value of an SDI service lies in its individuality. Others have found the same; Dammers, for example, writes (2) "To the user, one of the principal benefits of the SDI system should be a more personalised service...... Each profile in run for one particular user". While the costs of an SDI service can be calculated, costing the service is much more difficult. From a survey Leggate (3) found that, "it appears that the value of the SDI service as seen by the user lies not in its retrieval performance, in its ability to retrieve more relevant references than would have been found otherwise, but in the fact that the user receives on his desk every fortnight a nicely packaged list of references. It saves him having to remember to go to the library and, presumably, reduces the time spent in monotonous scanning of (say) title pages of journals". How much time this represents, and hence the cost save is difficult to gauge, but it has been suggested that "a professional may be spending as much as 20% of his time on information use/handling the widest sense."(2).

Problems of IR/SDI

The main difficulty with IR systems is that whatever method s being used to retrieve information, all the literature has to be indexed in some form. This may be by a classification system, or by the use of keywords, but in either case it is necessary for someone to read through all the material received by the library and define the contents of each item. This can be extremely time-consuming. If external sources are used, there is also the difficulty of the slant of the indexing.

Green (4) found that in his field of numerical analysis he could not get one data-base simply by "conjoining the bases of a set of discipline-orientated systems". A paper may be indexed in several different ways depending on the person who is doing it, and the users for whom it is intended.

The searching also provides problems, since it is difficult for a user to state simply what he wants first time. If he was doing his own search he would modify his requirements depending on what he was finding. "You have got one stab at him (the person doing the search), and at that stab you have got to tell him what you think you want". (5) If the searcher is human, we rely on his common sense, but if he is a machine, this will not work! Fugmann writes (6), "We have to resign ourselves to the fact that the delegated literature search cannot satisfy all the information needs of a scientist", since he can not define everything. Shaw and Rothman (7) claim that several simple indexes give a higher recall than one elaborate one, and that a KWIC index is as good as most. Leggate (3) points out that any system should be kept simple, since one does not want the user spending as long trying to use the system as he would have done searching before its inception. The breadth of an SDI service is also open to discussion. Some users may only want papers which are strictly relevant to what they are working on at the time, while those "of a more speculative type of mind" may prefer to get some general picture of what is going on in related fields. After discussing this, Vickery (8) concludes with "so preconceived ideas of aiming at some particular precision is not necessarily the right approach; we must in fact always come back to the individual user's need".

There would therefore seem to be a certain number of unresolved questions in the operation of an SDI system. Corbett (9) has found "little demand for retrospective searches" at the Atomic Weapons Research Establishment. Such a service also produces secondary problems. "Overall, though, the availability of SDI would appear to be beneficial to the operation of a library/information service. It will widen the range if its capabilities and provide a greater interaction with both the sources and the users of the information. However, until we establish a satisfactory means of dealing with loan procedures, it will also mean routine clerical operations are perhaps not going to decrease all that significantly". Dammers (2) wrote this about his system at Shell Research, and the same is largely true for Taylor Woodrow except that while he suggests that time saving through SDI will not decrease the work, I would suggest that in fact it is going to positively increase it. Apart from the indexing, and operation of the system, there is also the fact that when people see the abstracts of information which they did not know existed, they will want to see the originals, which will put a greater demand on the loans service. Corbett suggested (9) that libraries ought to be taking on new approaches to information handling and that "mental attitudes must move towards emphasis on availability and access rather than acquisition".

In the subsequent discussion on this paper Groeger said that we ought to be taking the "supermarket approach", with much information of a short disposable kind (9). This would of course involve much larger use of the National Lending Library, and particularly applies to a library like TW where the stock is not large.

Other problems arise directly the indexing, Townley says that it is necessary to monitor the use of the different keywords used, and that each one should be used for not more than 5% of the documents and not less than 0.01% (10). It takes a long time to actually index the document and prepare them for punching into a computer system or on cards for a card index. Townley gives a figure of 25 documents per hour for this (11). Given that 2750 issues of journals are received in a year, each with an average of 5 articles, there would be 13750 documents to be indexed per year. At a rate of 25 per hour, this would take 550 man hours per year, or about 15 man weeks. This means that it would take about a third of the time of one of the library staff to index everything that came into the library on journals alone. In the test of the old IR/SDI programs in the library (12), they found only 50 sets of data could be prepared per day per person, which would require 55 man weeks; more than one full time staff. However, it might be possible to reduce this since not everything in the journals would be relevant to the company's needs, and so would not need to be indexed for the SDI/IR system. It would therefore seem that with the other literature, reports, etc, and the distribution of the information it would require at least one man's full time work to operate an in-house system.

Since the library is very small in comparison to the total world literature on civil engineering, it would be reasonable to go outside the company for sources of information. There are three sorts of information which one could take; abstracts journals, tape services and bureau searches. Abstracts journals are the cheapest of these, but still necessitate the tedious business of searching through them. They have the advantage that it is possible to use several independant data bases merely by looking in different abstracts journals whereas, the other services are of only one much larger data base with a particular slant to its indexing.

Vickery records that there are at least 90 information services available, and that more than half of them supply the data on magnetic tapes which can be purchased or leased (8). However, these tend to be rather expensive, and are mostly in the pure science. The Engineering Index tapes cost 13 times the printed abstracts and indexes. Corbett writes (9), "they appear to be priced to a market level the customer can be induced to pay rather than being based on cost of production, some exploitability value or factor, plus reasonable profit." Having obtained the tape, there is still the cost of processing it on the computer, and most of the tapes contain a large number of abstracts. Robinson (13) found that 5 abstracting services index between 50 - 100 thousand items a year, while 10 cover more than 100,000. The cost of such a service varies, but AWRE, using INSPEC tapes, estimated the cost to be around £25 per question, and £65 a year each for the 46 SDI profiles which they run (9).

In producing a new system, several points must be considered; Fugmann (6) has set down various criteria for overcoming the problems associated with a growing system. Many that have been devised to deal with a small data base have collapsed when the input and demand have grown. Simplicity is also a criterion, as Legge'e points out (3); it is pointless to save the user's tim by giving him a mechanised system, if he has to spend as long preparing his profile as he would have one doing the search. It would also be nice to have one's nformation on-line but Buxton has questioned the worth of on-line storage (14). "On-line disc storage costs 3p/day for just 1000 60-bit words. ...You must ask yourself the question: What is your information really worth, and what is it worth to make it dynamic? It is usually worth much less than most think, and not much more if made dynamic anyway". One way of overcoming the difficulty and still keeping some of the convenience is to have a terminal to a system such as UCC's 'ASBAC, where a large batch processing computer is interfaced y small on-line computer.

Possibilities for Taylor Woodrow

The first point on which TW management must make a decision is whether they want an IR/SDI service at all, and the size which it should be. Unfortunately this is a decision which must be based on incomplete evidence, since the value of such a service cannot be quantified. One piece of information may save the company thousands of pounds, or a long search may only show that there is nothing significant to find. While this service will certainly enhance the facilities of the library, anything that will be remotely comprehensive will cost a fairly large amount of money. It has already been shown that to index everything that comes into the library in journals indiscriminately would take the whole time of one of the staff, and that is before the system is used. Some idea of cost is given in the appendix to this study. It is probably worth nothing that in Aslib's survey of libraries (15), 93% of firm's libraries did literature searching and 62% provided SDI, both higher percentages than for the other three groups: government, academic and non-profitmaking organisations' libraries. This would imply that commercially orientated industry considers it to be worth-while to produce IR/SDI services. It may seem that £5500 is a large sum, but if it only saves 20 scientists 10% of their time, it has paid for itself. If one is going to have a system, the first possibility is to have a purely manual one, with staff searching the existing stock and abstract journals. This is approximately what is being done by the information scientist in the research laboratories, but he has included the next extension of this which is a card or optical-coincidence index. This merely requires the additional staff to man the system.

The next possibility is to use an outside bureau. This is expensive, and in the case of IR rather slow, since one has first to contact them and then they have to send the results. I have not given costs of having profiles run for engineers, as I have not been able to locate a suitable service, in our field.

The third method of producing an IR/SDI service is by doing computer searching of a data base. The data can be obtained by one or two methods, either buying or tape service or indexing the material ourselves in the library. The former is expensive and the latter time consuming. There are three tape systems which are relevant to engineering. The first of these is ASCA (Automated Science Citation Alert), who have their data on magnetic tape and search it for you, but as their system is based on the bibliographies at the end of the papers and not keywords, we would not be able to include T.W. information or process the tapes at T.W.

The second tape service is PANDEX, produced by CCM Information Sciences Inc, in the US. No one in this country seems to know much about them, and when I rang their agent in London, they seem to know next to nothing and promised to write to CCM for me as my two previous letters there had not been answered. As far as I could make out, they thought there were only about 17 subscribers in the whole of the US and none in Britain, but this seems to be fairly normal for tape services. Discussion with one of the directors of Engineering Index revealed that they had no

British subscriber to compendex, though there are one or two in some European countries. Both companies publish printed abstracts journals which are more widely used. Pandex tapes are distributed weekly and cover 2,700 journals, 6,000 monographs and 35,000 US Government reports a year. This costs $6500 per year including "program compilation service". The printed indexes (fortnightly) are $360 and the microfilm or fiche quarterly and annual cumulations are $295.

Although it covers fewer items, the most relevant system is COMPENDEX, the tapes of the Engineering Index. It costs $7,300. per year, made up of $6,500 for leasing the tapes, $500 for the monthly and annual printed cumulations and $300 for the tapes themselves. There are slight drawbacks to this system, when one wants to use the tapes for IR. There do not appear to be any fixed language keywords, but for SDI, the tapes can be searched by subject headings (several to one document). However, the size of the data base that would be built up would soon be prohibitive if the whole tapes were searched for IR. This could be avoided by firstly running a profile for the company for items to be kept, and then condensing these to headings and code number. This would work well if the abstracts could be found from their numbers by going to the printed cumulations. However, this can not be done, as the abstracts are not listed in number order, but by main subject heading. Whether it would be possible to print one's own list from the tapes would depend on the order in which they were stored; they might have to be sorted into order. All this would add an additional cost to the system. There is no organisation in Britain using Compendex.

Engineering Index covers about 46% of the periodicals which Taylor Woodrow takes, but they are widening their range by including a few management journals, a field which they do not cover at all now, so this figure may increase. It is interesting to note that they index 60% of the journals which the library used to receive at some time in the past but have now cancelled, as this would suggest a slightly different emphasis. It would be necessary to index the other 54% of the periodicals in the library, together with internal reports, etc. and add them to the system if possible. If used with IBM's compatible search program TEXT-PAC, an external computer would have to be used to process the tapes, since the company's 360/30 has only half the store required for the smallest version of TEXT-PAC.

One of the large computer bureaus is thinking of subscribing to Compendex and making it available to their users, in which case it might be feasible to use the service through them. However, as this has not been fixed yet, no idea of the cost can be quoted, but some of the problems mentioned still apply.

The last possibility is the one which would seem the most feasible: to index the documents by hand and use the computer to search them, both for SDI and for IR. It has been stressed that one important point is to keep the procedure simple. The best method would therefore be to use an indexing language from a thesaurus, and search on the basis of AND logic only, and not the full Boolean logic. The full set would make the system much more complicated, and Helen Townley said during her visit to TW, that Cleverdon has been doing work which showed that this method gives a very good set of results. The number of matches between document and profile would produce a hierarchical order of relevance; so the user could choose the approximate number of reference which he wanted, and these would provide the cut-off. This method could be used for SDI and IR, and would give the flexibility mentioned as being necessary for those who like to have a more general coverage.

Comparison of Costs

The costs of using Compendex and a local system are given in the appendix to this study. They have not been worked out precisely because they will depend on use and the exact number of articals indexed. However, it will cost the company five or six thousand pounds a year to run an SDI/IR system, and the COMPENDEX one appears to be about £1000 more than the local one, though it will have a wider coverage. The main advantage of the local system is that anything can be included, and its disadvantage is that indexing and punching are tedious. If the computer tapes were taken, any additional material in the library which was not covered for example internal reports and obscure journals should be indexed and inclued in the system, and at the moment this would mean well over 50% of the items received in the library. Including this might well be difficult in a commercial service.

The decision on whether a SDI/IR system is worth £6000 is one which have to be taken by management, but it would seem to be so. The problem is to guess whether such a service will save the company more money in the long run, and the experience of other firms seems to suggest that it will. "Gilmore in his study of certain US industries found that the cost of acquiring information from outside the firm exceeded £1000 per professional employee, assuming one adds overheads to the salary element. These costs include those of reading, 'phoning, attending conferences and the like. A good service should, in these terms, quickly pay for itself". (16)

Proposals

1. All the relevant articles in the journals should be indexed with a thesaurus, together with other items, abstracts and reports.

2. Computer programs should be written to search this information on the computer, using AND logic only.

3. An SDI and IR service should be implemented using these programs and outputting only the number of papers requested, chosen by relevance.

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Appendix to Study G.

RUNNING COSTS OF IR/SDI

A. In-house system

	£
Indexing of the literature received in the library: 1 man's full time work (including overheads)	2000
Punching the data for computer input: from the study (ref.12) 500 cards punched per day. with an average of 12 cards per item for 13750 items takes 330 days. Cost of punching (including overheads)	2000
Computer time (depends on use)	300
Preparation of profiles by an information scientist ($\frac{1}{3}$rd of his time)	1000
Total	£5300

B. EI Tapes (COMPENDEX)

Cost of the service (1971 prices)	2440
EI monthly (compulsory)	200
Cost of tapes	120
Indexing library holdings not included (TW reports, management journals, etc.,) (approx $\frac{1}{2}$ the library holdings)	1000
Punching this data	1000
Computer time (using a bureau computer, depends on use of service)	500
Preparation of profiles (as before)	1000
Total	£6260

C. Bureau Service

As the details of this service have not yet been settled, it is impossible to give any idea of the costs.

The coverage of B and C would be considerably wider than the in-house system, which would only include the publications already taken by the library.

H. C A T A L O G U E L I B R A R Y

Introduction

In the past the library has had a fairly extensive library of manufacturers' catalogues, but today there are very few current ones, and it is hoped to build up another collection. Unfortunately the old catalogue library was moved to an inaccessible basement, where it became several years out of date. When the library moved into its present location, a large area was set apart for catalogues. The old collection is still in the library but so far only about 100 new items have been received. We are therefore in the good position of virtually having to start from scratch, and this means that it should be possible to implement the best system.

The Use of a Catalogue Library

Most of the literature which has been written on information flow in the construction industry has concerned itself with a much wider area than it is necessary to consider here. One must first distinguish between identity codes and classification codes (1). Classification codes divide products by type, while identity codes are just arbitary indentifiers which would enable one to specify any product of any manufacturer absolutely uniquely. This is not what is needed here. Secondly, within classification codes, we must make a division between project documentation and general documentation (2 & 3). Project documentation is concerned with the provision of a specific piece of information from the documents relating to a particular project, while general documentation, which we are to deal with here, is concerned with providing specific sets of information on a product type.

Bishop and Alsop have given six areas of interest in products for the contractor (4):-

1. Does the product satisfy the specification?
2. Are there cheaper alternatives?
3. Are there constraints on workmanship?
4. Are there special acceptance tests?
5. Is this product available?
6. Are there any benefits that vary with the source of supply?

"Clearly one document that set out to answer all these questions would be bulky and expensive to produce, and no single user would need all the information that would be included".

This points out the first advantage of having a locally produced source of commodity information: it would be possible to restrict the information to that need in the company. The converse of it is that additional information can also be included which would not be available to a public information system. H. Hatfield, in his report on the Materials Laboratory's Building Commodity File, pointed out this advantage very well (5). He proposed to include:- (a) Information from periodicals, (b) Trade literature, (c) Agreement certificates, (d) Independent tests conducted on products, (e) Tests done at TWC, (f) "Feedback" from sites, (g) Technical service enquiries.

"The unique quality of this system is the inclusion of items covered by (d) - (g) above. Other indexes are based purely on the trade literature provided by the manufacturer. It is anticipated that data on the performance of materials will provide a sounder basis for the selection of materials than relying on the claims of the manufacturer who is hardly without bias" (5).

To get some idea of the range of information given in the catalogue library, I looked at all the new material, at present held alphabetically by manufacturer, under the letter "P", since this appeared to be one of the fuller sections in the library. Under "P" were filed:-

1. A leaflet (11½" x 8") on Pilkington & Carter's floor tiles.
2. A folder (12" x 8½") containing 57 sample P & C tiles.
3. A leaflet (11.7" x 8.3") on the Pitch Fibre Pipe Association of Great Britain, which has three member companies beginning with the letters C, K & T.
4. A book (300 pp, 9.2" x 5.9") called Propolist, containing a list of drugs and their manufacturers and dosages.
5. A reprint from The Engineer (1967) (14" x 10") describing the Flour Mill Construction at Leith by Kinnear Moodie, but with a sliding shuttering and its associated equipment by Proteus System Building Limited, and sent by Proteus.
6. A booklet (9½" x 9¾") by Shires Ltd., on bathroom fittings, which must have come from
7. A folder (12" x 9") from Plastic Bath Development Assoc., containing leaflets of different sizes on baths and showers from 6 manufacturers, two of whose names begin with p.

This list gives some idea of the diversity of material, and shows some of the problems of collecting and organising information of this sort. It is of different shapes and sizes, can contain varied products by one manufacturer in one catalogue, and there can even be leaflets by several manufacturers in a folder from an association.

As Hatfield pointed out (5), it would be useful to have information on the company's experience with products included in the catalogue library, and some of these are covered by the Materials Laboratory Technical Notes. The following are just some of the more recent Notes:-

1. The use of steel fibre concrete in practice.
2. Discolouration of concrete treated with Acrosil (includes a letter from the manufacturer).
3. Results of a test of Spanish Cement.
4. Precautions when using silicone solution (Cementone No. 3) (includes a specification of Cementone No. 3 test report and details of another product; all by manufacturer).
5. Results of tests on Rescon surface (skid tests)
6. Tests on bags, showing water leakage (includes a letter from the manufacturer giving prices).

All of these should be included in an index for the appropriate products.

According to Bishop and Alsop (4), "It is believed that between 10-20% of design effort is spent in searching for information". On this basis it is obviously worth-while that the company should have as good a product information system or catalogue library as possible. Also it is necessary to orientate the system to the sort of information which will be asked for. A survey by W.S. Atkins and Partners (6) "revealed that the principal aspects of information sought were: the name of the manufacturer; details of technical performance; its weight, dimensions and similar specification data; its availability; its price; and, in addition, whether any comparable products unknown to the enquirer are already on the market or have been newly introduced. Other specific aspects were: methods of fixing, applying, handling, and storage of the product; the manufacturer's commercial status; the service he offers; whether the product complies with regulations; and where it can be seen and handled by the enquirer before final selection". All these things suggest that a very flexible method of indexing is required, and the possible systems will be considered below.

Commodity File National)

Before detailing the possible systems, it is necessary to look briefly at the possibility of a national commodity file. This idea of having all product information stored together in one central data bank has been bandied around for some time, but like the Channel Tunnel it has recently come into increasing prominence. Atkins in his survey gave a definition of such a file (6). "For the purposes of this study a commodity file was defined as a central store of information about commodities used in the industry - the information to comprise data on their indentification, composition, manufacture, properties, shape, dimensions, weight, applications, availability, delivery, distribution, prices, costs and accounting procedures. Data would be classified, kept up to date and readily available for use by all sections of the industry."

In 1971, the Working Party on Data Co-ordination (7) proposed that, "the development of a comprehensive commodity file should take place slowly in a sequence of stages, starting with improvements in the existing system; pilot development of a computerised or microform system should not commence until a precise definition of contents and usage has been established for the different parts of the total file." Atkins estimates that such a system would cost about £23-33 million a year to users (e.g. TW), and £20-40 million to the suppliers, making a total of £43-73 million pounds a year (6). Bishop and Alsop say (4) that it would cost about £50 per item put onto the file.

With so much money involved, even though the large firms are keen on the idea (6), it will probably be some time before anything useful comes of it. There are also some difficulties due to the differences in interests between users and suppliers (6). The suppliers want the maximum profit, while the users want high quality at a low price, and this will provide a tension. A mere comparison of statistics does not reflect the good name and reliability of a company and opens the way for small unscrupulous firms to appear superior with dubious data on its product by concentrating on the parts measured and not on overall quality. It would be difficult, for example, to quantify the standard of finishing on metal or plastic components. With the whole idea of a commodity file still in such a vague state, it is not possible to take it definitely into consideration in the proposals; though if it were brought into being, Taylor Woodrow could subscribe to the system and use it as an additional aid to its own catalogue library.

Possible Systems

a Faceted Classification

The most common way of organising commodity information is by means of a faceted approach. This would seem to be a reasonable way: classifying the material employing up to three or four facets. For example under CI/SfB, a document on dimensions of clay pipes for sanitary fittings in hospitals would be coded 41 (74) Ig2 (F). (F) is "dimensions" (in the Activities and Requirements facet). Ig2 is "clay pipes" (Construction form facet), (74) is "sanitary fittings" (Elements facet) and 41 is "hospitals" (Built Environment facet).

Some firms have developed their own faceted classification, but most are using SfB or CI/SfB. The former is the development of the Swedish SfB, and is now controlled by a central international body, the International Council for Building Documentation. In

Britain, the agency for SfB is RIBA, and they have published a new edition of the system in 1968 (8). This was based on criticisms for industry that the facets were not all mutally exclusive. As a result the finished product has substantial changes from the international SfB, and to distinguish the two, the British Edition is called CI/SfB, though it is hoped to get it accepted eventually by the international committee.

If TW were to decide to use the faceted approach, it would be best to use this system rather than try to work out a completely new classification from scratch. The disadvantage of this is that the classification is not tailor made to our needs; it was developed mostly by architects, though it is supposed to be able to handle project as well as general documentation. A major advantage of CI/SfB is that many trade descriptions are already coded in it.

The information scientist in the Materials Laboratory is using the faceted index at the end of the Construction Industry Thesaurus for coding his small commodity file of the materials relevant to the laboratory. Up to now it has been fairly adequate, although he has had to add one or two terms of his own, for example, "glass reinforced plastic". In a system covering the complete range of materials of interest to the whole company, it seems likely that it would not be detailed enough.

b) The Barbour Index

The company already has a Barbour Index in the architects' office, and it is worth considering whether this is adequate for the needs of the company. The Barbour Index is a collection of manufacturer's information on their products, produced in a standard A4 format and bound and indexed by CI/SfB by the Barbour organisation. Each collection is regularly updated every month by a travelling representative. However, it was developed as a service for architects, so it is based towards their needs. If the whole company is to be considered, something more broadly based than this is really called for. Of the seven items found in the catalogue library sample investigated, only the Shires baths are in the Barbour Index. The basic service costs £120 per year, but one can have one's own information included for between £15 - £20 per shelf of folders. However, it is unlikely that Taylor Woodrow would want its reports studied and coded by an outsider. The Barbour Index also has a "redimix" concrete information service giving specifications and prices.

c) Card Index

In organising product information, there is only one practical means of arrangement, and that is the way in which it is produced: by company. Arrangement by product is impossible since many companies publish catalogues once every five years, and these may contain a very large range of products. Grouping information by product would involve dissecting catalogues, which might mean even splitting pages. To photocopy all the catalogues for insertion by product would be an expensive time consuming duplication.

Publications like the folder from the Plastic Bath Development Association should be kept together. A very flexible index is required, and the most suitable would therefore be a card index extensively cross-referenced. A card index is very "hospitable" in that cards can easily be added or removed as the catalogues change, it can be expanded for ever, and, since the entries are done manually, exceptions and notes can be included with no difficulty.

If the items themselves are filed by company, there is no need to have a company index, one can go straight to the shelf. Trade names could be found from the Kompass Directory of UK Trade Names, or Atkins (6) reports that BLIS are "Planning to introduce a new series which will include a 'Trade Names Index for the Construction Industry', so there would seem to be little point in having an entry for trade names. This means that the only entry necessary for the system is one by commodity.

Since the collection is still to be built up, it is possible for the card index to grow with the number of documents, and develop a hierarchy as it does so. If one takes a list of general headings from some authority list (the CIRIA thesaurus would allow compatibility with the collection in the Materials Laboratory, which could then be also entered in the library's index), sub-division could be made when necessary (i.e. when a card was full after about 20 entries), and the original and narrower terms could be entered on the appropriate cards, thus enabling one to browse hierarchically through the index, a facility which Atkins (6) found to be important.

This system would seem to be the best. A CI/SfB index was tried in the old catalogue library, but it was found that the users did not like it so it had to be changed. This problem should not arise with a card index of this sort, since it would be very simple to use, particularly if indexed in depth. Since the cards are hand-written, notes can be added giving explanation where necessary.

d) Computerised Systems

This section has to be included for the sake of completeness, though the use of the computer in the catalogue library is not really feasible. Unless there is an on-line facility, the time taken to search the file will be too long. People want this sort of information at once, and are not prepared to wait for a batch-process computer search. Also, unless the system was extremely elaborate, there would be no possibility of browsing on the computer. Thirdly there will be a large amount of input to the system, as amendments to the catalogues and other trade literature are frequently sent round. New data would have to be manually entered on to coding sheets and punched into the computer instead of merely being written on cards; so this will be twice as expensive in a computer system. The only advantage of the latter would be that it could record the enquiries, and hence show which areas of the catalogue library should be developed because they are well used, and which are of little interest to the company.

When one considers what form retrieval from the system would take, one again finds that the computer adds little to what can be done manually. A co-ordinate indexing approach would not help very much, since one would not want many items put together; one normally only wants say "baths", and this can be done much better by a simple card index. The other alternative would be to have true "information" retrieval; finding all the data on a specific type of product from the computer direct, without using documents. However, this would need a very complicated system, and would not meet the needs of the company very well.

Proposals

If there is to be a library of manufacturers' catalogues all the commodity information in the company should be indexed with a hierarchic system which could grow out of the CIRIA Thesaurus. As well as trade literature, Materials Laboratory Technical Notes and notes of company experience with particular products should be included in the index. The information held in the Materials Laboratory's Commodity File should also be included in the index, so that data is not duplicated. (For discussion of the need for a catalogue library see also Study S, General Discussion of Survey Results, particularly the last paragraph of the section on "Reasons for User Failure".)

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S. GENERAL DISCUSSION OF SURVEY RESULTS

Introduction

As a part of the feasibility study of the library, a survey was made of those who use the library services and a librarian's diary was kept for a week. As a result of these it was also felt necessary to have some idea of how much the library is used by those who write in rather than visit or telephone. An analysis of the post was therefore made for a week. The results of these studies are given at the end of this report.

The information which was obtained from the surveys gave some rather surprising results, which bring into question one or two fundamental points. This report is an attempt to look at some of these basic ideas.

The Surveys

The first part of the survey was a user questionnaire and a librarian's diary which were done for 4 days and just over a week respectively. Since this was in February, when the electricity crisis was at its height, it was decided that one more week of the user survey ought to be carried out to test whether the result had been seriously affected. A second week was accordingly undertaken at the beginning of May. It can be seen that the results have not been significantly altered. Two people came in to the library to work because it was warm during a power cut, but one person came in to revise for an e am because it was quieter than his office during the second w ek. All in all, the figures are remarkable similar for e two weeks. Four more people came in during the first one, b t there was an extra morning included, during which 6 visitors came. Th only change which might be accepted is that the users stayed longer during the first than the second week, because t e library was warmer than all the offices with outside w lls. The differences in the number of people wanting loans, information and specific data, etc., can be accounted for by th fact that in some cases it was difficult to distinguish between these catagories.

Since the two user surveys are similar, it is reasonable to accept the diary exercise carried out at the same time as the first one, as being fairly typical too. It was felt that it was also necessary to have figures of the requests and other work that was included in the "post" catagory of the librarian's diary, since it constitutes nearly 10% of his time. Therefore or one week the post was listed in eight different catagories according to the nature of the items.

Sur eys and questionnaires of this sort are not an ideal y to collect the sort of information required, since they nteract with the system, but they are probably the best. If e librarian is filling in a diary he cannot be working for that time, and several users who did not like answering questions gave the impression that they would wait till the survey finished before visiting the library again. However, one third of the visits were by people who had already completed a form. The diary was kept as simple as possible to prevent it taking up too much time, and in most cases the users were asked the questions rather than being left to fill in a questionnaire themselves.

Waiting until people had finished before asking what they had come in for did prevent the questionnaire interacting with the users, but produced an equal and opposite effect; as their original intentions had been modified by what they received in response to their requests. A user who came in asking for information about a subject and was given a book would then say on the way out "I came in to borrow this book". In the second survey I tried to fill in that part of the form from what I could hear of what they originally asked the librarian, but this did not work too well when several people came in at once.

Nature of Users

During the survey the library was visited by 136 people from 23 different departments at least 44 of the visits being for the second or third time. The departments from which more than ten visits were made were:-

Atomic Power (014C) 24 visits
Materials Laboratory (014J) 18 visits
Estimating (0127) 15 visits
Projects & Contracts (014B) 12 visits
Civil Design (014K) 11 visits

Two people came to the library from outside the building, one from Swiftplan and one from as far away as Western House.

This suggests that the services of the library are fairly widely known.

Length of Visits

Almost half the people who came into the library only wanted to do something short; borrow a British Standard, return a book, look up a telephone number, etc. All the three people who stayed over two hours were exceptions; two were keeping warm, and the third was the information scientist from the materials laboratory. It is interesting to note that although it does not appear in the combined figures, there are more people staying for 1-2 hours in the first survey and $\frac{1}{2}$ - 1 hour in the second, than in the next shorter period. Remembering that people tended to stay longer in the first week because there was the power shortage, this would suggest that if people are going to look for information in the library, they will stay for an hour rather than half an hour.

Nature of Enquiries

The majority of the use of the library was for routine things, such as returning a book, ordering items, borrowing a British Standard; these constituted 48% of the "enquiries". Just over 8% were to look at maps and Admiralty Charts, which shows that this is an important aspect of the library's service. The areas which may be considered as a request for information are; looking for specific data (17 times = 11.6%), current awareness (also 17 times, 11.6%) and most important, requests for information on a subject (18 times = 12.3%). The miscallaneous visits were such things as revising for an exam, delivering internal reports, one person who came in to advise against getting a large book which had been under consideration, and one who came in to use the microfilm reader for looking at material which his department had on film.

This means that only a third of the people who came in do so because they want information rather than particular documents. Study CD looked at cataloguing and ordering, but it seems that the catalogues in the library at present are not being much used. During the whole period of the survey, the catalogue was only used six times, two being for the same enquiry, and in every case it was the library staff who used it. Most people when asked did not even know of the catalogue's existence. One must balance this slightly by pointing out that the librarian in many cases knew where to find the material without recourse to the catalogue, and that the system must be able to withstand a change of librarian; but the potential use is not large. (Since this was written the librarian has left and been replaced.)

Only 18 people in the two weeks of the survey wanted information on a subject, an average of 9 each week. Allowing for some of the other questions requiring the catalogue, there might be 15 in total visiting the library each week wanting to use it. There were no telephone search requests made at all in the week of the librarian's diary, and as the telephone requests for data only took an average $2\frac{1}{2}$ minutes each, it is doubtful if any of them would have been complicated enough to require the use of the catalogue. The post analysis gives no information requests, so it would seem that 20 users of the catalogue a week would be more than an absolute possible figure. In that case, is there really a demand for the large, expensive SDI/IR service proposed; or would just a good catalogue be sufficient? It must be mentioned that senior staff do sometimes ask for detailed searches to be done, but none occurred during the survey. The question of the need for the various possible services is covered in the discussion at the end of this study.

Reasons for User Failure

The significant reasons for the failure of users to obtain what they wanted in the library have been given in the "complaints" table of the survey results. Many of the reasons speak for themselves, but one or two points are worth noting. Over one third of all the complaints were concerned with the circulation of journals. Three times people complained that the "current" journals on display were out of date, and in some cases this meant that they were over a year old! Virtually none of the copies of Consulting Engineer for 1971 have come back to the library. Ten pages of one journal were removed by someone while it was on circulation, thus making one complete article and substantial parts of two others totally unavailable. These were all facts which were discovered during eight working days of survey, so there may be many more undiscovered as yet, - except by disappointed users. A spot check did not reveal any circulated journal where there was a complete run for any year. Almost 50% of the post received by the library is journals coming in off circulation, so it is a large factor there too. However, the main loss here is in the standard of the service provided by the library; it cannot hope to satisfy the potential users while large quantities of journals are lost, borrowed and torn up on circulation.

It has already been mentioned that nearly 10 per cent of the users wanted to consult or borrow maps and Admiralty Charts, and the fact that over 20% of the complaints were to do with the incompleteness of the map collection, suggests that this is perhaps an area which the library should concentrate on. They are trying to build up the collection already, but perhaps this area might be more valuable than some others.

In several cases the people had failed to find the information they sought because they did not know what exactly was in the library. One such request was dealt with when the librarian overheard a dissatisfied person answering the questionnaire, and found a relevant article among the backlog of photocopies of NLL loans which the library staff had not had time to catalogue. This would suggest that it would be worth having one simple index which contained all the material in the library, perhaps a KWIC index.

Only one person during the whole survey requested information which would normally be contained in the catalogue library. This raises questions as to how necessary a catalogue library really is. The lack of attempted use may be accounted for by the fact that most people know that there is no useful catalogue library at the moment, but the company has run successfully for several years without one, so either people are getting the information from other sources, or they do not need the information, or the company is not running at maximum efficiency. It would be worth knowing what other sources of manufacturer information are in use, and possibly incorporating some of them into the proposed catalogue library. For example, there is a Barbour Index in the Architects Office; is this sufficient?

Librarian's Time

The librarian's diary gave some surprising figures for the time spent by the librarian on different functions. The most time consuming areas were as follows:-

Inter-library loans.	25½%
Helping people in the library	12½%
Dealing with the post.	10%
Loans & Recalls.	8½%
Producing and distributing photocopies.	7%
Purchases	6½%
Answering phone calls.	5%

The assistant librarian's time was spent almost exclusively on cataloguing the backlog of items in the library.

The figure of 25% of the librarian's time spent on inter-library loans seems remarkably high, and represents about 9 hours a week. Any simplifying of the system in this area would be of great value. Reducing the time needed to help people in the library could only be done by making the library simpler to use: one unified catalogue perhaps, or more obvious shelf numbering.

The post has been analysed in detail, and the largest item is the number of journals received back from circulation. Suggestions have been put forward already in the appropriate studies for cutting the time spent on loans and purchases.

Discussion

There is a need to know not only who does use the library, but who does not, and why they do not. Since a large number of potential users are not coming to the library, it is important to find out where they are getting their information from, if at all. If they are not getting all the information they need, and if they give up when it becomes difficult to find, then they are not doing their work as well as they could, with consequent loss to the company. This would suggest an expansion on the information side of the "Technical Library & Information Group". If on the other hand they are using other sources to find the information they need, then it must be ascertained whether a centralised professional information service could not do this for them more cheaply, quickly and efficiently. In such a case the large SDI/IR service discussed earlier (Study G) would be a valuable asset to the library.

If new services are to be introduced, a certain amount of advertising will have to be done, and it will be necessary to work out how best this can be achieved. Increased advertising will mean increased usage of the services available, and this will put more work on small, already overworked staff. If this happens the service will not be efficient and the users will go back to their old methods of information retrieval, thereby making the whole exercise pointless. How much potential demand is there in the company, and how many more staff will be needed in the library to deal with this demand if fully realised? These are questions which need answering.

Proposal

To enable the best system to be introduced, some form of survey should be carried out round the company to answer the questions raised. It will have to be large to make it worth-while, but what form it should take is open to discussion. It should be remembered that this will act as basic publicity for the library.

RESULTS OF SURVEY OF USERS OF THE LIBRARY AT TAYLOR WOODROW

Frequency of Use

Number of Visits

Date	Morning		Afternoon		
	08.45–10.30	10.30–13.00	13.00–15.30	15.30–17.30	
10th Feb.	X	X	3	7	
11th Feb.	4	7	10	3	Total = 69
14th Feb.	0	6	2	3	
15th Feb.	3	7	11	3	
3rd May.	X	X	4	2	
4th May.	4	5	7	6	Total = 65
8th May.	X	X	6	2	
9th May.	5	7	10	7	
Total	16	32	53	33	

Users

Dept.	010B	014A	014B	014C	014D	014E	014G	014H	014J	014K	014M
People	1 (1,0)	2 (2,0)	6 (5,1)	15 (9,6)	5 (2,3)	6 (2,4)	3 (0,3)	8 (4,4)	10 (3,7)	5 (2,3)	3 (1,2)
Revisits	0	0	6 (5,1)	8 (4,4)	2 (1,1)	1 (1,0)	0	0	8 (4,4)	6 (5,1)	1 (0,1)

Dept.	0111	0125	0127	0130	0150	0160	0163	0165	0212	7900
People	1 (0,1)	1 (1,0)	8 (6,2)	1 (1,0)	5 (1,4)	1 (1,0)	3 (0,3)	4 (3,1)	1 (0,1)	1 (0,1)
Revisits	0	0	7 (5,2)	0	3 (0,3)	1 (1,0)	0	1 (1,0)	0	0

In addition there were visits during the second survey from 1 person in the Architects Office in Western House and 1 person from Swiftplan.

The first figure gives the total number of people and the ones in brackets underneath give the number for the first and second surveys.

Three of the people from 014H during the first survey came in together.

Success.

	Yes	Partly	No
Feb. 10	5	4	1
11	15	7	2
14	6	5	0
15	18	6	0
May. 3	2	4	0
4	11	6	5
8	5	2	1
9	21	4	4

Time taken for Visits

Time	Total	1st survey	2nd survey
under 5 mins	54	26	28
6 - 15 mins	37	17	20
16 - 30 mins	17	10	7
$\frac{1}{2}$ - 1 hours	11	3	8
1 - 2 hours	9	9	0
over 2 hours	3	2	1

The two who were in the library for more than 2 hours during the first survey were only there to keep warm, the one during the second was the information scientist from the Materials Laboratory.

Nature of Enquiries

Enquiry	Total	1st survey	2nd survey
Loan	14	3	11
Return	19	10	9
To order items	10	5	5
Collect ordered item	12	5	7
Consulting References	15	5	10
Specific data	17	11	6
Info. on a subject	18	11	7
Current awareness	17	11	6
Maps or charts	12	6	6
Keeping warm	2	2	0
Miscellaneous	10	4	6

4 people in the first survey & 7 in the second came in to do more than one thing.

1 person uses the micro-film reader during the lunch-hour for his own hobby.

Catalogue

The catalogue was used twice in the first survey and four times in the second and each time it was by a member of the library staff, most of the library users expressed lack of knowledge of its existence.

Complaints

1. Financial Times out of date (4 times).
2. Current Journals out of date (3 times) i.e. (still January 1971)
3. Library does not possess certain Admiralty Charts (3 times) e.g. Jersey, River Tees.
4. OS map collection incomplete (once), and map out on loan (once). However, the librarian says that a reference collection is kept which is not normally loaned; but it is not complete either.
5. No street map of Manchester in the library or of Leicester.
6. 1 issue of Building Science Abstracts missing, including the index.
7. Person to whom book was loaned in February 1971 has left the Company.
8. Circulation problem.
9. 10 or 11 of the monthly issues of Consulting Engineer (1971) not back from circulation.
10. The ten middle pages of The Engineer removed during circulation.
11. Who owns Whom out of data.
12. Latest edition of a British Standard not in the library.
13. No information on paint or paint technology in the library.
14. The information was not in the journal, but when the librarian overheard he found something useful in an uncatalogued photocopy of an NLL loan.
15. The catalogue library has not been built up, so there was no information on glass.
16. The library was noisy - stamping was done on a shelf "which acts as a sounding board".

These are all the complaints which were received from the users in both surveys, and have all been included to illustrate the reasons for people's failure in the library, whether it was the fault of the library or not. In the case of material which the library does not hold, these have been included when the user felt that the library ought to have the item. For books they were mostly quite happy to have these obtained on inter-library loan, which is obviously a normal function of the library.

RESULTS OF LIBRARIAN'S DIARY AT TAYLOR WOODROW

Operation	Time (%)	Average Time	Minutes spent per day						
			10 Feb	11 Feb	14 Feb	15 Feb	16 Feb	17 Feb	Total
Post	9.37	1.25m/letter	5 (6)	20(35)	76(54)	26(21)	45(32)	14 (4)	186
Loan Book B.S. Journal	1.76 4.03 0.25	1.79m/loan 2.58m/BS 0.38m/Jour.	7 (8) 5(13)	2 (1) 3 (2)	8 (6) 69(23)	4 (2) 8 (6)	10(1)	3 (1)	34 80 5
Recall Lib.items Journals External Loans	1.47 0.40 0.50	5.80m/recall 2.0 m/recall 5.0 m/recall	 8 (4) 	22(3) 	 10(2)		7 (2) 		29 8 10
Tel. Data or Oral Search O T Oral Search O T Loan O T Report No.	4.84 2.98 3.22 0.00 4.34 2.02 0.00	3.84m/visit 2.46m/visit 16.0m/search - 3.18m/loan 2.35m/loan -	5 (2)	29(5) 14(8) 26(1) 40(11) 11(8)	8 (4) 4 (3) 28(8) 9 (3)	40(9) 21(8) 38(3) 13(5) 13(3)	14(4) 16(4) 2 (2) 3 (1)	 4 (1) 3 (1) 4 (2)	96 59 64 0 86 40 0
Photocopying & distribution	7.05	4.0m/article	5 (3)	17(10)	24(6)	43	51(6)		140
CIRIA	4.34	-			80		16		96
NLL Telex, etc receipt/return	10.38 10.94	4.73m/item 3.84m/item	10(3) 50(8)	86 71(15)	59(12) 65	51 31			206 217
Borrowing from other libraries	4.34	8.45m/item	33(5)	40		13(1)			86
Purchasing, etc	6.45	-		35	11	16	48	18	128
Up dating BSs, ammendments	2.67	-			33			20	53
Miscellaneous reading, shelving etc.	18.15	-	32	83	22	133	5	85	360
	100.00								1983

The first figure gives the time spent in minutes, and the second figure in brackets shows the number of units involved, e.g. the number of books loaned. In some cases it was not possible to obtain this figure, but the average was obtained for the ones where this was known. The last two dates do not constitute whole days, [illegible]

RESULTS OF ANALYSIS OF THE POST RECEIVED BY TAYLOR WOODROW'S LIBRARY

Post	Loan Requests	Purchase Requests	Purchase Arrivals	External Loans Received	Books Returned	Circ. Jours. return	Catalogs. & Tech. Inform.	Invoice Memos Letters
Tues.16 May 1st	2 (5)	0	0	1	2	6	2	0
2nd	0	0	0	0	1	1	0	1
3rd	0	0	0	0	0	6	0	1
4th	0	0	0	6	1	8	1	3
5th	0	0	0	1	1	3	0	5
6th	0	0	0	0	0	2	1	0
Wed.17 May 1st	1 (2)	0	0	2	0	7	1	3
2nd	0	0	1 (13)	0	0	11	2	2
3rd	1 (1)	1 (2)	0	0	0	3	1	1
4th	0	0	0	0	2	1	0	1
5th	1 (2)	2 (5)	0	0	1	3	1	2
Thur.18 May 1st	0	0	1 (4)	1	0	6	0	3
2nd	0	0	0	0	2	11	0	0
3rd	0	0	0	0	2	2	0	0
4th	1 (1)	0	0	0	1	6	0	2
5th	0	0	0	0	0	1	0	0
Fri. 19 May 1st	1 (2)	0	0	0	1	5	0	4
2nd	0	1 (1)	0	0	1	4	0	1
3rd	0	0	0	0	0	11	0	0
4th	0	0	0	6	2	6	1	1
5th	0	0	0	1	0	3	0	3
Mon. 22 May 1st	0	0	0	4	0	3	6	4
2nd	0	1 (1)	0	0	0	2	0	3
3rd	2 (4)	0	0	0	1	3	0	2
4th	0	0	0	2	0	3	1	4
5th	0	0	0	0	2	2	1	1
TOTALS								
Tues.16th May	2 (5)	0	0	8	5	26	4	10
Wed. 17th May	3 (5)	3 (7)	1 (13)	2	3	25	5	9
Thur.18th May	1 (1)	0	1 (4)	1	5	26	0	5
Fri. 19th May	1 (2)	1 (1)	0	7	4	29	1	9
Mon. 22nd May	2 (4)	1 (1)	0	6	3	13	8	14
Week's Total Percentage of post.	9 (17) 3.7%	5 (9) 2.0%	2 (17) 0.8%	24 9.8%	20 8.2%	119 48.8%	18 7.4%	47 19.3%

The main figures are the number of items received through the post, and the ones in brackets give the number of books actually requested.

A P P E N D I X   D

U S E R   M A N U A L

F O R   T H E   S Y S T E M

USER MANUAL OF THE NEW COMPUTERISED

L I B R A R Y S Y S T E M

AT TAYLOR WOODROW CONSTRUCTION, SOUTHALL

developed by J. Johnston
February 1975.

THE NEW LIBRARY SYSTEM

A detailed study of the library and information system in Taylor Woodrow in 1972 proposed that certain library activities ought to be mechanised. The report recommended that the old, out-of-date cataloguing programs should be rewritten for the new computer, and that at the same time programs for handling the loan of items should be incorporated with them. The new system does this as simply and flexibly as possible.

The system is based on two computer files: an accession file giving full details of every item in the library, and a user file with details of all the users. Records on the accession file give the whereabouts of each copy of an item, and user records include a list of items on loan to that user.

The catalogues and all other printed output can be produced by very flexible printout programs. The computer will write a complete file or selected entries in whatever form is required, and in any order. This means that author indexes, publisher lists, telephone directories of users, recall letters, lists of all items on loan, etc. can all be obtained from the printout programs.

The computer will produce book and user cards. These are simply punched cards containing enough information for the computer and the librarian to identify a book or user. To record a loan, the librarian merely has to put the correct book and user cards together in a file to be run with the loans program. Returns require only the book card. The loans program will also reserve items for a user, and notify the librarian of the reservation when a copy is returned.

There is a "new additions" program which will add new entries to the files, the data for which are presented on punched cards. The computer records management information such as the number of times each book is borrowed. There is also a facility for recording items on "permanent loan". A list of the programs and their functions is given on the next page.

There are two major advantages of the computerised library system over its manual counterpart. Firstly, the drudgery of repetitive clerical work is shifted from the human operator to the machine, and secondly the system is very flexible to growth. It is easier to add a few seconds of computer time than employ and train an extra member of the library staff.

A LIST OF PROGRAMS IN THE SYSTEM AND THEIR FUNCTIONS

PROGRAM	FUNCTION
ADDTNS	The additions program will set up tapes of new accession records and user records. It will also mark records to be deleted from the files. It will change existing records and substitute new entries for them.
ASORT	The sort program will take either a tape of accession records, or a tape of user records, or both, and sort them into order by their accession or user numbers.
FILE	The filing program sets up new accession or user disc files with their indexes from sorted magnetic tapes. It can also be used to copy the accession or user files to tape.
LISTING	The listing program sets up a format from control cards and then writes out specified accession or user records according to that format. It can take as input, a list of individual numbers, the whole of one file, selected full records on tape, sort keys from the PRESORT program, etc. It can only take one type of record at a time, but will refer to the other file for details if required. Additional information can be included in each record, such as headings, etc. This program is used to produce the catalogues, loan list, recall and renewal letters, etc.
LOANS	The loans program records details of all the loans on the accession and user disc files. It cancels loans and informs the librarian of any user who is waiting for an item. The program creates waiting lists for items, cancels entries when the item is loaned to that user or it is requested to do so. It will take loans of certain items which are not recorded on the accession file, such as British Standards.

LSORT — This sort merely consists of job control to use the system standard sort on the machine to sort the output tape from PRESORT.

MERGE — This program is used to merge a tape of sorted additional entries with the permanent disc files and produce a magnetic tape.

NEWCRDS — The new cards program produces input cards for all the items and users. These cards are used for input to the LOANS program.

PRESORT — The presorting program produces either a tape of selected records to be printed, or of selected sort of keys for the required records. The tape of records is passed straight to the LISTING program to be written out, while the sort keys are sorted by LSORT first. Selection may be of a particular kind of material designated by a letter at the beginning of the accession number, or only permanent loans, etc; sort keys may be the authors, UDC numbers, loan date, etc.

STATS — The statistics program allows all or some of the statistic values to be changed on one of the files.

WRTUCRD — The new cards produced for users by the NEWCRDS program may be sorted into name rather than user number order by the utility sort. The sorted entries are taken from the magnetic tape and punched as user cards by the WRTUCRD program.

C O N T E N T S

INTRODUCTION

BACKGROUND

The library housekeeping system was produced by J. Johnston as part of a joint research project between the University of Aston in Birmingham and Taylor Woodrow Construction Ltd. The work was begun in 1971 with a detailed analysis of Taylor Woodrow's (TW's) library and information system at Southall. A largely machine independant computer system was then designed to meet the needs of the library and to give maximum flexibility, so that it could be used elsewhere. A detailed costing of the system is given in J. Johnston's Ph.D thesis (1975).

CAPABILITIES OF THE SYSTEM

As the programs are written in Fortran IV, it should be possible to operate them on most machines. The system is designed to handle the normal routine housekeeping functions of the library, apart from ordering and inter-library loans, which it is shown in the thesis would only benefit from computerisation under certain circumstances which do not apply at TW. A set of programs adds items and makes changes to the existing entries, and produces back-up tapes from which the permanent files and indexes can be recreated. Certain management statistics are kept and loans, returns and reservations can be recorded. A very general print program permits any or all of the entries to be written out in a totally flexible format. This program can be used to produce the catalogues, to give information on the state of individual items, and to write out recall letters, or anything else involving the data held on the permanent files.

THE FILES

The system operates with permanent disc files and temporary tape files. The first disc file is the "user file", which lists all those who use the library with details of their departments, addresses, telephone numbers, and the accession numbers of all the items on loan to them. The second one is the "accession file", which gives the bibliographic details of every item held in the library, the number of the user to whom any copy is on loan, and whether anyone is waiting for the item. Indexes to these two files are also held on disc. Back-up tapes should be kept in case the disc files are damaged or destroyed, and tapes are used to hold data while it is being moved from one program to another. New entries, for example, are held on tape until added to the disc files.

THE PROGRAMS

The initial setting up of the disc files is either done by entering new data with the ADDTNS (new additions) and file programs, or a program must be written to convert existing machine-readable data into the format required by the system. (This format is described in the next section) At TW a special program was written to do the conversion. Loans, returns and reservations are entered with the LOANS program. Back-up tapes are produced and the files and indexes recreated from them by the FILE program. The statistics can be modified by the STATS program. Book and user cards are punched by the NEWCRDS program. All forms of listing are produced by using PRESORT, LSORT AND LISTING. The following pages give details of the operation and capabilities of all these programs.

D E T A I L S   O F   T H E   F I L E S

MACHINE REQUIREMENTS

At TW the programs are run under DOS on an IBM 370/135 with 144K of main storage. The largest program (ASORT) currently requires 112K of storage, but this could be reduced by decreasing the number of records which can be sorted. The next largest (LISTING) needs 96.5K, and the others are all less than 64K. Storage requirements for the data are 900 bytes/book + 550 bytes/user for the main files. The indexes take up 546 bytes/39 books, + 550 bytes/55 users. A book for this purpose is taken as any item which is to be included in the library catalogues, and a user is any person or organisation which borrows books.

The system could be operated with only 2 tape drives, but for efficient running it is necessary to have 4. Data is input on cards via a card reader. If a card punch is available, the computer can produce the book and user cards used for input to the Loans program. For card punches which do not interpret the cards automatically, this must be done afterwards.

COMPOSITION OF THE FILES

a) User File.

The user file consists of a series of user records each giving the details of a user and any books which he has out on loan. The file may be of any length, but ends with a record which has a "Z" as the first character. For this reason, it is essential that a Z is never used as the first character of the user number, as it will stop further processing of the file. (See user record format below). User Records are 275 characters, in length and must be held in user number order.

b) Accession File.

The accession file is set up in the same way as the user file. There may be any number of accession records, each of them 450 characters in length, stored in accession number order, again ending with a record which has a "Z" for its first character. Accession numbers too must therefore not begin with a Z.

c) Indexes.

The records are in accession or user number order and indexes are set up so that it is possible to find a given record without looking through the complete file. The "user file index" consists of records each giving the user number and the location of the main record for that number in the main file. There are 55 user numbers and locations on an index record, and Zs are used to indicate the end of the file. The first entry of the first index record contains the number of records in the file. A subroutine called URECRD searches the index for a given user number and finds the location of that record in the main file. The accession file is indexed in the same way by the "accession file index", but there are only 39 accession locations per index record. The accession file index is searched by subroutine RECORD.

COMPOSITION OF ACCESSION RECORDS

a) Accession Numbers.

Each accession record is 450 characters long, and if there is insufficient data to fill that length, the remainder is left blank. Any record is identified uniquely by an accession number. This number, which appears at the beginning of the record, is 6 characters in length, and consists of any letters or numerals which the library selects, with two exceptions.

1. The first character must never be a "Z", as this is used to mark the end of the file.
2. The second character must also never be a "Z", as this is used to indicate a record which is to be deleted from the file.

The first character can be used to describe different types of material; for example, at TW a numeral at the beginning denotes text books, T denotes internal reports, A indicates an ACI publication, etc. When producing the catalogues it is possible to select items beginning with a given letter.

TW does not include British Standards (BSs), Codes of Practice (CPs) or Ordnance Survey maps (OSs) in its catalogues, but they are given copy letters. The system can, however, record loans of these items, identifying them by the letters BS, CP, and OS. Special accession numbers are then created by taking the official numbers for the publications, which never exceed 4 characters, and adding them to the letters, to make up the normal 6 characters. For example, British Standard 449 would have accession number BS0449. For further details see "Input for the LOANS program (b) loans of uncatalogued material".

b) UDC Number, Publication Date & Classification Star

The accession number is followed by the UDC numbers. UDC permits two classification numbers to be joined together with a colon, each of which may be up to 15 characters long. Since there is no code for ":" on punched cards, ".*" has been used instead. A field of 32 characters has been allocated for the two numbers separated in the middle by ".*"

The next two characters are allocated to the date of publication, e.g. 1972 is entered as "72". This in turn is followed by an asterisk to designate certain types of material. At TW it has been used to differentiate files from the entries within them, and to signify which internal reports are not on restricted access. The only significance of the star is that it is possible to select starred or unstarred items from the file before listing them.

c) Statistics

The next four characters of the accession record have been allocated for the collection of library management data. They are stored as numerics. The first one gives the date of acquisition of the item, and is automatically set by the ADDTNS program when the item is added to the permanent file. The second statistic records the total number of times that the item has been out on loan, and the third one the number of times in the current year. This gives a measure of the value of the item, and whether its use is increasing or decreasing. In both cases the value is incremented automatically each time the item goes out on loan. The fourth statistic has not yet been allocated. For a more detailed discussion see the description of the STATISTICS program.

d) Location Keys.

The next four characters provide an index to the remainder of the record, since the length of the title, publisher and authors varies from book to book. The values are all, like the statistics, stored as numerics. The first one contains the number of authors, and since these are all of 20 characters, this determines their total length. The second value gives the number of characters in the title, the third the number of characters in the publisher, and the fourth the number of copies of the item which are held in the library. It is therefore possible to find the start of any of the remaining parts of the record from this set of location keys.

e) Authors.

The authors of the publication, follow the keys and there can be any number of these as specified by the first key. Each author is 20 characters, and if the name is not that long the excess is filled with spaces. Corporate authors which are too long must be abreviated. It is possible to include report numbers with a corporate author, so that all the publications of the organisation appear in number order in the author index. For example, Special Publication No. 265 of the Cement and Concrete Association could have as its first author not merely "CCA", but "CCA" S P 265". It will then appear with the other special publications held, in the right order. If this is not done, computer sorting would produce all the CCA publications in any order.

f) Title & Publisher.

The title immediately follows the authors. Notes can be added to the original title and will be treated as part of that title. The total number of characters will be specified in the second location key. The publisher follows the title in exactly the same way.

g) Copy Entries.

Following the publisher 17 characters are allocated to each copy of the item, as specified in the fourth key. The first of the seventeen characters is a copy letter identifying the particular copy. Then four characters are left for the user number of the user to whom the copy is on loan. The next four characters may contain the user number of anyone who is waiting for (reserving) the item (the waiting list user). TW lends some books for an unlimited time. These are known as "permanent loans" and recorded by a "P" and 3 blanks instead of the waiting list user number. The last eight characters are used to record the date of the loan in the order day, month, year. (e.g. "27.02.71"). When any field has no data in it, it is filled with alphabetic zeros, as they must all contain letters.

h) Format of Accession Records

Characters	Contents
1 - 6	Accession number
7 - 38	UDC number (.* in characters 22 & 23)
39 - 40	Publication date
41	Classification star
42 - 45	Statistics
46	Number of Authors (A)
47	Number of characters in title (T)
48	Number of characters in publisher (P)
49	Number of copies of item held in the library (C)
50 - 49 + 20 A	A authors (each 20 characters)
50 + 20 A - 49+20 A+T	Title (T characters)
50 + 20 A + T - 49+20A + T + P	Publisher (P characters)
followed by C sets of	
1	Copy letter
2 - 5	Borrower
6 - 9	Waiting list user or P for permanent loan.
10 - 17	Date of loan

\- - - - - -

The following is a possible record. The figures in brackets are numerics which can be numbers larger than 9. Zeros are "o" and letter Os are "O".

Aoo245 52.935,488 .*698.35 72*(73)(3)(1)(o)(3)(43)(29)(3) 1ST AUTHOR SECOND AUTHOR BODY A N Y TITLE OF THE ITEM, AREA MUST BE FILLED UP. PUBLISHER OF ITEM INVOLVEDAoo23Pooo26.o1.73Boo41ooo22o.o1.73D o1o2oooo14.o3.73 the remainder of the 450 characters are blanks.

Copy A is on permanent loan to user 0023, copy B is on loan to user 0041, and copy D to 0102. User 0002 is waiting for a copy.

COMPOSITION OF USER RECORDS

a) User Numbers.

Each user record is 275 characters long, and like the accession records it is padded with blanks if necessary, and begins with an identifying number. As for the accession number any 4 characters are permitted as the user number, except that a "Z" must again never be used as the first or second character. Z is a delimiter and a symbol that the item is to be deleted. The first letter of the user number can be used to designate different catagories of user, for example by their departments.

b) User Name, Department & Phone Number

After the user number, 25 characters are allocated to the user's name. This should be in the order: surname, initials, (e.g. SMITH A B). Next there are 30 characters for the usuer's department or, in the case of an external user, his address. This is followed by 11 characters for the telephone number. In cases where there is an external telephone number and a long extension, it may be necessary to put the extension at the end of the department. If "X" followed by the extension is used for internal numbers, there is room to leave a space and put "S" followed by the extension of the user's secretary.

c) Statistics and the Number of Items on Loan

Following the phone number, there are five numerics providing four statistics and the number of items on loan. The statistics are very similar to those for the accession records. The first is to record the number of items borrowed by the user in total, and the second the number of items borrowed in the last year. These two are both incremented by one each time the user borrows another item. The other two statistics have not been allocated but one of them could be used to record the number of inter-library loans to the user or charges for library services. Data for these could be entered via the STATS program. The fifth value gives the number of items currently on loan to the user. Details of the items borrowed are given in the next part of the user record.

d) Loans

There are 8 characters allocated to recording each item on loan. This means that in the 275 characters of the user record there is room for 25 loans to be recorded. If a user wished to borrow more items than this he would have to be given another user number. The first 6 loan characters give the accession number of the item. This is followed by the copy letter, and a "P" if the book is on "permanent loan", in which case it will not normally be required back in the library.

e) Format of User Records

Characters	Contents
1 -4	User number
5 - 29	User's name
30 - 59	User's department or address if more appropriate.
60 - 70	Phone number of user
71 - 74	Statistics
75	Number of items on loan to user (L)
followed by L sets of	
1 - 6	Accession number of item borrowed
7	Copy letter of item borrowed
8	A "P" if the item is on permanent loan

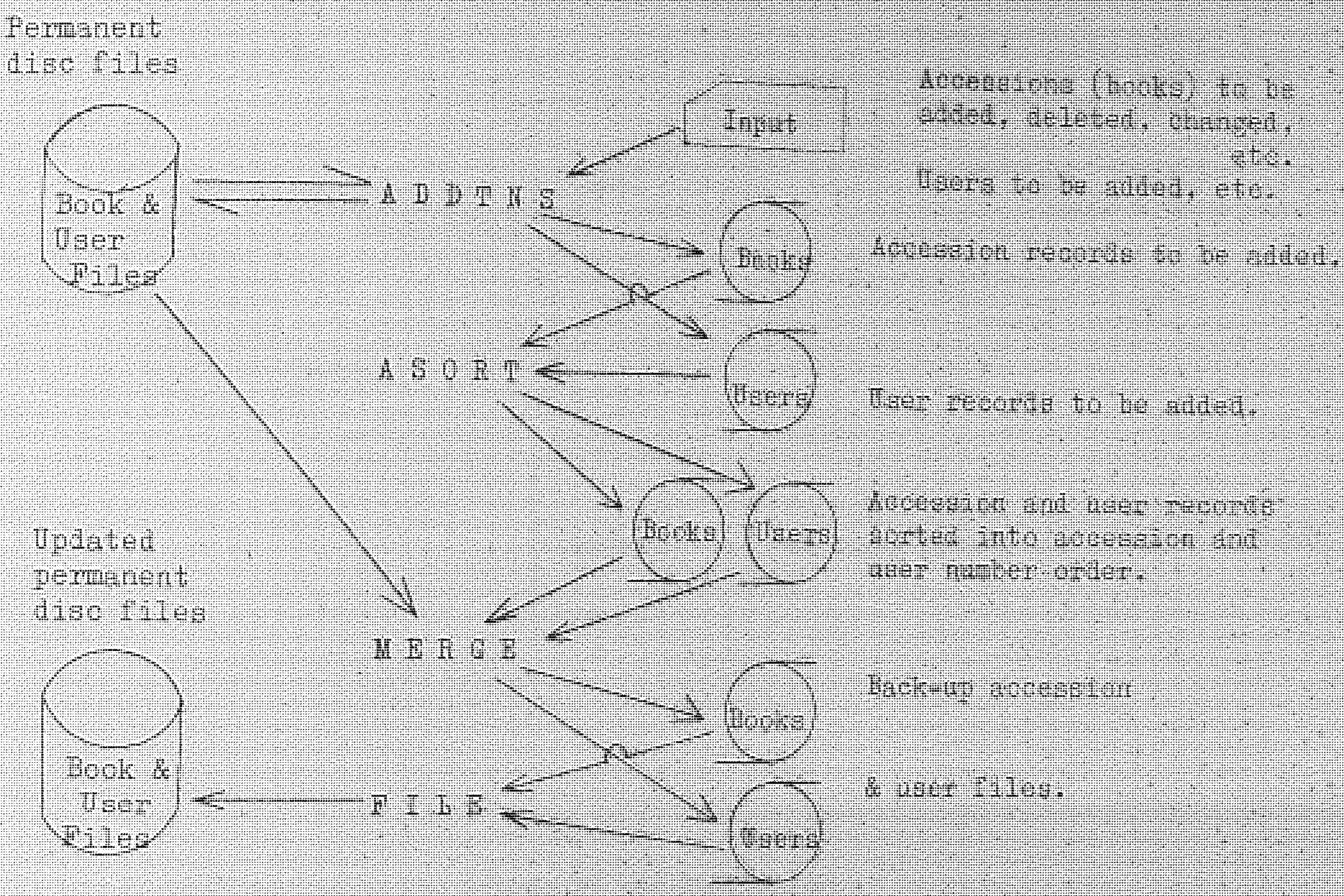
The following is a possible user record. The figures in brackets are numerics which can be numbers larger than 9. Zeros are "o", letter Os are "O".

Co23USER A N Y   ANY DEPARTMENT IN THE FIRM   X 4o25   (50)(14)
(5)(o)(4)Cooo25A oooo37CPN23425A BSo449D

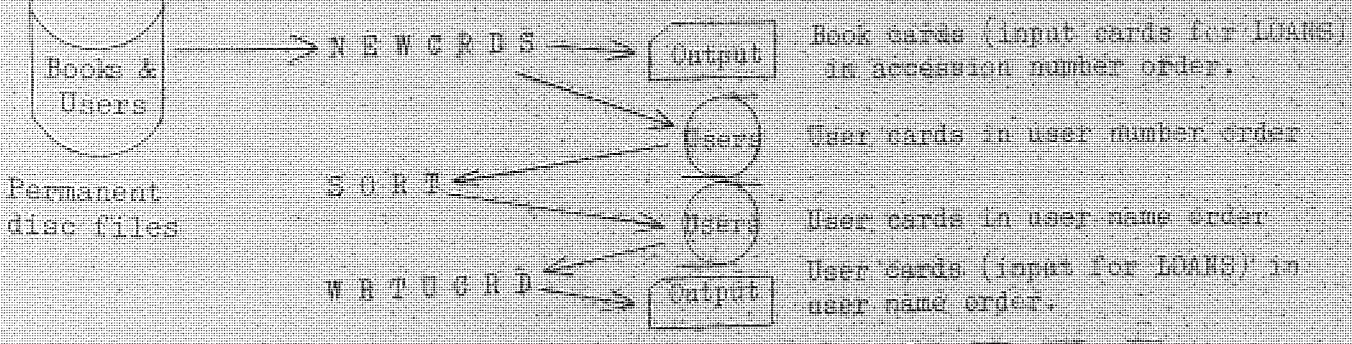
The user has copy A of item C00025 on loan, copy C of item 000037 on permanent loan and copy A of item N23425 and copy D of British Standard 449 (see Composition of Accession Records (a) Accession numbers) on regular loan.

FLOW DIAGRAM OF THE SYSTEM

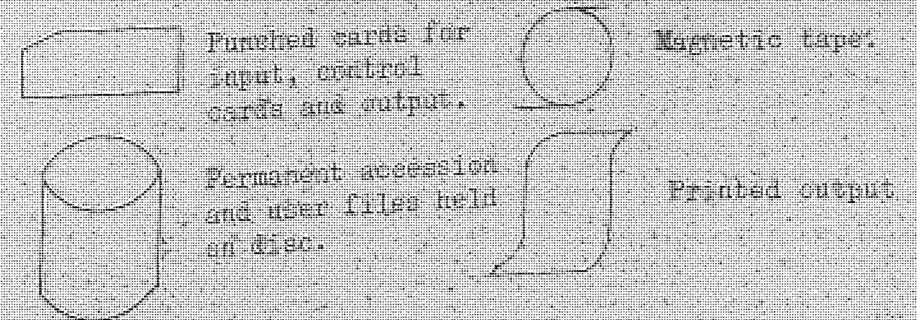
1. Adding New Records To The Files



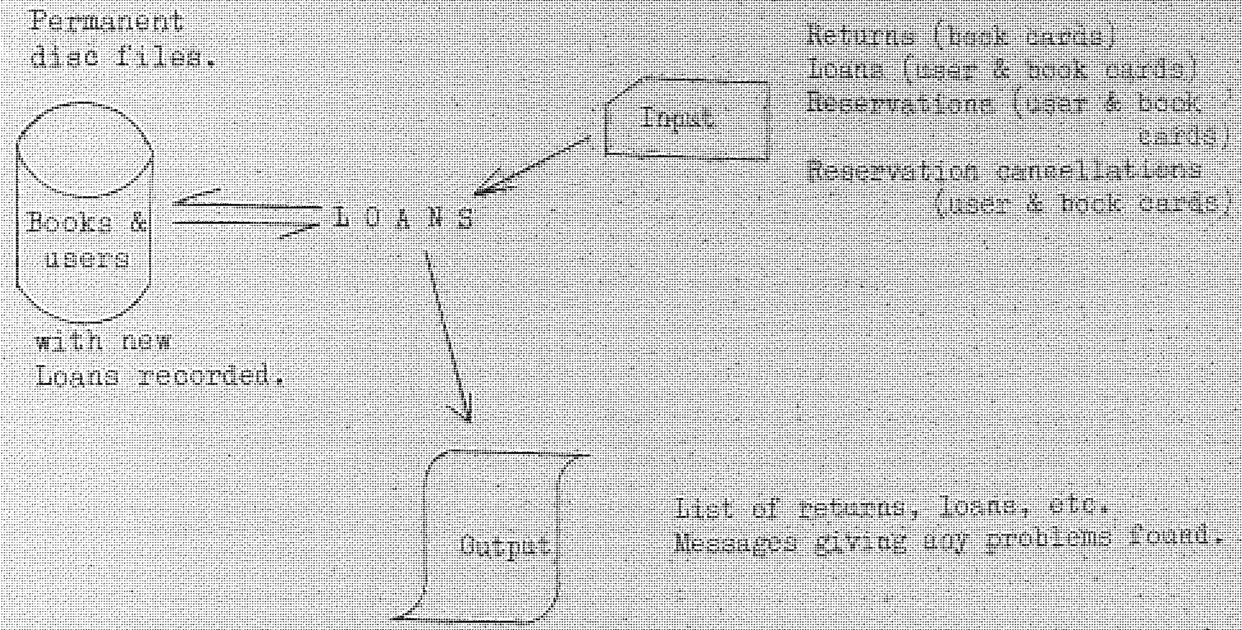
2. Production of New Input Cards For LOANS Program



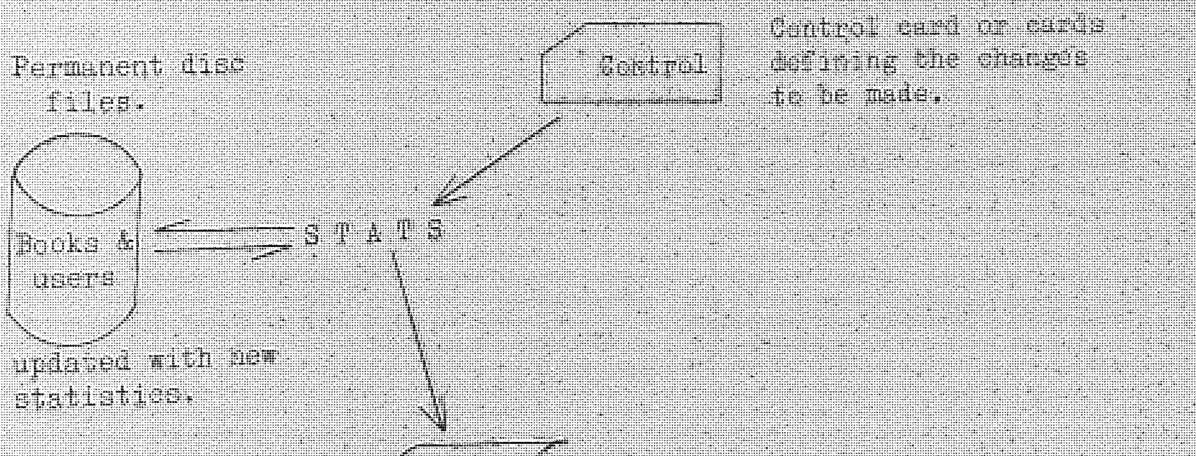
Key To Symbols



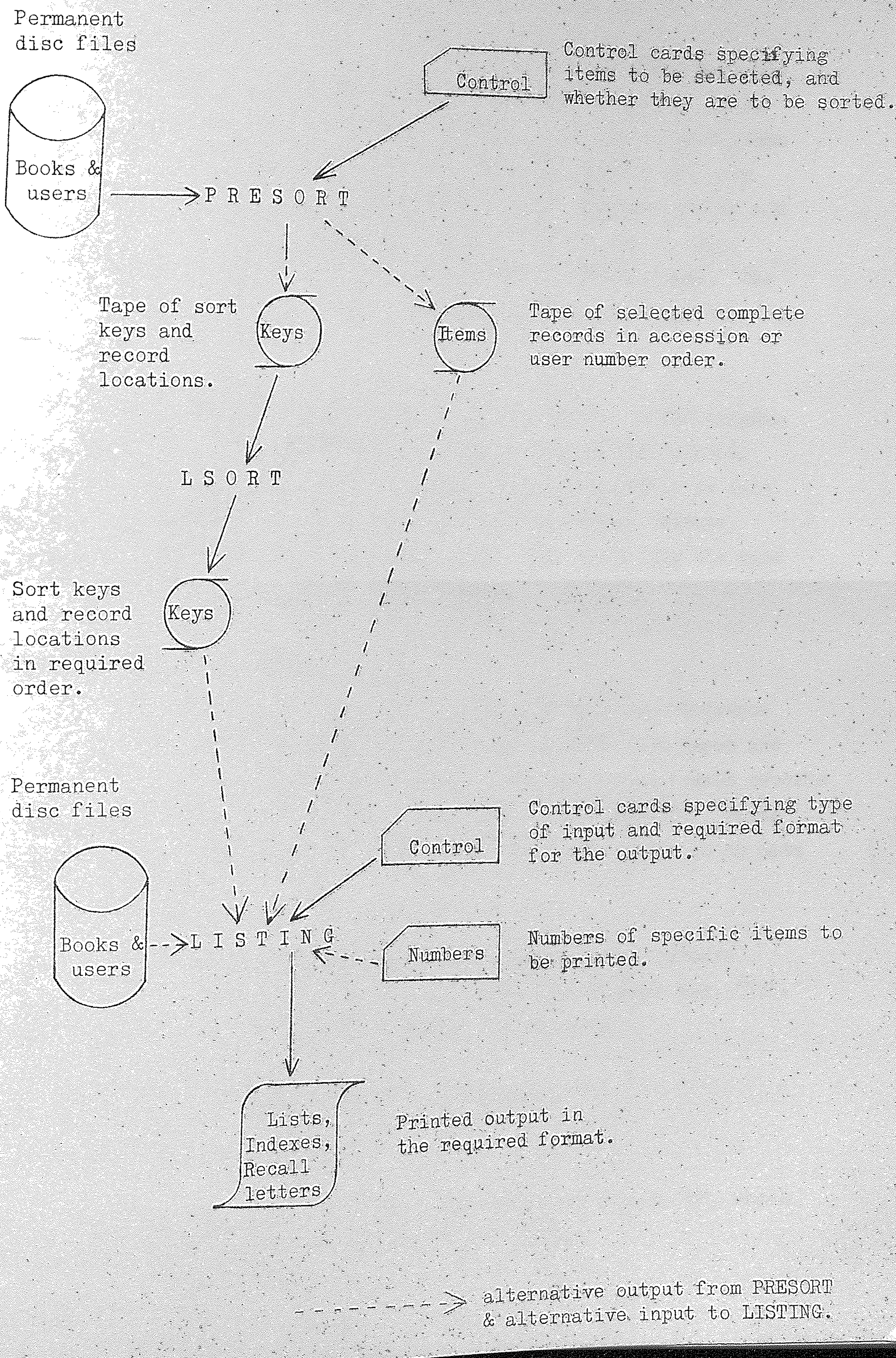
3. Loans



4. Changing the Values of the Statistics.



5. Written Output from the Files



THE ADDITIONS PROGRAM

GENERAL DESCRIPTION

The ADDTNS program is used to make changes to entries on the accession and user files. It takes the accession data first. It is possible to make changes to entries already on the file, to mark items for deletion, to prepare new entries to be substituted for old ones with retention of the original statistics and loan records, and to add new entries. New and substituted entries are written out on tape, sorted, and merged with the disc accession file to another tape. The files are then recreated by the FILE program and the tape kept for back-up.

After the accession data has been entered the ADDTNS program takes user data in the same way. Again entries can be substituted, marked for deletion or added to the file. It is not possible in this case to change existing entries, they must be substituted instead. The tape of new user records are added to the disc in exactly the same way as the accessions, using the FILE program.

INPUT & STORAGE REQUIRED

The disc accession and user files are on data set reference numbers 4 & 5 respectively with the indexes on 11 & 12. Two tapes are required: one on data set reference number 6 for the new accession records and the other on data set reference number 9 for new user data. Cards are input on data set reference number 1 and the line printer is on data set reference number 3.

The following data is required on cards by the program:-

1 card giving the date (year only) in the first two columns; e.g. "73".
Cards giving the accession data (see below for formats).
1 card with a "Z" in column 1.
cards giving the user data (see below for formats).
1 card with a "Z" in column 1.

Accession and user data are each terminated with a "Z", which permits any number of items to be entered in a batch.

ACCESSION DATA FORMATS

a) Identification of records.

There are five different types of input: new entries, and duplicates, substitutions, changes and deletions of existing records in the permanent files. New additions substitutions and changes will require more than one card, so each card of a set should be numbered consecutively in column 80 of the card. The first card of any set is used to identify the record which is referred to, and has the following format.

The first column indicates the type of input: a blank for a new addition, "S" for a substitution, "D" a duplicate, "C" a change, and "R" a removal (deletion). This is followed by the accession number, copy letter, and UDC numbers. For the new additions, these are followed by the date of publication and a "*" if required (e.g. for unclassified reports at TW, see Details of the Files, Composition of Accession Records (b)), then a three figure number gives the number of authors and a two figure number the number of copies.

Column	Contents	
1	Blank, S,D,C, or R.	
2 - 7	Accession number	
8	Copy letter (or blank if irrelevant)	
9 - 40	UDC number (.* in columns 24 and 25)	
41 - 42	Date of publication (e.g. "72")	for new additions only
43	Classification star	
44 - 46	Number of authors	
47 - 48	Number of copies to be included	
80	A figure "1".	

The following is a possible first card for a new addition.

(b = blank)
b123456 625.023 .*432.05 69* 03 1 (col.80) 1
Item 123456 (3 authors) UDC no. 625.623:432.05.

The copy letter is blank as the program will automatically allocate letters to the copies (in this case A to the single copy).

b) New Additions

At least four cards are required for new additions; an identification card as described in the previous section, an author card, a title card, and a publisher card. In some cases it may be necessary to have more than one card for these, and all the cards in the set should be numbered consecutively in column 80. The total may not exceed 9 cards in any set, as more than this would create records longer than the maximum permissible size: 450 characters.

Author cards follow the identification card and each may contain up to three 20 character authors. The program will go on reading these until it has reached the number specified in columns 44-46 of the identification card (see previous section). The first author on each card begins in column 11, the second in column 31 and the third in column 51. If authors have been omitted, the computer will take whatever is found in the appropriate columns as being the author.

The format for the title and publisher cards is identical. The data start in column 3 of each card and the first two columns are used to specify the number of the last column used for the writing. As column 80 is used for the sequential numbering of the cards the maximum number for the first two columns is 79. If the computer finds this number in these columns it assumes that the next card is a continuation and adds the data held on that card to what it already has. The title and publisher should therefore never be terminated in column 79. For possible formats see the coding sheet at the end of this section (Page 23).

c) Substitutions

The format for substitutions is exactly the same as for new additions, except that the first column of the identification card is "S". In this case, however, the loan records of the original entry and the statistics are maintained. The updated entry is put on to the same tape as the new entries, and the original entry on disc is marked for deletion.

d) Duplicate Copies

To increase the number of copies of an item held in the catologues, it is necessary to put in only the identification card (see section (a)), containing its first four parts: - a "D" in the 1st column, the accession number, the copy letter to be used for the new copy, and the UDC numbers to check the selection of the entry. If no copy letter is specified the computer will allocate the next available one and print it out.

e) Deletions - Removal of Entries from the Accession Files

To remove entries from the file a card identical to that for duplicates is used, except that there is an "R" in the first column.

f) Changes to Existing Entries

Two cards are required for changes, and they should be numbered 1 and 2 in column 80. The first card is an identification card as required for duplicates, except with a "C" in column 1. The accession number and UDC numbers are required, but not the copy letter, as this would be irrelevant. The second card describes the change to be made, and has the following format:-

Column	Data
1	"C" (to indicate a change)
3 - 6	Code designating the part of the record to be changed
8 - 10	The number of the first character of the change within the relevent part of the record.
12	An asterisk.
13 -	The characters to be changed, an asterisk, the characters which replace them, and a terminating asterisk (see below)
80	"2" (to indicate the second card of the change)

The following codes may be used in columns 3 - 6 to define the parts of the entry to be changed:-

TITL - the title
PUBR - publisher
AUTH - author
STAR - classification star
DATE - date of publication
UDCN - UDC number
ACCN - accession number

For the STAR, no further details of the change need be specified. If the computer finds an asterisk, it will change it to a blank, and if it finds a blank it will change it to an asterisk.

The exact details of the change are defined by asterisks starting in column 13. The old characters are written first, ending with an asterisk. Then the characters which are to replace them are written, again terminating with an asterisk. The rest of the card, except column 80, is left blank. Only for the title and publisher may the number of new characters be different from the number replaced. In all other cases blanks must be used to fill out the both parts to the same length, as the overall field is of fixed length. An example of this is given below.

The change is made on the disc file, but if the accession number is changed, the corrected entry is written on the tape with the new additions, and the old entry marked for deletion. When the disc file is merged to tape or recreated the old entry will be shown as being deleted.

Sample formats are given on the coding form at the end of this section, but cards could have the following data:

C TITL 027 *OTHER*EACH* (column 80) 2

Change the 27th and following characters of the title (the word "other") to read "each".

C AUTH 006 *SON A*Y A * (column 80) 2

Change the first author from "SMITHSON A" to "SMITHY A". (The Smith part of the name is merely an example, any other 5 letters could have been involved at the start of the change). If the second author were to be changed in this way the card would have begun C AUTH 026, since 20 characters would have to be allowed for the first author.

USER DATA FORMAT

Only one card is required for users, as the data is sufficiently short, and it is not possible to make changes (a substitution entry must be used). Again, the first column indicates the type of record; a blank means a new addition, "S" means a substitution, and an "R" indicates that the item is to be removed from the permanent file. Following this is the user number, the user's name, his department and phone number.

Column	Contents	
1	Blank, S or R	only these three items required for removing entries from the file.
2 - 5	User number	
6 - 30	The user's name	
31 - 60	The user's department	
61 - 71	The user's telephone number (Xoooo for an internal extension)	

There is room in the telephone number field to put the user's internal number and then that of his secretary, designated with an "S".

A sample format is given for this on the coding sheet at the end of this section. Any data may be included in a field, and will appear in it in all listings.

OUTPUT

a) Correct Output

The sets of data input are printed out in their original card form. If their are no errors and the data has been input correctly, there are no comments added, and each set of data is separated by two or three blank lines. Error messages stand out as they are set back 10 spaces from the data. If there are no error messages in a block of data, it may be assumed that the entries have been written to tape or changed on the disc correctly. The following would be a correct new entry followed by a duplicate. (Each line would begin 10 characters from the start of the printline).

```
N00054 624.04                          60*  2 1                    1
        MATHESON J A           FRANCIS A J                         2
79HYPERSTATIC STRUCTURES.* AN INTRODUCTION TO THE THEORY OF STATICALLY INDETERM3
19INATE STRUCTURES.                                                4
27BUTTERWORTH, LONDON 1960.                                        5

D000006 529.6                          0 0                         1
```

b) Errors

Error messages are set back from the data so that they stand out, and each message refers to the line of data immediately preceeding it. The following in alphabetical order are the possible error messages which may be encountered.

CARDS NOT IN ORDER. THIS SET HAS NOT BEEN INCLUDED

For new or substituted entries, the cards are not in order, or a card is missing, as specified by the numbers in column 80 of the cards. The remainder of the cards up to the next blank lines have been ignored. For changes, the card following the identification card does not have a 2 in column 80. This message will also be printed if the first card is unreadable.

CHANGE OF NUMBER OF CHARACTERS IN A FIXED FIELD

For a change, the new version is shorter or longer than the original. This does not apply for changes in the title or publisher.

FORMAT ERROR ON ABOVE CARD - CORRECTION NOT MADE

There is a format error in the immediately preceeding card. For example:

(i) The code in the first column of the identification card is not permissible.

(ii) On the second change card there are insufficient "*"s to show the new and old characters for change.

(iii) The code for the part of the record to be changed is not permissible.

(iv) The three figure number on the second change card is either not a positive integer, or exceeds the length of the relevant part of the record.

MATCH NOT FOUND FOR CHANGE - ABOVE CARD NOT ENTERED

The character given as the first to be changed is not found in the existing entry in the position specified (or in the case of the title or publisher, in the adjacent positions either), or the remainder of the characters do not check with those specified.

NO COPY LETTER GIVEN. FOR THIS ITEM A COPY LETTER MUST BE SPECIFIED. IT HAS NOT BEEN ENTERED.

For this duplicate the computer could not find a suitable copy letter to use. The letters already used should be checked and the record and the duplicate re-entered specifying a possible copy letter.

NO COPY LETTER SPECIFIED SO 'a' USED

No copy letter was given for a duplicate copy, so the computer has used the letter specified. No action is required from this message, the letter should just be noted.

NO FILE ENTRY FOUND FOR COPY NO. aaaaaa

For entries which require reference to be made to existing entries on the disc accession or user file, no entry with the given accession or user number (aaaaaa) has been found.

THIS ENTRY EXCEEDS 450 CHARACTERS followed by the record so far.

A new record which is being set up has exceeded the maximum of 450 characters which is permitted by the programs; or the addition of a duplicate copy or a change has made an existing record exceed this length.

UDC CHECK - UDC NO. WRONG FOR ENTRY aaaaaa

For existing accession records the computer checks the UDC number given against that of the record found on the disc. In this case the two numbers are not the same, so no further action is taken on this data set.

USER'S NAME & NUMBER DO NOT CHECK aaaa user name

For existing user records the computer checks the user name given against that of the record found on the disc. In this case the two names are not the same so processing of this record has been terminated.

THE LOANS PROGRAM

GENERAL DESCRIPTION

The LOANS program records four operations on the disc files: the return of items, their loan, reservation of items by users, and cancellation of the reservations. These four operations are taken in that order with the data for each terminated by a "Z". The computer lists the input data, but apart from the changes to entries in the disc files, the only other output is any error messages which may be necessary.

STORAGE & INPUT REQUIRED

The disc accession and user files are on data set reference numbers 4 & 5 respectively, with the indexes to them on 11 & 12 respectively. No tapes are required. Card input is on data set reference number 1 and the line printer on 3.

Column 73 of each card of the loan data contains codes to signify the type of card, or delimiters (Z). The following data are required:-

Cards giving the return data (see below for formats) Each card should have an "A" or "N" in column 73 (accession cards).

1 card with a "Z" in column 73
1 card with the date (day, month, year in the following format "22.02.73")

Cards giving details of loans (sets of a User card ("U" in column 73), followed by accession cards.)

1 card with a "Z" in column 73

Cards giving waiting list entries (reservations) (sets of one User and one or more accession cards as before.)

1 card with a "Z" in column 73

Cards giving waiting list cancellations (as for waiting list entries.)

1 card with a "Z" in column 73

TYPES OF INPUT CARD

All the cards required for input can be produced by the NEWCRDS program, and kept in files in order. NEWCRDS will produce 1 accession card for each copy of each book, 1 user card for each user, 10 delimeter (Z) cards and 10 permanent loan cards. The formats of these are given below, and in each case the character in column 73 is used to identify the type of card.

a) Accession (book) cards

Accession cards are used by the computer to identify the accession record which is being referred to in a loan. The card is identified by an "A" in column 73. This is followed by the 6 character accession number and the copy letter. The accession cards can be kept in accession number order. The first 20 columns contain the author, and the computer uses this to check that the accession number is correct. No other data are necessary, but the NEWCRDS program writes the first part of the title into the remainder of the card to aid identification. The following is the format of the accession cards:-

Column	Contents
1 - 20	First author
21 - 71	Title (first part of) - not necessary, but produced by NEWCRDS.
73	"A"
74 - 79	Accession number
80	Copy letter

b) User cards

User cards are used by the computer to identify the user in a transaction. The card is identified by having a "U" in column 73, and this is followed in the final four columns by the user number. The first 25 columns are used for the user's name, and this is checked with the record held on file in the same way as the author of the item on the accession card. (No check is made for cancellation of waiting list entries). The user cards may be kept in alphabetic order by user name. No other data is necessary, but again the NEWCRDS program uses the intervening space for the user's department, to aid the librarian in identifying the card. The format for the user card is as follows:-

Column	Contents
1 - 25	User's name
30 - 59	User's department - not necessary, but included by the NEWCRDS program.
73	"U"
77 - 80	User number

c) Permanent Loan Cards & Z Delimiter Cards

Permanent loan cards indicate that the accession card immediately following is to be entered as a permanent loan. They contain only a "P" in column 73.

As explained in "Storage and Input Required" by the LOANS program, data for each of the four operations is terminated by a card with a "Z" in column 73.

INPUT FOR LOANS PROGRAM

The overall arrangement of data is given in the earlier section "Storage and Input Required"; this section gives the detailed arrangements for each of the four operations performed by the program.

a) Input for Returns

Two kinds of material may be returned, those which are recorded in the accession file, and uncatalogued material: British Standards, Codes of Practice and Ordnance Survey Maps (OS Maps). The latter group has special provision made for it in the program so that these items may be loaned using the system, although there is no entry for them on the file. They are dealt with below in (b), Loans of Uncatalogued Material.

For material which is held in the accession file, the computer needs only the accession number of the item which is being returned before it can cancel the loan. This is provided by the accession card of the item, but it is necessary to take care that it is the card for the right copy letter. The computer finds the number of the borrower from the entry in the accession file and cancels the loan on both files. Input for normal returns is therefore only a series of accession cards in any order ending with a terminating "Z".

For uncatalogued material, however, there is no record on the accession file, so the number of the item alone is insufficient to find the loan records easily. The loan is recorded only in the user file against the borrower, so for these entries the accession card should be followed by his user card. The return will then be recorded on the user file. However, there may be times when it is not possible to find out who had the item on loan; and in these cases it is permissible to put in merely the appropriate uncatalogued material card. The computer will then go right through the user file looking for that item on loan, so this should only be done in extreme cases.

b) Loans of Uncatalogued Material.

At TW large numbers of copies of British Standards (BSs), British Standards Institute Codes of Practice (CPs) and Ordnance Survey maps (OS maps) are held in the library, but have not been catalogued with the rest of the library stock. They are uniquely identifiable by their own official numbers and a copy letter, and since these numbers consist of a maximum of four figures, it was decided that provision should be made to include them in the LOANS program. The above codes, with the official numbers thus constitute "accession numbers" for this uncatalogued material. For example, accession numbers such as BS6349, CP0114 and OS2246 would all be acceptable. Cards for uncatalogued material are therefore produced for use as accession cards in the loans procedure. For returns the card is followed by a user card (see previous section). Reservation of uncatalogued material is not possible. These uncatalogued accession cards merely have an "N" in column 73, followed by the accession number and copy letter. They cannot be produced by the NEWCRDS program, because it takes data only from the accession file, but must be punched specially in the following format.

Column	Contents
73	"N"
74 - 79	Accession number (e.g. CP2486)
80	Copy letter

c) Input for Loans

The data for the loans function of the program must begin with a card giving the date to be entered as the date of all the loans. This card should be of the form day, month, year (for example 24.03.72), in columns 1 - 8. Following the date card, all the loans are entered in sets; one set per user.

Each set should begin with the user card of the person to whom items have been loaned. This is followed by accession cards for the copies of all the items, and the set is taken to be complete only when another user card or a "Z" is encountered. (The "Z" indicates the end of the loans.) For uncatalogued material the process is exactly the same, except that a special accession card is created as described in the last section, and is used instead of the normal accession card. Loans and sets of loans may be taken in any order.

Permanent loans are entered by placing a permanent loan card (a "P" in column 73) immediately before the accession card of the item which is to be let out on permanent loan. Permanent loan cards only apply to the following card, and not subsequent ones. Uncatalogued material may be loaned permanently.

d) Input for Waiting Users (Reservations)

If a user wishes to see an item on loan to another user, his user number may be recorded against the book. When any copy is returned the computer prints a message to the librarian. This waiting list is set up by a set consisting of a user card followed by accession cards, as for the loans. However, in this case permanent loan cards and uncatalogued material cards are irrelevant, and will cause an error. The data for the reservations is again terminated by a card with a "Z" in column 73.

e) Removal of a User from a Waiting List

If a user who is waiting for an item decides that he does not wish to remain on the waiting list, exactly the same data is used as was used to put him on the list, but this operation cancels what was done in the previous one. If the user borrows the book, he is automatically removed from the waiting list. The computer does not check the file to see that such an item exists. If the user is not found to be waiting for the item, a message will be printed.

OUTPUT

a) Correct Output

A heading appears at the beginning of the listing of the data for each of the four operations of the program. The data for the operations is printed with the words ACCESSION CARD or USER CARD as appropriate at the beginning of each line for clarity. If there are any errors these are printed out with the line, or immediately after it. Blank lines are left between each set of data. Unless there is an error message it may be assumed that a set of data has been recorded successfully, but for uncatalogued material a message states that a return has been completed successfully. The same message is also given after the loans for any returns which were borrowed and returned in the same run. The message is as follows:-

aaaaaaa RETURNED SUCCESSFULLY BY USER A N Y (uuuu)

(aaaaaaa is the accession number and copy letter, and uuuu is the user number.

The following are the headings which are printed out:-

THE FOLLOWING ITEMS HAVE BEEN RETURNED

ACCESSION CARD data as input

etc.

DATE ENTERED FOR LOANS IS 14.03.70

THE FOLLOWING LOANS HAVE BEEN RECORDED

USER CARD)
ACCESSION CARD)) data as input followed by "permanent loan" where appropriate

THE FOLLOWING USERS HAVE BEEN RECORDED AS WAITING FOR THE ITEMS GIVEN

user and accession cards

THE FOLLOWING CARDS REFER TO THE CANCELLATION OF WAITING LIST ENTRIES

USER uuuu IS WAITING FOR THE ABOVE ITEM

The user stated is listed as waiting for the item which has just been returned. The librarian should therefore issue the item to that user.

b) Errors.

Error messages are printed after the card which caused the error. The following messages are possible.

ACCESSION NO. (aaaaaa) & AUTHOR (NAME A N Y) DO NOT MATCH. WAITING LIST RECORD NOT ENTERED

For entering or cancelling a waiting list entry, the accession number and name of the author on the card do not match those on the disc file.

ACCESSION NUMBER AND AUTHOR DO NOT CHECK
(NO LOANS HAVE BEEN ENTERED FOR THIS
(NO WAITING LIST RECORDED TO THIS USER
USER NAME DOES NOT CHECK WITH USER NUMBER

The computer has checked the author of the item specified against the accession number, or the user's name against the user number; and found that they do not match. The former applies only to returns, while the latter applies to each of the first three operations of the program. The second part of the message indicates which.

AUTHOR DOES NOT CHECK WITH ACCESSION NUMBER. LOAN HAS NOT BEEN ENTERED

As above for loans.

BSooooa NOT FOUND RECORDED AS ON LOAN TO NAME A N Y (uuuu)

For the return of uncatalogued material the user given on the user card is not recorded as having the item on loan.

COPY LETTER NOT FOUND. ENTRY CANNOT BE MADE

For a return the copy being returned cannot be found on the accession file, or for a loan there is no record on the file of such a copy, so in both cases this entry cannot be processed.

COPY aaaaaac CANNOT BE LOANED AS IT IS ALREADY ON LOAN TO USER NO. uuuu

It is not possible to record the loan of copy c of item aaaaaa, as it is already recorded as being on loan to user uuuu. Either its return has not been recorded, or the wrong accession number or copy letter has been input.

ENTRY aaaaaa NOT FOUND ON ACCESSION FILE
ENTRY uuuu NOT FOUND ON USER FILE NO LOANS HAVE BEEN ENTERED FOR THIS USER

The computer has been unable to find the number given on the accession or user card in the appropriate disc file.

ERROR 1 LOAN NOT RECORDED TO USER uuuu
ERROR 2 USER LISTED AS HAVING ITEM ON LOAN (uuuu) NOT FOUND IN USER FILE

Error 1 and Error 2 are both serious. They mean that the computer has found an item recorded on the accession file as being on loan to a user, but that either that user is not found on the user file, or he does not have that item entered against him. This means that there has been corruption of the files, and these must be checked. If the message is preceded by

RETURN OF ITEM aaaaaac ATTEMPTED

The corruption has occurred during the current run, since the computer had not found this item on loan earlier when it first attempted to return it, and was in the process of checking whether the item had been loaned and returned during the same run. In this case the back-up tapes could be used to recreate the original files, but loans in the current run would have to be entered again.

ITEM aaaaaac CANNOT BE RETURNED AS IT IS NOT RECORDED AS BEING ON LOAN

No user is recorded as having this item on loan.

NEXT CARD IS NOT AN ACCESSION CARD

For a loan, waiting list or waiting list cancellation a user card has been processed, and the computer now expects an accession card but has not found one.

NO WAITING LIST ENTRY HAS BEEN MADE AS THE POSSIBLE AREAS ARE ALL ALLOCATED

There are only as many spaces allocated for waiting list entries as the number of copies, and these can be occupied by either waiting user numbers or "P"s for permanent loans. This message means that all the possible spaces are full so that the loan lists should be consulted to decide on further action, e.g. to recall a permanent loan.

ONLY USER & ACCESSION CARDS ARE PERMITTED FOR INPUT TO THE WAITING LIST; THIS CARD DOES NOT HAVE AN 'A', 'U', OR 'Z' IN COLUMN 73
contents of card

The computer does not recognise this card as input to the waiting list or waiting list cancellation operations. Uncatalogued material cannot be reserved.

RETURN OF BSooooa NOT RECORDED AS THE USER NAME AND NUMBER DO NOT MATCH FOR THE FOLLOWING CARD contents of card

RETURN OF BSooooa NOT RECORDED AS USER NUMBER NOT FOUND ON USER FILE FOR THE FOLLOWING CARD contents of card

For uncatalogued material being returned, the user specified on the next user card can either not be found on the user file, or his name and number do not check.

THE FOLLOWING ITEM IS NOT RECORDED AS BEING ON LOAN TO ANY USER BSooooa

An uncatalogued item was returned without a user card. The computer has searched the complete user file, but has not found that item recorded on loan to any user.

THE LOANS SHOULD BEGIN WITH A USER CARD. THIS ONE IS NOT
contents of card

The first data card for the loans operation should be a user card. The computer has not found one, and cannot record any loans until it does.

THERE ARE ALREADY 25 ITEMS ON LOAN TO THIS USER (uuuu) THIS LOAN HAS NOT BEEN RECORDED

The user records are only large enough to contain 25 loan records. This user already has this number of items, so another user file entry must be created (with a different user number) for this user.

THERE ARE x COPIES OF THIS ITEM AND NO COPY LETTER WAS INCLUDED ON THE ACCESSION CARD

Since no copy letter has been specified the computer does not know which copy of the item is being loaned or returned.

THIS CARD DOES HAVE AN 'A', 'U', 'N', 'Z' OR 'P' IN COLUMN 73
contents of the card

The contents of column 73 are invalid, so the type of card cannot be identified.

THIS IS NOT AN ACCESSION CARD

contents of card

For returns the computer expects to find only accession cards (or uncatalogued material cards, which precede their user cards) This card is not.

USER NAME DOES NOT CHECK .....

(See "ACCESSION NUMBER AND AUTHOR .....")

USER uuuu WAS WAITING FOR ITEM aaaaaa WHICH HAS JUST GONE OUT ON PERMANENT LOAN. HIS NUMBER HAS HAD TO BE DELETED.

A space in the waiting list is required to record the permanent loan and there is no space for the waiting list user recorded against the item, so the number has been deleted.

WAITING LIST CANNOT BE CANCELLED. ITEM (aaaaaa) IS NOT RECORDED AS BEING WANTED BY USER uuuu

The waiting list entry specified cannot be cancelled as it cannot be found by the computer; i.e. the user number is not recorded against the item.

WAITING LIST MUST BEGIN WITH A USER CARD. THIS IS NOT

contents of card

The waiting list and cancellation of waiting list operations must both begin with a user card. No entries can be included until this is done.

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CODING FORM

IBM

THE NEWCRDS & WRTUCRD PROGRAMS

GENERAL DESCRIPTION

These two programs produce a complete set of new accession cards, or a complete set of new user cards, or both. The NEWCRDS program punches accession cards for all copies of all the items in the accession file, and a magnetic tape of user entries in user number order. After this tape is sorted into name order, the WRTUCRD program punches the user cards. These cards are used for input to the LOANS program (see "Types of Input Card" in the description of that program (page 25)).

STORAGE AND INPUT REQUIRED

The NEWCRDS program goes straight through the accession and user files on disc, and these are on data set reference numbers 4 and 5 respectively. The new cards are produced by the card punch on data set reference number 2, and the tape of new user cards is on 6 for both programs. The card reader is on data set reference number 1. The 80 column records are taken from the tape and sorted by a utility sort into order by the first 20 characters. They are then written back into the same tape.

WRTUCRD required no input, but if only accession cards are wanted, this program and the sort can be omitted. The NEWCRDS program requires only an end of file mark (/*) to produce book and user cards. However, if only user cards are required, a blank card should be inserted before the end of file card, and this will suppress the creation of book cards.

OUTPUT FROM NEWCRDS

There are no error messages or listings from the NEWCRDS program, so the only output is the accession cards, and some permanent loan and delimiter cards. The output received from the program is 10 cards with a "P" in column 73, 10 cards with a "Z" in column 73, and one accession card for each copy of every item on the accession file in accession number order. The use of these is described in the description of the LOANS program, "Input for the LOANS program", and "Storage and Input Required". The user records are written to the tape in user number order.

Accession card formats:

Column	Contents
1 - 20	First author
21 - 71	First part of title
73	"A" (for accession card)
74 - 79	Accession number
80	Copy letter

OUTPUT FROM WRTUCRD

After the utility sort has sorted the user card data on the magentic tape into user name order, the WRTUCRD program punches them on cards. The output is thus a set of user cards in user name order. If the user cards were preferred in user number order the sort could be omitted. In this case the WRTUCRD program would punch the cards in the original order on the tape (user number order).

User card formats:

Column	Contents
1 - 25	User's name
30 - 59	User's department
73	"U" (for user card)
77 - 80	User number

THE STATISTICS PROGRAM

GENERAL DESCRIPTION

The STATS program is used to make changes to the statistics recorded against each accession or user number. It is possible to set individual values for specified items, to increase individual items by a given amount, or to set all of one of the four statistics throughout the whole of either the accession or the user file to a given value. Old values are printed out, or the printing can be suppressed when every entry in a file is being changed.

USE OF THE STATISTICS

Each entry on the accession file and each entry on the user file has four statistics associated with it. (See Details of the Files, "Composition of Accession Records", (c) Statistics; and "Composition of the User Records", (c) Statistics and Number of Items on Loan.) The ADDITIONS program automatically enters the year of acquisition as the first statistic on accession records. The next two are increased by one each time an item goes out on loan, so one of them can be used for the total number of loans of that item, and the other the number in the current year. The last statistic is unallocated.

For the users the first two statistics are updated each time an item is borrowed by the user, so these can be used to record the number of books borrowed in previous years and the number in the current year; The last two are unallocated. At the end of the year a list of all the statistics can be produced and then the value of some of them reset to zero. The STATS program will do this, or the LISTING program could provide a more complex printout while the STATS program reset the values. The unallocated statistics can be used as desired, for example, one of the user ones could be used to record the number of inter-library loans borrowed by that user; or if charges were made for library services one could be used to record the cumulative charge to each user.

INPUT AND STORAGE REQUIRED

The changes made by STATS are on the permanent disc files, so no tapes are required. The accession and user files should be on data set reference numbers 4 & 5 respectively, and their indexes on numbers 11 & 12 respectively. The card reader should be on 1 and the line printer on 3. There are two uses to which the program can be put, changes to the whole file and changes to individual entries. (If a printout is required without changing the statistics, the Printout programs should be used.)

a) Changes to the Whole File

Only one statistic can be reset at a time; to change two of the statistics throughout the file would require the program to be run twice. Only one card is required to change a statistic, but if a list of all the old values is NOT required then an additional card should precede it saying "WRITE OFF" in columns 1-9. This will suppress all the printing except error messages.

The control card for the program to reset a statistic throughout begins either "SET ASTAT" or "SET USTAT" depending on which file is to be changed. This is followed by the number of the statistic to be changed (a number between 1 and 4). (The exact use of the statistics is the decision of the library, but the suggested use is given in "Use of the Statistics" above.) After the number of the statistic the value is given to which the statistic is to be set, e.g. "TO 0000" for set the value to zero.

SET ASTAT 3 to 0315 would set the third statistic of each accession record throughout the file to 315. No other data are required after this control card; the computer will stop executing after it has processed the complete file.

The following is the format:-

Column	Contents
1 - 3	"SET"
5 - 9	"USTAT" or "ASTAT" for user or accession file
11	1 - 4 (number of statistic to be changed)
13 - 14	"TO"
16 - 19	Number to which statistic is to be set (4 figure number).

b) Changes to Individual Records

The program will handle any number of changes to the statistics of individual records, and will either set them to given values or increase the current values by specified amounts. The former would be useful to correct an error, or to reset the statistics of an individual user, while the latter could be used to increase the charge to be made to a user by the cost for providing a service. Any number of cards can be entered, one card per change, but the data must end with a card with a "Z" in column 1.

The control cards for the program start with "UF" or "AF" for the user or accession file. Then the accession or user number of the record to be changed is given, followed by the number of the statistic, as described for the changes to the whole file in the last section. The next word determines whether the statistic is to be set to the value stated ("TO"), or increased by that value ("UP"), and this is followed by the value.

The following is the format:-

Column	Contents
1 - 2	"UF" or "AF" for the user or accession file
4 - 7) 4 - 9))	User or accession number of entry to be changed
11	1 - 4 (number of statistic to be changed)
13 - 14	"TO" to reset a value or "UP" to increase a value
16 - 19	Value to which statistic is to be set, or by which it is to be increased.

```
UF 0025    3  TO  5631
AF N03274  1  UP  0002
Z
```

The above data would set the third statistic of user record 25 to 5631, increase the first statistic of accession record N03274 by 2 and then stop. User and accession changes may be mixed freely.

OUTPUT

a) Correct Output for Changes to the Whole File

If the statistic is being changed throughout the file, the printout would be in the form of one of the two below, depending on the file to be changed. If a card was inserted before the control card saying "WRITE OFF", there will be no printout after the heading.

Ex.1. Possible output from setting old values of the second accession statistic to 2.

ACCESSION FILE STATISTIC 2 HAS BEEN SET TO ooo2

THE FOLLOWING VALUES WERE CHANGED

ACCESSION NO.	STATISTIC
A00001	000006
A00009	000038
A00010	000483
C00005	000000
etc	etc

Ex.2. Possible output from setting old values of the fourth user statistic to 1.

USER FILE STATISTIC 4 HAS BEEN SET TO ooo1

THE FOLLOWING VALUES WERE CHANGED

USER NO.	STATISTIC
A044	000000
C234	058439
0235	000042
0390	000001
etc	etc

b) Correct Output for Individual Changes

The following output shows the different types of statement printed by the computer. There will be one statement for each statistic changed. For increases the old values can be worked out from the new, but for resetting them the old value is printed out. In the examples aaaaaa is the accession number, uuuu the user number, 4 is the old value of the third statistic and 10 the new value or increase.

STATISTIC (3) OF ACCESSION RECORD aaaaaa HAS BEEN INCREASED BY 00010

STATISTIC (3) OF ACCESSION RECORD aaaaaa HAS BEEN CHANGED TO 0010 OLD VALUE WAS 00004

STATISTIC (3) OF USER RECORD uuuu HAS BEEN INCREASED BY 00010

STATISTIC (3) OF USER RECORD uuuu HAS BEEN CHANGED TO 00010 OLD VALUE WAS 00004.

c) Errors

The following messages are possible from the system, For changes to the whole file, execution has been terminated, but for individual changes they appear instead of the entry which would have been printed.

ITEM aaaaaa NOT FOUND ON ACCESSION FILE

USER uuuu NOT FOUND ON USER FILE

These two messages only apply to individual changes, and indicate that the computer was unable to find the user or accession number in the file specified on the card. This could be due to an incorrect number, or to specifying the wrong file.

STATISTIC NUMBER (x) IS TOO LARGE

The number of the statistic specified (x) is greater than 4, the number of statistics held in each record.

LETTER SPECIFYING FILE (X) IS NOT AN 'A' OR 'U'

The letter which indicates which file is to be considered (X) has not been recognised by the computer. For the whole file changes this means column 5 of the control card, for individual changes it refers the first column.

FORMAT ERROR. MUST SPECIFY 'UP' OR 'TO' VALUE

This message applies only to the individual changes, and indicates that neither a "U" nor a "T" has been found in column 13 of the card.

MAINTENANCE OF THE DISC FILES

THE ASORT, MERGE & FILE PROGRAMS

FILE MAINTENANCE

The system involves four files, the accession file, the user file and an index to each of them. The indexes are produced automatically by the FILE program when the permanent files are created on the disc, so no copies of these need be kept. No computer system is perfect, and tapes and discs can be damaged. This will inevitably cause inconvenience, but to keep this to a minimum, back-up tapes of the accession and user files should always be kept. These can be produced at intervals using the FILE program , but are normally created as a byproduct of adding new records to the files.

The entries are produced on a magnetic tape by the ADDTIONS program, and entries on the disc files are marked for deletion. These changes are actually effected by merging the disc files with the new entries and omitting the deleted records. The output from the ADDITIONS program is in any order, so it has to be sorted into accession and user number order, by the ASORT program. The sorted tapes are then merged with the disc files by the MERGE program to produce new tapes of the complete updated files, and at the same time, the marked entries are deleted. The new tapes are used by the FILE program to recreate the files and indexes and then kept as back-up tapes. It is normal to have two generations of back-up tapes. A flow diagram is given for this in The New Library System, (1) "Adding New Records to the Files" on page 11.

ASORT PROGRAM

To ensure that the entries are in the correct order before merging, they should be sorted. I.B.M. Fortran writes records on magnetic tapes in 260 byte lengths, so it is not possible to use the I.B.M. standard sort. The ASORT program sorts a tape of accession or user records, or one tape of each, into accession or user number order.

The tapes to be sorted should be on data set reference number 7 for the accession records, and 5 for the user records. The clear disc utility is run before the sort to clear a sorting area on the system disc (SYSRES). The sorted data are written back on the tape on which they were input. The card reader should be on data set reference number 1, and the line printer on 3.

Only one control card is required for ASORT, and should read SORT AFILE, SORT UFILE, SORT AFILE & UFILE, or SORT UFILE & AFILE, beginning in column 1. If the sorting is carried out without any errors, the only message which will be printed is:

SORTING SUCCESSFULLY COMPLETED

There are two error messages.

FORMAT ERROR IN SORT CARD instruction from the card.

One of the letters on the control card is wrong, or the computer cannot identify the type of records to be sorted. Processing is terminated.

ARRAY (KEY) & DISC AREA NEED ENLARGEMENT

The number of records to be sorted is too large for the area allocated on the SYSRES disc and in the KEY array, in the program (currently 5000). Either sort fewer records, or consult a programmer for modifications to the program to allow more records to be sorted.

MERGE PROGRAM

The MERGE program takes the output tapes from ASORT (the accession records should be on data set reference number 6 and the user data on reference number 9), and merges them alphabetically with the accession (reference number 4) and user (reference number 5) disc files. The output is written to tapes on data set reference numbers 10 and 13 for the accession and user data respectively.

The output tapes are rewound after use. The card reader should be on reference number 1 and the line printer on 3.

Only one input card is required, and this should say "MERGE A", "MERGE U", or "MERGE A & U". A message is produced saying that processing of each file has been successfully completed.

USER FILE AND TAPE MERGED

ACCESSION FILE AND TAPE MERGED

Other possible message are as follows:-

FORMAT ERROR IN CARD - CHARACTER (x) DOES NOT REPRESENT A FILE

The computer could not identify from the control card which file was to be processed.

TWO ITEMS HAVE THE SAME ACCESSION NUMBER. THE FOLLOWING ENTRY FROM THE NEW ADDITIONS TAPE HAS NOT BEEN ENTERED
accession entry in full

or

TWO USERS HAVE THE SAME USER NUMBER. THE FOLLOWING USER FROM THE TAPE OF NEW ADDITIONS HAS NOT BEEN ENTERED
user entry in full

An entry on the tape of new additions has the same accession or user number as an item on the disc file, so the new entry has not been added to the file.

The ADDITIONS program marks entries on the files to be deleted by changing the second letter of the accession or user number to a "Z". Such letters would cause an error in the merged order, so they must be deleted from the files at this stage. When this is done a message is printed out giving the details.

THE FOLLOWING ENTRY HAS BEEN DELETED FROM THE ACCESSION FILE
accession entry in full

or

THE FOLLOWING ENTRY HAS BEEN DELETED FROM THE USER FILE
user entry in full

The entry is given in full after the message, as it is possible that it is still wanted, and in that case the data could be reintroduced with the next set of new additions.

N.B. If either file was not in alphabetical order; after the merge it will remain as it was, and other entries may have been added in the wrong place.

FILE PROGRAM

The FILE program sets up the files on disc with their indexes, using the TODSKA & TODSKU subroutines described on the next page. It will also dump the files to tape using the TOTPEA & TOTPEU subroutines. The disc files must be on the usual data set reference numbers 4, 5, 11 & 12, with the tape for the accession file on 10, and that for the user file on 13. The line printer is on 3 and the control cards are read on 1.

Any number of control cards are acceptable to FILE, but more than two would be meaningless. The possible cards are "FILE AFILE", "FILE UFILE", "DUMP AFILE", & "DUMP UFILE". It is therefore possible to file or dump one or both files. It would also be acceptable to file one and dump the other. To operate on the same file more than once would be accepted by the program, but would be meaningless in practice, since the tape used for filing and dumping each file is the same. Thus, once a file has been dumped, the file recreated would be identical to that already there and visa versa. The only exception would be if the index and not the file itself had been damaged. The control cards should be ended with an end file mark (a card with /*).

If only one file is to be filed or dumped, the other one should normally also be dumped, so that the back-up tapes are of the same age. If, for example, a new tape of the accession file is produced, but not of the user file, there may be loans entered on the accession file back-up tape, but not the latest user file tape. If it becomes necessary to recreate the disc files from these tapes there will therefore be inconsistencies. The disc files should always be of the same age, and the sets of back-up tapes should be of consistent ages too.

There are three possible messages from the FILE program, and those from TODSKA & TODSKU are described on the next page.

AFILE FILED	or	UFILE FILED
AFILE DUMPED	or	UFILE DUMPED

The accession or user files have been filed or dumped to tape as specified.

FORMAT ERROR IN CONTROL CARD control instruction

There is an error in the control card.

TODSKA & TODSKU

TODSKA & TODSKU (TO DISK ACCESSION & TO DISK USER) take back-up tapes of the accession and user files respectively and set up new copies of the disc files with their indexes from them. These subroutines are called by the FILE program. The two input tapes should be on data set reference number 10 for TODSKA and on 13 for TODSKU, and may have been produced by TOTPEA and TOTPEU or by the MERGE program. No input data is required to commence processing, but the line-printer should be on data set reference number 3. The only output messages are as follows:-

DISK AREA FOR USER FILE NEEDS ENLARGEMENT

There is a corresponding entry in TODSKA for the accession file. This means that the area of the disc allocated for the file is now too small and requires enlargement. To do this the area allocated in all the job control cards needs enlarging, a corresponding change is needed in the define file statements of all the programs, and the statement marked with a comment in the subroutine also needs changing. A list of all the define file statements is given in the next section.

THE FOLLOWING ENTRY HAS BEEN DELETED FROM THE USER FILE
deleted entry

There is a corresponding entry in TODSKA for the accession file. The entry shown was marked by the ADDITIONS program to be deleted. It is printed out in full, so that if there has been a mistake the data can be reintroduced to the system the next time the ADDITIONS program is run. The second character of the accession number will have been changed to a "Z", as this is the indicator that the entry is to be deleted. Deletion as part of the FILE program is not common, as this will normally be done by the MERGE program, but it is necessary to prevent the possibility of an index being set up with erroneous user or accession numbers.

PRODUCING BACK-UP TAPES (TOTPEA & TOTPEU)

These two subroutines are called by the FILE program and merely copy the accession and user files from the disc to tapes (TO TaPE Accession file and TO TaPE User file). No data is required, and there are no error messages or printed output. TOTPEA takes the accession file on data set reference number 4, and copies the file to a tape on reference number 10. TOTPEU does the same for the user file on number 5 to a tape on number 13.

DEFINE FILE STATEMENTS

The following is a list of programs which contain define file statements which must be changed when the size of area for each file on disc is changed. It also shows the subroutines called which have define file statements. X indicates that the file must be defined in the program.

	Program or subroutine	Accession file	User file	Accession file index	User file index	Subroutines called
MAIN PROGRAMS	ADDTNS	X	X			RECORD URECRD
	ASORT					KEYS JOSORT TAPE
	FILE					TODSKA TODSKU TOTPEA TOTPEU
	LISTING					NONCAL CALLING
	LOANS	X	X			RECORD URECRD
	MERGE	X	X			
	NEWCRDS	X	X			
	PRESORT	X	X	X	X	
	STATS	X	X			RECORD URECRD
	WRTUCRD					

Continued/...

	Program or subroutine	Accession file	User file	Accession file index	User file index	Subroutines called
SUBROUTINES	CALLA	X				RECORD
	CALLING	X	X			CALLA CALLU RECORD URECRD
	CALLU		X			URECRD
	JOSORT					
	KEYS	scratch	area			
	NONCAL	X	X			RECORD URECRD
	RECORD			X		
	TAPE	scratch	area			
	TODSKA	X		X		
	TODSKU		X		X	
	TOTPEA	X				
	TOTPEU		X			
	URECRD				X	

THE PRINTOUT PROGRAMS

RELATIONSHIP BETWEEN THE PROGRAMS

The printout programs produce all forms of printed output from the files. There are four different types of list which may be produced: the whole of one file in its original order, individually selected items from one file, a subset of a file, and records sorted into a new order. An example of the first type would be an accession list for the books, an example of the second would be recall notices to specified users, the third an accession list of internal reports, and the fourth an author index. All these can be done by the printout programs.

The format of the output is very flexible, and is controlled by a subroutine, ARRAA, which sets the data out as an array. A subroutine called PRNTAR prints the array and adds blank lines and new pages, etc. These two subroutines in turn come under the control of the LISTING program, which arranges which records are to be printed and finds any subsidiary records which may be required. For example, a loan list might require the entry against each user of the titles of any books he has on loan, so each accession record given in the user record would have to be called in turn. The details of this are described in the later sections.

The LISTING program can handle all the four types of selection which are possible, but some of them may need to be arranged first. It will find individual accession or user numbers (not both) on the files and list them. It will go through one of the two files listing every entry in turn. However, LISTING will not itself make selections from the files, and it will not sort records. The input for this must be presented to it on tape in the order required with no unwanted entries. Such a tape is created by the PRESORT program, and can be sorted by an installation sort utility (LSORT) if required, or if it is already in the correct order it can be input straight to LISTING. All indexes except a KWIC or KWOC index can be produced in this way. Details of PRESORT are given later, while the details of the inter-relation of the printout programs are shown in the diagram The New Library System, (5), "Written Output from the Files". (Page 13).

LISTING PROGRAM

ARRANGEMENT OF LISTING PROGRAM

The LISTING program is composed of subroutines, each of which performs a different operation. They are called by a routine in the level above, and when the operation has been completed, control is handed back to that routine. The subroutines have the following functions.

MAIN program - selects NONCAL or CALLNG , and writes out any further data at the end. It reads data for ARRA via READAR.

NONCAL - finds each record in turn when there is no other data required during printing, and hands it over to NOCALL.

CALLNG - does the same for records for which reference will be made to the other file to obtain additional data for printing.

NOCALL - calls ARRAA and arranges for the record to be printed without reference to the disc files.

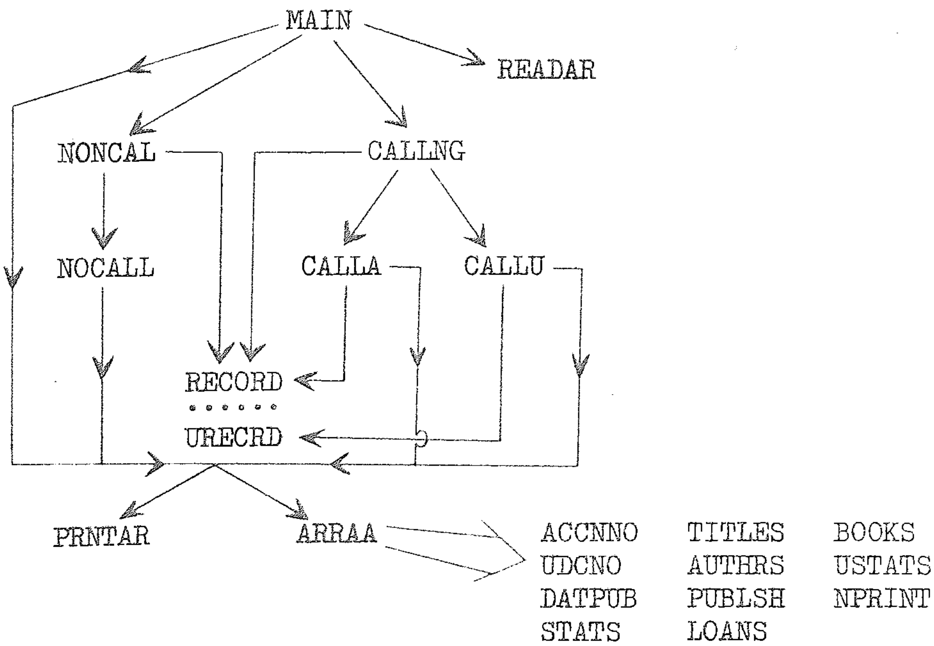
CALLA - calls additional records from the accession file and arranges for the printing of all the records.

CALLU - does the same for the user file.

RECORD & URECRD search the accession and user indexes for given entries.

ARRAA & associated subroutines set up each record in an array to be printed.

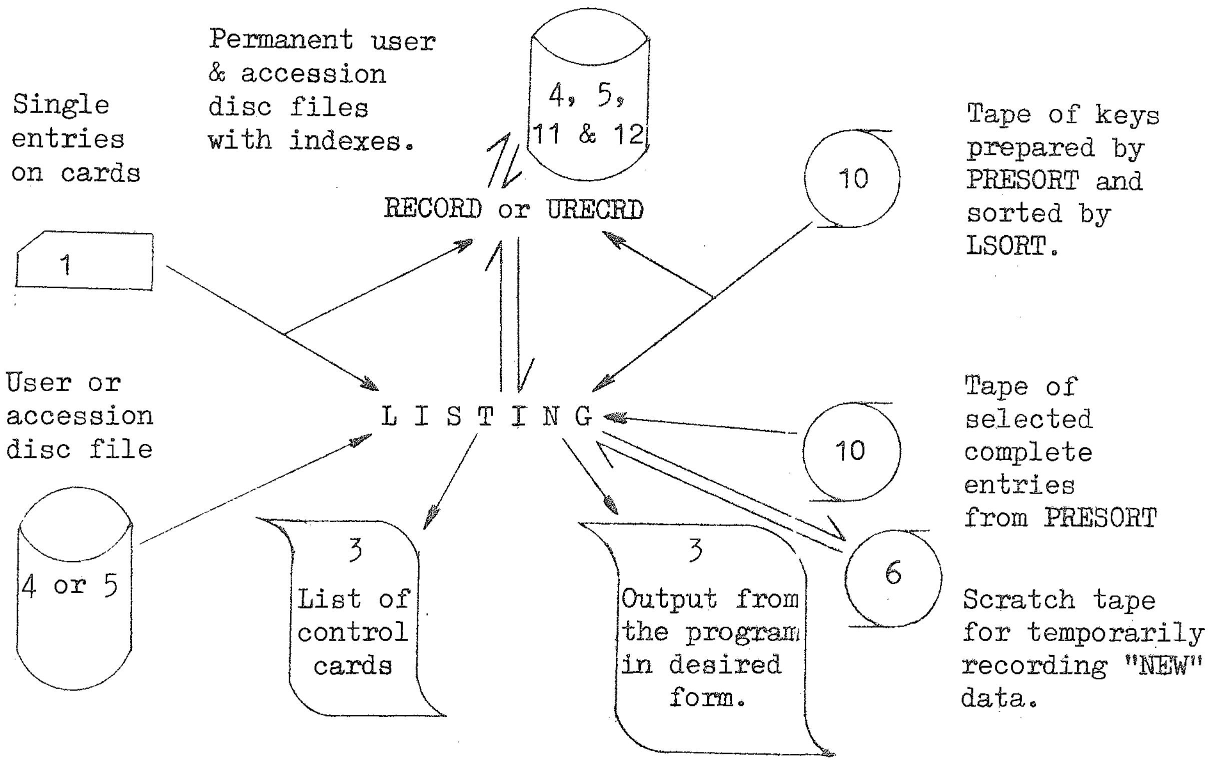
PRNTAR - prints the array with appropriate spacing.



INPUT & STORAGE REQUIRED BY LISTING

Wether or not the disc files are directly required for input, they may be needed, and the accession file and its index should be on data set reference numbers 4 & 11 respectively and the user file and index on 5 & 12. These files will be necessary if user or accession records are referred to in the records being listed, if individual records have to be called from them, or if the data has been sorted. If the input is on magnetic tape, this tape should be on data set reference number 10. The lineprinter should be on 3, and the card reader on 1. There should be a scratch tape on reference number 6 if "NEW" is specified.

There are four types of input to the LISTING program, and these are shown in the diagram below. The figures give the data set reference numbers.



The following input is required on cards. (Details given later)

Control card for LISTING

Control cards for ARRAA

Single entries - if required (cards with the accession numbers (or user numbers) in the first columns), terminated by a card with a "Z" in column 1.

CONTROL CARDS FOR ARRAA

a) Uses of ARRAA Subroutine

The ARRAA subroutine sets up the data to be printed in the specified format. It does this by arranging the data in an area (an "array") consisting of up to 20 lines each 130 characters long. One or more arrays are set up for each record to be listed, and printing is controlled by the PRNTAR subroutine.

The ARRAA subroutine can operate on one accession record, one user record, and up to 9 lines of additional written data (literal data). The selection of the records is done by other parts of the LISTING program, and the literal data is supplied with the control cards for ARRAA (the printout control). Any part of the accession or user records can be put anywhere in the array, and the literal data can be used anywhere as headings. When an item is too long to fit on the line, it can be automatically continued on the next, thereby reducing any difficulty with the variable length parts of the accession records; the title, authors and publishers.

In some cases it may be necessary to set up more than one array for a record. Any number of blank lines may be left between arrays to make lists clear and attractive. Where there are, for example, several books on loan to one user, and it is necessary to list them all, the LISTING program will present each accession record in turn to ARRAA & PRNTAR. It will then be necessary for one set of printout control to be used for the main entry (the user), and another for printing each of the accession records. Up to 4 sets of control are permitted, and are all read in at the start of the program by the READAR subroutine. Instructions on the LISTING control card determine when each one is to be used.

b) Printout Control Cards

Sets of printout control are read by READAR immediately after the Listing control card (see later section "Control Cards for LISTING", page 70). The first card gives the number of sets of printout control to be read; a two figure number, 01 - 04. This is followed by each set, consisting of one card specifying the number of lines to be left after the array before printing the next, then the printout control cards (a maximum of 20) terminated by a card with a "0" (zero) in column 1 and then up to 9 literal data cards again terminated by a card with a "0" (zero) in column 1.

The first card giving the number of lines to be left blank is of the same format as the one giving the number of sets of printout control; a two figure number is required in the first two columns. When the PRNTAR subroutine has printed the array, it will leave blank the number of lines specified on this card. The one exception is when the computer repeats one set several times for records called from a different file from the one being processed, but this is discussed in the later section "Control Cards for LISTING" on page 70.

Up to 20 printout control cards are permissible, and each consists of five elements. The first is a 4 character code which specifies which part of which record is to be taken. The next is a 2 figure number specifying how many lines down the computer must move before entering the data. For example, "00" would mean the same line as before, "02" would mean miss the next line and write in the one after it. The third element is a 3 figure number which can have two meanings; if the second item is "00" (stay on the same line), the computer is to move forward leaving that number of spaces, while if a new line has been specified (item two greater than or equal to "01"), it should leave that number of blank spaces in the new line before printing anything. The last two elements are optional. If they are omitted, the computer will write the whole of the specified part of the record, continuing it from the beginning of the next line if it is too long for the current one.

The fourth element specifies a limit for the number of characters to be printed, e.g. only to print the first 030 characters of the title. For literal data this element must be included to give the number of literal data characters to be printed. The fifth element specifies the column of the next line in which to begin the continuation of an entry which is too long for the current one. If a zero is specified, the line will be continued directly underneath the start of the entry in the array, thus preserving a column in the printout. A negative number will cause the entry to be terminated at the end of the line whether or not it is complete. For fixed length entries such as the accession number which can only appear complete, this may cause the entry not to be printed at all, though a message to this effect will precede the printing of the array.

It can thus be seen that the method of inserting entries into the array is to move from the top left hand corner to the bottom right, entering the parts of the record where necessary by specifying the number of lines down each time and the number of spaces from the left in each line. The format of the printout control cards is as follows:-

aaaa 22,333,444,555

aaaa is one of the codes set out below, which specify a part of a record.

22 is a 2 figure number giving the number of lines down before inserting aaaa (00 for the current line, 01 for a new line, etc.)

333 is a 3 figure number specifying the number of blank spaces to be left after the last entry on the current line, or from the beginning of a new line.

444 is a 3 figure number specifying a limit to the number of characters to be printed, or the number of literal data characters to be included. If it is zero, 555 will be set to 1, so a large number should be used if no limit is required and 555 is specified.

555 is the column of the next line which should be used if the entry is longer than the space in the current line. If it is "000", printing will continue under the start of the entry on the next line; and if it is negative, the entry will be terminated at the end of the current line.

The following are the permissible codes to designate which part of the record is to be printed. They are given in the order they occur in the records; all user parts begin with a "Z".

Code	Part of Record	
ACCN	Accession number (6 characters excluding copy letters (see LETT below)).	
UDCN	Complete UDC number (32 characters including the ".*")	
UDC1	First UDC number (15 characters before the ".*")	
UDC2	Second UDC number (".*" + 15 characters of second number)	
DATE	Date of publication (2 characters)	
STAR	Classification star (1 character)	
NØS1 - 4	The value of the statistic (1 - 4) specified. (variable length)	
CØPY	Number of copies (1 or 2 characters)	
AUTH	All the authors (20 characters for each author + 1 space between each.	
TITL	Title (variable length)	
PUBR	Publisher (variable length)	
LETT	Copy letter	Set out in columns for each copy see below "Effect of Printout Instructions"
BØRR	Borrower's user number	
WTNG	Waiting list user's number	
LØNP	"P" for permanent loan (or blank)	
LDTE	Date of loan	
ZUNØ	User number (4 characters)	
ZUSR	User's name (25 characters)	
ZDPT	User's department (30 characters)	
ZUPH	User's telephone number (11 characters)	
ZNØ1 - 4	Value of the user statistic specified (1 - 4). (variable length)	
ZLNS	Number of items on loan to the user (1 or 2 characters)	
ZACN	Accession number of item on loan	Set out in columns for each loan, see below.
ZLNP	"P" for permanent loan	
SKEY	Sort key from sorted input tape (e.g. Author or UDC number) - will take up to 20 alphabetic characters (not statistics).	
XXXX	Literal data (number of characters specified in 444 above)	

"Ø" indicates letter O, "O" = zero.

The effect of these codes is discussed later with examples in "Effect of Printout Instructions". Where possible the length of the entry has been given, but some are not of a fixed length, and others, like the loan data for the users, may have several entries and must be set out in columns.

c) Literal Data Cards

The end of the printout control cards is indicated by a card with "0" (zero) in column 1, and subsequent cards until another card is found with a zero in column 1, are taken as literal data entries for the printout. As given in the table of codes on the previous page, "XXXX" means that literal data is to be written into the array at that point. As for normal entries the computer moves the required number of lines and spaces as specified on the card, and then fills the number of characters of the array specified in 444 (the fourth element on the card) with that many characters of data from the next literal data card. Up to 9 literal data entries may be made, so up to nine literal data cards are permissible. The first characters of the first card are used for the first XXXX entry, the first characters of the second for the second XXXX, etc.

Literal data cards can be used to insert headings or notes into the printout. However, the message will appear each time the set of printout control is used, i.e. for each record. Anything may appear on the cards, except that if there is a "0" (zero) in the first column the computer will assume that it has reached the end of the literal data. Only the number of characters specified on the appropriate printout control card will be printed from a literal data card. Literal data is treated as one block and cannot be distributed over more than one line.

d) Sort Key Selection

When the records to be printed have been sorted by a key (e.g. Authors), (see "Control Cards for Presort", (c) Sort requests) it may be necessary to print out the key. This is done by using "SKEY", with 444 giving the number of characters to be printed (as for literal data). Again like the literal data the sort key will be treated as a block for printing, and must be composed only of alphabetic figures or letters - e.g. the author or UDC number. (For author 444 will be "020", for the UDC number it will be "015"). This cannot be used for format control for "NEW" (p. 61-2), as the last entry on the tape will be used perpetually.

EFFECT OF PRINTOUT INSTRUCTIONS

a) General Application of Instructions

The simplest way of demonstrating the instructions is to describe the effect of various examples. Consider the following instructions as a sequence with explanation between each one. The final result is given at the end.

ACCN 00,010

The "00" means remain on the same line, and since this is the first instruction, the entry is to be printed in the first line, indented by 10 spaces. The current accession number will therefore be put into spaces 11 - 16 of the top line. Since the accession number is of a fixed size and in a fixed place, there is no need to specify a limit or overflow continuation position.

DATE 00,002

The date of publication is to be printed on the same line after 2 spaces. It consists of 2 characters, so it will occupy spaces 19 - 20 of the top line.

TITL 01,012,040

The "01" requires the computer to move to the next line (line 2), and indent the title 2 spaces further than the accession number. The fourth element ("040") gives a limit to the number of characters to be printed. If the title is less than 40 characters long (including spaces), it will be printed complete, but if it is longer than this, only the first 40 characters will be printed, even if this limit comes in the middle of a word. Again, there is no question of overflow to the next line, so this parameter is omitted.

PUBR 03,090,500,013

Two blank lines will be left, and the computer will start printing the publisher in the 91st space of the 5th line. As the fourth item is "500", the whole of the publisher is to be printed (there is no limit since the complete record is only 450 characters). If the publisher is less than 40 characters it will be printed on the 5th line, and the computer will remain on that line (130 characters to a line). If, however, it is longer than this, the first 40 characters will be printed on the current line, and the remainder will be continued in the next line, beginning in the 13th column; i.e. under the start of the title.

AUTH 01,107,040,108

The authors are to be printed on the next line following the end of the publisher, and start in the 108th space (after 107 blank spaces). As a limit of 40 characters has been specified, the computer will not print more than the first two authors. The first or only author will be put into spaces 108 - 127 of the current line. If there are further authors to be printed a space will then be left (space 128), and the computer will prepare to write the next author. As there are only 2 spaces left on the line, and the author will require 20, the computer will then move to the next line and will start printing in the 108th space, underneath the first author. As the limit has been set as two authors, the computer will then move on to the next instruction, even if the record contains further authors.

XXXX 01,010,022

0

THIS IS THE LAST ENTRY

0

The XXXX indicates literal data, so the computer moves on to the next line, starting in the 11th space (under the accession number), and allocates the next 22 spaces for the first entry of the literal data. It then finds the zero which means that all the printout instructions have been processed, and control is then handed to the PRNTAR subroutine via the calling routine. PRNTAR then looks for the literal data, and finds the first entry to be "THIS IS THE LAST ENTRY", so it writes 22 characters into the array in the appropriate place. The zero indicates that all the literal data has been processed, so it prints the array out on the line printer.

There may be several literal data entries, but the computer takes the first "XXXX" to be applied to the first literal data card, the second to the second, etc.

The instructions are therefore as follows:

```
ACCN  00,010
DATE  00,002
TITL  01,012,040
PUBR  03,090,500,013
AUTH  01,107,040,108
XXXX  01,010,022
0
THIS IS THE LAST ENTRY
0
```

An application of this to the following record would give the result shown below. The central part of the printout is omitted.

Item 000675, "The CCA Handbook on the use of structural concrete in tall buildings", by A. Abbot, B. Parkinson & J. Smith, published by "The Cement and Concrete Association, London, S.W.1., 1972."

```
        000675  72
         THE CCA HANDBOOK ON THE USE OF STRUCTURA
                                                   THE CEMENT AND CONCRETE ASSOCIATION,
         DON, S.W.1,1972.
                                                             ABBOT A
                                                             PARKINSON B

        THIS IS THE LAST ENTRY
```

b) Multiple Copy Entries

When the computer is asked to write out the borrower of a book, there may be more than one copy out on loan. It is therefore necessary for the computer to arrange the borrowers in columns. Thus when there is more than one copy, the copy letter, borrower, waiting list user or loan date for each copy is written underneath theprevious one. In the following example of book 000345, there are four copies of which A, B & D are on loan to FRED, JOE & BILL.

```
ACCN 01,030
BORR 00,005
ACCN 00,003

                    000345     FRED
                               JOE
                               0000
                               BILL    000345
```

This works well for cases where only one of the multiple copy entries is required; however, there would be problems if two followed each other, for example if the copy letters were also required.

```
ACCN 01,030
LETT 00,004
BORR 00,002
ACCN 00,003
                    000345     A
                               B
                               C
                               D  FRED
                                  JOE
    (This result )                0000
    (is prevented)                BILL    000345
```

In this case, the second part is displaced from the first. To overcome this difficulty, every multiple copy entry following the first is set back to the same line as the first until an entry which is not multiple copy is found. This is shown in the following example.

```
ACCN 01,020
LETT 00,003
BORR 00,002
LDTE 00,003
LONP 00,002
WTNG 00,005
ACCN 00,003
                    000345   A  FRED   12.04.73  P   P000
                             B  JOE    03.12.72      0123
                             C  0000   00000000      0000
                             D  BILL   23.01.73      0000   000345
```

This is an unlikely situation, in that copy C is not out on loan, but user 0123 is waiting for a copy. Copy A is on permanent loan to FRED. The resetting of the beginning of the columns can be prevented, either by an entry which is not multiple copy, or by specifying a new line for a multiple copy entry, for example:-

```
LETT 01,005
BORR 00,002
LETT 02,005
WTNG 00,002
     A  FRED
     B  JOE
     C  0000
     D  BILL

     A  P000
     B  0123
     C  0000
     D  0000
```

c) Multiple Loan Entries

The same situation arises for users who have more than one item out on loan. In this case since there can be more entries than lines available, they are grouped in columns of not more than five. This can be seen in the example.

```
ZUSR  00,005
ZLNS  01,008
XXXX  00,001,013
ZACN  00,005
ZLNP  00,002
XXXX  00,004,003
0
ITEMS ON LOAN
END
0
```

```
SMITH P H
   1 ITEMS ON LOAN      N00453D        END


JONES A B
   2 ITEMS ON LOAN      A00528
                        000064B  P     END


DAVIES T W
   8 ITEMS ON LOAN      001234B        N00342  P
                        003564         C00670B
                        005142   P     000002
                        098648C  P
                        A23590                        END


LINTON B J
   11 ITEMS ON LOAN     A00345         000406B        A00001D  P
                        B09690D        P00045
                        000004         000573
                        000567   P     980344E P
                        000582C        000570                       END
```

Up to 25 loans may be entered in this way, though care should be taken to see that the number does not cause the computer to exceed the 130 characters in the line. Three spaces are inserted between columns.

ERRORS FROM ARRAA

The normal output from the computer is the records printed in the format specified, with appropriate spacing between them. However, there are certain errors which may arise during the printing of an individual record, and the following messages may appear before the entry concerned.

LINE ALLOCATION EXCEEDED - ARRAY SO FAR

The amount of data to be printed exceeds the maximum of 20 lines which can be processed by the computer. The 20 lines which have been set up are then printed.

LINE LENGTH EXCEEDED ON MULTIPLE COPY ENTRY nn - ARRAY SO FAR

For borrower, waiting list user, date of loan or loan "P", there is insufficient room on the line for all the columns required. This only applies when "no overflow" has been specified (element 555 of the printout control statement is negative.).

TOO MUCH LITERAL DATA

More than ten literal data requests (XXXX entries) have been found. This message will be printed each time the 11th one is encountered.

NO OVERFLOW CONDITION - ITEM nn (ACCESSION NO.) NOT PRINTED IN THE FOLLOWING ENTRY

(DATE)
(NO. COPIES/STATISTIC)
(UDC NO.)
(USER NO.)
(USER)
(PHONE NO.)

No overflow has been specified (element 555 of the printout control is negative), and there was no room on the line for an item with a fixed length, so this item has not been printed. The item referred to is given in brackets.

NUMBER TOO LARGE

A number from a record exceeds 1,000,000 so it cannot be printed. Anything may be printed, probably the value for the last record. The number could have been a statistic from either the accession or user file, the number of loans to a user, or the number of copies of a report or book. This will not normally occur.

WRONG FORMAT IN ITEM nn

The nn.th printout control has a format error, or the limit on SKEY is greater than 20. Processing will be terminated.

The following messages will be printed out by READAR if there is an error in the printout control cards.

NUMBER OF PRINTOUTS (nn) TOO LARGE

The first card, which specifies the number of sets of printout control cards is greater than 4. As the other programs can only process up to 4 sets, the processing of the information has been terminated. Possible errors are that the number has been put in as a one figure number, when it should be a two figure one (e.g. 2 instead of 02), or that the card has been omitted and the computer has read the next card which gives the number of blank lines associated with the first set.

TOO MANY PRINTOUT CONTROL CARDS - ONLY 20 ALLOWED

READAR has found more than 20 control cards in the set before a zero has been found. It cannot process more than 20, so the program has been terminated.

TOO MANY LITERAL DATA ENTRIES - ONLY 9 INCLUDED

READAR has found more than 9 literal data entries before a zero. It can only process the first 9. It is probable that further errors will have occurred.

CONTROL CARDS FOR LISTING

a) Order of Control Cards

The first card which should be read by the LISTING program should be the Listing control card. This should then be followed by the printout control for ARRAA as described in the previous sections. The listing control card indicates how the various printout control sets are to be used, and is printed out by the program followed by the printout controls. The order of cards is as follows:

Listing control card (see next subsection for format).

On, where n is the number of printout control sets to be read (1 - 4).
(zero).

nn - the number of lines to be left blank Set of printout control cards for ARRAA (1 - 20 cards) 0 (zero) Literal data cards for set (0 - 9 cards) 0 (zero)	1 set of these printout cards for each of n printouts.

Cards with accession or user numbers (ending "Z")
for "SINGLE"

b) Format for LISTING Control Card

The listing control card specifies the type of input to be expected by the program, and allocates the printout control sets to the different records to be printed. The first six characters specify the medium on which the records to be printed will be input.

SORTED

means that certain records have been selected by the PRESORT program and written out to magnetic tape. This tape will then have been sorted by the Sort utility. The tape consists merely of the sort key and the location of the record on the file, so each record will have to be called from the disc in turn. To select the sort key, SKEY can be used for printout control (see page 61).

NO SRT

means that the whole of one of the disc files is to be printed in the order in the file (user or accession number order). The computer will then go straight through the file calling each record from the disc in turn.

RFORMD

means that a tape of records has been produced by PRESORT, which does not require sorting. The records on the tape are complete, so there is no need for the program to refer to the disc file for them. Each record will be taken in turn in the order they appear on the tape (user or accession number order).

SINGLE

means that the records required will be specified individually on cards, and will have to be called from the disc. They will be processed in the order in which they are submitted.

SORTSR (Sorted Single Records)

means that accession numbers have been selected by PRESORT from the user file and sorted, or visaversa, and that the records for these numbers are to be called from the disc. (The record locations given on the tape will be for the file from which the numbers were taken, and so cannot be used in the normal way by "SORTED".) An example would be a loan list for which the items on loan would be found from the user file, their numbers would be sorted on the tape, and LISTING would refer to the accession file to find the full bibliographic details of the items.

The input medium is followed by "AFILE" or "UFILE" to define the type of records which are to be processed. This is followed by "NO CALLING", "CALL AFILE" or "CALL UFILE". "NO CALLING" means that the file specified in the previous part is the only file required for the printout. An example of this would be the author index, in which most of the accession data would be printed, but information held on the user file would be irrelevant. "CALL A (or U) FILE" means that the LISTING program will be required to obtain information from the accession (or user) file as well as from the original user (or accession) file.

For a loan list, all the items on loan may be required with their details and details of the borrowers. In this case the accession numbers of items on loan would be taken from the user file and written to tape by PRESORT. They would then be sorted by the standard sort.

LISTING would receive this tape with the control instruction "SORTSR AFILE, CALL UFILE". It would find bibliographic details from the accession file and call the borrower's details from the user file.

The called file should always be different from the calling file; - "SINGLE UFILE, CALL UFILE" would be meaningless.

The final part of the LISTING control card specifies which set of printout control is to be used for each part of the records. Up to 4 sets of printout control are permissible, and these are referred to as 1 - 4. For calling information from the other file, it must be specified what is to be called. For accession records, there may be two user numbers recorded for each copy: the borrower and the waiting list user. It is possible to allocate printout control sets for each of these. Similarly, accession numbers are recorded in a user record for each item on loan. The latter applies when "CALL AFILE" has been specified, and the former for "CALL UFILE".

To allocate a printout control set to calling a particular part of a record it is merely necessary to associate the number of the set with that part. The codes for the parts are "ACCN" for accession records recorded as loans on the user file, and "BORR" & "WTNG" for the borrower and waiting list user respectively. "1=BORR" would mean call the borrower's user record for each copy of every item in turn and print it out using the first printout set. The computer looks for the first number in column 25 of the card. It will printout the main record with each of the printout sets in turn prior to the number specified there. It will then look for another number in column 32. It will call the record from the other file for the first copy or item on loan and print it out using each printout, starting with the first number and stopping before the second one. This will be repeated for each copy or item. The computer will repeat this for all the calls. It is then possible to have the original record printed on its own, by using "ENDD" as the code in place of the calling code (e.g. BORR). This will be clarified below in an example.

In some cases it may be desirable to have a second record of what has been printed out. For example, if renewal notices have been sent to each user, the librarian will probably want a record of what was sent and to whom. This can be done by specifying the last printout as "NEW", which will cause the computer to record a copy of each of the main entries on tape. When the printing out of all the records is complete the computer will go through all the records on tape and print them out according to the last printout set. This is the only one of the codes which is relevant for a "NO CALLING" request; any others would cause an error, "1=NEW" would also cause an error, since this means that there is no main printout.

The card format is as follows:-

Columns	Contents		
1 - 6	SORTED	tape of sorted keys and record locations	
	NO SRT	take each entry in turn from the disc file	
	RFORMD	tape of selected complete records	
	SINGLE	single records specified on cards	
	SORTSR	tape of sorted accession or user numbers to be treated as single records.	
8 - 12	AFILE or UFILE to specify accession or user input		
13	comma		
14 - 23	NO CALLING	- records to be printed without reference to the other file	
	CALL AFILE	- find accession details for loans	
	CALL UFILE	- find borrower and/or waiting list user details from user file.	
25 - 31, 32 - 37, 39 - 44, 46 - 50	Up to 4 sets of "n=XXXX" where n is the number of the printout set to be used first for XXXX, and XXXX is one of:		
	BORR	borrower	) for each copy of an item.
	WTNG	waiting list user	) for each copy of an item.
	ACCN	accession record - for each loan to a user.	
	ENDD	an ending to the printing of the record	
	NEW	set up a new printout of the record	

c) Line Spacing between Printouts

In "Control Cards for ARRAA", (b) Printout Control Cards, it was explained that each printout control set was preceded by a card giving the number of lines to be left blank after printing out a record with that set. However, a problem arises when one set is used several times; for example, to write out the details of each copy on loan. In such cases the rule is that the number of lines specified on the card is only used for the last time, (i.e., before the next set is printed) and one blank line is left between each repetition of the set. This will be seen more clearly in the next section which includes examples.

d) Examples of Use of the Listing Control Card

The following examples show only the use of listing control cards. For examples of the printout formats see the earlier section, "Effect of Printout Instructions".

For each case consider up to four relevant printout control sets, the first of which specifies that four blank lines are to be left after printing; the second, two; the third, none; and the fourth, three.

NO SRT AFILE,NO CALLING

"NO SRT" means that the computer would go through the whole of the "A (accession) FILE" using each record in turn for each of the printout sets. "NO CALLING" means that there will be no need in the printout sets to refer to the user file. If there was only one printout set, the result of this instruction would be to print out each record on the accession file in accession number order according to the format given in the set, and the printing of a record would be spaced four blank lines from the one above. If all four sets were specified, each record would be printed according to the first one, there would be four blank lines, the record would then be printed again according to the second set, followed by two blank lines, again according to the third set and then immediately the fourth set. Three blank lines would be left before this was repeated for the next record.

RFORMD UFILE,CALL AFILE 1=ACCN,2=ENDD,3=NEW

"RFORMD" means that the records to be printed are to be input on tape. They will have been selected in some way by the PRESORT program from the "U (user) FILE", but as they have not been sorted, they are written in a complete form so that there will be no need to refer to the user file for the complete entry. "CALL AFILE" indicates that at some point it will be necessary to refer to the accession file for data. The final three codes mean that the first printout set is to be used once for each item on loan (taking the accession details from the record in the accession file). Then the entry is to be ended with data merely from the user record. In addition a copy of the user record is to be kept and processed for a separate list at the end according to printout set 3. The result would be as follows. For the first loan to the user, the computer would call the record for that accession number from the accession file. This would be printed out according to printout control set 1. The same would be done for all the other items on loan, leaving 1 blank line between each printout. After all the loans have been printed four blank lines will be left before the computer prints out the user according to the second printout set. Two blank lines will be left before the next record is printed. At the same time the computer will print out the user in a separate list according to the third printout set. This extra list will be produced after listing all the user records according to sets 1 and 2; and no lines will be left between entries.

SORTED AFILE,CALL UFILE 2=BORR,4=ENDD

"SORTED" means that the input will be a sorted file of record locations on magnetic tape. They will have been selected by PRESORT and sorted by the standard sort. The remaining codes indicate that the accession record is to be printed by set 1, then the borrower by set 2 and then 3, and finally the accession record is to be printed again according to set 4. The result would be that the computer would call the accession record in the location given on the input tape. This would be printed according to the first printout set, followed by the four blank lines specified (see introduction to this section). The details of each borrower would then be called in turn from the user file and printed. The format for this would be firstly according to set 2, then two blank lines and the record would be printed again according to the third set. One blank line would be left before this was repeated for the next borrower. After all the borrowers were written, no blank lines are left before the computer prints the accession record again according to the fourth printout set.

ERRORS FROM LISTING

See also "Errors from ARRAA" for details of the error messages produced by the ARRAA subroutine. The following messages produced by the READAR subroutine will also be found in that section.

NUMBER OF PRINTOUTS (nn) TOO LARGE
TOO MANY PRINTOUT CONTROL CARDS - ONLY 20 ALLOWED
TOO MANY LITERAL DATA ENTRIES - ONLY 9 INCLUDED

The computer will printout the listing control card before the data from ARRAA. It is written according to the format:-

LISTING CONTROL CARD IS no srt ufile, no calling.

The following error messages are produced by LISTING.

a) Errors for NO CALLING

FORMAT ERROR IN CONTROL CARD

One of the letters in the first code is wrong (e.g. REFORM for RFORMD), or the file specified is not an "A" or "U" file, or "NO CALLING" has not been correctly specified.

FOR A NO CALLING REQUEST ONLY 'NEW' IS PERMISSIBLE AS A PRINTOUT ALLOCATION AND ONLY FOR A SET BETWEEN 2 & 4

There is a 1 in column 25 of the control card, or something other than NEW has been specified. Only "NEW" is meaningful for a listing which does not call the other file, but "1=NEW" would mean that there was no original listing, only the NEW one.

USER RECORD FOR uuuu NOT FOUND ON USER FILE

or

ACCESSION RECORD FOR aaaaaa NOT FOUND ON ACCESSION FILE

For single records ("SINGLE") or sorted single records ("SORTSR"), the accession or user number given has not been found on the accession or user file.

b) Errors when "CALL A (or U) FILE" is Specified

FORMAT ERROR IN THE FIRST 8 CHARACTERS OF CONTROL CARD
PROGRAM HAS BEEN CANCELLED

One of the first 8 characters of the control card is wrong. Either the file specified is not an "A" or "U", or the first six letter code specifying the input medium has been incorrectly spelled.

CALLED FILE IS THE SAME AS THE CALLING FILE
PROGRAM HAS BEEN CANCELLED

The allocation of printout formats is not legal. For example, four codes have been specified for "CALL AFILE". (There is only one possible set of four codes - BORR, WTNG, ENDD & NEW - and this is for "CALL UFILE".) Alternatively, "CALL UFILE" has been specified with "ACCN". The message will also be printed if the "F" of "CALL A (or U) FILE" is incorrect.

THERE IS A FORMAT ERROR IN ONE OF THE PRINTOUT FORMATS
PROGRAM HAS BEEN CANCELLED

One of the codes for the printout allocations is not identifiable (e.g. WAIT for WTNG).

ACCESSION RECORD FOR aaaaaa NOT FOUND ON ACCESSION FILE

or

USER RECORD FOR uuuu NOT FOUND ON USER FILE

For single records (SINGLE) or sorted single records (SORTSR), the accession or user number given has not been found on the appropriate file.

NO BOOKS ON LOAN

For a "CALL AFILE" request it is impossible to access the accession file for items on loan, as there are no items recorded as being on loan.

NO COPIES OF THIS ITEM ARE ON LOAN

For a "CALL UFILE" request no copies are on loan, so it is not possible to refer to the user file for borrower or waiting user details.

USER uuuu NOT FOUND ON USER FILE

ITEM aaaaaa NOT FOUND ON ACCESSION FILE

The item or user to be called from the record being processed has not been found on the appropriate file. This will only occur if there has been an error in previous entries.

PRESORT PROGRAM

GENERAL DESCRIPTION

The PRESORT program selects the records to be printed out by the LISTING program and arranges them on a magnetic tape. This may merely involve copying a block of records from one of the files in its original order, or it may mean selecting certain records to be sorted before input to LISTING. For the former the records are written to the tape complete, but for the latter only the part by which the record is to be sorted and the location key (e.g. the author and the position of the record within the file). The tape is then sorted by a standard utility sort on the computer (LSORT). In some cases it may be necessary to set up more than one entry for the record. For example, there would be one entry for each author of an item on the accession file, but the PRESORT program automatically arranges this.

STORAGE & INPUT REQUIRED

The accession and user files, and the accession and user file indexes should be on data set reference numbers 4, 5, 11 & 12 respectively. One tape is required for output, and this should be on data set reference number 10. The card reader is on 1 and the line printer on 3.

The PRESORT program requires only one control card, and will then take the appropriate data from the accession or user disc file. No card is required to terminate the data. In one case the data for the control card continues onto a second card, but this is explained below.

CONTROL CARD FOR PRESORT

Only one control card is normally required for PRESORT and this defines the type of records to be selected, and whether a sort will be required (e.g. sort by author). If the records are to be sorted, only the sort key and the location of the record in the file will be entered on the magnetic tape, but if no sort is required (certain records are merely to be selected in their original sequence), then complete records are copied onto the tape.

a) Format of PRESORT Control Card

```
ACCNFILE SØRT aaaa
USERFILE SELECT bbbb, SØRT aaaa
                      SELECT cccc, SORT aaaa

dddddd
```

The entry may be terminated after the 1st, 2nd or 3rd request.

aaaa specifies the sort key, and is one of the following codes:-

Accession Data

UDC1	first UDC number
UDCN	both UDC numbers
DATE	publication date
NØS1-4	statistic 1 - 4
AUTH	authors
PUBR	publisher
CØPY	number of copies
LDTE	loan date

User Data

ZUSR	user's name
ZDPT	user's department
ZNØ1-4	user statistic 1 - 4
ZACN	accession numbers of items on loan.

bbbb is one of the following codes:-

AF x Accession file
UF x User file

x = a letter. It is the first character of the accession or user number by which items are to be selected.

PPPP a permanent loan
NØ P not permanent loan

only a permanent loan (or non-permanent loan) will be selected (as specified). Only relevant after sort LDTE or ZACN, or for the unsorted user file.

x(GT greater than) / x(EQ equal to) / x(LS less than) the value specified on the next card (a five figure number, ddddd). "x" is a number (1 - 8) which defines the number of a statistic (1 - 4), or for users 5 = the number of loans to the user. For accession records 5 = the number of authors, 6 the number of title characters, 7 the publisher characters and 8 is the number of copies of the item. The record will only be selected if the appropriate number (x) is related in the way specified to the number given (ddddd). (See page 38 for these numbers and the use of the statistics.)

cccc is one of the following codes:-

PPPP
NO P as for bbbb above.

**** with classification star
NO * without classification star

Records with or without a classification star (as specified) will be selected. These apply to the accession file only.

x GT (EQ or LS) as for bbbb above.

ddddd is a five figure number for "x GT", "x EQ", and "x LS", as specified in bbbb above.

The first 8 characters of the PRESORT control card specify the input as the accession ("ACCNFILE") or user ("USERFILE") disc file. The card then specifies up to three "requests". The "select" requests must appear first if used, and there may be none, one or two. After that there may be a "sort" request.

b) Select Requests

The select requests allow the computer to select certain records from the disc file. There are four selection criteria. Firstly, a section of the file may be required, the section being defined by having a particular letter as the first character of the accession or user number. (See page 4 for Details of the Files, "Composition of Accession Records", (a) Accession Numbers). This is done by use of "AF x", or "UF x" for the accession and user files respectively, where x is the letter to be found. For example, "SELECT AF N" would make the computer select all those records with an "N" as the first character of the accession number, and these would be kept for further processing. This instruction must be the first request.

Secondly, it is possible to select items which are on permanent or normal loan. This is done by the instruction "SELECT PPPP" or "SELECT NO P". Some copies of an item may be on permanent loan and others not, so they can only be separated when copies are to be sorted individually (i.e. with "SORT LDTE"). In this case the program would select only permanent or normal loans as specified and sort them by the date of issue. Similarly, users may have items on both permanent and normal loan, in which case the program can select one type only if it is to sort the loans individually (i.e. with "SORT ZACN"). These select instructions will otherwise be irrelevant, except that for producing recall letters it may be necessary to exclude permanent loans (or visa versa). To do this, entries from the user file would be written to tape complete. The instruction "SELECT NO P" would then cause the program to omit all users without items on normal loan, and all the permanent loans recorded to the remainder of the users would be deleted from their records on the tape. The permanent files will not be affected in any way. A similar deletion of normal loans would occur for "SELECT PPPP".

The third selection is by the classification star (see Details of the Files, Page 4, "Composition of Accession Records", (b) UDC Number, Publication Date & Classification Star). By specifying "SELECT ****" or "SELECT NØ *" it is possible to obtain a selection of records all of which either have, or do not have, a classification star. This only applies to the accession file, as user records do not have classification stars.

The final selection criteria are the value of statistics. The statistic is defined by its number (see Details of the Files, "Composition of Accession Records"., (c) Statistics), which may be from 1 to 4. In addition, the number 5 for the user file means that the number of items on loan to the user is to be considered as a statistic. For the accession file 5 means that the number of authors is to be taken, 6 that the number of characters in the title is to be taken, 7 the number of characters in the publisher and 8 the number of copies of the item. The value of the appropriate statistic (or other number) for each record will be compared to the number given in the first 5 columns of the next card (ddddd). The criterion for selection is that the statistic is in the relationship with the number that is shown by the code - "GT" = greater than, "EQ" = equal to, and "LS" = less than. For example, "SELECT 3 EQ" with the next card beginning "00014" would require the computer to include only those records for which the third statistic was equal to 14.

"ACCNFILE SELECT 5 GT" followed by "0001" would select only those accession records with two or more authors.

If there are two select requests, the first one must be "AF x" or "UF x". Two select requests from the last three catagories are not permissible and the second one would over write the first and cancel it.

c) Sort Requests

A sort request is used when the complete file or selected records are to be sorted. Instead of copying complete records from the disc file onto the tape, a sort request arranges for only the part which is to be sorted, to be transferred, together with the original location of the record on the disc. The tape will be sorted by a standard sort of the computer installation (LSORT) and LISTING will then go through the sorted tape and call each record from its location in the permanent file. In some cases more than one entry may be made on the tape for a single record on the file, for example, one for each author. These sort keys can be printed out by ARRAA using SKEY (Page 61).

The tape entries will be 47 characters long. The first 40 of them contain the sort field, or the sort field followed by blanks; characters 41 - 46 contain the accession number, or 43 - 46 the user number, and the file location is held as the last character.

If "ACCNFILE" is specified, only the "Accession Data" codes in the table in section (a) may be used, and with "USERFILE" the "User Data" codes. The codes themselves are the same as those used for the printout control cards, but some of the latter are not applicable. It is not possible to sort by certain parts of the records as this is either unnecessary or meaningless. No facility has been included to enable the record to be sorted by title, as this will often begin with a word like "A" or "The". For the title a KWIC index program should be used. However, it is possible to sort by publisher, since this field can be used to hold a journal reference if journal articles are to be included in the catalogues. Since the files are already in accession and user number order, there is no need to sort by accession or user numbers. No feature has been included for sorting by borrower (BORR), as this arrangement can more easily be obtained by taking the user file and selecting the users who have items on loan. The instruction would be "USERFILE SELECT 5 GT" with the following card "00000". It is not necessary to sort by the number of loans to a user, his telephone number, the second UDC number or waiting list user number, and it would be meaningless to sort by classification star, or the "P" for permanent loans. If the codes for any of these are used (ACCN, UDC2, STAR, TITL, LETT, WTNG, LØNP, ZUNØ, ZUPH, ZLNS or ZLNP), the computer will give an error message.

When ZUSR, ZDPT or ZNØ1 - ZNØ4 are used, the computer takes the user's name, his department or the appropriate statistic from the user record, and uses it as the sort key, i.e., it is copies into the first characters of the entry on the tape. For ZACN, the computer sets up an entry for each item on loan to that user, with the accession number in each case as the sort key. For CØPY, DATE & NØS1 - NØS4, the computer sets up one entry for each record, with the appropriate part of the record as the sort key. For PUBR the sort key is the first 40 characters of the publisher. UDC1 sets up one entry per record for the first UDC number, and UDCN sets up two, one for each UDC number. AUTH sets up as many entries as there are authors, each with one author as sort key. LDTE sets up an entry for each item which is on loan. The criterion for this is whether there is a number greater than zero for the first number of the year. (e.g. the 6 of 03.05.64).

d) Examples of PRESORT Control Cards

To produce an author index, the control card would simply specify that the accession file is to be sorted by the author. (The LISTING program would be used to actually write out the index, and formats would be specified in it for the ARRAA subroutine.) The card for PRESORT would be:

```
ACCNFILE SORT AUTH
```

This would require the computer to go through the accession file writing a tape of entries consisting of one author and the location of the record from which it was taken. The tape can then be sorted.

To produce renewal letters, all the users who have items on loan are required in user number order. In this case no sort will be required, but the users who have items on loan must be selected. Two cards are needed:

USERFILE SELECT 5 GT
00000

If the letters were only to be sent to those in a given department, for example those with an "H" as the first character of the user number, the cards would be:

USERFILE SELECT UF H,SELECT 5 GT
00000

To produce a publisher index of all text books (text books have no letter for the first character of the accession number, it is always a number), the card would be:

ACCNFILE SELECT AF 0,SØRT PUBR ("0" = Zero, "Ø" is letter O)

To produce a loan list of all non-permanent loans is more complex than at first appears. Such a list would contain all the items on loan in accession number order. However, the accession file is considerably longer than the user file, so it would be time consuming to go through the complete accession file selecting items on loan, and there is no feature for this. Instead the accession numbers of items on loan are selected from the user file and sorted into accession number order. The sorted tape of accession numbers is input to the LISTING program as "SORTSR AFILE". The program will then find each accession record from the accession file in turn. If this was only being done for the selected group of users given above, the control card for PRESORT would be:

USERFILE SELECT UF H,SELECT NØ P,SØRT ZACN

For details of inputting this to the LISTING program, see "Control Cards for Listing, (b) Format for LISTING control card" on page 70.

LSORT PROGRAM

The tape of records output by the PRESORT program may have to be sorted before it is processed by the LISTING program. The program which does this has been called for convenience LSORT, but it is not part of the set of programs written in FORTRAN. On any computer there will be a standard utility sort, and this should be used to sort the tape produced by PRESORT. The tape will consist of a variable number of 102 byte records ending with an end of file mark, and these should be sorted into ascending order beginning with the 9th byte. (The first 8 bytes are set up by the IBM computer on all records as a key for its own use).

ERRORS

If the program runs correctly, the only output is the magnetic tape of records, and a copy of the "SORT REQUEST CARD" (the PRESORT control card). The following messages are produced if there is an error.

FORMAT ERROR IN SORT REQUEST

There is an error in the PRESORT control card. One of the codes cannot be identified, or there is a spelling mistake, or the sort request appears before the end.

ONLY x ENTRIES FOUND. THEY ARE LISTED BELOW
followed by one, two or three records.

The selection requests have eliminated all the entries, or all of them except one or two. Since it is not worth sorting these they have been printed out and the program terminated. "x" gives the number found. This only applies when there are 2 selection requests, and all but 3 entries are eliminated on the first.

THERE IS NO FACILITY FOR SORTING BY THE FIELD REQUESTED

For a sort request, the sort key specified is one which cannot be used. See the last paragraph of "Control Card for PRESORT, (c) Sort Requests", for details.

THE SORT KEY CONFLICTS WITH THE SELECTION KEY. ONLY LDTE & ZACN ARE PERMITTED WITH SELECT PPPP OR NO P

It is normally only meaningful to select permanent or non-permanent loans when sorting by loan date or accession number. For details see "Control Card for PRESORT", (b) Select Records.

If a "SELECT" instruction for one file is followed by a request to sort by a key from the other type of records, the computer will sort the second file using positions selected from the first. For example,

USERFILE SELECT UF D,SORT AUTH

will set up a tape of authors for records found in the positions in the accession file which would be occupied in the user file by users with user numbers beginning with a "D".

SUPPLEMENT

INSTRUCTIONS FOR RUNNING

THE PROGRAMS

AT TAYLOR WOODROW

February 1975

Notes For Running The Taylor Woodrow Library System

1. All runs should be recorded in the diary at the time of running, with details of the library tapes used.

2. The library tapes AFILE & UFILE should be used in pairs (one AFILE and one UFILE tape together). The diary should be consulted to see which pair was the last to be used, and the other pair should be used for the current run. If AFILE2 and UFILE1 were used together on the last run of the FILE program, AFILE1 & UFILE2 should be used for the current run of the FILE program. If there is any possibility that the current tapes or disc files may have been damaged, the other set must NOT be run until this is checked. They may only be used to recreate the files - see 5 below.

3. The programs may be terminated with one of the following messages:

ILF223I	The computer has read a letter where a number ought to be. Check the cards in the area of the program where the the computer stopped. For example, in the ADDTNS program there may be a series of cards listed on the output, which suddenly stop. The following cards should be checked.
ILF239I	The program has been unable to read something. Check with the computer staff to see if something is wrong with the tape or disc drives. Unless FILE, LOANS or STATS was being run at the time, the programs may be rerun. If one of these programs was being run at the time, see below - 4.
ILF219I	/& or /* cards may have been put in the wrong place; this should be checked. It is possible that tape or disc files have been damaged if FILE, LOANS or STATS programs were running at the time of the failure. For these see 4 below, otherwise rerun.

Other messages are printed by the programs themselves, and explanations will be found in the user manual at the end of the appropriate sections.

4. If the program fails during FILE, LOANS or STATS, certain entries may have been entered on the disc already. The procedure to be adopted to correct these is as follows.

LOANS - The loans printed on the output listing have been recorded. Before rerunning, the cards for these loans should be removed. If it is necessary to set up the discs afresh (see 5), all the loans will have to be rerecorded.

STATS - As for LOANS, all the entries listed on the output have been recorded. The same procedure should be adopted.

FILE - If this program fails or is cancelled by the operator, the disc will have been partly set up. If there is nothing wrong with the tapes, the programs would be recreated as described in 5 below. If the program has failed because the tapes were damaged, then the disc files will have to be recreated from the other earlier set of tapes, and all the loans and additions recorded subsequently will have to be entered afresh.

ADDTNS - It should be noted that the ADDTNS program too records changes deletions and substitutions directly on the disc files, so that if this program is rerun these cards should be removed. The new entries set up on the tape of new additions will not have been entered unless the FILE program has also been run.

5. If the disc files have been damaged or destroyed, they must be recreated from the most recent correct set of tapes, and all the runs recorded in the diary which change the files in any way must be rerun. The output listings from these runs should have been kept. The procedure for recreating the discs is as follows:

   The most recent set of back-up tapes should be run with the FILE program. The data for the program will be as follows:

   ```
   // EXEC
   FILE AFILE
   FILE UFILE
   /*
   /&
   ```

   The run request card for the run is given below. The ring column for the tapes should be left blank, so that nothing can be accidently overwritten on them. This set of tapes is now the most recent copy of the file and should NOT be used for any other purpose until another copy has been produced on the other set of tapes.

...PUTER RU...

J Johnston | Library | Tel 4546 | Identity A014JJ | Date Nov 74

		Number	Ring	Plat	SPECIAL INSTRUCTIONS
Start: FILE					
Start: —	SYSRES				
...ndance in Start: —	LIBRARY				
	PCS / LIB		✓		
—: —					
...ated Run Time: 13					
	AFILE (1 or 2)				
...al Run Time	UFILE (1 or 2)				Charge To: Library

6. When running the ADDTNS set of programs, the MERGE program should be consulted before the new book and user cards are put in the boxes with the others, in case any of the new entries have been rejected in the merging process.

THE LOANS PROGRAM

Purpose To record the loan, return, reservation & cancellation of reservations of books.

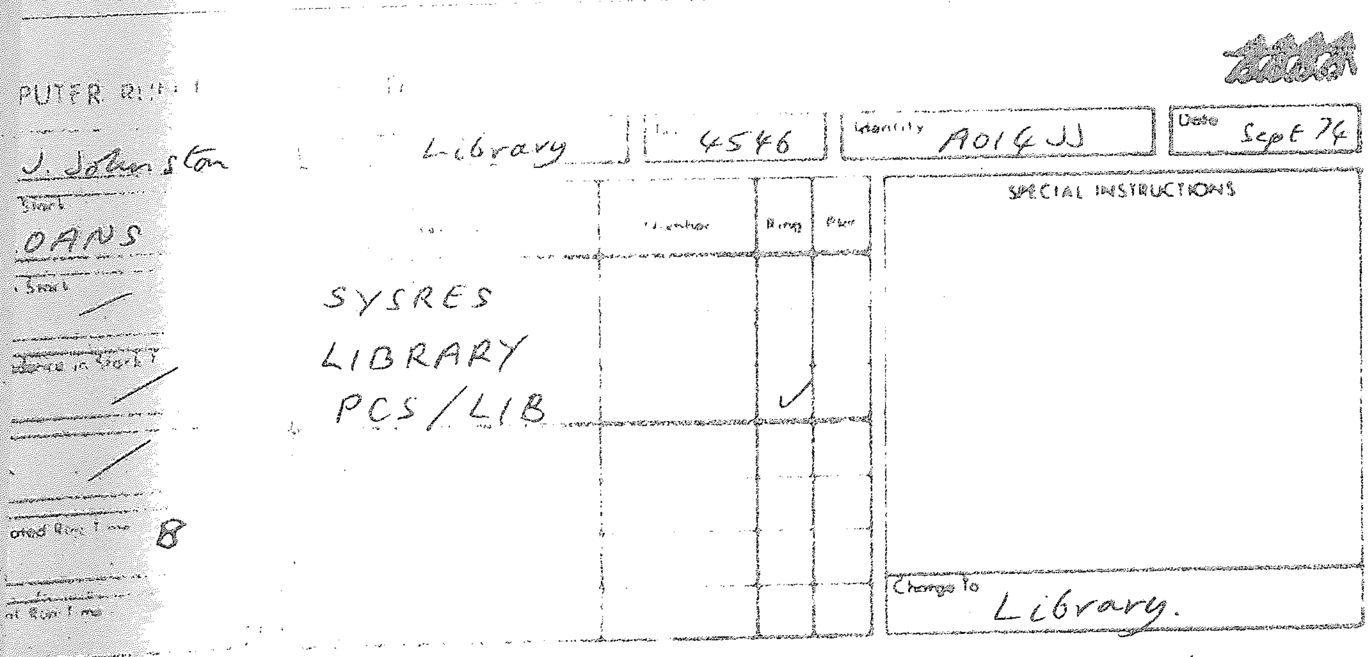
Cards to be submitted to the computer

```
// JOB LOANS 16,A014JJ
// OPTION LINK,LOG,DUMP
   INCLUDE #LOANS
   INCLUDE #KAA
   INCLUDE #URECRD
   INCLUDE #RECORD
/*
// EXEC LNKEDT
// ASSGN SYS001,X'132'
// ASSGN SYS002,X'132'
// ASSGN SYS008,X'132'
// ASSGN SYS009,X'132'
// DLBL IJSYS01,'ACCESSION FILE',72/001
// EXTENT SYS001,,1,1,2200,720
// DLBL IJSYS02,'USER FILE',72/001
// EXTENT SYS002,,1,1,3000,60
// DLBL IJSYS08,'ACCESSION FILE INDEX',72/001
// EXTENT SYS008,,1,1,2940,20
// DLBL IJSYS09,'USER FILE INDEX',72/001
// EXTENT SYS009,,1,1,3095,5
// EXEC
data for the loans program  -  see page 21 of the user manual.
/&
```

neral
t of
rds in
l programs
scribing
les

Computer Run Request Card

A computer run request card must be submitted with the deck. It should be filled in as shown below.


PUTER RU
J. Johnston
Start
OANS
Start
Library
4546
Identity A014JJ
Date Sept 74
SPECIAL INSTRUCTIONS
Number
Ring
SYSRES
LIBRARY
PCS/LIB
ated Run Time 8
Charge to Library.

THE ADDITIONS PROGRAM

<u>Purpose</u> To add, modify or delete entries on the accession and user files.

<u>Cards to be submitted to the computer</u>

```
// JOB ADDTNS 16,A014JJ
// OPTION LINK,LOG
   INCLUDE #ADDTNS
   INCLUDE #KAA
   INCLUDE #NUMBER
   INCLUDE #RECORD
   INCLUDE #URECRD
// EXEC LNKEDT
// ASSGN SYS003,X'280'
// ASSGN SYS006,X'281'
// ASSGN SYS001,X'132'
   .
   .
   .
// EXTENT SYS009,,1,1,3095,5
// EXEC
74   (year of additions being added)
accession data - additions,deletions,changes & substitutions.
Z
user data - additions, deletions, substitutions
Z
/&
```

General set as for LOANS program (applies to the cards from `// ASSGN SYS001,X'132'` to `// EXTENT SYS009,,1,1,3095,5`)

See p. 13 of user manual for details of data (applies to the data cards from `74` to the final `Z`)

<u>Associated programs</u>

The ADDTNS program will normally be run followed by the ASORT, MERGE & FILE programs. If an accession list of the new additions is required, the LISTING program must be run with the sorted tape as input using the "RFORMD AFILE" option.

<u>Computer Run Request Card</u>

Acomputer run request card must be submitted with the job. For the complete job, as described above with an accession list of the new additions, the following is the form of the card.

OMPUTER ...

Name J Johnston   Library   Tel 4546   Identity A014JJ   Date Sept 74

ADDTNS

LISTING

YES

30

40

	Number	Ring	Pkd
SYSRES			
LIBRARY			
PCS/LIB		✓	
Scrach		✓	
Scrach		✓	
AFILE	010	✓	
UFILE	00C	✓	

SPECIAL INSTRUCTIONS

New paper

Save tapes on 282 & 283

If MERGE, FILE or LISTING fail save tapes on 280 & 281

LISTING requires 124K

Charge to Library

numbers of tapes.

1 per new entry, duplicate etc

tapes on which new accession & user files are

THE ASORT PROGRAM

<u>Purpose</u> To sort a tape of user records and/or a tape of accession records into user number and accession number order and write the sorted records back onto the original tape.

Cards submitted to the computer

```
// JOB ASORT 16,A014JJ
// ASSGN SYS007,X'130'
// DLBL UOUT,,72/001
// EXTENT SYS007,,1,1,1760,720
// EXEC CLRDK
// UCL B=(K=0,D=900),x'00',OY,E=(2314)
// END
/*
// OPTION LINK,LOG
   INCLUDE  ASORT
   INCLUDE  KEYS
   INCLUDE  TAPE
   INCLUDE  JOSORT
/*
// EXEC LNKEDT
// ASSGN SYS002,X'281'
// ASSGN SYS004,X'280'
// ASSGN SYS001,X'130'
// DLBL IJSYS01,,72/001
// EXTENT SYS001,,1,1,1760,720
// EXEC
sort control card
/&
```

Associated Programs

The ASORT program will only normally be run with other programs, though it could be used to sort any tape of accession or user records. It will usually be used to sort the tapes from the ADDTNS program. The sorts specified should correspond with the tapes of new additions prepared by that program - there is no point in sorting a blank tape if no users or no accession entries are being added. For adding items to the files, the ASORT program will be followed by the MERGE & FILE programs.

Possible sort control cards

SORT AFILE	sort the accession file alone
SORT UFILE	sort the user file alone
SORT AFILE & UFILE	sort both the accession and the user files

Computer run request card

The ASORT program will normally only be run with the ADDTNS, MERGE & FILE programs, and one run request card will suffice. The format for this is given in the description of the ADDTNS program.

THE MERGE PROGRAM

Purpose   To merge a tape of accession records with the accession disc file and write the result to a new tape, and/or merge a tape of user records with the user file and write the result to tape.

Cards submitted to the computer

```
// JOB MERGE 16,A014JJ
// OPTION LINK,LOG
   INCLUDE  MERGE
// EXEC LNKEDT
// ASSGN SYS003,X'280'  tape of accession records
// ASSGN SYS006,X'281'  tape of user records
// ASSGN SYS007,X'282'  tape of accession file after merging
// ASSGN SYS010,X'283'  tape of user records after merging
// ASSGN SYS001,X'132'
.
.
.                          General set as for LOANS
.                                            program
// EXTENT SYS009,,1,1,3095,5
// EXEC
merge control card
/&
```

Associated Programs

The MERGE program will normally always be run as part of the additions group: - ADDTNS, ASORT, MERGE & FILE.

Merge control card

The merge control card specifies which of the two files is to be merged. It can be one of the following.

MERGE A	merge tape of accession data and accession file.
MERGE U	merge tape of user data and user file.
MERGE A & U	merge tape of user data and user file, and merge tape of accession dat and accession file.

Computer run request card

The MERGE program will always be run with the ADDTNS program, so the run request card given for ADDTNS will cover the MERGE program.

T H E   F I L E   P R O G R A M

Purpose To set up a new accession and/or user file with the associated indexes. Alternatively it may be used to copy one or both of the files to tape.

Cards submitted to the computer

```
// JOB FILE 16,A014JJ
// OPTION LINK,LOG
   INCLUDE #FILE
   INCLUDE #KAA
   INCLUDE #TODSKA
   INCLUDE #TODSKU
   INCLUDE #TOTPEA
   INCLUDE #TOTPEU
/*
// EXEC LNKEDT
// ASSGN SYS007,X'282'    The accession back-up tape
// ASSGN SYS010,X'283'    to be used should be on unit
                          282 and the user tape on 283.
// ASSGN SYS001,X'132'
.
.                         General set as for LOANS
.
// EXTENT SYS009,,1,1,3095,5
// EXEC
file control cards
/*
/&
```

Associated Programs

The file program can be used on its own, if it is required to produce a tape of all the data held in the files, or if the disc files have been damaged and it is necessary to set them up again from a back-up tape. However, the most common use will be as part of the adding of new additions to the files. In such cases it will follow the ADDTNS, ASORT & MERGE programs.

File control cards

Any number of the following four cards is permissible, and the operations will be exectuted in the order of the cards, though it will be normal to have two cards for each run, one refering to the user file and one to the accession file.

FILE AFILE	set up a new disc accession file from tape
FILE UFILE	set up a new disc user file from tape
DUMP AFILE	copy the accession file to tape.
DUMP UFILE	copy the user file to tape.

Computer run request card

Normally the computer run request card for ADDTNS will cover the FILE program, but if it is to be run on its own, the card will be as follws. The tapes on 282 and 283 should be the accession and user tapes to be used respectively. The time to file or dump both the accession accession and user files is about 13 minutes.

OMPUTER RUN REQUEST CARD

Name J. Johnston | Department Library | Tel. 4546 | Identity A014 JJ | Date Oct 74

First in Stack: FILE

Last in Stack: /

Dependence in Stack?: /

Punch / Cards

Estimated Run Time: 13

Actual Run Time:

Unit	Identity	Number	Ring	Plot
130	SYSRES			
131	LIBRARY			
132	PCS/LIB		✓	
280				
281				
282	AFILE	tape no ...	✓	
283	UFILE	tape no ...	✓	

SPECIAL INSTRUCTIONS

Save tapes AFILE & UFILE

Charge To: Library

T H E   N E W C R D S   P R O G R A M

<u>Purpose</u> To produce a new set of book cards for <u>all</u> the books on the file and/or a set of new user cards for <u>all</u> the users.

<u>Cards to be submitted to the computer</u>

```
// JOB NEWCRDS 16,A014JJ
// OPTION LINK,LOG
   INCLUDE #NEWCRDS
// EXEC LNKEDT
// ASSGN SYS003,X'282'
// ASSGN SYS001,X'132'
// ASSGN SYS002,X'132'
// DLBL IJSYS01,'ACCESSION FILE',72/001
// EXTENT SYS001,,1,1,2200,720
// DLBL IJSYS02,'USER FILE',72/001
// EXTENT SYS002,,1,1,3000,60
// EXEC
(Insert a blank card here if book cards not wanted.)
/&
```

Omit this job if no user cards wanted.

```
// JOB WRTUCRD 16,A014JJ
// ASSGN SYS002,X'282'
// ASSGN SYS001,X'282'
// ASSGN SYS003,X'130'
// DLBL SORTWK1,,72/001
// EXTENT SYS003,,1,1,2720,200
// EXEC SORT
 OPTION PRINT=ALL,LABEL=(U,U)
 SORT FIELDS=(9,50,BI,A),WORK=1,SIZE=500
 RECORD TYPE=F,LENGTH=168
 END
/*
// OPTION LINK,LOG
   INCLUDE #WRTUCRD
/*
// EXEC LNKEDT
// ASSGN SYS003,X'282'
// EXEC
/&
```

<u>Selection of book and user cards</u>

The first job punches all the book cards in accession number order. To suppress this (ie to print only user cards) a blank card should be inserted before the /& as shown. The job then writes the user cards in user number order on magnetic tape. If these are not required (ie only book cards are wanted), the second job should be omitted. The second job sorts the user entries into user name order and punches the user cards.

Computer Run Request Card

The NEWCRDS programs are totally independant of all the other programs and will therefore always be run separately. The run request card will be as follows.

COMPUTER RUN REQUEST CARD

Name J. Johnston | Department Library | Tel. 4546 | Identity A014JJ | Date Oct 7[illegible]

First in Stack: NEWCRDS

Last in Stack: WRTUCRD

Dependence in Stack? YES

Punch 10,000 300 Cards

Estimated Run Time 30 4

Actual Run Time

Unit	Identity	Number	Ring	Plot
130	SYSRES			
131	LIBRARY			
132	PCS/LIB			
280				
281			✓	
282	Scrach			
283				

SPECIAL INSTRUCTIONS

Scrap paper

Charge To Library

f

ed

ok cards.

for user cards only.

THE STATS PROGRAM

Purpose To alter the four statistics of the accession and/or user records. Either all of one statistic throughout one file or individual statistics from either file can be modified (ie incremented by a given value or set to a value).

Cards to be submitted to the computer

```
// JOB STATS 16,A014JJ
// OPTION LINK,LOG
   INCLUDE  STATS
   INCLUDE  KAA
   INCLUDE  RECORD
   INCLUDE  URECRD
// EXEC LNKEDT
// ASSGN SYS001,X'132'
:
:
// EXTENT SYS009,,1,1,3095,5
// EXEC
```

Standard set defining the disc files, as for LOANS

data cards - either 1 card to change the whole file, or a set of one or more cards to change individual records, ending with a card with a "Z" in column 1.

/&

Cards to change the whole file

The following card would set the 4th statistic of every record in the accession file by 27. It is not possible to increase every value as for the individual records. Only one of such a card is permissible for a run.

SET ASTAT 4 TO 0027

The following card would set the value of the first user statistic throughout the file to zero.

SET UFILE 1 TO 0000

If a list of all the old values of the statistic is not required, the control card should be preceded by one saying

WRITE OFF

Cards to change individual statistics

Any number of cards refering to either or both files is permissible, ending with a card with only a Z . A sample of such cards is given below. It is not possible to supress the printing of old values.

AF 000034 3 TO 0059	set the 3rd statistic of accession record 34 to 59.
AF 006743 1 UP 0001	increase the 1st statistic of accession record 6743 by 1.
UF A063 2 TO 1000	set the 2nd statistic of user record A063 to 1000.
UF 0004 4 UP 0023	increment the 4th statistic of user record 23 by23.
Z	end of data

Computer run request card

The STATS program is completely independant of all the other programs, so it will always be run as a separate job with its own run request card, as follows.

COMPUTER RUN REQUEST CARD

Name J. Johnston | Department Library | Tel. 4546 | Identity A014JJ | Date [illegible]

First in Stack: STATS

Last in Stack: /

Dependence in Stack?: /

Punch / Cards

Estimated Run Time: 10

Actual Run Time:

Unit	Identity	Number	Ring	Plot
130	SYSRES			
131	LIBRARY			
132	PCS/LIB		✓	
280				
281				
282				
283				

SPECIAL INSTRUCTIONS

Charge To: Library

THE PRESORT PROGRAM

Purpose To select records from the accession or user file and prepare them for the LSORT or LISTING programs.

Cards submitted to the computer

```
// JOB PRESORT 16,A014JJ
// OPTION LINK,LOG,DUMP
   INCLUDE #PRESORT
   INCLUDE #PREKAA
   INCLUDE #AUTHRS
// EXEC LNKEDT
// ASSGN SYS007,X'280'  -  the output will be on the tape on
                                            unit 280.
// ASSGN SYS001,X'132'  \
:                        }      General set as for LOANS
:                        }                        program.
:                        }
// EXTENT SYS009,,1,1,3095,5 /
// EXEC
presort control card (see below)
/&
```

Associated Programs

The PRESORT program only produces a tape of selected records, so unless this tape is to be kept for some future occasion, it is necessary to process it, and the normal way will be to submit it to the LISTING program to be written out in a specified format. If necessary the tape can first be sorted by the LSORT program. If the tape is to be sorted by LSORT, the presort control card must specify "SORT" followed by the sort key, as described in the user manual. (page 69 - 74)

Presort Control Cards for Standard Cases

(i) Author Index

ACCNFILE SORT AUTH

(ii) UDC Index

ACCNFILE SORT UDCN

(iii) User List (user name order)

USERFILE SORT ZUSR

(iv) Renewal Letters

USERFILE SELECT 5 GT
00000

(v) Loan list

USERFILE SELECT NO P,SORT ZACN (if permanent & non-permanent loans are required omit the select)

N.B. If a special collection only is to be included, a "select" should be inserted after the file type. For example an author index of TW reports (whose accession numbers begin with a "T") would require a presort control card as follows.

ACCNFILE SELECT AF T,SORT AUTH

Computer Run Request Card

The PRESORT program will always be run with the LISTING program, and possibly the LSORT program as well. The LISTING program requires 124K of storage, and this must be specified under special instructions on the card. If carbon copies are required this too should be specified on the card. PRESORT will run for about 2 minutes with selections from the user file, and 7 minutes for all the authors from the whole accession file. LSORT takes similar times. LISTING takes about 8 minutes for small printouts and up to 60 minutes for the complete accession file.

COMPUTER RUN REQUEST CARD

Name J. Johnston | Department Library | Tel 4546 | Identity A014 JJ | Date Oct 74

First in Stack: PRESORT

Last in Stack: LISTING

Dependence in Stack: YES

Punch: /

Estimated Run Time: 70

Actual Run Time:

	Identity	Number	Ring	Plot
	SYSRES			
131	LIBRARY			
132	PCS/LIB			
280	Scrach		✓	
281				
282				
283	Scrach		✓	

SPECIAL INSTRUCTIONS

LISTING requires 124K

New paper.

Charge To: Library

T H E   L S O R T   P R O G R A M

<u>Purpose</u> To sort the tape of sort keys provided by PRESORT.

<u>Cards to be Submitted to the computer</u>

```
// JOB LSORT 16,JOS
// ASSGN SYS002,X'280'
// ASSGN SYS001,X'280'
// ASSGN SYS003,X'130'
// DLBL SORTWK1,,72/001
// EXTENT SYS003,,1,1,1760,1000
// EXEC SORT
 OPTION PRINT=ALL,LABEL=(U,U)
 SORT FIELDS=(9,92,BI,a),WORK=1,SIZE=9500
 RECORD TYPE=F,LENGTH=102
 END
/&
```

<u>Run request card</u>

This program will never be run on its own, so it does not need its own run request card. It will always be run with PRESORT. LSORT merely makes use of the installation's standard sort for sorting a particular type of records on magnetic tape.

THE LISTING PROGRAM

Purpose   To produce all printed output concerned with the accession or user files.

Cards submitted to the computer

```
// JOB LISTING 16,A014JJ
// OPTION LINK,LOG
   INCLUDE #LISTING
   INCLUDE #LSTGKAA
   INCLUDE #CALLNG
   INCLUDE #NONCAL
   INCLUDE #NOCALL
   INCLUDE #CALLA
   INCLUDE #CALLU
   INCLUDE #READAR
   INCLUDE #PRNTAR
   INCLUDE #ARRAA
   INCLUDE #ACCNNO
   INCLUDE #UDCNO
   INCLUDE #DATPUB
   INCLUDE #ARSTATS
   INCLUDE #TITLES
   INCLUDE #AUTHRS
   INCLUDE #PUBLSH
   INCLUDE #ARLOANS
   INCLUDE #BOOKS
   INCLUDE #USTATS
   INCLUDE #NPRINT
   INCLUDE #RECORD
   INCLUDE #URECRD
// EXEC LNKEDT
// ASSGN SYS003,X'283'      the number specified could also be
                            281 or 282, but there must be a
                            "scrach" tape assigned to this unit
                            on the run request card.

// ASSGN SYS007,X'280'      this will be correct for any output
                            from PRESORT & LSORT, and for printing
                            a tape of new accession records from
                            the ADDTNS, ASORT, MERGE, FILE sequence.
                            For printing tapes from other sources,
                            the number given must be that of the
                            unit on which the tape is mounted.

General set    // ASSGN SYS001,X'132"
as for LOANS      :
program.          :
               // EXTENT SYS009,,1,1,
                         3095,5
// EXEC
listing control card - possible formats given below.
data for ARRAA  -  see user manual pages 48 - 51, samples below.
numbers of accession or user numbers required - not often wanted.
/&
```

Associated Programs

The LISTING program may be run on its own, using the complete files or given accession or user numbers. It may be run with a tape from PRESORT or a tape from PRESORT sorted by LSORT. It may be run with a tape of accession or user records from any other source, for example the tape of new accession records produced by ADDTNS and sorted by ASORT.

Sample Listing Control Cards. (See user manual pages 59 - 64)

Type of printout	Format
Accession list (complete)	NO SRT AFILE,NO CALLING
Accession list (new additions)	RFORMD AFILE,NO CALLING
User list (user no order)	NO SRT UFILE,NO CALLING
User list (user name order)	SORTED UFILE,NO CALLING
UDC & Author Index	SORTED AFILE,NO CALLING
Loan list	SORTSR AFILE,CALL UFILE 2=BORR
Recall letters	RFORMD UFILE,CALL AFILE 2=ACCN,3=ENDD,4=NEW

Sample ARRAA Control Sets

(i) Accession list

```
01
02
ACCN
UDCN 00,003
COPY 00,003
XXXX 00,001,021
DATE
XXXX 00,003,012
NOS1
STAR 01
TITL 00,008,500,066
AUTH 01,009,500,066
PUBR 01,009,500,066
0
COPIES   PUBLISHED 19
PURCHASED 19
0
```

(ii) User List (either in user number, or in user name order)

```
01
00
ZUSR
XXXX 00,001,001
ZUNO
XXXX 00,000,001
ZDPT 00,002
ZUPH 00,002
0
(
)
0
```

Sample ARRAA Control sets cont.

(iii) UDC Index

```
01
01
SKEY 00,000,015
AUTH 00,006,020
TITL 00,001,500,022
XXXX 00,003,002,022
DATE 00,000,500,022
ACCN 00,002,006,022
XXXX 00,002,010,022
UDC1 00,002,020,114
0
19
SHELVED AT
0
```

(iv) Author Index

```
01
01
SKEY 00,000,020
TITL 00,002,080, -2
XXXX 00,003,012,025
DATE 00,000,004,118
ACCN 00,004,006,124
0
PUBLISHED 19
0
```

(v) Loan list

```
02
00
ACCN
AUTH 00,002,020
COPY 00,002
XXXX 00,001,006
TITL 00,002,200, -2
XXXX 01,009,010
0
COPIES
ON LOAN TO
0
02
ZUSR 00,015
XXXX 00,001,001
ZUNO
XXXX 00,000,001
ZDPT 00,006
ZUPH 00,002
0
(
)
0
```

Computer run request card

The LISTING program will only be the first one in a set with its own run request card if a printout of a complete file or selected single entries on cards are required. The run request card for this would be as follows.

In any deck in which LISTING is included, it must be specified on the card under "special instructions" that the program requires 124 K of storage, or the program will be to big to run. A run time of 45 minutes should be specified for a complete accession and about 8 mins for a few single entries on cards. If a carbon copy of the printout is required, this too should be specified under "special instructions"

MPUTER RUN ... CARD

...me J. Johnston

Department Library

Tel 4546

Identity A014 JJ

Date Sept 74

...in Stack LISTING

...in Stack /

...endence in Stack? —

...ch / Cards

...mated Run Time ?

...ual Run Time

Identity	Number	Ring	Plat
SYSRES			
LIBRARY			
PCS/LIB			
Scratch			

only if "NEW" specified.

SPECIAL INSTRUCTIONS

LISTING requires 124K

New paper

Charge to Library